Bridge and Culvert Preservation

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METAL CULVERT LINING

Wayne A. Harrall, PE
Deputy Managing Director – Engineering
Mike TenBrock, PE
Bridge Engineer

2-8-23

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Kent County Bridges

172 Total Bridges

- 164 Over Water
- 1 Over Roadway
- 1 Over Railroad
- 5 Railroad Over
- 2 Pedestrian Over

Bridge lengths – 20 feet to 1,250 feet

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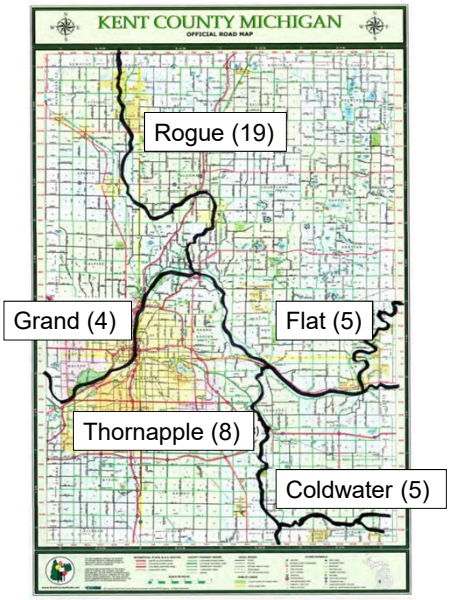
Major Bridge Crossings



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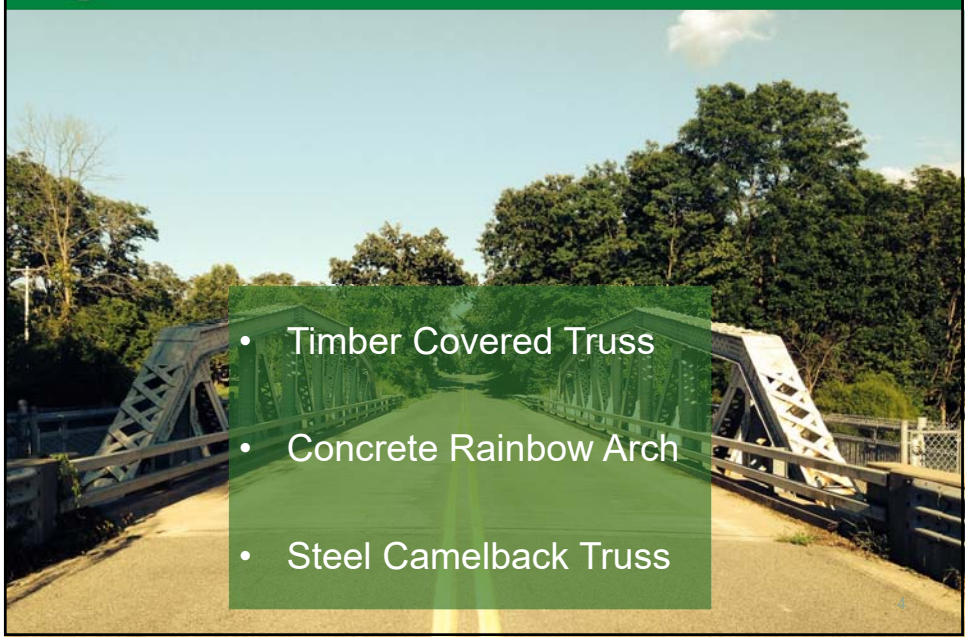
Three Historic Bridges



- Timber Covered Truss
- Concrete Rainbow Arch
- Steel Camelback Truss

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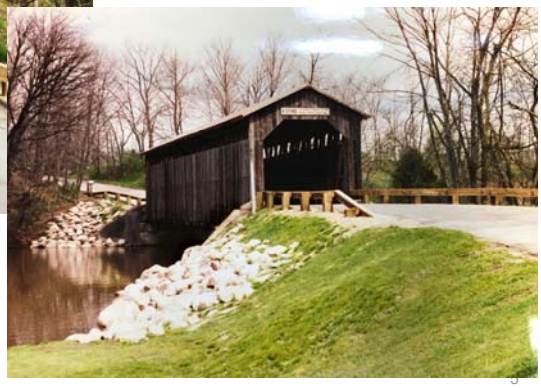
Timber Covered Bridge

Built in 1871



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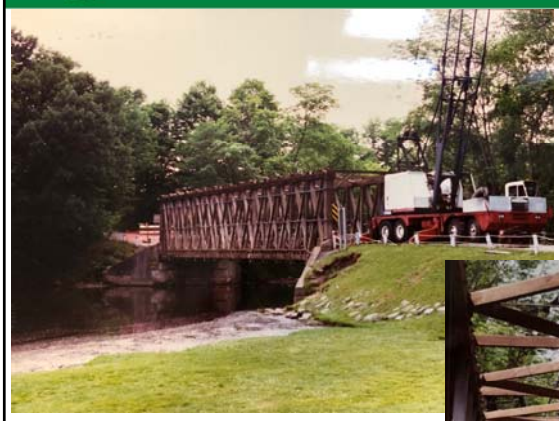
1994 Restoration



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Pine Island Bridge

Built in 1924

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2014 Superstructure Restoration

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Borroughs Bridge

Built in 1925 / Relocated1995

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2015 Clean & Paint

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Metal Culvert Install

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Bridge Crew

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Preventative Maintenance

- Vegetation Control
- Deck Sweeping
- Joint Cleaning
- Waterproofing
- Epoxy Deck Seal
- Slope Repair
- Culvert Repair

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Slope Repair

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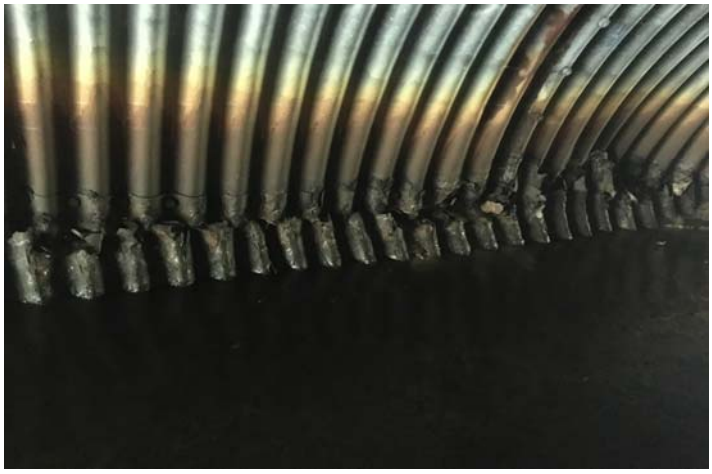
A FAILURE WE COULD NOT REPAIR



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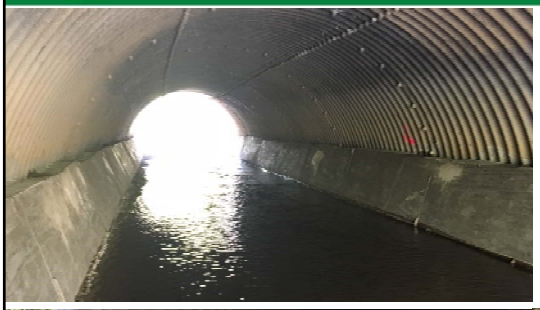
Culvert Lining



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REINFORCEMENT

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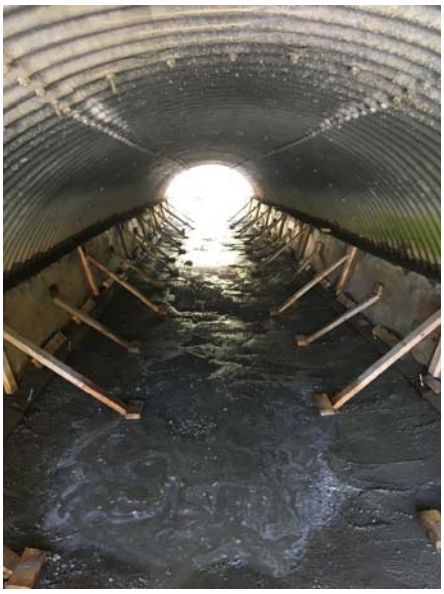
FORMING



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CAS 27 COMPLETED

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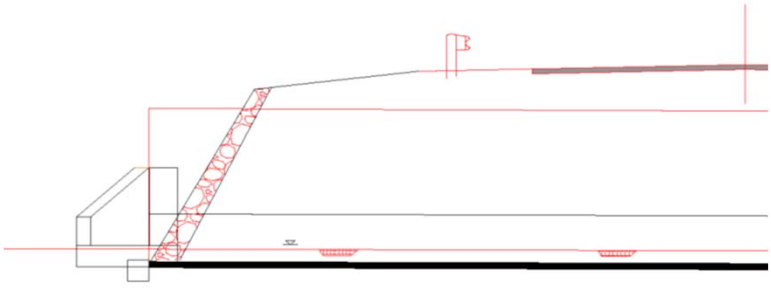
HYDRAULICS MATTERS



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HATCH AVENUE REPAIR

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HATCH AVENUE REPAIR

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HATCH AVENUE FINAL

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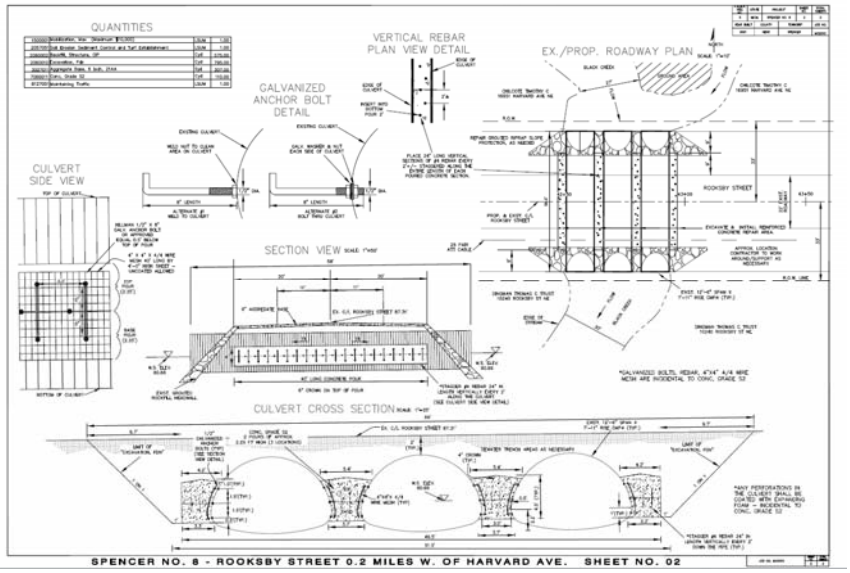
TYPICAL PLAN SET - ENCASEMENT



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22 MILE ENCASEMENT

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ECONOMICS

NEW BRIDGE COST = $450/SFT + DEMO + MAINT. OF TRAFFIC (SAY **$550 / SFT TOTAL**)

TYPICAL BRIDGE SIZE FOR CULVERT LINING LOCATIONS (LOCAL ROADS):

38 FOOT WIDE X 24 FOOT SPAN = 900 SFT

900 SFT X $550 / SFT = $495,000

CULVERT LINING (EXTERNAL OR INTERNAL) COSTS MUCH LESS – AROUND 1/4TH TO 1/3RD THE COST

NELSON 14 (22 MILE ROAD) EXTERNAL LINING COSTS: $80,000

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SPENCER 22 (Twin 16’-7” x 10’-1” CMPA)

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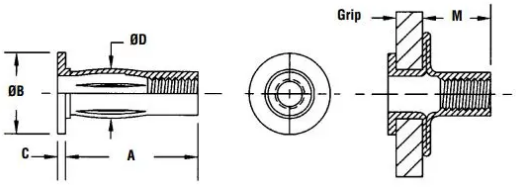
Special Fasteners



- These Steel Shank Cross Nuts are ideal for “Blind Fastening” – Good For Cases Where Your Native Bolts are Excessively Rusty and Can’t Accept a “coupling bolt”.

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Special Fastener

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SPENCER 22 ECONOMICS

NEW BRIDGE COST = $450/SFT + DEMO + MAINT. OF TRAFFIC (SAY $550 / SFT TOTAL)

TYPICAL BRIDGE SIZE FOR CULVERT LINING LOCATIONS (PRIMARY ROADS):

42 FOOT WIDE X 34 FOOT SPAN = 1500 SFT

1500 SFT X $550 / SFT = $825,000

SPENCER 22 INTERNAL LINING + WINGWALL COSTS: $247,000

A LINED CULVERT MAY NOT LAST AS LONG AS A NEW BRIDGE
NEW BRIDGE AMORTIZED OVER 80 YEARS: $10,300 / YEAR + MAINTENANCE COSTS

LINED CULVERT AMORTIZED OVER 35 YEARS: $7,100 / YEAR + MINIMAL MAINTENANCE COSTS

COUNTY ENGINEER WORKSHOP 20223 30

Economics – Use Some Caution

CULVERT LINING COST ESTIMATE COMPARISON

YEAR	PROJECT	PROJECT DESCRIPTION	SEDIMENT AND WATER / SITE DIFFICULTY ?	APPROX SYDS LINING	ENG. ESTIMATE	CONTRACT COST	COST PER SYD FOR LINING
2020	ALPINE #24 - VINTON	2 BARRELS OF 2 - CLEAN INVERTS	EASIER	238	$101,400.00	$124,704.00	$523.97
2020	BOWNE #5 - WINGEIER AVE.	2 BARRELS OF 2	MODEST	180	$92,370.00	$99,370.00	$552.06
2020	BYRON #66 - 108TH ST	2 BARRELS OF 2	MODEST	226	$92,370.00	$99,370.00	$439.69
2019	CASCADE 27-THORNAPPLE R. DR.	2 BARRELS OF 2 - KCRC INSTALLED	MODEST	286	$85,000.00	$87,549.00	$306.12
2022	SPENCER 22 - LINCOLN LAKE	2 BARRELS OF 2	MORE DIFFICULT	406	$150,000.00	$247,370.00	$609.29

Additional “Home Grown” Solutions

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Box Beam Replacement

Childsdale Bridge in 2009 – Super Structure Replacement with KCRC Bridge Crew and Milbocker & Sons

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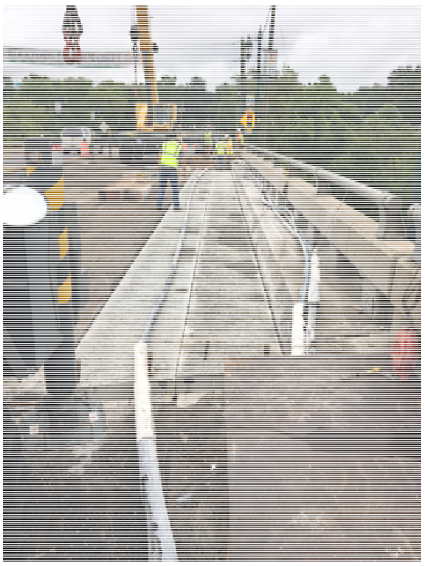
10 Mile/Division Bridge



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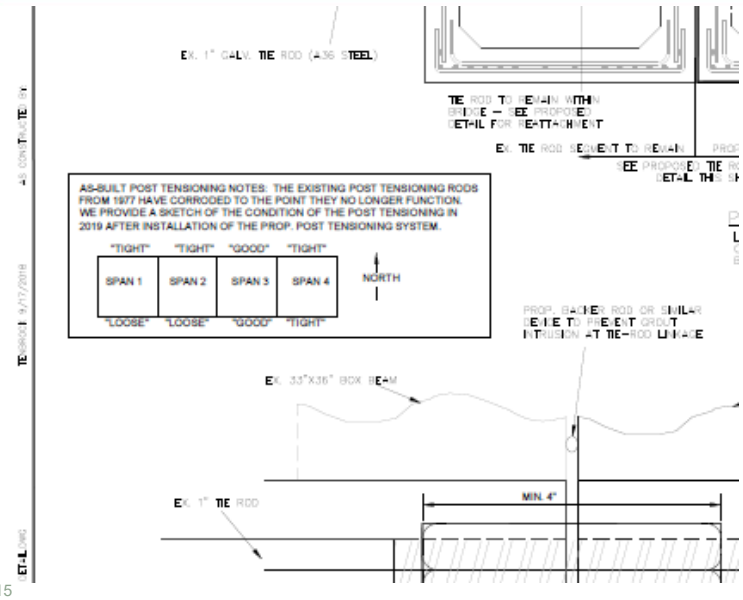
2019 – ALGOMA 52 POST TENSION "AS-BUILTS"



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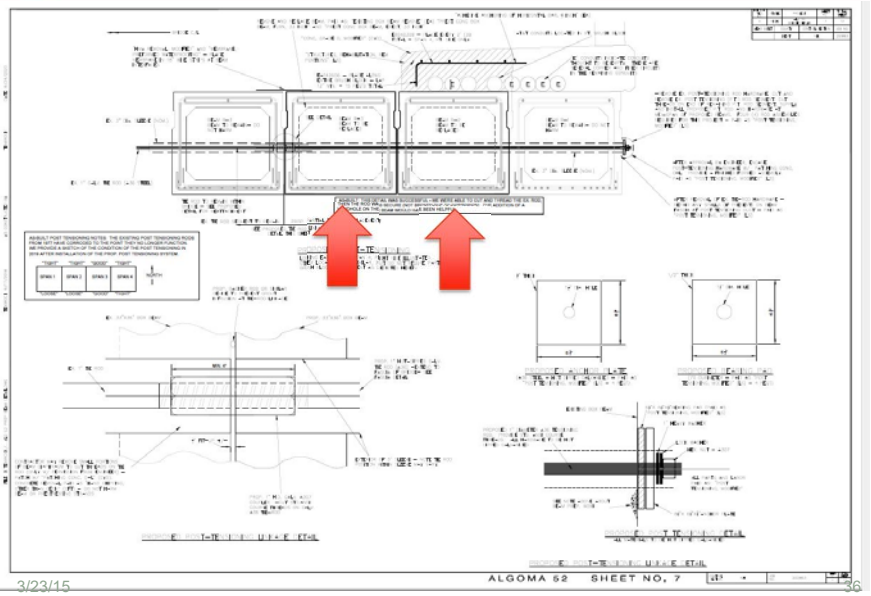
10 MILE RD. POST-TENSIONING



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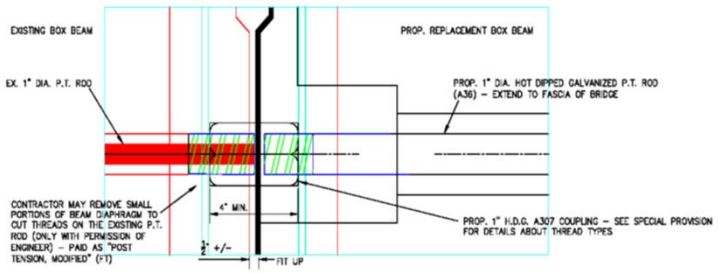

TYPICAL POST TENSIONING LINKAGE DETAIL

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P.T. TENDON AFTER 50 YEARS

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SPARTA 38 – STRAND LOSS AT CENTERLINE

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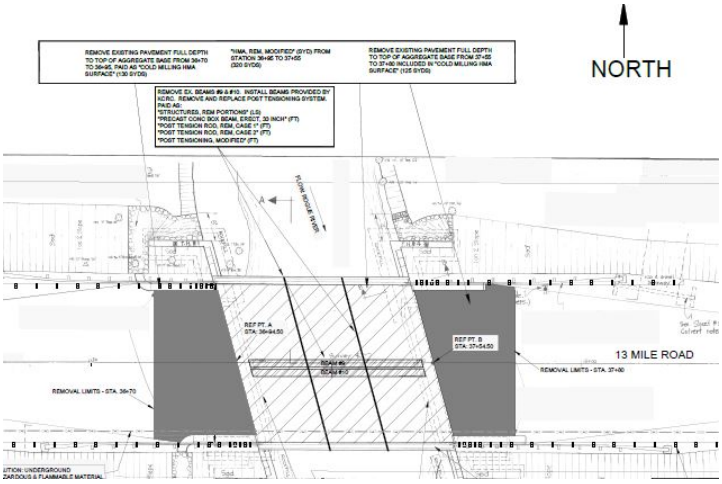
POST TENSION ROD, REM – “CASE 1” OR “CASE 2”



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POST TENSION "EXTRACTION"

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Post Tensioning Details

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Side by Side Box Beam Bridge Rehabilitation

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SPE 38-External Post Tensioning

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PARTIAL BOX BEAM REPLACEMENT ECONOMICS

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BRIDGE BOX BEAM PARTAIL REPLACEMENT COSTS

LOCATION	SCOPE / YEAR	DECK AREA REPLACED (SFT)	CONTRACT COST	COST / SFT OF DECK REPLACED
10 MILE OVER THE ROGUE RIVER / W.P.T.	10 BEAMS REPLACED, MINOR BEAM PATCHING (2019)	2,280	$659,000	$300/SFT
SPARTA 38 -ALPINE AVE	4 BEAMS REPLACED, MINOR SUBSTRUCTRE PATCHING (2020)	528	$218,000	$412/SFT
SPARTA 28 – 13 MILE ROAD	2 BEAMS REPLACED, MINOR SUBSTRUCTURE PATCHING (2021)	360	$230,000	$638/SFT

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THANK YOU

THANK YOU!

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