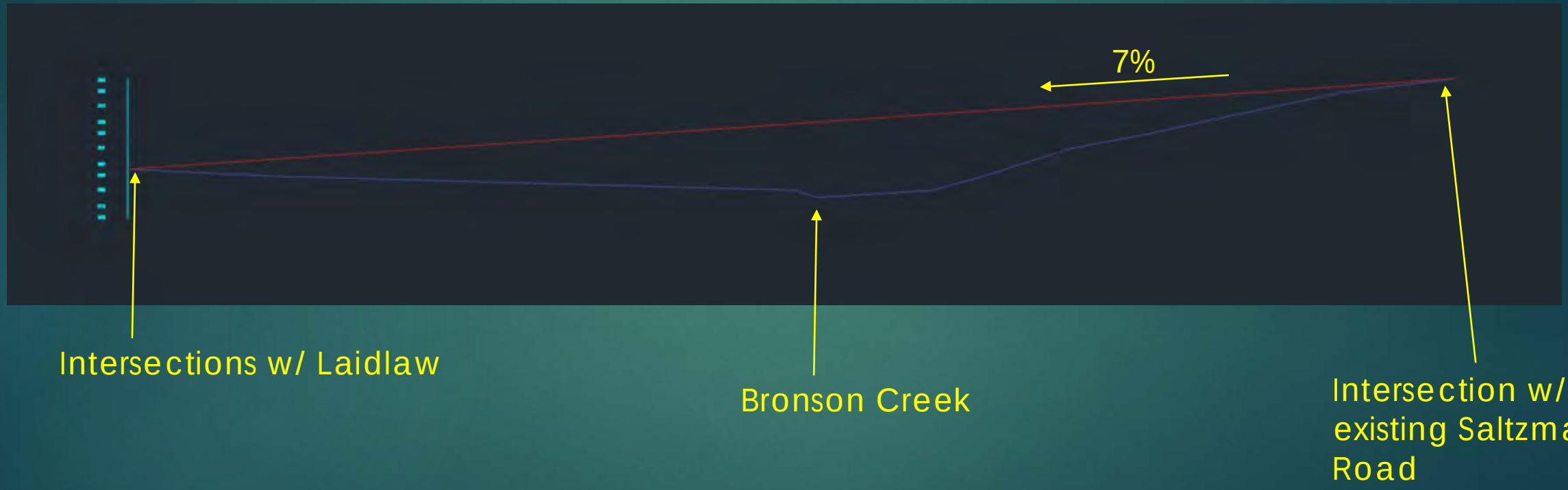
At Grade vs. Buried Bridge for Saltzman Road

- A CONTECH comparison study

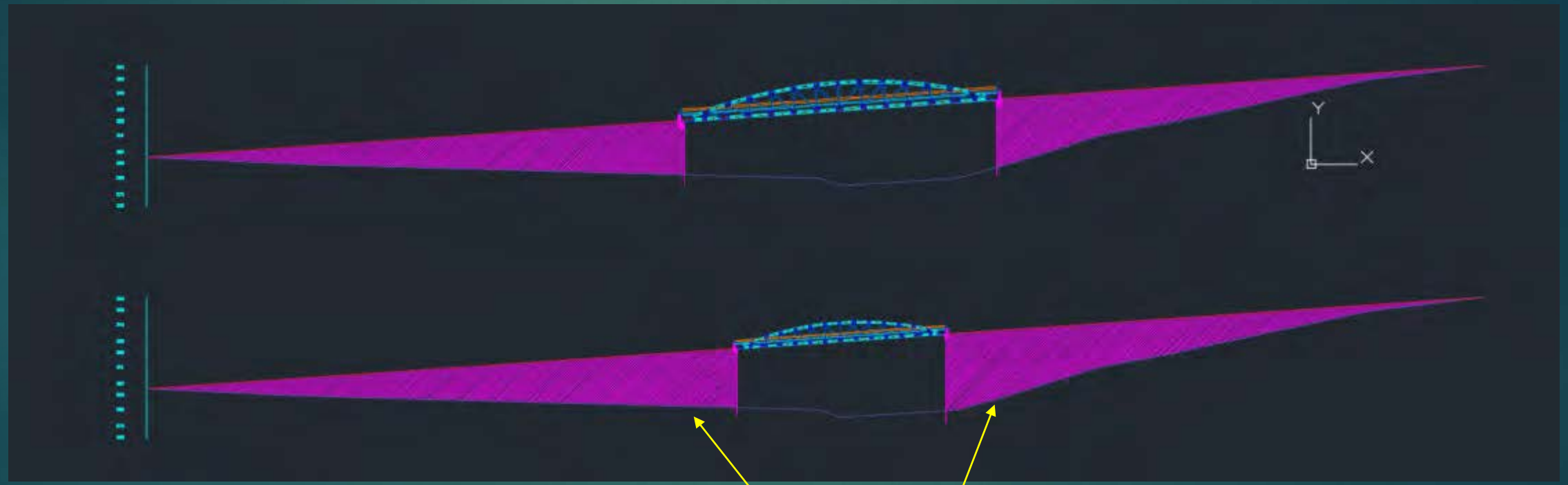
Aligment considered for comparison

Approximate vertical profile from alignment and contour data



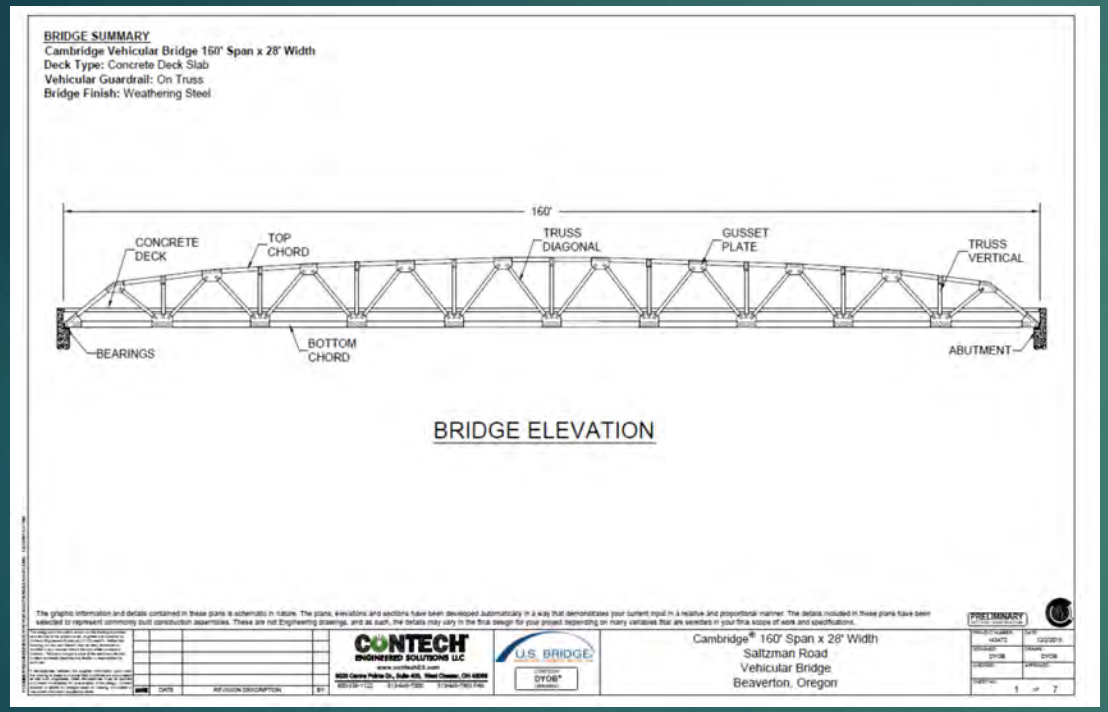
This comparison assumes consistent slope throughout alignment. Actual profile will vary with full design.

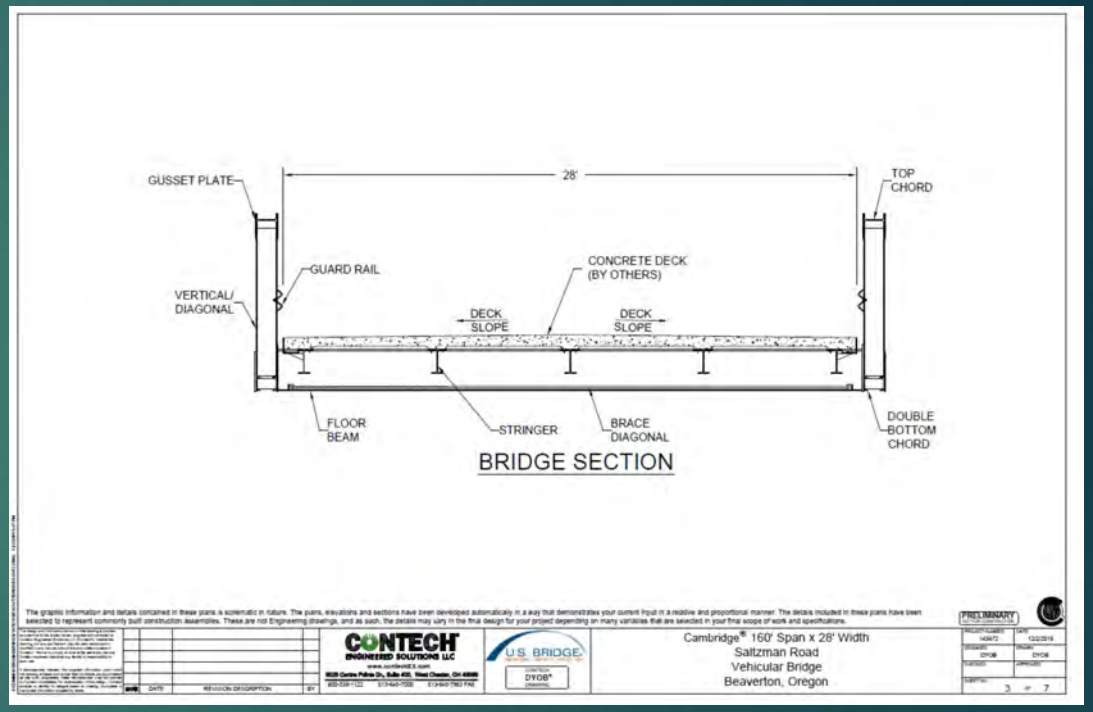
Bridge at Grade Profiles for 225’ and 150’ span centered on Bronson Creek



Fill Placed to create new road way

Sample sketches of Vehicular Truss Bridge





Project Examples:

South Fork Snoqualmie River

King County, Washington

Print Case Study

Roadway Over River

Owner:
USDA Mt. Baker - Snoqualmie National Forest Service Mowat Construction Company

Engineer:
CES Consulting Engineers

Contractor:

Technical Description:
- Width: 26 - ft.
- Span: 126 - ft.
- Style: Custom204
- Finish: Painted Steel
- Decking: Concrete

Installation:
September 25, 2005

A historic bridge built in 1914 needed to be replaced along Forest Service Road 58 in the mountainous region of Snoqualmie Pass. The United States Forest Service wanted a quick installation and a bridge system that could closely resemble the original structure, designated a registered historic bridge for its use on the Yellowstone Trail.

In the first phase of the project, consulting engineer CES completed replacement design type, size & location and a preliminary engineering report for the original 90-foot steel truss bridge. Section 106 historical evaluation, which included a preliminary design of existing truss strengthening, hydraulic analysis and approach roadway realignment design were also part of the scope.

After evaluation, the USFS signed a contract with Mowat Construction for a design-build project that utilized a Contech prefabricated truss system and an innovative retaining wall system with rock anchors for the bridge replacement. The custom bridge was designed as a replica down to every specific detail, including the wood deck. The project was successfully constructed in a two-month window in 2004.

The Cascades

Atlanta, Georgia

Print Case Study

Roadway Over Creek

Owner:
Centex Homes

Engineer:
Planners & Engineers Inc.

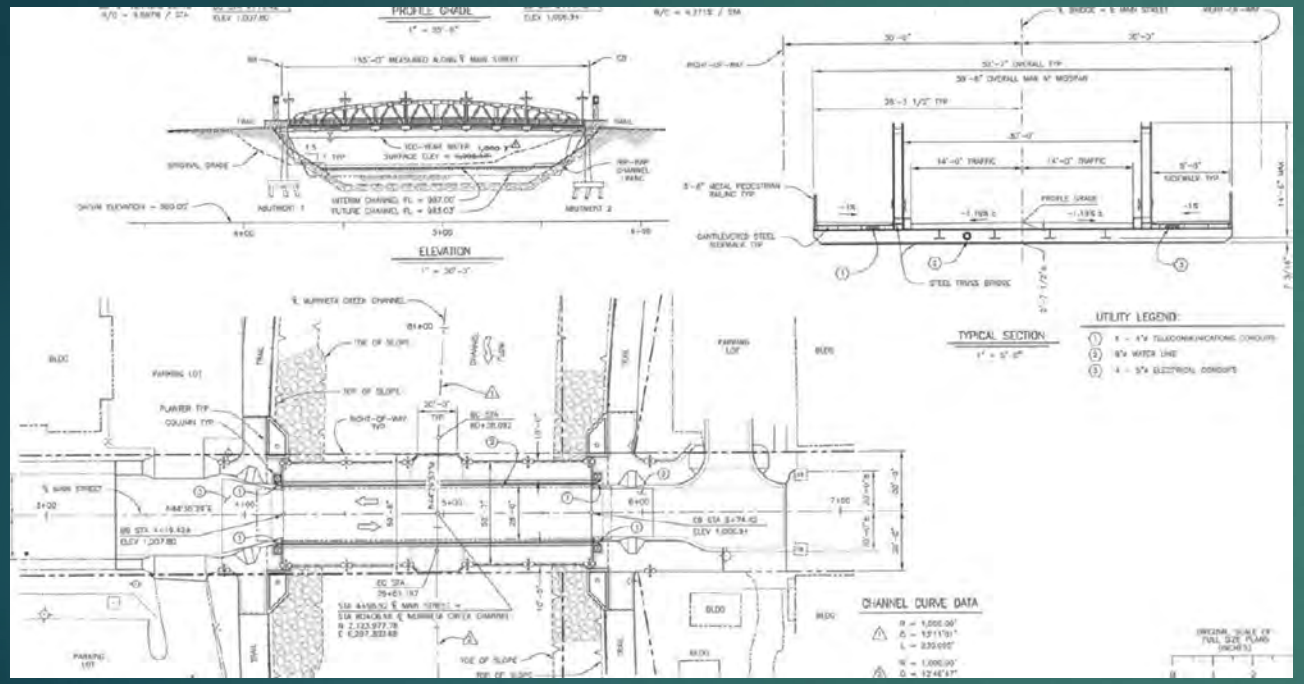
Contractor:
G&R Plant Maintenance

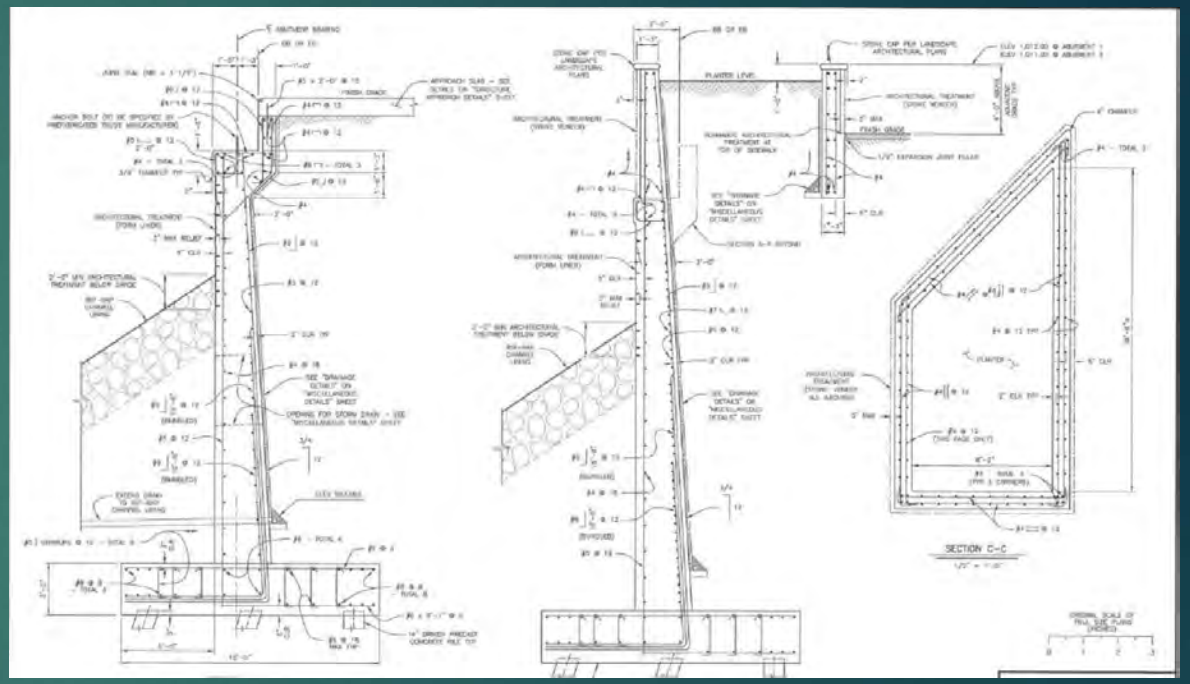
Technical Description:
- Width: 30 - ft.
- Span: 127 - ft.
- Style: Capstone®
- Finish: Painted
- Decking: Concrete asphalt overlay

Installation:
July 2005

When a vehicular bridge was needed to span a creek at the entrance to The Cascades community, Centex contacted Contech Engineered Solutions. Centex Homes chose a Contech Capstone ® painted bridge for the main entryway into the scenic development because of itsaesthetic appeal and the ease of installation. The truss height of the Capstone style varies to allow a low-abutment back wall for improved hydraulic efficiency. This modified bow truss design also allows a constant rail height for an unobstructed view over the top chord. The graceful arc of its top chord is pleasing to the eye and fits the wooded surroundings of The Cascades. "The bridge offers both aesthetic appeal and structural efficiency" said Michael Twiner, President of Planners and Engineers Collaborative. "The design incorporated hydraulic considerations as well as the comfort and enjoyment of residents who would be traveling over the structure on a daily basis"

Sample foundation used for cost estimate:





Installation Sequence:

Truss sections are matched, assembled, bolts torqued

First truss is moved into position

Installation Sequence:

Bearing plates in position, truss is set in place

With first truss secured, the second truss is ready to be set.

Installation Sequence:

With both trusses set and secured onto bearings the first floorbeam is set

Once several floorbeams are installed, structure is stabilized

Installation Sequence:

After all floorbeams have been installed and bolts tightened, stringers are placed.

After all structural steel is installed and tightened to specification the deck is placed. Here we see SIP forms for concrete deck.

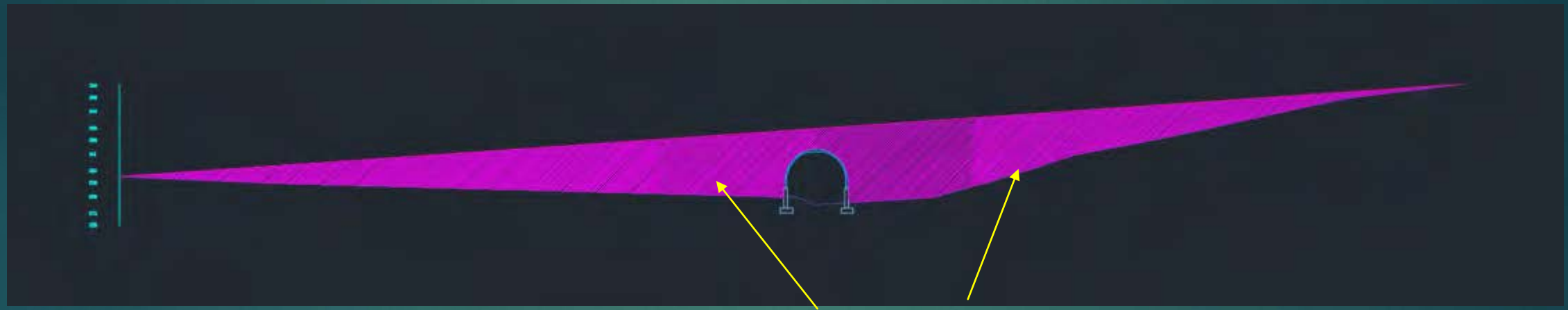
Installation Sequence:

Reinforcement is placed and concrete deck is poured.

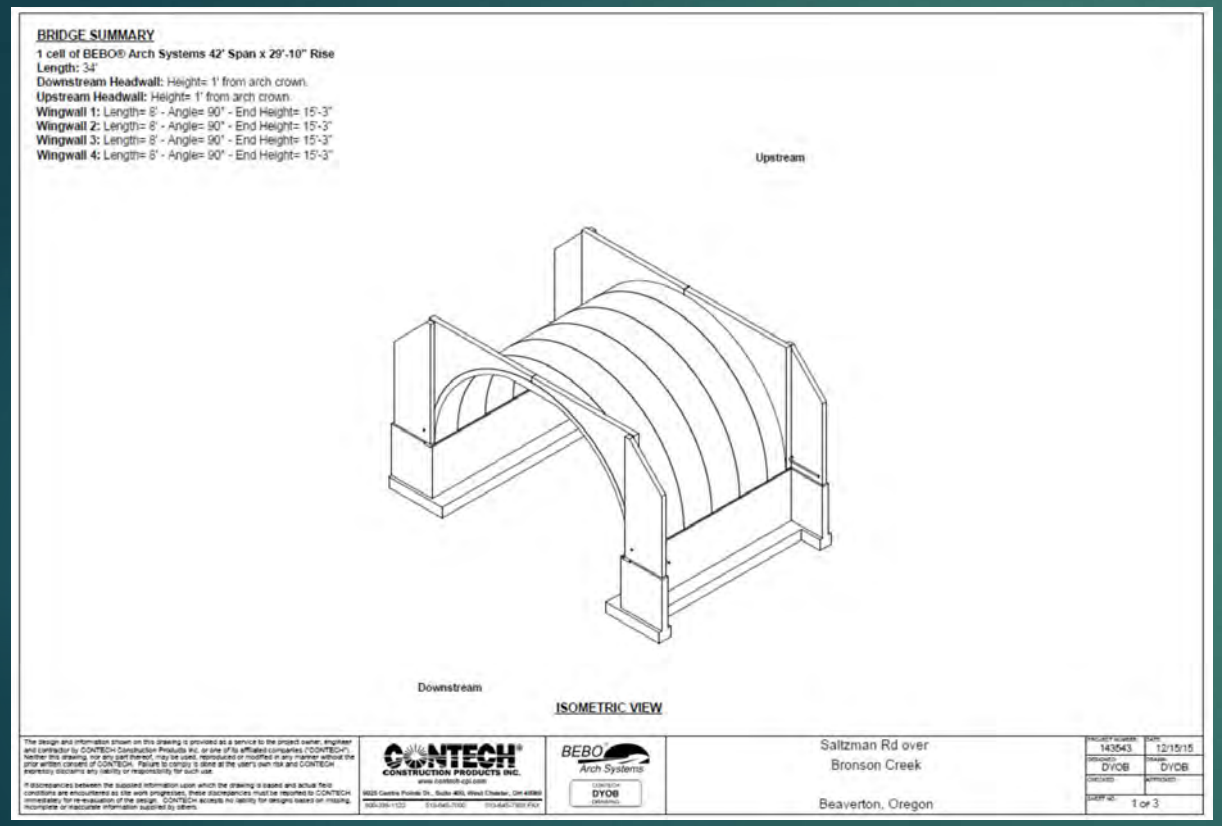
Total time to assemble:
2 weeks

Constructed after road fill is placed and abutments constructed

Buried Bridge Profile for 42’ span centered on Bronson Creek



Sample sketches of Bebo Precast Bridge System



BRIDGE SUMMARY

1 cell of BEBO® Arch Systems 42' Span x 29'-10" Rise
Length: 34'
Downstream Headwall: Height= 1' from arch crown.
Upstream Headwall: Height= 1' from arch crown.
Wingwall 1: Length= 8' - Angle= 90° - End Height= 15'-3"
Wingwall 2: Length= 8' - Angle= 90° - End Height= 15'-3"
Wingwall 3: Length= 8' - Angle= 90° - End Height= 15'-3"
Wingwall 4: Length= 8' - Angle= 90° - End Height= 15'-3"

Upstream

Downstream

ISOMETRIC VIEW

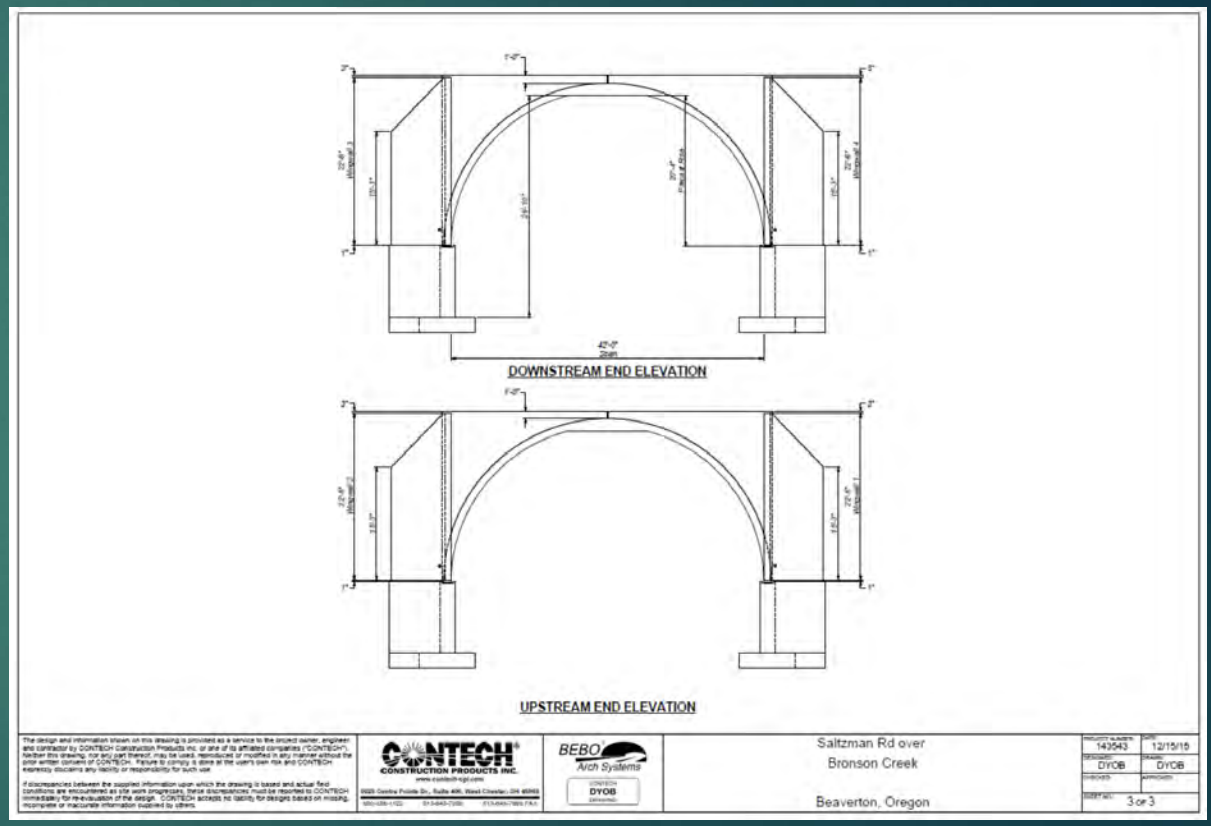
CONTECH CONSTRUCTION PRODUCTS INC.

BEBO Arch Systems

Saltzman Rd over
Bronson Creek

Beaverton, Oregon

143543 | 12/15/15
DYOB | DYOB
1 of 3



DOWNSTREAM END ELEVATION

UPSTREAM END ELEVATION

CONTECH CONSTRUCTION PRODUCTS INC.

BEBO Arch Systems

Saltzman Rd over
Bronson Creek

Beaverton, Oregon

143543 | 12/15/15
DYOB | DYOB
3 of 3

Project Examples:

U.S. 395 Railroad Tunnel

Spokane, Washington

Print Case Study

Railway

Owner:
Washington State Department of Transportation

Engineer:
HDR Engineering

Contractor:
Scarsella Bros.

Technical Description:
- Span: 54-ft.
- Rise: 25.5-ft.
- Length: 1,332-ft.

Installation:
August 2008

The US-395 Corridor Project is an effort to address increasing congestion and improve traffic movement through metropolitan Spokane. As part of the $3.3 billion highway project, the Washington State Department of Transportation (WSDOT) needed a structure to span a Burlington Northern Santa Fe (BNSF) railroad track and support a new stretch of Highway 395 above.

A conventional girder bridge was initially proposed for the project. Typically, when projects of this scope require BNSF involvement and approval, conventional beam bridges are often utilized due to ventilation concerns. BNSF requested a structure with a clearance large enough to accommodate a second railroad track in the future; however, several project factors led WSDOT and consulting engineer HDR to consider other alternatives.

The conventional bridge would have allowed for construction of just one lane of US 395 at a time over the structure. The second lane would have to be constructed at a later date, pushing back project completion time. Additionally, the curve of the railroad tracks and skew of the roadway above would have required a massivesized

I-70 Wildlife Crossing

Sevier County, UT

Print Case Study

Wildlife Crossing

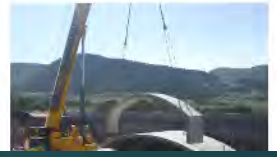
Owner:
Utah Department of Transportation (UDOT)

Engineer:
UDOT, Lochner

Contractor:
Ralph L. Wadsworth Construction

Technical Description:
- Span: 48 ft
- Rise: 11 ft
- Length: 50 ft

Installation:
Fall 2010



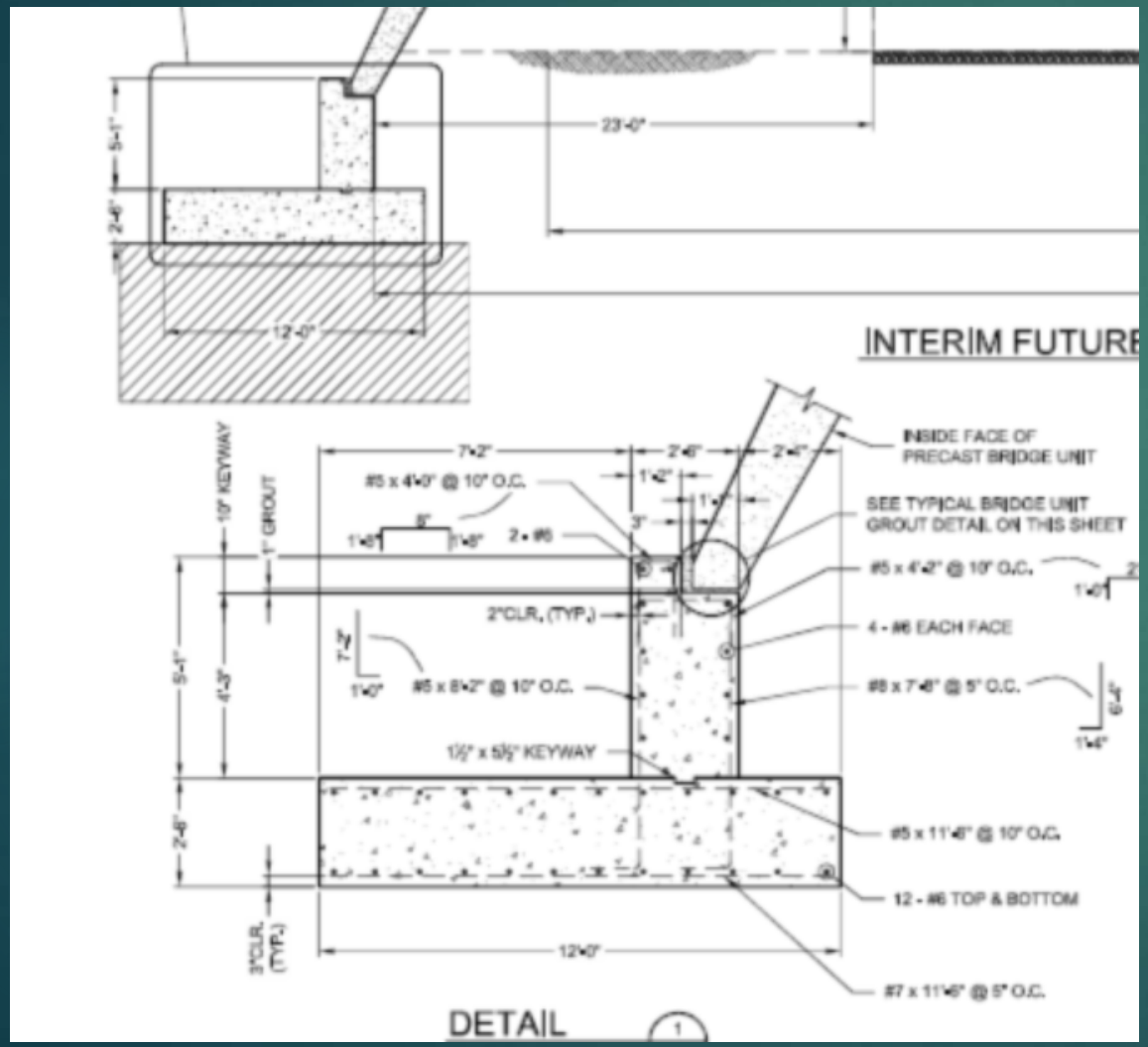
The construction of roadways can sometimes disrupt the natural migration paths for wildlife. To remedy this, wildlife crossings can be constructed above or below roadways to facilitate a safe passage. Structures with wide clear spans and small footprints enable crossing over environmentally sensitive areas with little impact to the environment.

The Utah Department of Transportation (UDOT) needed a structure on I-70 that would provide safe passage for wildlife migrating across the interstate. The project location is approximately 5 miles east of the I-15 junction, just southeast of Cove Fort at the foot of Clear Creek Canyon. The area was carefully examined by UDOT and the Utah Division of Wildlife Resources (UDWR) and was found to be a critical wildlife migration area and concern for motor safety.

UDOT worked with Lochner and Contech to design a structure beneath the existing roadway. The project was on both a tight schedule and budget which required a fast installation and cost efficient structure.

A CON/SPAN® structure from Contech was the chosen solution for the wildlife crossing due to its low cost, ideal aesthetics, wide clear span and small footprint.

Sample foundation used for cost estimate:



Installation Sequence:

Arch Units are shipped to jobsite, picked and rotated to vertical

Rotate Arch Units are set on foundation and matched with companion arch

Installation Sequence:

Arch legs are grouted to foundation and joint sealant is installed

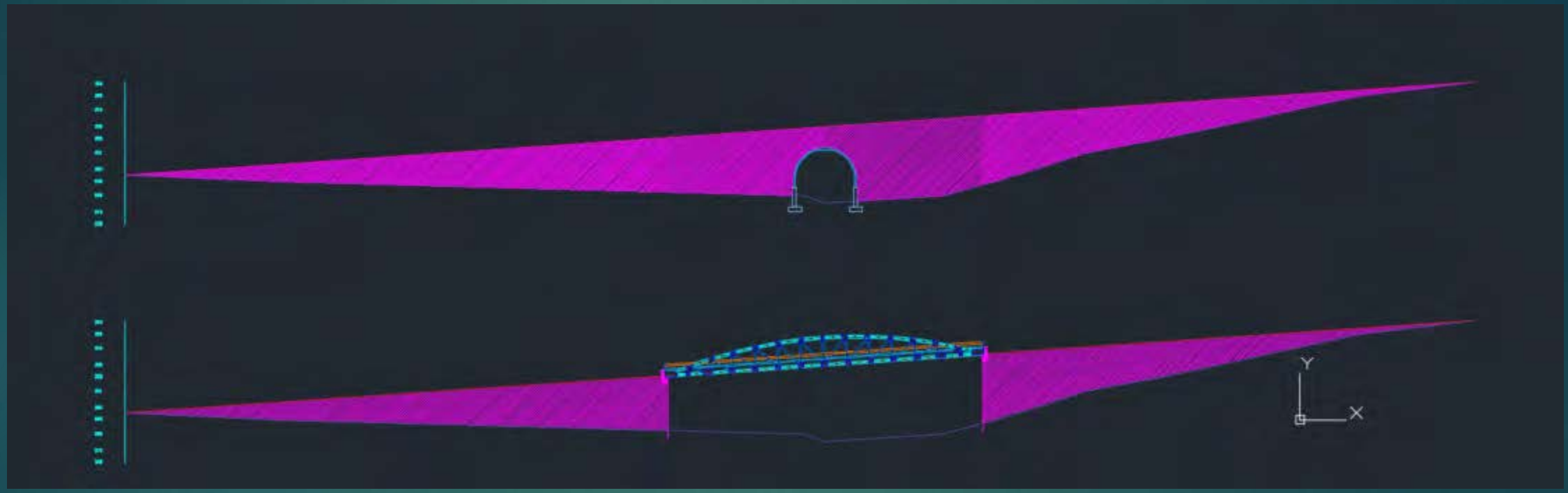
Installation Sequence:

Structure is backfilled and end walls constructed

Total time to assemble:
2 to 3 days

Constructed prior road fill and backfill / road fill is built simultaneously

Profiles for Bridge at Grade 225’ span and 42’ span Buried Bridge centered on Bronson Creek



Installed Cost Comparison Between Options

Vehicular Truss Bridge –

$2.44 M

STRUCTURE						
	Saltzman Rd over Bronson Creek					
TYPE				DATE	3/3/14	
	Vehicular Truss Bridge					
SPAN	225.00	x LENGTH	27.00	= AREA	6075	SF
RISE	43.00	WATERWAY (SF)	9675			

ITEM	CONTRACT ITEMS	UNIT	QUANTITY	PRICE	AMOUNT
1	ABUTMENT FOUNDATION CONCRETE (Installed Price)	CY	250	$750.00	$187,500
2	FURNISH VEHICULAR TRUSS BRIDGE	LF	225	$8,000.00	$1,800,000
3	INSTALLATION OF TRUSS BRIDGE	LS	1	$47,500.00	$47,500
4	ABUTMENT STRUCTURE BACKFILL (CBZ)	CY	700	$25.00	$17,500
5	PILE REINFORCING FOR FOUNDATIONS	LS	1	$20,000.00	$20,000

SUB TOTAL	$2,072,500
MOBILIZATION (10%)	$207,250
SUB TOTAL BRIDGE ITEMS	$2,279,750
CONTINGENCIES (7%)	$159,583
BRIDGE ($ 90,346 / LF)	$2,439,333
GRAND TOTAL	$2,439,333
FOR BUDGET PURPOSES ONLY - SAY	$2,439,000
COMMENTS	$ 90,346 / SF

Installed Cost Comparison Between Options

Bebo Precast Arch –

$1.67 M

STRUCTURE						
	Saltzman Rd over Bronson Creek					
TYPE				DATE	3/3/14	
	BEBO					
SPAN	42.00	x LENGTH	32.00	= AREA	1344	SF
RISE	36.00	WATERWAY (SF)	1346			

ITEM	CONTRACT ITEMS	UNIT	QUANTITY	PRICE	AMOUNT
1	FOUNDATION CONCRETE (Installed Price)	CY	120	$750.00	$90,000
2	FURNISH C/S O-Series Structure	LF	32	$13,281.25	$425,000
3	INSTALLATION OF BEBO	LF	32	$400.00	$12,800
4	STRUCTURE BACKFILL (CBZ)	CY	657	$25.00	$16,415
5	PILE REINFORCING FOR FOUNDATIONS	LS	1	$20,000.00	$20,000
6	ADDITIONAL FILL INSIDE OF 'TRUSS ENVELOPE'*	CY	7,100	$25.00	$177,500
7	ADDITIONAL WALL REQUIRED INSIDE OF 'TRUSS ENVELOPE'	SF	15,000	$45.00	$675,000
	*compared to 225' span truss				

SUB TOTAL	$1,416,715
MOBILIZATION (10%)	$141,671
SUB TOTAL BRIDGE ITEMS	$1,558,386
CONTINGENCIES (7%)	$109,087
BRIDGE ($ 52,109 / LF)	$1,667,473
GRAND TOTAL	$1,667,473
FOR BUDGET PURPOSES ONLY - SAY	$1,667,000
COMMENTS $ 52,109 / SF	

Summary -

- **Both options can be suitable for this site. Final dimensions and layout will impact the difference in the cost estimates**
- **Both options follow FHWA's Accelerated Bridge Construction guidelines**
- **Both options can be enhanced to achieve a desired aestetic**
- **Buried bridges are often less expensive than bridges at grade**
- **Buried bridges typically install faster than bridges at grade**

Disclaimer -

- **CONTECH Engineered Solutions LLC is a manufacturer of bridge structures and is not licensed as a Consulting Engineering Firm in the State of Oregon**
- **CONTECH's technical support is available to aid the Engineer of Record for this project, in no way should this exercise be construed as a design or final solution. Dimensions will likely change in the design process**
- **The alignment and contours were provided by BNC for CONTECH's use in demonstrating potential options available by CONTECH**
- **All cost figures are estimates and in no way constitute firm bid pricing. Bid pricing is available once final quantities are determined by EOR or bidding contractor**
- **Other items associated with this project including but not limited to design, permitting, geotechnical investigation, construction of road fill, storm water treatment, right of way acquisition, paving, retaining walls for fills, and other are not included in the estimates provided by CONTECH**