

# Marquette Trail Design

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# Team Members



**Project Manager**

Max Abbott  
Environmental



**Technology Service**

Ben Witzig  
Transportation  
Water Resource



**Report Graphics  
Production**

Shimin Xu  
Civil Practice



**Report Text Production**

Mason Welter  
Civil Practice

# Outline



Project Objective



Design Elements



Project Costs



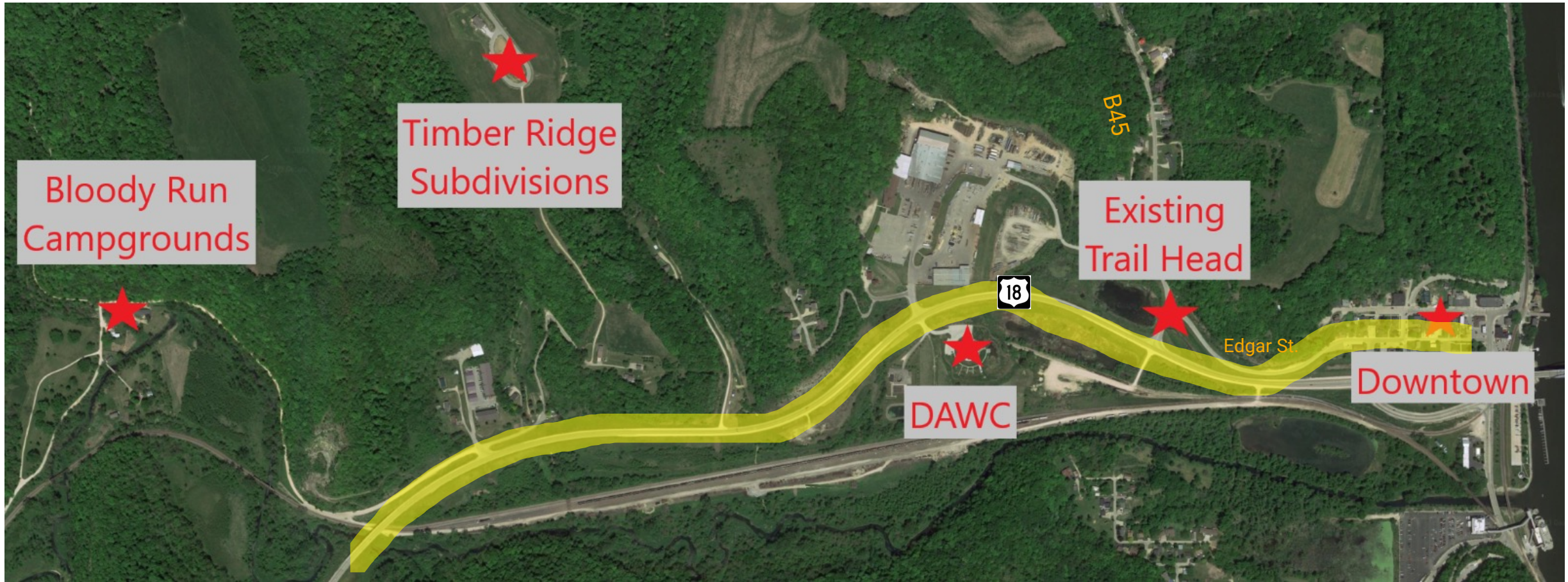
Conclusion/Recommendations



Questions



# Project Objective





# Highway Crossing



1



2



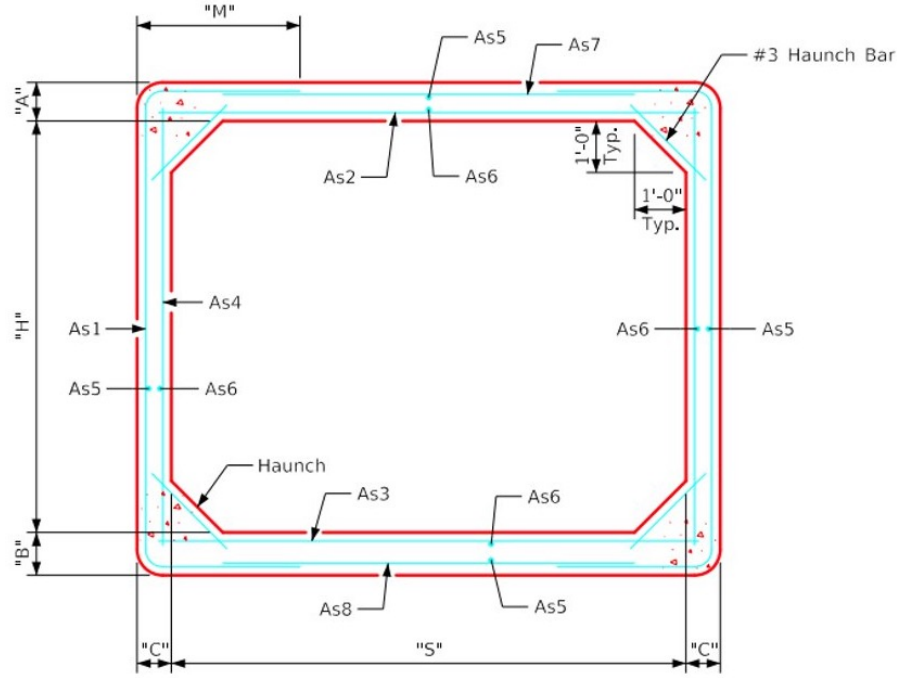
3



# New Underpass Design

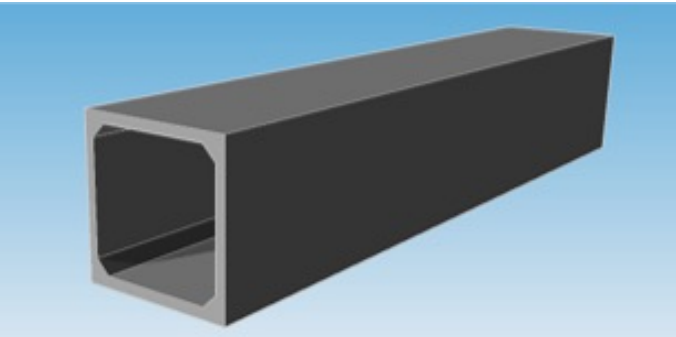


Dimensions							
Size	f'c (KSI)	Fill (FT)	S (IN)	H (FT)	A (IN)	B (IN)	C (IN)
10'x10'	5	2-11	10	10	9	10	8

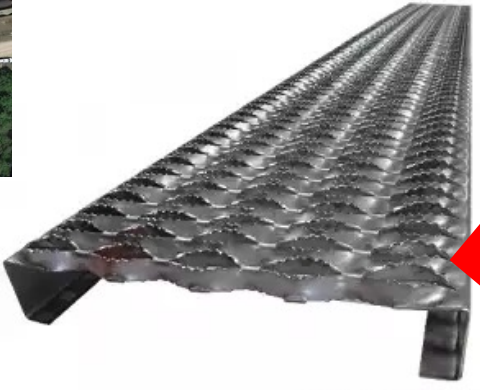
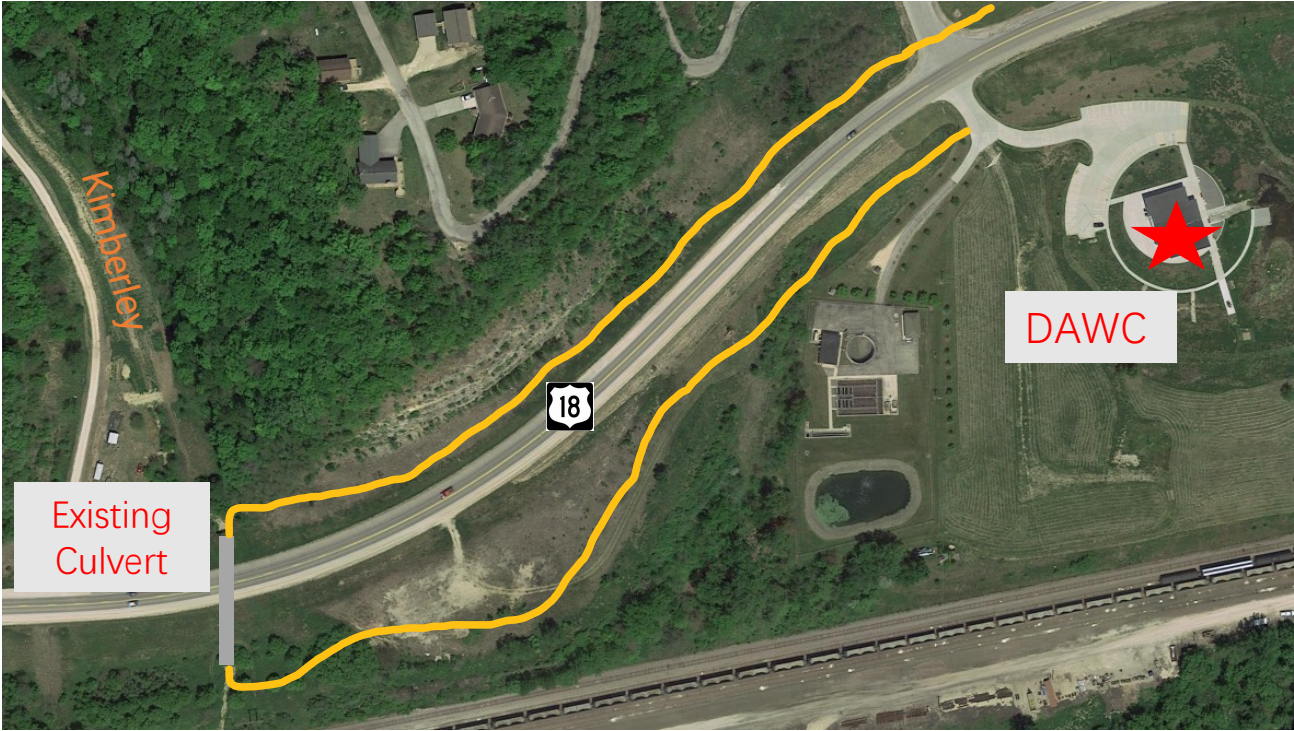


Reinforcement Requirements												
As1			As2		As3		As4		As5/As6		As7/As8	
Area (IN <sup>2</sup> /FT)	Length	M	Area (IN <sup>2</sup> /FT)	Length	Area (IN <sup>2</sup> /FT)	Length	Area (IN <sup>2</sup> /FT)	Length	Area (IN <sup>2</sup> /FT)	Length	Area (IN <sup>2</sup> /FT)	Length
0.54	16'-7"	2'-10"	1.04	10'-6"	1.13	10'-6"	0.2	10'-6"	0.12	10'	0.24	9'-4"

Alternative Cost: \$261,000



# Existing Culvert

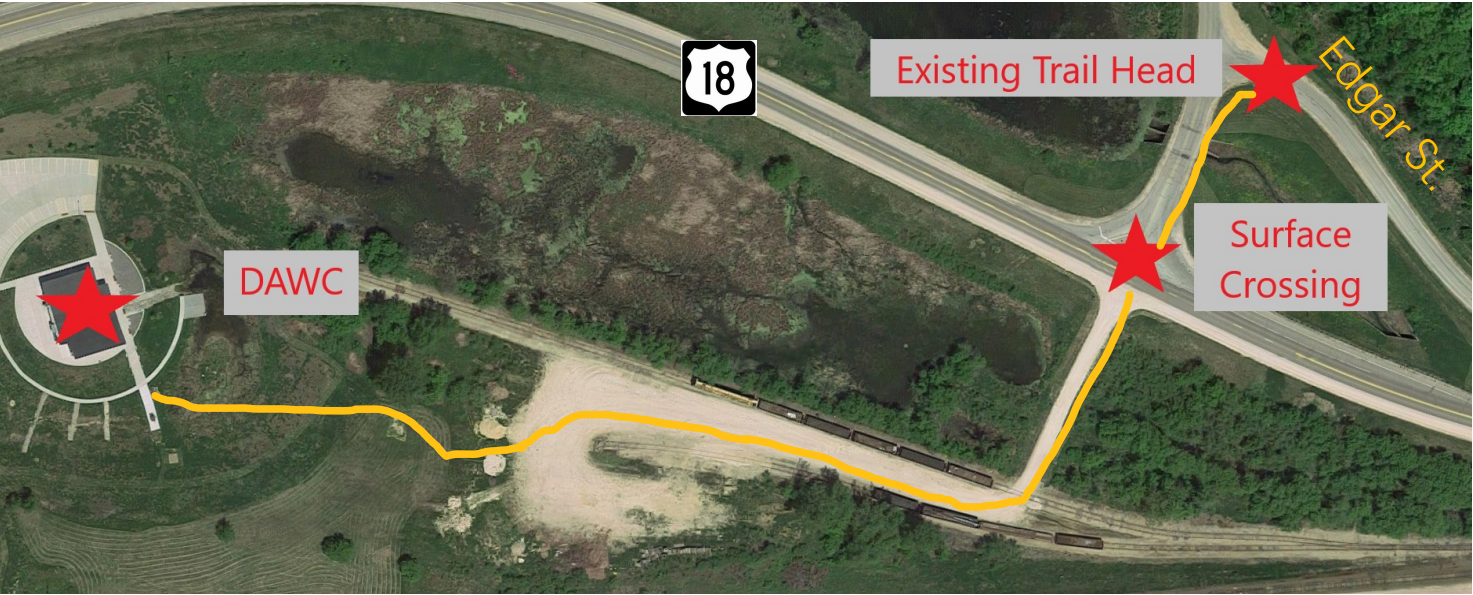


Alternative Cost: \$53,000

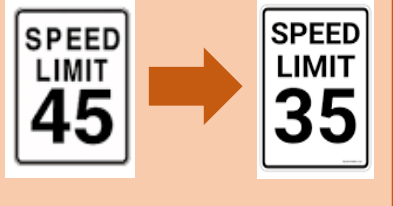
© Metals Depot



# Pedestrian Surface Crossing

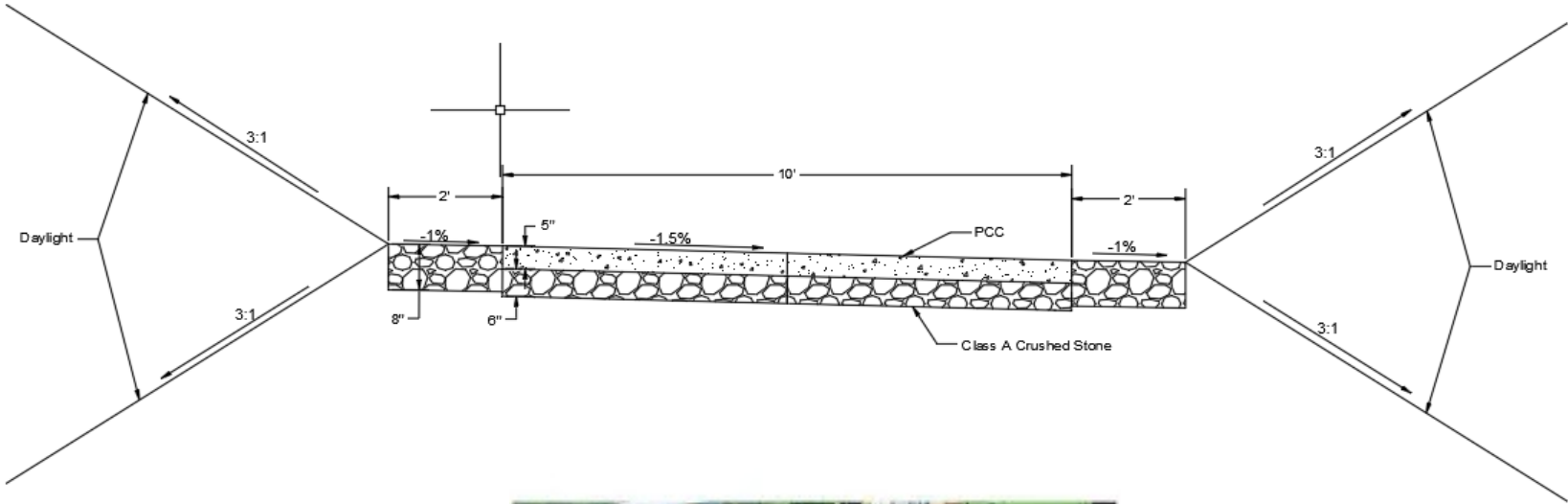


Alternative Cost: \$15,000





# Trail Design



Iowa SUDAS  
12B-2 Design  
Guidelines:  
Type 3

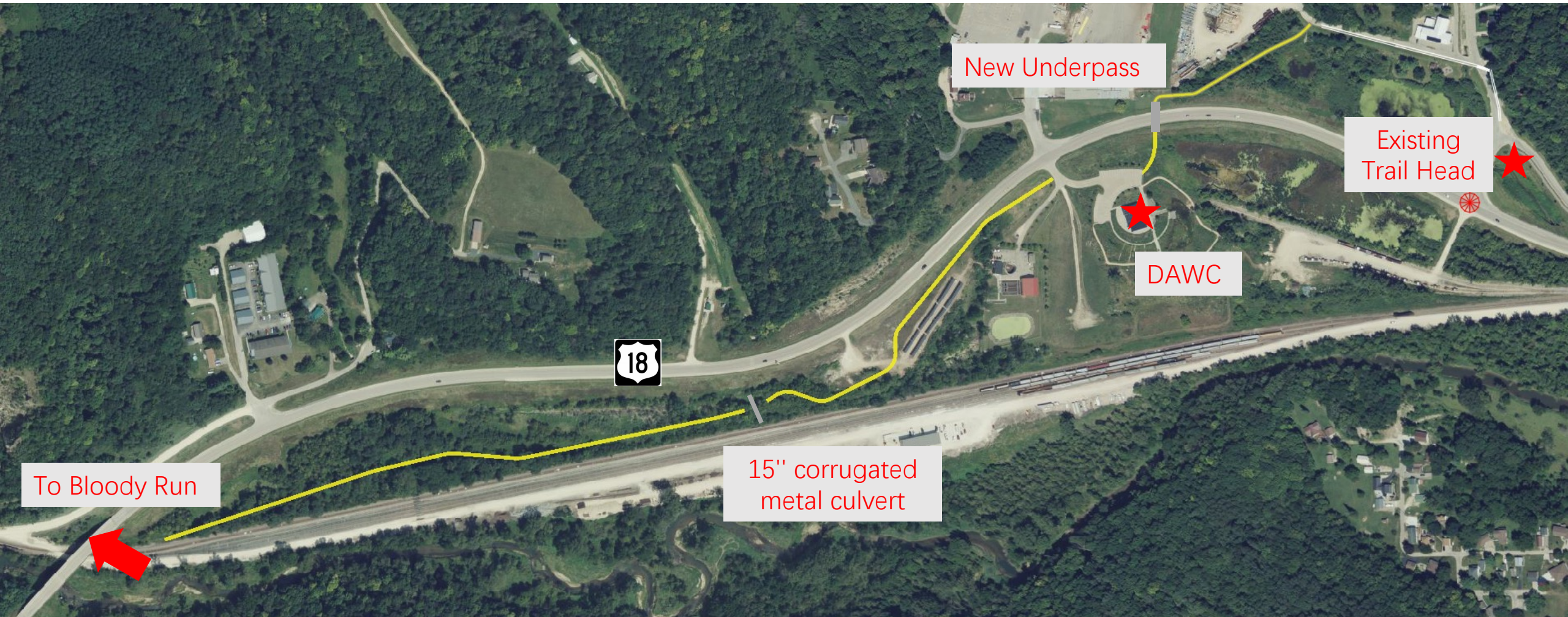


# Trail Design





# Recommendations



# Project Cost

## Recommended Route Cost

Design Element	Cost
Trail and Trail Elements	\$370,000
New Underpass	\$261,000
Total Project Cost	\$631,000
Total Project Cost (20% Contingency)	\$757,000

### Costs Include/Factor:

- Material
- Labor
- Equipment
- Overhead
- Profit
- Inflation

### Cost Sources:

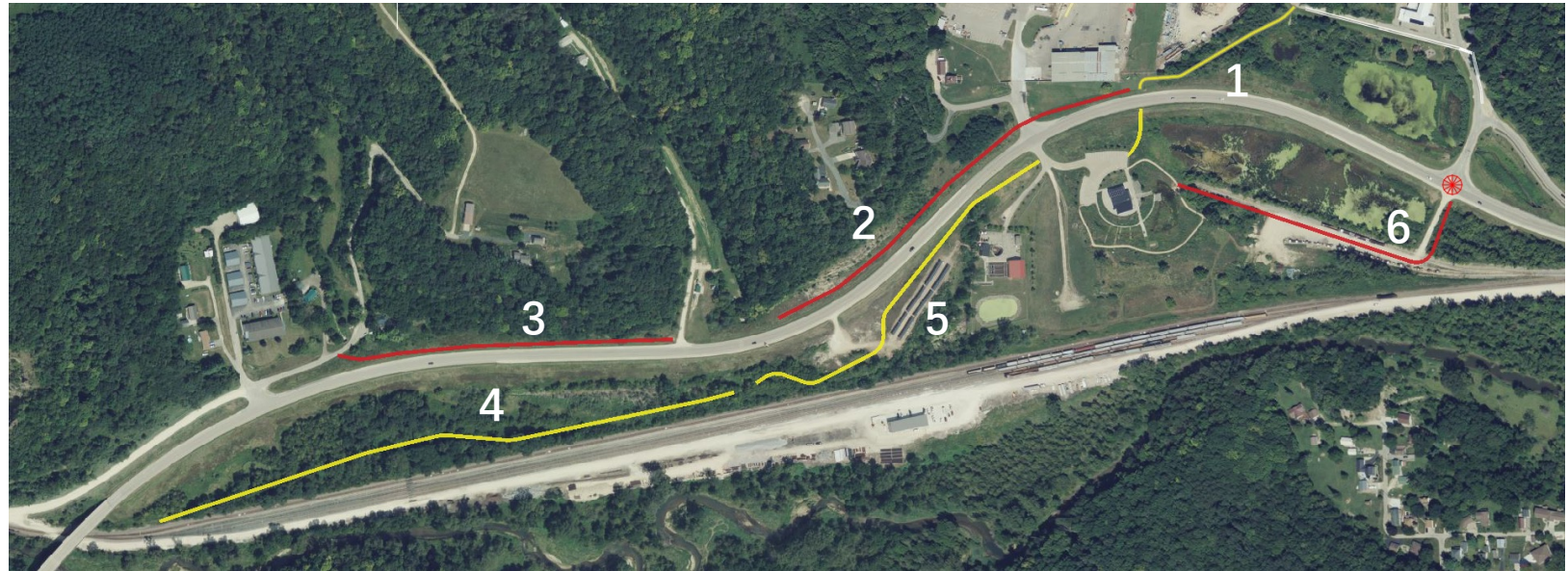
- DOT Bid Tabs
- Iowa City Example Cost Estimation
- Online Vendors



# Conclusion

Trail Segment	Cost
1	\$71,000
2	\$128,000
3	\$85,000
4	\$166,000
5	\$132,000
6	\$51,000

Crossing Alternative	Cost
New Underpass	\$261,000
Existing Underpass	\$53,000
Crosswalk	\$15,000



# Detailed Cost Estimations

Northeast Trail Segment				
Item	Quantity	Unit	Unit Price	Total
Clearing and Grubbing	0.35	ACRE	\$4,531	\$1,575
Excavation - class 12				
Cut/fill	626.98	CY	\$48	\$30,070
soil compaction	20.60	CY	\$11	\$222
Pavement				
5" PCC	617.98	SY	\$42	\$25,881
6" class A crushed stone	272.53	Ton	\$32	\$8,675
Pavement Marking	384.52	STA	\$12	\$4,614
				\$70,837 Subtotal

North Central Trail Segment				
Item	Quantity	Unit	Unit Price	Total
Clearing and Grubbing	0.67	ACRE	\$4,531	\$3,045
Excavation - class 12				
Cut/fill	527.52	CY	\$48	\$25,300
soil compaction	59.23	CY	\$11	\$633
Pavement				
5" PCC	1776.78	SY	\$42	\$74,411
6" class A crushed stone	783.56	Ton	\$32	\$24,941
				\$127,761 Subtotal

Northwest Trail Segment				
Item	Quantity	Unit	Unit Price	Total
Clearing and Grubbing	0.66	ACRE	\$4,531	\$3,000
Excavation - class 12				
Cut/fill	101.74	CY	\$48	\$4,879
soil compaction	45.71	CY	\$11	\$493
Pavement				
5" PCC	1371.21	SY	\$42	\$57,426
6" class A crushed stone	604.7041	Ton	\$32	\$19,248
				\$84,603 Subtotal

Southwest Trail Segment				
Item	Quantity	Unit	Unit Price	Total
Clearing and Grubbing	0.88	ACRE	\$4,531	\$4,003
Excavation - class 12				
Cut/fill	568.15	CY	\$48	\$27,248
soil compaction	80.49	CY	\$11	\$865
Pavement				
5" PCC	2414.67	SY	\$42	\$101,126
6" class A crushed stone	1064.868	Ton	\$32	\$33,895
				\$166,358 Subtotal

South Central Trail Segment				
Item	Quantity	Unit	Unit Price	Total
Clearing and Grubbing	0.81	ACRE	\$4,531	\$3,689
Excavation - class 12				
Cut/fill	738.94	CY	\$48	\$35,440
soil compaction	53.87	CY	\$11	\$583
Pavement				
5" PCC	1616.03	SY	\$42	\$67,679
6" class A crushed stone	712.6707	Ton	\$32	\$22,684
Post fence (wood)	261.66	ft	\$8	\$2,093
				\$131,643 Subtotal

Total width	14	ft		
Pavement Width	10	ft		
Soil compaction				
Base depth	0.5	ft		
Clear zone width	2	ft		
Cross Area	1	sq. ft.		

6" class A crushed stone				
Depth	0.5	ft		
Density	140	lb/ft <sup>3</sup>		

South East Trail Segment				
Item	Quantity	Unit	Unit Price	Total
Clearing and Grubbing	0.14	ACRE	\$4,531	\$653
Excavation - class 12				
Cut/fill	247.00	CY	\$48	\$11,846
soil compaction		CY	\$11	\$0
Pavement				
5" PCC	441.00	SY	\$42	\$18,468
6" class A crushed stone	618	Ton	\$32	\$19,671
				\$50,639 Subtotal

Total width	14	ft		
Pavement Width	10	ft		
Soil compaction				
Base depth	0.5	ft		
Clear zone width	2	ft		
Cross Area	1	sq. ft.		

6" class A crushed stone				
Depth	0.5	ft		
Density	140	lb/ft <sup>3</sup>		

## Marquette Trail Cost Estimate - 4/23 Underpass Alternative Costs

### Alt. 1 - Existing Culvert

Item	Quantity	Unit	Unit Price	Total
Underpass Lighting	1	LS	\$ 9,450.00	\$ 9,450.00
24" wide x 2 x 12GA Galvanized Steel Safety Grate / Grip Strut	70	EACH	\$ 622.00	\$ 43,540.00
<b>Total</b>				<b>\$ 52,990</b>

### Alt. 2 New Underpass

Item	Quantity	Unit	Unit Price	Total
Precast Concrete Box Culvert, 10 FT. X 10 FT.	60	LF	\$ 2,200.00	\$132,000.00
Precast Concrete Box Culvert Straight End Section, 10 FT. X 10 FT.	2	Each	\$ 31,500.00	\$ 63,000.00
Lighting	1	LS	\$ 9,450.00	\$ 9,450.00
Excavation	250	CY	\$ 35.00	\$ 8,750.00
Temporary Shoring	1	LS	\$ 20,000.00	\$ 20,000.00
Anti-Graffiti Coating	300	SY	\$ 25.00	\$ 7,500.00
Steel Guardrail	200	LF	\$ 100.00	\$ 20,000.00
				\$260,700.00

### Alt. 3 Surface Pedestrian Crossing

Item	Quantity	Unit	Unit Price	Total
Rectangular Rapid Flash Beacon	2	Each	\$ 3,680.00	\$ 7,360.00
Lighting Poles	2	Each	\$ 3,685.00	\$ 7,370.00
Paint	1	Sta	\$ 250.00	\$ 250.00
<b>Total</b>				<b>\$ 14,980.00</b>

## Project Recommendation Cost Estimate

Total Trail Length = 4183.81 ft				
Trail Item	Quantity	Unit	Unit Price	Total
Clearing and Grubbing	2.04	ACRE	\$4,531.41	\$9,267
Excavation - class 12				
Cut/fill	1934.07	CY	\$47.96	\$92,758
soil compaction	154.96	CY	\$1.07	\$166
Pavement				
5" PCC	4648.68	SY	\$41.88	\$194,687
6" class A crushed stone	2050.07	Ton	\$31.83	\$65,254
Pavement Marking	384.521	STA	\$12.00	\$4,614
Post fence (wood)	261.6635	ft	\$8.00	\$2,093
				\$368,838 Subtotal

Small Culverts				
Item	Quantity	Unit	Unit Price	Total
CULVERT, CORRUGATED METAL ENTRANCE PIPE, 15 IN. DIA.	28	LF	\$40.00	\$1,120
				\$1,120 Subtotal

Box Culvert (Underpass)				
Item	Quantity	Unit	Unit Price	Total
Precast Concrete Box Culvert Straight End Section, 10 FT. X 10 FT.	2	Each	\$31,500.00	\$63,000
Underpass Lighting	1	LS	\$9,450.00	\$9,450
Excavation - class 12	250	CY	\$ 35.00	\$8,750
Temporary Shoring	1	LS	\$20,000.00	\$20,000
Anti-Graffiti Coating	300	SY	\$25.00	\$7,500
Steel Gaurdail	200	LF	\$100.00	\$20,000
				\$260,700 Subtotal

			Construction Subtotal	\$630,658
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			Contingencies (10%)	\$126,132
			<b>Total Project Cost</b>	<b>\$756,790</b>



**Questions?**

**BSMM**