



Project: CUY-17-13.50
Subject: Proposed Bridge
Task: Stage 3 Estimated Quantities
Job #: 10336513

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Stage 3 Estimated Quantities

User_Input

Yellow Highlight

Checks

Light-Blue Highlight

Results

Boxed

Objective: Determine preliminary estimated quantities in order to generate a cost estimate.

Assumptions: As stated throughout the calculation file.

Note: " := " Defines a variable
" = " Recalls a variable

Item 202E11203 - Portions of Structure Removed, Over 20 Foot Span, As Per Plan

Total Item Quantity: $Q_{202} := 1$ LS

Item 202E22900 - Approach Slab Removed

Existing Approach Slab Width: $W_{e_app_slab} := 30 \text{ ft}$

Existing Approach Slab Length: $L_{e_app_slab} := 15 \text{ ft}$

Number of Existing Approach Slabs: $N_{e_app_slab} := 2$

Total Item Quantity: $Q_{202_app_slab} := W_{e_app_slab} \cdot L_{e_app_slab} \cdot N_{e_app_slab} = 900.00 \text{ ft}^2$

$Q_{202_app_slab} = 100 \text{ yd}^2$

Item 503E11100 - Cofferdams and Excavation Bracing

Total Item Quantity: $Q_{503} := 1$ LS

Number of Bracing: $N_{bracing} := 2$

Bracing Length: $L_{bracing} := 97 \text{ ft}$

Bracing Average Height: $H_{bracing} := (699.15 \text{ ft} - 691 \text{ ft}) \cdot 2$

Bracing Average Area: $A_{bracing} := N_{bracing} \cdot L_{bracing} \cdot H_{bracing} = 3162.20 \text{ ft}^2$



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Item 503E21100 - Unclassified Excavation

Number of Pier Footings: $N_{p_footing} := 5$

Average Ground Elevations: $E_{ground} := 699.15 \text{ ft}$

Area Per Pier Footing: $A_{excavated} := (2 \cdot 1 \text{ ft} + 10 \text{ ft} + 10 \text{ in}) \cdot (2 \cdot 1 \text{ ft} + 10 \text{ ft} + 10 \text{ in} + 64 \text{ ft}) = 986.028 \text{ ft}^2$

Bottom Pier Footing Elevation: $E_{p_footing} := 691 \text{ ft}$

Total Item Quantity: $Q_{503_unclassified} := \text{Ceil} \left((E_{ground} - E_{p_footing}) \cdot A_{excavated} \cdot 5 \text{ yd}^3 \right)$

Total Item Quantity: $Q_{503_unclassified} = 300 \text{ yd}^3$

Item 505E11100 - Pile Driving Equipment Mobilization

Total Item Quantity: $Q_{505} := 1 \text{ LS}$

Item 507E00700 - 16" Cast - In - Place Reinforced Concrete Piles, Driven

When determining total length of driven piles, calculate the number of piles times the estimated pile lengths.

Number of Pier Piles: $N_{pile_pier} := 5 \cdot 4 = 20$

Driven Length of Pier Piles: $L_{drive_pier} := 95 \text{ ft} + 0 \cdot \text{in}$

Total Driven Length of Pier Piles: $LT_{drive_pier} := N_{pile_pier} \cdot L_{drive_pier} = 1900 \text{ ft}$

Total Item Quantity: $Q_{507_16_CIP_driven} := LT_{drive_pier}$

$Q_{507_16_CIP_driven} = 1900 \text{ ft}$

Item 507E00750 - 16" Cast - In - Place Reinforced Concrete Piles, Furnished

When determining furnished pile lengths, add 5 feet to the estimated pile lengths per ODOT BDM 305.3.5.2.

Number of Pier Piles: $N_{pile_pier} = 20$

Estimated Length of Pier Piles: $L_{est_pier} := L_{drive_pier} = 95 \text{ ft}$

Furnished Length of Pier Piles: $L_{furn_pier} := L_{est_pier} + (5 \text{ ft} + 0 \text{ in}) = 100 \text{ ft}$

Total Furnished Length of Pier Piles: $LT_{furn_pier} := N_{pile_pier} \cdot L_{furn_pier} = 2000 \text{ ft}$

Total Item Quantity: $Q_{507_16_CIP_furn} := LT_{furn_pier}$

$Q_{507_16_CIP_furn} = 2000 \text{ ft}$



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Item 509E10000 - Epoxy Coated Steel Reinforcement

Deck Reinf. Weight: $reinf_{deck} := 82110 \text{ lbf}$

Pier Reinf. Weight: $reinf_{pier} := 36109 \text{ lbf}$

End Diaphragm Reinf. Weight: $reinf_{end_dia} := 4800 \text{ lbf} \cdot 2 = 9600 \text{ lbf}$

Sidewalk Reinf. Weight: $reinf_{sidewalk} := 9233 \text{ lbf}$

Fwd. Abutment Reinf. Weight: $reinf_{fwd_abut} := 12099 \text{ lbf}$

Rear Abutment Reinf. Weight: $reinf_{rear_abut} := 12999 \text{ lbf}$

Wall 1 Reinf. Weight: $reinf_{wall_1} := 13242 \text{ lbf}$

Wall 2 Reinf. Weight: $reinf_{wall_2} := 6307 \text{ lbf}$

Total Item Quantity:
$$Q_{509} := \left(reinf_{deck} + reinf_{pier} + reinf_{end_dia} \downarrow + reinf_{sidewalk} + reinf_{fwd_abut} + reinf_{rear_abut} \downarrow + reinf_{wall_1} + reinf_{wall_2} \right) = 181699.00 \text{ lbf}$$

$$Q_{509} = 181699 \text{ lbf}$$

Item 509E26000 - Galvanized Steel Reinforcement

Wall 1 Reinf. Weight: $reinf_{wall_1_galv} := 7232 \text{ lbf}$

Wall 2 Reinf. Weight: $reinf_{wall_2_galv} := 3024 \text{ lbf}$

Total Item Quantity: $Q_{509_galv} := (reinf_{wall_1_galv} + reinf_{wall_2_galv}) = 10256.00 \text{ lbf}$

$$Q_{509_galv} = 10256 \text{ lbf}$$

Item 510E10001 - Dowel Holes with Nonshrink, Nonmetallic Grout, As Per Plan

Number Dowels per Set: $No_{dowels} := 2$

Wall 1 Sets:
$$No.sets_{wall_1} := 4 + (5 \cdot 2) + 6 + 8 + (9 \cdot 2) + 10 + 11 + (12 \cdot 2) \downarrow = 849$$

$$+ 13 + 14 + 15 + 17 + 21 + (20 \cdot 8) + (19 \cdot 8) \downarrow$$

$$+ (18 \cdot 8) + (17 \cdot 7) + (16 \cdot 6) + 7$$

Wall 2 Sets:
$$No.sets_{wall_2} := (4 \cdot 2) + (5 \cdot 2) + 7 + 9 + (11 \cdot 8) \downarrow = 355$$

$$+ (10 \cdot 10) + (9 \cdot 10) + (8 \cdot 5) + 3$$

Total Item Quantity: $Q_{510} := No_{dowels} \cdot (No.sets_{wall_1} + No.sets_{wall_2}) = 2408.00$

$$Q_{510} = 2408$$



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WALL 1 INFORMATION TABLE										
SHAFT NO.	STATION	TOP OF WALL ELEV.	TOP OF SHAFT ELEV.	APPROX. EXISTING GROUND	BOT. OF CIP WALL ELEV.	BOT. OF DRILLED SHAFT ELEV.	ESTIMATED DRILLED SHAFT LENGTH (FT)	PRIMARY REINFORCING	CONFINEMENT REINFORCING	NUMBER OF DOWELS/ANCHORS
1	0+39.24	697.15	692.42	698.29	688.86	657.36	36	18 - DS1101	1 - DS SP501	4 SETS OF 2 - 1W501
2	0+43.40	698.69	693.95	699.63	689.20	657.70	37	18 - DS1102	1 - DS SP502	5 SETS OF 2 - 1W501
3	0+47.57	700.23	695.49	701.13	689.54	658.04	38	18 - DS1103	1 - DS SP503	6 SETS OF 2 - 1W501
4	0+51.74	701.77	697.03	701.35	689.89	658.39	39	18 - DS1104	1 - DS SP504	8 SETS OF 2 - 1W501
5	0+55.90	703.12	698.56	701.56	690.14	658.64	40	18 - DS1105	1 - DS SP505	9 SETS OF 2 - 1W501
6	0+60.07	704.25	699.70	701.77	690.30	658.80	41	18 SETS OF 1 - DS1101 AND 1 - DS1106	1 - DS SP506	10 SETS OF 2 - 1W501
7	0+64.24	705.38	700.83	701.98	690.46	658.96	42	18 SETS OF 1 - DS1101 AND 1 - DS1107	1 - DS SP507	11 SETS OF 2 - 1W501
8	0+68.40	706.51	701.96	702.19	690.62	659.12	43	18 SETS OF 1 - DS1101 AND 1 - DS1108	1 - DS SP508	12 SETS OF 2 - 1W501
9	0+72.57	707.63	703.09	702.61	690.78	659.28	44	18 SETS OF 1 - DS1101 AND 1 - DS1109	1 - DS SP509	13 SETS OF 2 - 1W501
10	0+76.74	708.76	704.22	702.80	690.94	659.44	45	18 SETS OF 1 - DS1101 AND 1 - DS1110	1 - DS SP510	14 SETS OF 2 - 1W501
11	0+80.90	709.89	705.35	702.64	691.10	659.60	46	18 SETS OF 1 - DS1101 AND 1 - DS1111	1 - DS SP511	15 SETS OF 2 - 1W501
12	0+85.07	711.02	706.48	702.76	691.26	653.76	53	18 SETS OF 1 - DS1101 AND 1 - DS1112	1 - DS SP512	16 SETS OF 2 - 1W501
13	0+89.24	712.15	707.61	702.89	691.42	653.92	54	18 SETS OF 1 - DS1101 AND 1 - DS1113	1 - DS SP513	17 SETS OF 2 - 1W501
14	0+93.40	713.28	708.74	702.95	691.58	654.08	55	18 SETS OF 1 - DS1101 AND 1 - DS1114	1 - DS SP514	18 SETS OF 2 - 1W501
15	0+97.57	714.41	711.37	703.01	691.74	654.24	58	18 SETS OF 1 - DS1101 AND 1 - DS1115	1 - DS SP517	20 SETS OF 2 - 1W501
16	1+01.74	712.00	712.00	703.06	691.89	654.39	58	18 SETS OF 1 - DS1101 AND 1 - DS1121	1 - DS SP517	21 SETS OF 2 - 1W501
17	1+05.90	712.00	712.00	703.12	692.03	654.53	58	18 SETS OF 1 - DS1101 AND 1 - DS1121	1 - DS SP517	20 SETS OF 2 - 1W501
18	1+10.07	712.00	712.00	703.17	692.17	654.67	58	18 SETS OF 1 - DS1101 AND 1 - DS1121	1 - DS SP517	20 SETS OF 2 - 1W501
19	1+14.24	712.00	712.00	703.23	692.31	654.81	58	18 SETS OF 1 - DS1101 AND 1 - DS1121	1 - DS SP517	20 SETS OF 2 - 1W501
20	1+18.40	712.00	712.00	703.32	692.44	654.94	58	18 SETS OF 1 - DS1101 AND 1 - DS1121	1 - DS SP517	20 SETS OF 2 - 1W501
21	1+22.57	712.00	712.00	703.47	692.58	655.08	57	18 SETS OF 1 - DS1101 AND 1 - DS1120	1 - DS SP516	20 SETS OF 2 - 1W501
22	1+26.74	712.00	712.00	703.62	692.72	655.22	57	18 SETS OF 1 - DS1101 AND 1 - DS1120	1 - DS SP516	20 SETS OF 2 - 1W501
23	1+30.90	712.00	712.00	703.76	692.86	655.36	57	18 SETS OF 1 - DS1101 AND 1 - DS1120	1 - DS SP516	20 SETS OF 2 - 1W501
24	1+35.07	712.00	712.00	703.91	693.00	655.50	57	18 SETS OF 1 - DS1101 AND 1 - DS1120	1 - DS SP516	19 SETS OF 2 - 1W501
25	1+39.24	712.00	712.00	704.06	693.14	655.64	57	18 SETS OF 1 - DS1101 AND 1 - DS1120	1 - DS SP516	19 SETS OF 2 - 1W501
26	1+43.40	712.00	712.00	704.06	693.28	655.78	57	18 SETS OF 1 - DS1101 AND 1 - DS1120	1 - DS SP516	19 SETS OF 2 - 1W501
27	1+47.57	712.00	712.00	704.01	693.42	655.92	57	18 SETS OF 1 - DS1101 AND 1 - DS1120	1 - DS SP516	19 SETS OF 2 - 1W501
28	1+51.74	712.00	712.00	703.95	693.56	656.06	56	18 SETS OF 1 - DS1101 AND 1 - DS1119	1 - DS SP515	19 SETS OF 2 - 1W501
29	1+55.90	712.00	712.00	703.90	693.70	656.20	56	18 SETS OF 1 - DS1101 AND 1 - DS1119	1 - DS SP515	19 SETS OF 2 - 1W501
30	1+60.07	712.00	712.00	703.84	693.84	656.34	56	18 SETS OF 1 - DS1101 AND 1 - DS1119	1 - DS SP515	19 SETS OF 2 - 1W501
31	1+64.24	712.00	712.00	703.79	693.98	656.48	56	18 SETS OF 1 - DS1101 AND 1 - DS1119	1 - DS SP515	19 SETS OF 2 - 1W501
32	1+68.40	712.00	712.00	703.72	694.12	656.62	56	18 SETS OF 1 - DS1101 AND 1 - DS1119	1 - DS SP515	18 SETS OF 2 - 1W501
33	1+72.57	712.00	712.00	703.56	694.26	656.76	56	18 SETS OF 1 - DS1101 AND 1 - DS1119	1 - DS SP515	18 SETS OF 2 - 1W501
34	1+76.74	712.00	712.00	703.40	694.40	656.90	56	18 SETS OF 1 - DS1101 AND 1 - DS1119	1 - DS SP515	18 SETS OF 2 - 1W501
35	1+80.90	712.00	712.00	703.24	694.54	657.04	55	18 SETS OF 1 - DS1101 AND 1 - DS1118	1 - DS SP514	18 SETS OF 2 - 1W501
36	1+85.07	712.00	712.00	703.08	694.68	657.18	55	18 SETS OF 1 - DS1101 AND 1 - DS1118	1 - DS SP514	18 SETS OF 2 - 1W501
37	1+89.24	712.00	712.00	702.92	694.81	657.31	55	18 SETS OF 1 - DS1101 AND 1 - DS1118	1 - DS SP514	18 SETS OF 2 - 1W501
38	1+93.40	712.00	712.00	702.76	694.95	657.45	55	18 SETS OF 1 - DS1101 AND 1 - DS1118	1 - DS SP514	18 SETS OF 2 - 1W501
39	1+97.57	712.00	712.00	702.60	695.09	657.59	55	18 SETS OF 1 - DS1101 AND 1 - DS1118	1 - DS SP514	17 SETS OF 2 - 1W501
40	2+01.74	712.00	712.00	702.44	695.23	657.73	55	18 SETS OF 1 - DS1101 AND 1 - DS1118	1 - DS SP514	17 SETS OF 2 - 1W501
41	2+05.90	712.00	712.00	702.28	695.37	657.87	55	18 SETS OF 1 - DS1101 AND 1 - DS1118	1 - DS SP514	17 SETS OF 2 - 1W501
42	2+10.07	712.00	712.00	702.12	695.51	658.01	54	18 SETS OF 1 - DS1101 AND 1 - DS1117	1 - DS SP513	17 SETS OF 2 - 1W501
43	2+14.24	712.00	712.00	701.96	695.65	658.15	54	18 SETS OF 1 - DS1101 AND 1 - DS1117	1 - DS SP513	17 SETS OF 2 - 1W501
44	2+18.40	712.00	712.00	701.80	695.79	658.29	54	18 SETS OF 1 - DS1101 AND 1 - DS1117	1 - DS SP513	17 SETS OF 2 - 1W501
45	2+22.57	712.00	712.00	701.64	695.93	658.43	54	18 SETS OF 1 - DS1101 AND 1 - DS1117	1 - DS SP513	17 SETS OF 2 - 1W501
46	2+26.74	712.00	712.00	701.43	696.07	658.57	54	18 SETS OF 1 - DS1101 AND 1 - DS1117	1 - DS SP513	16 SETS OF 2 - 1W501
47	2+30.90	712.00	712.00	701.18	696.21	658.71	54	18 SETS OF 1 - DS1101 AND 1 - DS1117	1 - DS SP513	16 SETS OF 2 - 1W501
48	2+35.07	712.00	712.00	700.95	696.35	658.85	54	18 SETS OF 1 - DS1101 AND 1 - DS1117	1 - DS SP513	16 SETS OF 2 - 1W501
49	2+39.24	712.00	712.00	701.10	696.49	658.99	54	18 SETS OF 1 - DS1101 AND 1 - DS1117	1 - DS SP513	16 SETS OF 2 - 1W501
50	2+43.40	712.00	712.00	700.98	696.63	659.13	53	18 SETS OF 1 - DS1101 AND 1 - DS1116	1 - DS SP512	16 SETS OF 2 - 1W501
51	2+47.57	712.90	707.87	700.85	696.73	665.23	43	18 SETS OF 1 - DS1101 AND 1 - DS1108	1 - DS SP508	12 SETS OF 2 - 1W501
52	2+51.74	710.76	705.73	700.55	696.84	665.34	41	18 SETS OF 1 - DS1101 AND 1 - DS1106	1 - DS SP506	9 SETS OF 2 - 1W501
53	2+55.90	708.62	703.59	700.23	696.94	665.44	39	18 - DS1104	1 - DS SP504	7 SETS OF 2 - 1W501
54	2+60.07	706.48	701.45	701.09	697.05	665.55	36	18 - DS1101	1 - DS SP501	5 SETS OF 2 - 1W501



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WALL 2 INFORMATION TABLE										
SHAFT NO.	STATION	TOP OF WALL ELEV.	TOP OF SHAFT ELEV.	APPROXIMATE EXISTING GROUND	BOT. OF CIP WALL ELEV.	BOT. OF DRILLED SHAFT ELEV.	ESTIMATED DRILLED SHAFT LENGTH (FT)	PRIMARY REINFORCING	CONFINEMENT REINFORCING	NUMBER OF DOWELS/ANCHORS
75	0+90.45	706.61	701.74	701.82	698.50	676.00	26	12 - DS1123	1 - DS SP519	4 SETS OF 2 - 2W501
76	0+94.62	708.43	703.56	701.95	698.70	676.20	28	12 - DS1124	1 - DS SP520	5 SETS OF 2 - 2W501
77	0+98.78	710.24	705.37	702.08	698.91	676.41	29	12 - DS1125	1 - DS SP521	7 SETS OF 2 - 2W501
78	1+02.95	712.06	707.18	702.21	699.11	676.61	31	12 - DS1126	1 - DS SP522	9 SETS OF 2 - 2W501
79	1+07.12	710.00	710.00	702.34	699.27	670.27	40	12 - DS1130	1 - DS SP505	11 SETS OF 2 - 2W501
80	1+11.28	710.00	710.00	702.48	699.37	670.37	40	12 - DS1130	1 - DS SP505	11 SETS OF 2 - 2W501
81	1+15.45	710.00	710.00	702.61	699.47	670.47	40	12 - DS1130	1 - DS SP505	11 SETS OF 2 - 2W501
82	1+19.62	710.00	710.00	702.74	699.57	670.57	40	12 - DS1130	1 - DS SP505	11 SETS OF 2 - 2W501
83	1+23.78	710.00	710.00	702.87	699.67	670.67	40	12 - DS1130	1 - DS SP505	11 SETS OF 2 - 2W501
84	1+27.95	710.00	710.00	703.02	699.77	670.77	40	12 - DS1130	1 - DS SP505	11 SETS OF 2 - 2W501
85	1+32.12	710.00	710.00	703.13	699.87	670.87	40	12 - DS1130	1 - DS SP505	11 SETS OF 2 - 2W501
86	1+36.28	710.00	710.00	703.10	699.97	670.97	40	12 - DS1130	1 - DS SP505	11 SETS OF 2 - 2W501
87	1+40.45	710.00	710.00	703.34	700.06	671.06	39	12 - DS1129	1 - DS SP504	10 SETS OF 2 - 2W501
88	1+44.62	710.00	710.00	703.59	700.16	671.16	39	12 - DS1129	1 - DS SP504	10 SETS OF 2 - 2W501
89	1+48.78	710.00	710.00	703.83	700.26	671.26	39	12 - DS1129	1 - DS SP504	10 SETS OF 2 - 2W501
90	1+52.95	710.00	710.00	704.07	700.36	671.36	39	12 - DS1129	1 - DS SP504	10 SETS OF 2 - 2W501
91	1+57.12	710.00	710.00	704.32	700.46	671.46	39	12 - DS1129	1 - DS SP504	10 SETS OF 2 - 2W501
92	1+61.28	710.00	710.00	704.56	700.56	671.56	39	12 - DS1129	1 - DS SP504	10 SETS OF 2 - 2W501
93	1+65.45	710.00	710.00	704.80	700.66	671.66	39	12 - DS1129	1 - DS SP504	10 SETS OF 2 - 2W501
94	1+69.62	710.00	710.00	705.04	700.76	671.76	39	12 - DS1129	1 - DS SP504	10 SETS OF 2 - 2W501
95	1+73.78	710.00	710.00	705.19	700.86	671.86	39	12 - DS1129	1 - DS SP504	10 SETS OF 2 - 2W501
96	1+77.95	710.00	710.00	705.08	700.96	671.96	39	12 - DS1129	1 - DS SP504	10 SETS OF 2 - 2W501
97	1+82.12	710.00	710.00	704.96	701.06	672.06	38	12 - DS1128	1 - DS SP503	9 SETS OF 2 - 2W501
98	1+86.28	710.00	710.00	704.84	701.16	672.16	38	12 - DS1128	1 - DS SP503	9 SETS OF 2 - 2W501
99	1+90.45	710.00	710.00	704.73	701.26	672.26	38	12 - DS1128	1 - DS SP503	9 SETS OF 2 - 2W501
100	1+94.62	710.00	710.00	704.61	701.36	672.36	38	12 - DS1128	1 - DS SP503	9 SETS OF 2 - 2W501
101	1+98.78	710.00	710.00	704.49	701.46	672.46	38	12 - DS1128	1 - DS SP503	9 SETS OF 2 - 2W501
102	2+02.95	710.00	710.00	704.38	701.56	672.56	38	12 - DS1128	1 - DS SP503	9 SETS OF 2 - 2W501
103	2+07.12	710.00	710.00	704.26	701.66	672.66	38	12 - DS1128	1 - DS SP503	9 SETS OF 2 - 2W501
104	2+11.28	710.00	710.00	704.39	701.76	672.76	38	12 - DS1128	1 - DS SP503	9 SETS OF 2 - 2W501
105	2+15.45	710.00	710.00	704.53	701.86	672.86	38	12 - DS1128	1 - DS SP503	9 SETS OF 2 - 2W501
106	2+19.62	710.00	710.00	704.67	701.96	672.96	38	12 - DS1128	1 - DS SP503	9 SETS OF 2 - 2W501
107	2+23.78	710.00	710.00	704.81	702.06	673.06	37	12 - DS1127	1 - DS SP502	8 SETS OF 2 - 2W501
108	2+27.95	710.00	710.00	704.96	702.16	673.16	37	12 - DS1127	1 - DS SP502	8 SETS OF 2 - 2W501
109	2+32.12	710.00	710.00	705.06	702.26	673.26	37	12 - DS1127	1 - DS SP502	8 SETS OF 2 - 2W501
110	2+36.28	710.00	710.00	705.18	702.36	673.36	37	12 - DS1127	1 - DS SP502	8 SETS OF 2 - 2W501
111	2+40.45	710.00	710.00	705.29	702.46	673.46	37	12 - DS1127	1 - DS SP502	8 SETS OF 2 - 2W501
112	2+44.62	711.99	707.36	705.26	702.51	680.01	28	12 - DS1124	1 - DS SP520	5 SETS OF 2 - 2W501
113	2+48.78	710.67	706.03	705.14	702.55	680.05	26	12 - DS1123	1 - DS SP519	4 SETS OF 2 - 2W501
114	2+52.95	709.34	704.71	705.01	702.58	680.08	25	12 - DS1122	1 - DS SP518	3 SETS OF 2 - 2W501



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Item 511E33500 - Semi- Integral Diaphragm Guide

Number of End Diaphragms: $N_{dia} := 2$

Number of Diaphragms
 Guides per End Diaphragm: $N_{diaG} := 2$

Total Item Quantity: $Q_{511_diaG} := N_{dia} + N_{diaG} = 4.00$

$Q_{511_diaG} = 4$ EACH

Item 511E34447 - Class QC2 Concrete with QC/QA, Bridge Deck, As Per Plan

Include concrete from end diaphragms and raised sidewalk.

Proposed Deck Width: $W_{deck} := 42 \text{ ft} + 4 \text{ in}$ (Out-to-Out)

Proposed Deck Length: $L_{deck} := 223 \text{ ft} + 8 \text{ in}$ (Measured Along CL)

Proposed Deck Thickness: $t_{deck} := 8.5 \text{ in}$

Number of Girders: $N_{girder} := 6$

Haunch Thickness: $t_h := 4.50 \text{ in}$ (Including Beam Flange)

Girder Flange Widths : $b_f := 22.0 \text{ in}$ (Plate Girder Top Flange)

Girder Flange Thickness: $t_f := 1.5 \text{ in}$ (Minimum)

Number of End Diaphragms: $N_{dia} := 2$

Bridge Skew: $\theta := 56.86 \text{ deg}$

End Diaphragm Length: $L_{dia} := W_{deck} \div \cos(\theta) = 77.436 \text{ ft}$

End Diaphragm Thickness: $t_{dia} := 3 \text{ ft} + 0 \text{ in}$

Proposed End Diaphragm Height: $H_{dia} := t_h + 36 \text{ in} + 1.5 \text{ in} + 9 \text{ in} = 4.25 \text{ ft}$ (Excluding deck)

Approach Seat Area: $A_{appr_seat} := (17 \text{ in} - 8.5 \text{ in}) \cdot 6 \text{ in} = 0.354 \text{ ft}^2$

Overhang Areas: $A_{overhang} := (12.625 \text{ in} - 8.5 \text{ in}) \cdot (3.25 \text{ ft} - 22 \text{ in} \cdot 0.5) \cdot 2 = 1.604 \text{ ft}^2$

Proposed Raised Sidewalk Area: $A_{walk} := (7 \text{ ft} + 2 \text{ in}) \cdot \frac{(8 + 10.5)}{2} \text{ in} = 5.524 \text{ ft}^2$

Length of Approach Slabs: $L_{apr} := 30 \text{ ft} + 0 \text{ in}$

Total Item Quantity: $Q_{511_deck} := \text{Ceil} \left(L_{deck} \cdot (W_{deck} \cdot t_{deck} + N_{girder} \cdot b_f \cdot (t_h - t_f) + A_{overhang}) \downarrow + N_{dia} \cdot ((t_{dia} \cdot H_{dia} - A_{appr_seat}) \cdot L_{dia}) + (A_{walk} \cdot (L_{deck} + L_{apr} \cdot 2)) \right) \cdot 5 \text{ yd}^3 = 11205.00 \text{ ft}^3$

$Q_{511_deck} = 415 \text{ yd}^3$



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Item 511E41012 - Class QC1 Concrete w/ QC/QA, Pier Above Footings

Number of Piers:	$N_{pier} := 1$	
Pier Cap Thickness:	$t_{cap} := 3 \text{ ft} + 4 \text{ in}$	
Pier Cap Out-to-Out Width:	$W_{cap} := 71 \text{ ft} + 0 \text{ in}$	
Variation in Seat Elevations:	$Var_{seat} := 0.57 \text{ ft}$	(Due to cross-slope, measured in CAD)
Minimum Pier Cap Height:	$H_{cap_min} := 4 \text{ ft} + 0 \text{ in}$	
Maximum Pier Cap Height:	$H_{cap_max} := H_{cap_min} + Var_{seat} = 4.57 \text{ ft}$	
Average Pier Cap Height:	$H_{cap} := \text{mean}(H_{cap_min}, H_{cap_max}) = 4.285 \text{ ft}$	
Number of Pier Columns:	$N_{col} := 5$	
Diameter of Pier Columns:	$d_{col} := 3 \text{ ft} + 0 \text{ in}$	
X-Sectional Area of Pier Columns:	$A_{col} := \left(\frac{\pi}{4}\right) \cdot d_{col}^2 = 7.069 \text{ ft}^2$	
Column Height:	$H_{col} := 712.9 \cdot \text{ft} - 694.0 \cdot \text{ft} = 18.9 \text{ ft}$	
Total Item Quantity:	$Q_{511_pier} := N_{pier} \cdot \text{Ceil}(t_{cap} \cdot W_{cap} \cdot H_{cap} + N_{col} \cdot (A_{col} \cdot H_{col}), 1 \text{ yd}^3) = 1701.00 \text{ ft}^3$	
	$Q_{511_pier} = 63 \text{ yd}^3$	

Item 511E44112 - Class QC1 Concrete w/ QC/QA, Abutment Not Including Ftg

Abutment Stem Thickness:	$t_{abut} := 3 \text{ ft} + 0 \text{ in}$	
Rear Abutment Stem Area:	$A_{ra_stem} := 297 \text{ ft}^2$	(Measured in CAD)
Fwd. Abutment Stem Area:	$A_{fa_stem} := 288 \text{ ft}^2$	(Measured in CAD)
Wing Wall Thickness:	$t_{wing} := 2 \text{ ft} + 6 \text{ in}$	
Rear Abutment Wingwall Area:	$A_{ra_wing} := 265 \text{ ft}^2 + 118 \text{ ft}^2 = 383 \text{ ft}^2$	(Measured in CAD)
Fwd. Abutment Wingwall Area:	$A_{fa_wing} := 190 \text{ ft}^2 + 130 \text{ ft}^2 = 320 \text{ ft}^2$	(Measured in CAD)
Total Item Quantity:	$Q_{511_abut} := \text{Ceil}\left(t_{abut} \cdot (A_{ra_stem} + A_{fa_stem}) + t_{wing} \cdot (A_{ra_wing} + A_{fa_wing}), 1 \text{ yd}^3\right) = 3537.00 \text{ ft}^3$	
	$Q_{511_abut} = 131 \text{ yd}^3$	



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Item 511E46012 - Class QC1 Concrete w/ QC/QA, Retaining/Wingwall not including Footing

Rear CIP Wall 1: $A_{Wall_1} := 3928.8 \cdot ft^2$ (Measured in CAD)

FWD CIP Wall 2: $A_{Wall_2} := 1625.5 \cdot ft^2$ (Measured in CAD)

Wall Thickness: $T_{Wall} := 10 \cdot in$

$$V_{CIP_Wall} := T_{Wall} \cdot (A_{Wall_1} + A_{Wall_2}) = 4628.58 \cdot ft^3$$

Coping Height, Thickness and Length: $H_{Coping} := 2 \cdot ft$

Coping Thickness: $T_{Coping} := 5 \cdot in$

Coping Length: $L_{Coping} := 74.74 \cdot ft + 28.01 \cdot ft + 24.12 \cdot ft + 24.05 \cdot ft = 150.92 \cdot ft$

$$V_{Coping} := H_{Coping} \cdot T_{Coping} \cdot L_{Coping} = 125.77 \cdot ft^3$$

Cap Transition & Shaft Cap:

$A_{Cap_RR} := 79.8 \cdot ft^2$ (Measured in CAD)

$A_{Cap_LR} := 34.4 \cdot ft^2$ (Measured in CAD)

$A_{Cap_RF} := 34.5 \cdot ft^2$ (Measured in CAD)

$A_{Cap_LF} := 28.1 \cdot ft^2$ (Measured in CAD)

$T_{Cap} := 2 \cdot ft$ (Conservative to assume 2' for full area)

$$V_{Cap_Trans} := T_{Cap} \cdot (A_{Cap_RR} + A_{Cap_LR} + A_{Cap_RF} + A_{Cap_LF}) = 353.60 \cdot ft^3$$

Cantilever Wall Length, Average Height and Thickness:

$L_{Cant_RR} := 12.24 \cdot ft$

$L_{Cant_LR} := 9.43 \cdot ft$

$L_{Cant_RF} := 7.45 \cdot ft$

$L_{Cant_LF} := 10.55 \cdot ft$

$H_{Cant_RR} := 0.5 \cdot (3.2 \cdot ft + 7.72 \cdot ft) = 5.46 \cdot ft$

$H_{Cant_LR} := 0.5 \cdot (8.35 \cdot ft + 3.5 \cdot ft) = 5.925 \cdot ft$

$H_{Cant_RF} := 0.5 \cdot (4.1 \cdot ft + 7.35 \cdot ft) = 5.725 \cdot ft$

$H_{Cant_LF} := 0.5 \cdot (6.1 \cdot ft + 2.75 \cdot ft) = 4.425 \cdot ft$

$T_{Cant} := 5 \cdot in$ (10" of 15" already accounted for above in Wall Area)

$$V_{Cant} := T_{Cant} \cdot (L_{Cant_RR} \cdot H_{Cant_RR} + L_{Cant_LR} \cdot H_{Cant_LR} + L_{Cant_RF} \cdot H_{Cant_RF} + L_{Cant_LF} \cdot H_{Cant_LF}) = 88.35 \cdot ft^3$$

Total Item Quantity:

$$Q_{511_wall} := V_{CIP_Wall} + V_{Coping} + V_{Cap_Trans} + V_{Cant} = 5196.30 \cdot ft^3$$

$$Q_{511_wall} = 192 \cdot yd^3$$



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Item 511E46512 - Class QC1 Concrete w/ QC/QA, Footing

Number of Abutments:	$N_{abut} := 2$	
Number of Wingwalls:	$N_{wing} := 2$	(Per abutment)
Proposed Abutment Footing Area:	$A_{abut_ftg} := (5 \text{ ft} + 9 \text{ in}) \cdot ((143 \text{ ft} + 9 \text{ in}) + (136 \text{ ft} + 4 \text{ in})) = 1610.479 \text{ ft}^2$	
Proposed Footing Thickness:	$t_{fig_abut} := 2 \text{ ft} + 0 \text{ in}$	
Abutment Footing Volume:	$V_{abut_ftg} := \text{Ceil}(t_{fig_abut} \cdot A_{abut_ftg}, 1 \text{ yd}^3) = 120.00 \text{ yd}^3$	
Number of Pier Columns:	$N_{col} = 5$	
Proposed Pier Footing Area:	$A_{pier_ftg} := (10 \text{ ft} + 10 \text{ in}) \cdot (10 \text{ ft} + 10 \text{ in}) = 117.361 \text{ ft}^2$	
Proposed Footing Thickness:	$t_{fig_pier} := 3 \text{ ft} + 0 \text{ in}$	
Pier Footing Volume:	$V_{pier_ftg} := \text{Ceil}(N_{col} \cdot t_{fig_pier} \cdot A_{pier_ftg}, 1 \text{ yd}^3) = 66.00 \text{ yd}^3$	
Cantilever Wall Length:	$L_{Cant_RR} = 12.24 \text{ ft}$	$L_{Cant_LR} = 9.43 \text{ ft}$
	$L_{Cant_RF} = 7.45 \text{ ft}$	$L_{Cant_LF} = 10.55 \text{ ft}$
Proposed Cantilever Footing Width:	$W_{fig_Cant} := 7 \text{ ft} + 0 \text{ in}$	
Proposed Cantilever Footing Thickness:	$t_{fig_Cant} := 1 \text{ ft} + 6 \text{ in}$	
Abutment Footing Volume:	$V_{fig_Cant} := \text{Ceil}(t_{fig_Cant} \cdot W_{fig_Cant} \cdot (L_{Cant_RR} + L_{Cant_RF} + L_{Cant_LR} + L_{Cant_LF}), 1 \text{ yd}^3) = 16.00 \text{ yd}^3$	
Total Item Quantity:	$Q_{511_ftg} := V_{abut_ftg} + V_{pier_ftg} + V_{fig_Cant} = 202.00 \text{ yd}^3$	
	$Q_{511_ftg} = 202 \text{ yd}^3$	

Item 512E10050 - Sealing of Concrete Surfaces (Non-Epoxy)

Sidewalk Sealing Perimeter:	$P_{ped_side} := 8 \text{ in} + 72 \text{ in} = 6.667 \text{ ft}$
Proposed Deck Length:	$L_{deck} = 223.667 \text{ ft}$
Length of Approach Slabs:	$L_{apr} = 30 \text{ ft}$
Length of Sleeper Slabs:	$L_{sleeper} := 3.27 \text{ ft}$
Additional Percentage Allowance:	$per_{inc} := 0.05$
Total Sealing Area:	$Q_{512_non_seal} := (1 + per_{inc}) P_{ped_side} \cdot (L_{deck} + L_{apr} \cdot 2 + L_{sleeper} \cdot 2) = 2031.45 \text{ ft}^2$
	$Q_{512_non_seal} = 226 \text{ yd}^2$



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Item 512E10100 - Sealing of Concrete Surfaces (Epoxy-Urethane)

Determine area of concrete surface sealing along the bridge railings, and deck fascia:

BR-2-15 Perimeter: $P_{ped_appr_D} := 42 \text{ in} + 12 \text{ in} + 42 \text{ in} + 6 \text{ in} = 8.5 \text{ ft}$ (Along Approach D-D)

BR-2-15 Perimeter: $P_{ped_appr_C} := 5 \text{ in} + 4.5 \text{ in} + 27 \text{ in} + 7.5 \text{ in} \downarrow + 32 \text{ in} + 6 \text{ in} = 6.833 \text{ ft}$ (Along Approach C-C)

BR-2-15 Perimeter: $P_{ped_super_B} := 24 \text{ in} + 12 \text{ in} + 24 \text{ in} + 10.5 \text{ in} \downarrow + 2 \text{ in} + 12.5 \text{ in} + 28 \text{ in} = 9.417 \text{ ft}$ (Along Deck B-B)

BR-2-15 Perimeter: $P_{ped_super_A} := 24 \text{ in} + 12 \text{ in} + 24 \text{ in} + 2 \text{ in} \downarrow + 12.5 \text{ in} + 28 \text{ in} = 8.542 \text{ ft}$ (Along Deck A-A)

BR-2-15 Perimeter: $P_{ped_appr_B} := 24 \text{ in} + 12 \text{ in} + 24 \text{ in} + 6 \text{ in} = 5.5 \text{ ft}$ (Along Approach B-B)

BR-2-15 Perimeter: $P_{ped_appr_A} := 24 \text{ in} + 12 \text{ in} + 24 \text{ in} + 6 \text{ in} = 5.5 \text{ ft}$ (Along Approach A-A)

Proposed Deck Length: $L_{deck} = 223.667 \text{ ft}$ (bridge limits)

Length of Approach With A-A And B-B: $L_{apr_A.A_B.B} := 19 \text{ ft} + 4.5 \text{ ft} = 23.5 \text{ ft}$

Length of Approach With D-D: $L_{apr_D.D} := 5 \text{ ft}$

Length of Approach With C-C: $L_{apr_C.C} := 1.5 \text{ ft}$

Additional Percentage Allowance: $per_{inc} := 5\%$ (To account for field deviation)

Total Sealing Area of Bridge Railings: $A_{seal_rail} := \text{Ceil} \left(\left((1 + per_{inc}) \cdot \left((L_{deck}) \cdot (P_{ped_super_A} + P_{ped_super_B}) \downarrow + L_{apr_A.A_B.B} \cdot (P_{ped_appr_B} + P_{ped_appr_A}) \downarrow + (4 L_{apr_D.D}) \cdot (P_{ped_appr_D}) \downarrow + (4 L_{apr_C.C}) \cdot (P_{ped_appr_C}) \right) \right), 1 \text{ yd}^2 \right) = 524 \text{ yd}^2$

Determine area of concrete surface sealing along the end diaphragms:

Number of End Diaphragms: $N_{dia} = 2$

End Diaphragm Length: $L_{dia} = 77.436 \text{ ft}$

Proposed End Diaphragm Height: $H_{dia} := \frac{(4.0447 + 9 + 1.5 + 36 + 13 - 17)}{12} \text{ ft}$ (Excluding deck)

Additional Percentage Allowance: $per_{inc} = 0.05$ (To account for field deviation and small area on ends of diaphragm which projects past face of wingwalls)

Total Sealing Area of End Diaphragms: $A_{seal_dia} := \text{Ceil} \left((1 + per_{inc}) \cdot N_{dia} \cdot L_{dia} \cdot H_{dia}, 1 \text{ yd}^2 \right) = 71 \text{ yd}^2$



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Determine area of concrete surface sealing along the abutments/wingwalls:

Estimated Abutment Face Sealing Area: $A_{seal_face} := (A_{ra_stem} + A_{ra_wing}) + (A_{fa_stem} + A_{fa_wing}) = 1288 \text{ ft}^2$ (See item 511E44112)

Estimated Top of Footing: $A_{seal_foot} := (2 \text{ ft} + 3 \text{ in} + 2 \cdot \text{ft} + 5 \text{ in}) \cdot \left((46 \text{ ft} + 8 \text{ in}) + (20.111 \text{ ft}) \downarrow \right) \downarrow + (38 \cdot \text{ft}) + (21 \cdot \text{ft} + 4 \cdot \text{in}) + (1 \text{ ft} + 9 \cdot \text{in} + 2 \text{ ft} + 5 \text{ in}) \cdot ((77 \cdot \text{ft}) + (77 \text{ ft})) = 1230.185 \text{ ft}^2$

Area of Exposed Wingwall Top: $A_{top_wing} := (t_{wing} + 6 \text{ in}) \cdot (45.5 \text{ ft} + 23.5 \text{ ft} + 35.5 \text{ ft} + 24.9 \text{ ft}) = 388.2 \text{ ft}^2$

Additional Percentage Allowance: $per_{inc} = 0.05$ (To account for field deviation and small area on ends of WW and ftg)

Total Sealing Area of Abutments: $A_{seal_abut} := \text{Ceil} \left((1 + per_{inc}) \cdot (A_{seal_face} + A_{seal_foot} + A_{top_wing}) \right), 1 \text{ yd}^2 = 340 \text{ yd}^2$

Determine area of concrete surface sealing along Tangent and Cantilever walls:

Estimated CIP Wall Sealing Area: $A_{seal_wall} := A_{Wall_1} + A_{Wall_2} = 5554.3 \text{ ft}^2$

Area Covered by Proposed Ground: $A_{seal_ground} := 2 \text{ ft} \cdot (246.5 \text{ ft} + 184.5 \text{ ft}) = 862 \text{ ft}^2$

Area of Exposed Top of Wall: $A_{top_CIP} := (15 \text{ in} + 6 \text{ in} + 5 \text{ in}) \cdot (74.74 \text{ ft} + 28.01 \text{ ft} + 24.12 \text{ ft} + 24.05 \text{ ft}) = 326.993 \text{ ft}^2$

Additional Percentage Allowance: $per_{inc} = 0.05$ (To account for field deviation and slightly wider top of cantilever wall)

Total Sealing Area of Walls: $A_{seal_Wall} := \text{Ceil} \left((1 + per_{inc}) \cdot (A_{seal_wall} + A_{top_CIP} - A_{seal_ground}) \right), 1 \text{ yd}^2 = 586 \text{ yd}^2$

Determine area of concrete surface sealing along the piers:

Number of Pier Columns: $N_{col} = 5$

Diameter of Pier Columns: $d_{col} = 3 \text{ ft}$

Perimeter of Pier Columns: $P_{col} := \pi \cdot d_{col} = 9.425 \text{ ft}$

Estimated Column Height: $H_{col} = 18.9 \text{ ft}$

Median Roadway Barrier Height: $h_{med_bar} := 42 \text{ in}$ (Type C - encasing pier columns)

Estimated Column Height: $H_{col_bgrnd} := 5 \text{ ft}$

Pier Column Sealing Height: $H_{seal_pier} := H_{col} - h_{med_bar} - H_{col_bgrnd} = 10.4 \text{ ft}$

Pier Cap Thickness: $t_{cap} = 3.333 \text{ ft}$

Pier Cap Out-to-Out Width: $W_{cap} = 71 \text{ ft}$

Average Pier Cap Height: $H_{cap} = 4.285 \text{ ft}$

Additional Percentage Allowance: $per_{inc} = 0.05$ (To account for field deviation)

Total Sealing Area of Pier: $A_{seal_pier} := \text{Ceil} \left((1 + per_{inc}) \cdot \left(N_{col} \cdot P_{col} \cdot H_{seal_pier} \downarrow + (t_{cap} + 2 \cdot H_{cap}) \cdot W_{cap} \downarrow + 2 \cdot (t_{cap} \cdot H_{cap}) \right), 1 \text{ yd}^2 \right) = 160 \text{ yd}^2$

Determined total area of concrete surface sealing for the entire bridge:

Total Item Quantity: $Q_{512_seal} := A_{seal_rail} + A_{seal_dia} + A_{seal_abut} + A_{seal_Wall} + A_{seal_pier} = 15129.00 \text{ ft}^2$

$Q_{512_seal} = 1681 \text{ yd}^2$



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Item 512E33000 - Type 2 Waterproofing

Forward abutment waterproofing length:	$L_{fwd_water} := 28.25 \text{ ft} + 17 \text{ ft} + 6 \text{ ft} \cdot 2 = 57.25 \text{ ft}$
Rear abutment waterproofing length:	$L_{rear_water} := 23 \text{ ft} + 17.144 \text{ ft} + 6 \text{ ft} \cdot 2 = 52.14 \text{ ft}$
Wall 1 waterproofing length:	$L_{wall_1_water} := (712 - 692.2 + 712 - 695.2 + 2 \cdot 3) \text{ ft} = 42.60 \text{ ft}$
Wall 2 waterproofing length:	$L_{wall_2_water} := (710 - 700.7 + 710 - 702.6 + 2 \cdot 3) \text{ ft} = 22.70 \text{ ft}$
Total Item Quantity:	$Q_{512_water} := \text{Ceil}(3 \text{ ft} \cdot (L_{fwd_water} + L_{rear_water} + L_{wall_1_water} + L_{wall_2_water}), 5 \text{ yd}^2) = 60.00 \text{ yd}^2$
	$Q_{512_water} = 60 \text{ yd}^2$

Item 513E10280 - Structural Steel Members, Level 4

Number of Girders:	$N_{girder} = 6$
Length of Smaller Part of Girder:	$L_{s_girder} := 2 \cdot (10 \text{ in} + 77.5 \text{ ft} + 17 \text{ ft}) = 190.667 \text{ ft}$
Length of Larger Part of Girder:	$L_{L_girder} := 31 \text{ ft} = 31 \text{ ft}$
Smaller Girder Cross Area:	$A_{s_girder} := 1.5 \text{ in} \cdot 22 \text{ in} + 0.5 \text{ in} \cdot 36 \text{ in} + 1.5 \text{ in} \cdot 24 \text{ in} = 0.604 \text{ ft}^2$
Larger Girder Cross Area:	$A_{L_girder} := 2.25 \text{ in} \cdot 22 \text{ in} + 0.5 \text{ in} \cdot 36 \text{ in} + 2.5 \text{ in} \cdot 24 \text{ in} = 0.885 \text{ ft}^2$
Total Volume of Girders:	$V_{tot_girder} := (L_{s_girder} \cdot A_{s_girder} + L_{L_girder} \cdot A_{L_girder}) \cdot N_{girder} = 855.854 \text{ ft}^3$

Field splices

Number of Splices:	$N_{splice} := 2$
Top Outside Plate :	$V_{Top_out_splice} := 1 \text{ in} \cdot 22 \text{ in} \cdot (2 \text{ ft} + 3.25 \text{ in}) = 0.347 \text{ ft}^3$
Top Inside Plate:	$V_{Top_in_splice} := 2 \cdot (1 \text{ in} \cdot 9 \text{ in} \cdot (2 \text{ ft} + 3.25 \text{ in})) = 0.284 \text{ ft}^3$
Web Splice Plate:	$V_{Middle_splice} := 2 \cdot \left(\frac{3}{8} \text{ in} \cdot 11.5 \text{ in} \cdot (2 \text{ ft} + 6.75 \text{ in}) \right) = 0.153 \text{ ft}^3$
Bottom Inside Plate:	$V_{bot_in_splice} := 2 \cdot (1 \text{ in} \cdot 10 \text{ in} \cdot (2 \text{ ft} + 3.25 \text{ in})) = 0.315 \text{ ft}^3$
Bottom Outside Plate:	$V_{bot_out_splice} := 1 \text{ in} \cdot 24 \text{ in} \cdot (2 \text{ ft} + 3.25 \text{ in}) = 0.378 \text{ ft}^3$
Total Field Splice Volume:	$V_{tot_splice} := (V_{Top_out_splice} + V_{Top_in_splice} + V_{Middle_splice} + V_{bot_in_splice} + V_{bot_out_splice}) \cdot N_{splice} \cdot N_{girder} = 17.738 \text{ ft}^3$

Intermediate Diaphragm

Number of Intermediate Diaphragm:	$N_{int_dia} := 10 \cdot 5 = 50$
MC18x45.8 Area:	$A_{MC18x45.8} := 13.5 \text{ in}^2$
MC18x45.8 length:	$L_{int_dia} := 7 \text{ ft} + 2 \text{ in} - (2 \cdot 1 \text{ in}) = 7 \text{ ft}$
Total Intermediate Diaphragm Volume:	$V_{tot_int_dia} := N_{int_dia} \cdot A_{MC18x45.8} \cdot L_{int_dia} = 32.813 \text{ ft}^3$



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Connection Plates

Number of Diaphragm Connection Plates:

$$N_{con_plate} := N_{int_dia} \cdot 2 = 100$$

Diaphragm Connection Plates Volume:

$$V_{con_plate} := 0.5 \text{ in} \cdot 11.75 \text{ in} \cdot 36 \text{ in} = 0.122 \text{ ft}^3$$

Total Diaphragm Connection Plate Volume:

$$V_{tot_con_plate} := N_{con_plate} \cdot V_{con_plate} = 12.24 \text{ ft}^3$$

Abutment Bearing Stiffener

Number of Abutment Bearing Stiffeners:

$$N_{bearing_stif} := N_{abut} \cdot N_{girder} = 12$$

Abutment Bearing Stiffener Volume:

$$V_{bearing_stif} := 2 \cdot (1 \text{ in} \cdot 6.5 \text{ in} \cdot 36 \text{ in}) = 0.271 \text{ ft}^3$$

Total Abutment Bearing Stiffeners Volume:

$$V_{tot_bearing_stif} := V_{bearing_stif} \cdot N_{bearing_stif} = 3.25 \text{ ft}^3$$

Pier Diaphragm

Number of Intermediate Diaphragm:

$$N_{p_dia} := 5$$

MC18x45.8 Area:

$$A_{MC18x45.8} = 0.094 \text{ ft}^2$$

MC18x45.8 length:

$$L_{p_dia} := 13.11 \text{ ft} - (2 \cdot 7 \text{ in}) - (2 \cdot 1 \text{ in}) = 11.777 \text{ ft}$$

Total Field Intermediate Diaphragm Volume:

$$V_{tot_p_dia} := N_{p_dia} \cdot A_{MC18x45.8} \cdot L_{p_dia} = 5.52 \text{ ft}^3$$

Pier Bearing Stiffener

Number of Split Pipe Stiffener:

$$N_{split_pipe} := 6$$

Split Pipe Stiffener Volume:

$$V_{split_pipe} := (2 \cdot 7 \text{ in} \cdot \pi) \cdot 0.5 \text{ in} \cdot 36 \text{ in} = 0.458 \text{ ft}^3$$

Number of Pier Connection Plates:

$$N_{p_con_plate} := N_{p_dia} \cdot 2 = 10$$

Pier Connection Plates Stiffener Volume:

$$V_{p_con_plate} := 0.5 \text{ in} \cdot 11.75 \text{ in} \cdot 36 \text{ in} = 0.122 \text{ ft}^3$$

Pier Connection Plates Stiffener Volume:

$$V_{tot_p_bearing_stif} := N_{split_pipe} \cdot V_{split_pipe} + N_{p_con_plate} \cdot V_{p_con_plate} = 3.973 \text{ ft}^3$$

Determined total weight of structural steel for the bridge:

Weight of steel:

$$WT_{steel} := 490 \frac{\text{lb}}{\text{ft}^3}$$

Additional Weight Allowance:

$$add_{per} := 5\%$$

(To account for misc. steel and welds)

Total Item Quantity:

$$Q_{513_stl} := \text{Ceil} \left((1 + add_{per}) \cdot \left(V_{tot_girder} + V_{tot_splice} \downarrow + V_{tot_int_dia} + V_{tot_con_plate} \downarrow + V_{tot_bearing_stif} + V_{tot_p_dia} \downarrow + V_{tot_p_bearing_stif} \right) \cdot WT_{steel}, 1000 \text{ lb} \right)$$

$$Q_{513_stl} = 480000 \text{ lb}$$

(Rounded up to nearest 1,000 lb)



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Item 513E20000 - Welded Stud Shear Connectors

Number of Girders: $N_{girder} = 6$
 Shear Studs Rows per Beam: $n_{row} := 290$
 Shear Studs per Row: $n_{stud} := 3$
 Total Item Quantity: $Q_{513_stud} := N_{girder} \cdot n_{row} \cdot n_{stud}$
 $Q_{513_stud} = 5220$ EA

Item 516E10011 - Armorless Preformed Joint Seal, As Per Plan

Sleeper Slab Length: $L_{dia} := W_{deck} \div \cos(\theta) = 77.436 \text{ ft}$
 Number of Sleeper Slabs: $N_{Sleeper} := 2$
 Total Item Quantity: $Q_{516_Armorless} := (N_{Sleeper} \cdot L_{dia})$
 $Q_{516_Armorless} = 155 \text{ ft}$

Item 516E12310 - Sidewalk Cover Plate

Plate Length: $L_{plate} := (6 \text{ ft} - 2 \cdot 4 \text{ in}) \div \cos(\theta) = 9.756 \text{ ft}$ (Length of plate along skew minus 4" clear each end)
 Plate Width: $W_{plate} := 1.5 \text{ ft}$ (Per Std. Dwg.)
 Plate Thickness: $T_{plate} := 0.375 \text{ in}$ (Per Std. Dwg.)
 Number of Plates: $N_{plates} := 2$
 Total Item Quantity: $Q_{516_CoverPlate} := \text{Ceil}((N_{plates} \cdot L_{plate} \cdot W_{plate} \cdot T_{plate}) \cdot WT_{steel}, 50 \text{ lb}) = 450.00 \text{ lb}$
 $Q_{516_CoverPlate} = 450 \text{ lb}$

Item 516E13600 - 1" Preformed Expansion Joint Filler

Area of Railing BR-2-15: $A_{railing} := 1 \text{ ft} \cdot 2 \text{ ft} = 2 \text{ ft}^2$
 Area of Railing with Sidewalk: $A_{railing_side} := 1 \text{ ft} \cdot (2 \text{ ft} + 10.5 \text{ in}) = 2.875 \text{ ft}^2$
 Length of Sidewalk: $L_{side} := 6 \text{ ft} \div \cos(\theta) = 10.975 \text{ ft}$
 Average Sidewalk Height: $H_{ave_side} := ((8 \text{ in} + (10.5 \text{ in} - 8 \text{ in}) \cdot (6 \div 7)) + 8 \text{ in}) \div 2 = 9.071 \text{ in}$
 Area of Sidewalk: $A_{side} := L_{side} \cdot H_{ave_side} = 8.297 \text{ ft}^2$
 $V_{Super_1in} := \text{Ceil}(2 \cdot (A_{railing} + A_{railing_side} + A_{side}), 5 \text{ ft}^2) = 30.00 \text{ ft}^2$
 Wall 1 water proofing length: $L_{wall_1_water} = 42.6 \text{ ft}$
 Wall 2 water proofing length: $L_{wall_2_water} = 22.7 \text{ ft}$



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Wall Thickness:

$$T_{wall} := 10 \text{ in}$$

Wall Coping:

$$A_{coping} := (2 \text{ ft} \cdot 5 \text{ in}) = 0.833 \text{ ft}^2$$

(1 location, the abutment footing is the coping in the other 3 locations, only additional 5" needed, 10" accounted for above)

Wall Coping:

$$A_{cap_trans} := 4 \cdot (1 \text{ ft} \cdot 1 \text{ ft} + 2 \text{ ft} \cdot 3.25 \text{ ft}) = 30 \text{ ft}^2 \text{ (4 locations, only within 2' coping)}$$

$$V_{Wall_lin} := \text{Ceil}(T_{wall} \cdot (L_{wall_1_water} + L_{wall_2_water}) + A_{coping} + A_{cap_trans}, 5 \text{ ft}^2) = 90.00 \text{ ft}^2$$

Total Item Quantity:

$$Q_{516_lin} := V_{Super_lin} + V_{Wall_lin}$$

$$Q_{516_lin} = 120 \text{ ft}^2$$

Item 516E13900 - 2" Preformed Expansion Joint Filler

Rear Abutment End Diaphragm Heights:

$$H_{r_dia_lt} := 723.33 \text{ ft} - 718.02 \text{ ft} = 5.31 \text{ ft}$$

$$H_{r_dia_rt} := 722.66 \text{ ft} - 717.43 \text{ ft} = 5.23 \text{ ft}$$

Forward Abutment End Diaphragm Heights:

$$H_{f_dia_lt} := 720.47 \text{ ft} - 715.25 \text{ ft} = 5.22 \text{ ft}$$

$$H_{f_dia_rt} := 721.19 \text{ ft} - 715.9 \text{ ft} = 5.29 \text{ ft}$$

Length along the side of End Diaphragm:

$$L_{2in_side} := 2.5 \text{ ft} \div \cos(\theta) = 4.573 \text{ ft}$$

Total Item Quantity:

$$Q_{516_2in} := \text{Ceil}(L_{2in_side} \cdot (H_{r_dia_lt} + H_{r_dia_rt} + H_{f_dia_lt} + H_{f_dia_rt}), 5 \text{ ft}^2)$$

$$Q_{516_2in} = 100 \text{ ft}^2$$

Item 516E14020 - Semi-Integral Abutment Expansion Joint Seal

Number of Diaphragms guides per abutment: $N_{dia} = 2$

Number of abutments:

$$N_{abut} = 2$$

Length of Guide Expansion Joint Seal:

$$L_{semi_int} := 6 \text{ ft}$$

Rear Abutment End Diaphragm Heights:

$$H_{r_dia_lt} = 5.31 \text{ ft}$$

$$H_{r_dia_rt} = 5.23 \text{ ft}$$

Forward Abutment End Diaphragm Heights:

$$H_{f_dia_lt} = 5.22 \text{ ft}$$

$$H_{f_dia_rt} = 5.29 \text{ ft}$$

Total Item Quantity:

$$Q_{516_semi_int} := N_{dia} \cdot N_{abut} \cdot L_{semi_int} + H_{r_dia_lt} + 1.5 \text{ ft} + H_{r_dia_rt} + 1.5 \text{ ft} + H_{f_dia_lt} + 1.5 \text{ ft} + H_{f_dia_rt} + 1.5 \text{ ft} + (77.44 \text{ ft} + 3 \text{ ft}) \cdot N_{abut} = 211.93 \text{ ft}$$

$$Q_{516_semi_int} = 212 \text{ ft}$$



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Item 516E44301 - Elastomeric Bearing with Internal Laminates and Load Plate (Neoprene), As Per Plan (14"x17"x4.0447" With 15"x19"x1.5" Load Plate

Number of Bearings at Rear Abut.: $N_{r_bearing} := 6$

Number of Bearings at Fwd. Abut.: $N_{f_bearing} := 6$

Total Item Quantity: $Q_{516_e_bearing14} := N_{r_bearing} + N_{f_bearing} = 12.00$

$Q_{516_e_bearing14} = 12$ EA

Item 516E44301 - Elastomeric Bearing with Internal Laminates and Load Plate (Neoprene), As Per Plan (18"x22"x4.4322" With 19"x26"x1.688" Max. Load Plate

Number of Bearings at Pier 1: $N_{p_bearing} := 6$

Total Item Quantity: $Q_{516_e_bearing18} := N_{p_bearing} = 6.00$

$Q_{516_e_bearing18} = 6$ EA

Item 517E75122 - Railing (Concrete Parapet with Twin Steel Tube Railing and Vandal Protection Fence)

Length or Steel Railing per side: $L_{s_railing} := 23 \text{ ft} + 6 \text{ in} + L_{deck} + 6 \text{ ft} + 6 \text{ in} + 6 \text{ ft} + 7 \text{ in} = 260.25 \text{ ft}$

Total Item Quantity: $Q_{517_railing} := 2 \cdot L_{s_railing} = 520.50 \text{ ft}$

$Q_{517_railing} = 521 \text{ ft}$

Item 518E20000 - Prefabricated Geocomposite Drain

Wall 1 Height: $L_{wall_1_drain} := 902.1 \text{ ft}$

(Conservatively assume sum top of shaft - bottom of wall elev + 1.5' into porous backfill for each shaft)

Wall 2 Height: $L_{wall_2_drain} := 394.7 \text{ ft}$

Drain Width: $W_{wall_drain} := 4 \text{ ft}$

(Assume 2" of shaft is touching the CIP wall facing)

Total Item Quantity: $Q_{518_drain} := \text{Ceil}((L_{wall_1_drain} + L_{wall_2_drain}) \cdot W_{wall_drain}, 5 \text{ yd}^2) = 580.00 \text{ yd}^2$

$Q_{518_drain} = 580 \text{ yd}^2$



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SHAFT NO.	STATION	TOP OF WALL ELEV.	TOP OF SHAFT ELEV.	APPROX. EXISTING GROUND	BOT. OF CIP WALL ELEV.	BOT. OF DRILLED SHAFT ELEV.	ESTIMATED DRILLED SHAFT LENGTH (FT)	PRIMARY REINFORCING	CONFINEMENT REINFORCING	NUMBER OF DOWELS/ANCHORS
1	0+39.24	697.15	692.42	698.29	688.86	657.36	36	18 - DS1101	1 - DS SP501	4 SETS OF 2 - 1W501
2	0+43.40	698.69	693.95	699.63	689.20	657.70	37	18 - DS1102	1 - DS SP502	5 SETS OF 2 - 1W501
3	0+47.57	700.23	695.49	701.13	689.54	658.04	38	18 - DS1103	1 - DS SP503	6 SETS OF 2 - 1W501
4	0+51.74	701.77	697.03	701.35	689.89	658.39	39	18 - DS1104	1 - DS SP504	8 SETS OF 2 - 1W501
5	0+55.90	703.12	698.56	701.56	690.14	658.64	40	18 - DS1105	1 - DS SP505	9 SETS OF 2 - 1W501
6	0+60.07	704.25	699.70	701.77	690.30	658.80	41	18 SETS OF 1 - DS1101 AND 1 - DS1106	1 - DS SP506	10 SETS OF 2 - 1W501
7	0+64.24	705.38	700.83	701.98	690.46	658.96	42	18 SETS OF 1 - DS1101 AND 1 - DS1107	1 - DS SP507	11 SETS OF 2 - 1W501
8	0+68.40	706.51	701.96	702.19	690.62	659.12	43	18 SETS OF 1 - DS1101 AND 1 - DS1108	1 - DS SP508	12 SETS OF 2 - 1W501
9	0+72.57	707.63	703.09	702.61	690.78	659.28	44	18 SETS OF 1 - DS1101 AND 1 - DS1109	1 - DS SP509	13 SETS OF 2 - 1W501
10	0+76.74	708.76	704.22	702.80	690.94	659.44	45	18 SETS OF 1 - DS1101 AND 1 - DS1110	1 - DS SP510	14 SETS OF 2 - 1W501
11	0+80.90	709.89	705.35	702.64	691.10	659.60	46	18 SETS OF 1 - DS1101 AND 1 - DS1111	1 - DS SP511	15 SETS OF 2 - 1W501
12	0+85.07	711.02	706.48	702.76	691.26	653.76	53	18 SETS OF 1 - DS1101 AND 1 - DS1112	1 - DS SP512	16 SETS OF 2 - 1W501
13	0+89.24	712.15	707.61	702.89	691.42	653.92	54	18 SETS OF 1 - DS1101 AND 1 - DS1113	1 - DS SP513	17 SETS OF 2 - 1W501
14	0+93.40	713.28	708.74	702.95	691.58	654.08	55	18 SETS OF 1 - DS1101 AND 1 - DS1114	1 - DS SP514	18 SETS OF 2 - 1W501
15	0+97.57	714.41	711.37	703.01	691.74	654.24	58	18 SETS OF 1 - DS1101 AND 1 - DS1115	1 - DS SP517	20 SETS OF 2 - 1W501
16	1+01.74	712.00	712.00	703.06	691.89	654.39	58	18 SETS OF 1 - DS1101 AND 1 - DS1121	1 - DS SP517	21 SETS OF 2 - 1W501
17	1+05.90	712.00	712.00	703.12	692.03	654.53	58	18 SETS OF 1 - DS1101 AND 1 - DS1121	1 - DS SP517	20 SETS OF 2 - 1W501
18	1+10.07	712.00	712.00	703.17	692.17	654.67	58	18 SETS OF 1 - DS1101 AND 1 - DS1121	1 - DS SP517	20 SETS OF 2 - 1W501
19	1+14.24	712.00	712.00	703.23	692.31	654.81	58	18 SETS OF 1 - DS1101 AND 1 - DS1121	1 - DS SP517	20 SETS OF 2 - 1W501
20	1+18.40	712.00	712.00	703.32	692.44	654.94	58	18 SETS OF 1 - DS1101 AND 1 - DS1121	1 - DS SP517	20 SETS OF 2 - 1W501
21	1+22.57	712.00	712.00	703.47	692.58	655.08	57	18 SETS OF 1 - DS1101 AND 1 - DS1120	1 - DS SP516	20 SETS OF 2 - 1W501
22	1+26.74	712.00	712.00	703.62	692.72	655.22	57	18 SETS OF 1 - DS1101 AND 1 - DS1120	1 - DS SP516	20 SETS OF 2 - 1W501
23	1+30.90	712.00	712.00	703.76	692.86	655.36	57	18 SETS OF 1 - DS1101 AND 1 - DS1120	1 - DS SP516	20 SETS OF 2 - 1W501
24	1+35.07	712.00	712.00	703.91	693.00	655.50	57	18 SETS OF 1 - DS1101 AND 1 - DS1120	1 - DS SP516	19 SETS OF 2 - 1W501
25	1+39.24	712.00	712.00	704.06	693.14	655.64	57	18 SETS OF 1 - DS1101 AND 1 - DS1120	1 - DS SP516	19 SETS OF 2 - 1W501
26	1+43.40	712.00	712.00	704.06	693.28	655.78	57	18 SETS OF 1 - DS1101 AND 1 - DS1120	1 - DS SP516	19 SETS OF 2 - 1W501
27	1+47.57	712.00	712.00	704.01	693.42	655.92	57	18 SETS OF 1 - DS1101 AND 1 - DS1120	1 - DS SP516	19 SETS OF 2 - 1W501
28	1+51.74	712.00	712.00	703.95	693.56	656.06	56	18 SETS OF 1 - DS1101 AND 1 - DS1119	1 - DS SP515	19 SETS OF 2 - 1W501
29	1+55.90	712.00	712.00	703.90	693.70	656.20	56	18 SETS OF 1 - DS1101 AND 1 - DS1119	1 - DS SP515	19 SETS OF 2 - 1W501
30	1+60.07	712.00	712.00	703.84	693.84	656.34	56	18 SETS OF 1 - DS1101 AND 1 - DS1119	1 - DS SP515	19 SETS OF 2 - 1W501
31	1+64.24	712.00	712.00	703.79	693.98	656.48	56	18 SETS OF 1 - DS1101 AND 1 - DS1119	1 - DS SP515	19 SETS OF 2 - 1W501
32	1+68.40	712.00	712.00	703.72	694.12	656.62	56	18 SETS OF 1 - DS1101 AND 1 - DS1119	1 - DS SP515	18 SETS OF 2 - 1W501
33	1+72.57	712.00	712.00	703.56	694.26	656.76	56	18 SETS OF 1 - DS1101 AND 1 - DS1119	1 - DS SP515	18 SETS OF 2 - 1W501
34	1+76.74	712.00	712.00	703.40	694.40	656.90	56	18 SETS OF 1 - DS1101 AND 1 - DS1119	1 - DS SP515	18 SETS OF 2 - 1W501
35	1+80.90	712.00	712.00	703.24	694.54	657.04	55	18 SETS OF 1 - DS1101 AND 1 - DS1118	1 - DS SP514	18 SETS OF 2 - 1W501
36	1+85.07	712.00	712.00	703.08	694.68	657.18	55	18 SETS OF 1 - DS1101 AND 1 - DS1118	1 - DS SP514	18 SETS OF 2 - 1W501
37	1+89.24	712.00	712.00	702.92	694.81	657.31	55	18 SETS OF 1 - DS1101 AND 1 - DS1118	1 - DS SP514	18 SETS OF 2 - 1W501
38	1+93.40	712.00	712.00	702.76	694.95	657.45	55	18 SETS OF 1 - DS1101 AND 1 - DS1118	1 - DS SP514	18 SETS OF 2 - 1W501
39	1+97.57	712.00	712.00	702.60	695.09	657.59	55	18 SETS OF 1 - DS1101 AND 1 - DS1118	1 - DS SP514	17 SETS OF 2 - 1W501
40	2+01.74	712.00	712.00	702.44	695.23	657.73	55	18 SETS OF 1 - DS1101 AND 1 - DS1118	1 - DS SP514	17 SETS OF 2 - 1W501
41	2+05.90	712.00	712.00	702.28	695.37	657.87	55	18 SETS OF 1 - DS1101 AND 1 - DS1118	1 - DS SP514	17 SETS OF 2 - 1W501
42	2+10.07	712.00	712.00	702.12	695.51	658.01	54	18 SETS OF 1 - DS1101 AND 1 - DS1117	1 - DS SP513	17 SETS OF 2 - 1W501
43	2+14.24	712.00	712.00	701.96	695.65	658.15	54	18 SETS OF 1 - DS1101 AND 1 - DS1117	1 - DS SP513	17 SETS OF 2 - 1W501
44	2+18.40	712.00	712.00	701.80	695.79	658.29	54	18 SETS OF 1 - DS1101 AND 1 - DS1117	1 - DS SP513	17 SETS OF 2 - 1W501
45	2+22.57	712.00	712.00	701.64	695.93	658.43	54	18 SETS OF 1 - DS1101 AND 1 - DS1117	1 - DS SP513	17 SETS OF 2 - 1W501
46	2+26.74	712.00	712.00	701.43	696.07	658.57	54	18 SETS OF 1 - DS1101 AND 1 - DS1117	1 - DS SP513	16 SETS OF 2 - 1W501
47	2+30.90	712.00	712.00	701.18	696.21	658.71	54	18 SETS OF 1 - DS1101 AND 1 - DS1117	1 - DS SP513	16 SETS OF 2 - 1W501
48	2+35.07	712.00	712.00	700.95	696.35	658.85	54	18 SETS OF 1 - DS1101 AND 1 - DS1117	1 - DS SP513	16 SETS OF 2 - 1W501
49	2+39.24	712.00	712.00	701.10	696.49	658.99	54	18 SETS OF 1 - DS1101 AND 1 - DS1117	1 - DS SP513	16 SETS OF 2 - 1W501
50	2+43.40	712.00	712.00	700.98	696.63	659.13	53	18 SETS OF 1 - DS1101 AND 1 - DS1116	1 - DS SP512	16 SETS OF 2 - 1W501
51	2+47.57	712.90	707.87	700.85	696.73	665.23	43	18 SETS OF 1 - DS1101 AND 1 - DS1108	1 - DS SP508	12 SETS OF 2 - 1W501
52	2+51.74	710.76	705.73	700.55	696.84	665.34	41	18 SETS OF 1 - DS1101 AND 1 - DS1106	1 - DS SP506	9 SETS OF 2 - 1W501
53	2+55.90	708.62	703.59	700.23	696.94	665.44	39	18 - DS1104	1 - DS SP504	7 SETS OF 2 - 1W501
54	2+60.07	706.48	701.45	701.09	697.05	665.55	36	18 - DS1101	1 - DS SP501	5 SETS OF 2 - 1W501



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75	0+90.45	706.61	701.74	701.82	698.50	676.00	26	12 - DS1123	1 - DS SP519	4 SETS OF 2 - 2W501
76	0+94.62	708.43	703.56	701.95	698.70	676.20	28	12 - DS1124	1 - DS SP520	5 SETS OF 2 - 2W501
77	0+98.78	710.24	705.37	702.08	698.91	676.41	29	12 - DS1125	1 - DS SP521	7 SETS OF 2 - 2W501
78	1+02.95	712.06	707.18	702.21	699.11	676.61	31	12 - DS1126	1 - DS SP522	9 SETS OF 2 - 2W501
79	1+07.12	710.00	710.00	702.34	699.27	670.27	40	12 - DS1130	1 - DS SP505	11 SETS OF 2 - 2W501
80	1+11.28	710.00	710.00	702.48	699.37	670.37	40	12 - DS1130	1 - DS SP505	11 SETS OF 2 - 2W501
81	1+15.45	710.00	710.00	702.61	699.47	670.47	40	12 - DS1130	1 - DS SP505	11 SETS OF 2 - 2W501
82	1+19.62	710.00	710.00	702.74	699.57	670.57	40	12 - DS1130	1 - DS SP505	11 SETS OF 2 - 2W501
83	1+23.78	710.00	710.00	702.87	699.67	670.67	40	12 - DS1130	1 - DS SP505	11 SETS OF 2 - 2W501
84	1+27.95	710.00	710.00	703.02	699.77	670.77	40	12 - DS1130	1 - DS SP505	11 SETS OF 2 - 2W501
85	1+32.12	710.00	710.00	703.13	699.87	670.87	40	12 - DS1130	1 - DS SP505	11 SETS OF 2 - 2W501
86	1+36.28	710.00	710.00	703.10	699.97	670.97	40	12 - DS1130	1 - DS SP505	11 SETS OF 2 - 2W501
87	1+40.45	710.00	710.00	703.34	700.06	671.06	39	12 - DS1129	1 - DS SP504	10 SETS OF 2 - 2W501
88	1+44.62	710.00	710.00	703.59	700.16	671.16	39	12 - DS1129	1 - DS SP504	10 SETS OF 2 - 2W501
89	1+48.78	710.00	710.00	703.83	700.26	671.26	39	12 - DS1129	1 - DS SP504	10 SETS OF 2 - 2W501
90	1+52.95	710.00	710.00	704.07	700.36	671.36	39	12 - DS1129	1 - DS SP504	10 SETS OF 2 - 2W501
91	1+57.12	710.00	710.00	704.32	700.46	671.46	39	12 - DS1129	1 - DS SP504	10 SETS OF 2 - 2W501
92	1+61.28	710.00	710.00	704.56	700.56	671.56	39	12 - DS1129	1 - DS SP504	10 SETS OF 2 - 2W501
93	1+65.45	710.00	710.00	704.80	700.66	671.66	39	12 - DS1129	1 - DS SP504	10 SETS OF 2 - 2W501
94	1+69.62	710.00	710.00	705.04	700.76	671.76	39	12 - DS1129	1 - DS SP504	10 SETS OF 2 - 2W501
95	1+73.78	710.00	710.00	705.19	700.86	671.86	39	12 - DS1129	1 - DS SP504	10 SETS OF 2 - 2W501
96	1+77.95	710.00	710.00	705.08	700.96	671.96	39	12 - DS1129	1 - DS SP504	10 SETS OF 2 - 2W501
97	1+82.12	710.00	710.00	704.96	701.06	672.06	38	12 - DS1128	1 - DS SP503	9 SETS OF 2 - 2W501
98	1+86.28	710.00	710.00	704.84	701.16	672.16	38	12 - DS1128	1 - DS SP503	9 SETS OF 2 - 2W501
99	1+90.45	710.00	710.00	704.73	701.26	672.26	38	12 - DS1128	1 - DS SP503	9 SETS OF 2 - 2W501
100	1+94.62	710.00	710.00	704.61	701.36	672.36	38	12 - DS1128	1 - DS SP503	9 SETS OF 2 - 2W501
101	1+98.78	710.00	710.00	704.49	701.46	672.46	38	12 - DS1128	1 - DS SP503	9 SETS OF 2 - 2W501
102	2+02.95	710.00	710.00	704.38	701.56	672.56	38	12 - DS1128	1 - DS SP503	9 SETS OF 2 - 2W501
103	2+07.12	710.00	710.00	704.26	701.66	672.66	38	12 - DS1128	1 - DS SP503	9 SETS OF 2 - 2W501
104	2+11.28	710.00	710.00	704.39	701.76	672.76	38	12 - DS1128	1 - DS SP503	9 SETS OF 2 - 2W501
105	2+15.45	710.00	710.00	704.53	701.86	672.86	38	12 - DS1128	1 - DS SP503	9 SETS OF 2 - 2W501
106	2+19.62	710.00	710.00	704.67	701.96	672.96	38	12 - DS1128	1 - DS SP503	9 SETS OF 2 - 2W501
107	2+23.78	710.00	710.00	704.81	702.06	673.06	37	12 - DS1127	1 - DS SP502	8 SETS OF 2 - 2W501
108	2+27.95	710.00	710.00	704.96	702.16	673.16	37	12 - DS1127	1 - DS SP502	8 SETS OF 2 - 2W501
109	2+32.12	710.00	710.00	705.06	702.26	673.26	37	12 - DS1127	1 - DS SP502	8 SETS OF 2 - 2W501
110	2+36.28	710.00	710.00	705.18	702.36	673.36	37	12 - DS1127	1 - DS SP502	8 SETS OF 2 - 2W501
111	2+40.45	710.00	710.00	705.29	702.46	673.46	37	12 - DS1127	1 - DS SP502	8 SETS OF 2 - 2W501
112	2+44.62	711.99	707.36	705.26	702.51	680.01	28	12 - DS1124	1 - DS SP520	5 SETS OF 2 - 2W501
113	2+48.78	710.67	706.03	705.14	702.55	680.05	26	12 - DS1123	1 - DS SP519	4 SETS OF 2 - 2W501
114	2+52.95	709.34	704.71	705.01	702.58	680.08	25	12 - DS1122	1 - DS SP518	3 SETS OF 2 - 2W501



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Item 518E21200 - Porous Backfill with Geotextile Fabric

Width of Porous Backfill Abut.:

$$W_{porous_backfill} := 2 \text{ ft}$$

Rear Abutment Backfill Area:

$$A_{ra_abut_backfill} := 556 \text{ ft}^2 \quad (\text{Measured in CAD})$$

Fwd. Abutment Backfill Area:

$$A_{fa_abut_backfill} := 543 \text{ ft}^2 \quad (\text{Measured in CAD})$$

Rear Wingwall Backfill Area:

$$A_{ra_wing_backfill} := 224 \text{ ft}^2 + 101 \text{ ft}^2 = 325 \text{ ft}^2 \quad (\text{Measured in CAD})$$

Fwd. Wingwall Backfill Area:

$$A_{fa_wing_backfill} := 164 \text{ ft}^2 + 113 \text{ ft}^2 = 277 \text{ ft}^2 \quad (\text{Measured in CAD})$$

$$V_{Abut_backfill} := W_{porous_backfill} \cdot (A_{ra_abut_backfill} + A_{fa_abut_backfill} + A_{ra_wing_backfill} + A_{fa_wing_backfill}) = 126.00 \text{ yd}^3$$

Tangent Wall Backfill Width back of wall:

$$W_{wall_bfill_back} := 3 \text{ ft}$$

Tangent Wall Backfill Plan Area Between Shafts and Facing:

$$A_{wall_bfill_btwn} := 2.1 \text{ ft}^2 \quad (\text{area only between two shafts and wall})$$

Tangent Wall 1 Backfill Volume Front:

$$V_{wall_1_bfill_front} := \text{Ceil}(1.5 \text{ ft} \cdot 2 \text{ ft} \cdot 224.83 \text{ ft}, 1 \text{ yd}^3) = 25 \text{ yd}^3 \quad (\text{only in front of shafts})$$

Tangent Wall 1 Backfill Volume Back:

$$A_{wall_1_bfill_back_RR} := 165 \text{ ft}^2 \quad (\text{Elevation area})$$

$$A_{wall_1_bfill_back_LR} := 58 \text{ ft}^2 \quad (\text{Elevation area})$$

$$V_{wall_1_bfill_back} := \text{Ceil}(W_{wall_bfill_back} \cdot (A_{wall_1_bfill_back_RR} + A_{wall_1_bfill_back_LR}) - T_{Cap} \cdot (A_{Cap_RR} + A_{Cap_LR}), 5 \text{ yd}^3) = 20 \text{ yd}^3$$

(Ceiling to 5 CY to account for additional volume behind the cap transitions)

Tangent Wall 1 Backfill Volume Btwn:

$$L_{wall_1_bfill_btwn} := 821.1 \text{ ft} \quad (\text{Conservatively assume sum top of shaft - bottom of wall elev, see previous wall info table})$$

$$V_{wall_1_bfill_btwn} := \text{Ceil}(A_{wall_bfill_btwn} \cdot L_{wall_1_bfill_btwn}, 1 \text{ yd}^3) = 64 \text{ yd}^3$$

Tangent Wall 2 Backfill Volume Front:

$$V_{wall_2_bfill_front} := \text{Ceil}(1.5 \text{ ft} \cdot 2 \text{ ft} \cdot 166.5 \text{ ft}, 1 \text{ yd}^3) = 19 \text{ yd}^3 \quad (\text{only in front of shafts})$$

Tangent Wall 2 Backfill Volume Back:

$$A_{wall_2_bfill_back_RF} := 54 \text{ ft}^2 \quad (\text{Elevation area})$$

$$A_{wall_2_bfill_back_LF} := 41 \text{ ft}^2 \quad (\text{Elevation area})$$

$$V_{wall_2_bfill_back} := \text{Ceil}(W_{wall_bfill_back} \cdot (A_{wall_2_bfill_back_RF} + A_{wall_2_bfill_back_LF}) - T_{Cap} \cdot (A_{Cap_RF} + A_{Cap_LF}), 5 \text{ yd}^3) = 10 \text{ yd}^3$$

(Ceiling to 5 CY to account for additional volume behind the cap transitions)

Tangent Wall 2 Backfill Volume Btwn:

$$L_{wall_2_bfill_btwn} := 334.7 \text{ ft} \quad (\text{Conservatively assume sum top of shaft - bottom of wall elev, see previous wall info table})$$

$$V_{wall_2_bfill_btwn} := \text{Ceil}(A_{wall_bfill_btwn} \cdot L_{wall_2_bfill_btwn}, 1 \text{ yd}^3) = 27 \text{ yd}^3$$

$$V_{T_Wall_backfill} := V_{wall_1_bfill_front} + V_{wall_1_bfill_back} + V_{wall_1_bfill_btwn} + V_{wall_2_bfill_front} + V_{wall_2_bfill_back} + V_{wall_2_bfill_btwn} = 165.00 \text{ yd}^3$$



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Cantilever Wall Backfill Width:

$$W_{cant_bfill} := 2 \text{ ft} + 7 \text{ in}$$

$$V_{cant_bfill_RR} := \text{Ceil} \left(W_{cant_bfill} \cdot L_{Cant_RR} \cdot H_{Cant_RR}, 1 \text{ yd}^3 \right) = 7 \text{ yd}^3$$

$$V_{cant_bfill_LR} := \text{Ceil} \left(W_{cant_bfill} \cdot L_{Cant_LR} \cdot H_{Cant_LR}, 1 \text{ yd}^3 \right) = 6 \text{ yd}^3$$

$$V_{cant_bfill_RF} := \text{Ceil} \left(W_{cant_bfill} \cdot L_{Cant_RF} \cdot H_{Cant_RF}, 1 \text{ yd}^3 \right) = 5 \text{ yd}^3$$

$$V_{cant_bfill_LF} := \text{Ceil} \left(W_{cant_bfill} \cdot L_{Cant_LF} \cdot H_{Cant_LF}, 1 \text{ yd}^3 \right) = 5 \text{ yd}^3$$

$$V_{C_Wall_backfill} := V_{cant_bfill_RR} + V_{cant_bfill_LR} + V_{cant_bfill_RF} + V_{cant_bfill_LF} = 23.00 \text{ yd}^3$$

Total Item Quantity:

$$Q_{518_backfill} := V_{Abut_backfill} + V_{T_Wall_backfill} + V_{C_Wall_backfill} = 314.00 \text{ yd}^3$$

$$Q_{518_backfill} = 314 \text{ yd}^3$$

Item 518E40000 - 6" Perforated Corrugated Plastic Pipe

Rear Abutment Perforated Pipe:

$$L_{ra_perforated} := 143 \text{ ft} + 9 \text{ in}$$

Fwd. Abutment Perforated Pipe:

$$L_{fa_perforated} := 136 \text{ ft} + 4 \text{ in}$$

Wall 1 Perforated Pipe:

$$L_{wall_1_perforated} := \left((224.83 \text{ ft})^2 + (696.25 \text{ ft} - 688.07 \text{ ft})^2 \right)^{0.5} \downarrow + \left((63 \text{ ft})^2 + (714 \text{ ft} - 692.37 \text{ ft})^2 \right)^{0.5} \downarrow + \left((19 \text{ ft})^2 + (714 \text{ ft} - 701.34 \text{ ft})^2 \right)^{0.5} + 4.2 \text{ ft} + 9.5 \text{ ft} \downarrow + 3.5 \text{ ft} + 12.25 \text{ ft} = 343.87 \text{ ft}$$

Wall 2 Perforated Pipe:

$$L_{wall_2_perforated} := \left((167 \text{ ft})^2 + (701.49 \text{ ft} - 697.48 \text{ ft})^2 \right)^{0.5} + 3.1 \text{ ft} \downarrow + \left((17 \text{ ft})^2 + (708.93 \text{ ft} - 701.51 \text{ ft})^2 \right)^{0.5} \downarrow + 3.1 \text{ ft} + 7.5 \text{ ft} + 3.6 \text{ ft} \downarrow + \left((14 \text{ ft})^2 + (708.37 \text{ ft} - 704.65 \text{ ft})^2 \right)^{0.5} \downarrow + 2 \text{ ft} + 10.6 \text{ ft} = 229.983 \text{ ft}$$

Total Item Quantity:

$$Q_{518_perforated} := \text{Ceil} \left(L_{ra_perforated} + L_{fa_perforated} \downarrow + L_{wall_1_perforated} + L_{wall_2_perforated}, 10 \text{ ft} \right) = 860.00 \text{ ft}$$

$$Q_{518_perforated} = 860 \text{ ft}$$



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Item 518E40011 - 6" Non-Perforated Corrugated Plastic Pipe, Including Specials, As Per Plan

Wall 1 Right Rear Non-Perforated
Pipe Horizontal Length:

$$L1_{wall_1_nonperforated} := 4.7 \text{ ft} + 12.1 \text{ ft} + 4.4 \text{ ft} = 21.2 \text{ ft}$$

Wall 1 Left Rear Non-Perforated
Pipe Horizontal Length:

$$L2_{wall_1_nonperforated} := 4.3 \text{ ft} + 9.4 \text{ ft} = 13.7 \text{ ft}$$

Wall 2 Right Fwd. Non-Perforated
Pipe Horizontal Length:

$$L1_{wall_2_nonperforated} := 4.3 \text{ ft} + 8.5 \text{ ft} + 4.6 \text{ ft} = 17.4 \text{ ft}$$

Wall 2 Right Fwd. Non-Perforated
Pipe Horizontal Length:

$$L2_{wall_2_nonperforated} := 4.3 \text{ ft} + 10.6 \text{ ft} = 14.9 \text{ ft}$$

Total Item Quantity:

$$Q_{518_nonperforated} := \text{Ceil} \left(L1_{wall_1_nonperforated} + L2_{wall_1_nonperforated} + L1_{wall_2_nonperforated} + L2_{wall_2_nonperforated}, 10 \text{ ft} \right) = 70.00 \text{ ft}$$

$$Q_{518_nonperforated} = 70 \text{ ft}$$

Item 523E20001 - Dynamic Load Testing, As Per Plan

Number of Tests at Pier:

$$N_{dyn_pier} := 1$$

(ODOT BDM 305.7.1)

Total Item Quantity:

$$Q_{523_load_test} := N_{dyn_pier}$$

$$Q_{523_load_test} = 1 \quad \text{EA}$$

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↓
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V

Item 523E20501 - Restrike, As Per Plan

Number of Tests at Pier:

$$N_{restrike_pier} := 1$$

Total Item Quantity:

$$Q_{523_restrike} := N_{restrike_pier}$$

$$Q_{523_restrike} = 1 \quad \text{EA}$$



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Item 524E94903 - Drilled Shafts, 48" Diameter, Above Bedrock, As Per Plan

Total Item Quantity:

$$L_{\text{drilled_shaft_Wall1}} := \left(36 + 37 + 38 + 39 + 40 + 41 + 42 + 43 + 44 + 45 + 46 + 53 + 54 \downarrow \right. \\ \left. + 55 + 58 \cdot 6 + 57 \cdot 7 + 56 \cdot 7 + 55 \cdot 7 + 54 \cdot 8 + 53 + 43 + 41 + 39 + 36 \right) \cdot \text{ft}$$

$$L_{\text{drilled_shaft_Wall2}} := \left(26 + 28 + 29 + 31 + 40 \cdot 8 + 39 \cdot 10 + 38 \cdot 10 \downarrow \right. \\ \left. + 37 \cdot 5 + 28 + 26 + 25 \right) \cdot \text{ft}$$

$$Q_{524_drilled_shaft_48} := L_{\text{drilled_shaft_Wall1}} + L_{\text{drilled_shaft_Wall2}}$$

$$Q_{524_drilled_shaft_48} = 4249 \text{ ft}$$

WALL 1 INFORMATION TABLE										
SHAFT NO.	STATION	TOP OF WALL ELEV.	TOP OF SHAFT ELEV.	APPROX. EXISTING GROUND	BOT. OF CIP WALL ELEV.	BOT. OF DRILLED SHAFT ELEV.	ESTIMATED DRILLED SHAFT LENGTH (FT)	PRIMARY REINFORCING	CONFINEMENT REINFORCING	NUMBER OF DOWELS/ANCHORS
1	0+39.24	697.15	692.42	698.29	688.86	657.36	36	18 - DS1101	1 - DS SP501	4 SETS OF 2 - 1W501
2	0+43.40	698.69	693.95	699.63	689.20	657.70	37	18 - DS1102	1 - DS SP502	5 SETS OF 2 - 1W501
3	0+47.57	700.23	695.49	701.13	689.54	658.04	38	18 - DS1103	1 - DS SP503	6 SETS OF 2 - 1W501
4	0+51.74	701.77	697.03	701.35	689.89	658.39	39	18 - DS1104	1 - DS SP504	8 SETS OF 2 - 1W501
5	0+55.90	703.12	698.56	701.56	690.14	658.64	40	18 - DS1105	1 - DS SP505	9 SETS OF 2 - 1W501
6	0+60.07	704.25	699.70	701.77	690.30	658.80	41	18 SETS OF 1 - DS1101 AND 1 - DS1106	1 - DS SP506	10 SETS OF 2 - 1W501
7	0+64.24	705.38	700.83	701.98	690.46	658.96	42	18 SETS OF 1 - DS1101 AND 1 - DS1107	1 - DS SP507	11 SETS OF 2 - 1W501
8	0+68.40	706.51	701.96	702.19	690.62	659.12	43	18 SETS OF 1 - DS1101 AND 1 - DS1108	1 - DS SP508	12 SETS OF 2 - 1W501
9	0+72.57	707.63	703.09	702.61	690.78	659.28	44	18 SETS OF 1 - DS1101 AND 1 - DS1109	1 - DS SP509	13 SETS OF 2 - 1W501
10	0+76.74	708.76	704.22	702.80	690.94	659.44	45	18 SETS OF 1 - DS1101 AND 1 - DS1110	1 - DS SP510	14 SETS OF 2 - 1W501
11	0+80.90	709.89	705.35	702.64	691.10	659.60	46	18 SETS OF 1 - DS1101 AND 1 - DS1111	1 - DS SP511	15 SETS OF 2 - 1W501
12	0+85.07	711.02	706.48	702.76	691.26	653.76	53	18 SETS OF 1 - DS1101 AND 1 - DS1112	1 - DS SP512	16 SETS OF 2 - 1W501
13	0+89.24	712.15	707.61	702.89	691.42	653.92	54	18 SETS OF 1 - DS1101 AND 1 - DS1113	1 - DS SP513	17 SETS OF 2 - 1W501
14	0+93.40	713.28	708.74	702.95	691.58	654.08	55	18 SETS OF 1 - DS1101 AND 1 - DS1114	1 - DS SP514	18 SETS OF 2 - 1W501
15	0+97.57	714.41	711.37	703.01	691.74	654.24	58	18 SETS OF 1 - DS1101 AND 1 - DS1115	1 - DS SP517	20 SETS OF 2 - 1W501
16	1+01.74	712.00	712.00	703.06	691.89	654.39	58	18 SETS OF 1 - DS1101 AND 1 - DS1121	1 - DS SP517	21 SETS OF 2 - 1W501
17	1+05.90	712.00	712.00	703.12	692.03	654.53	58	18 SETS OF 1 - DS1101 AND 1 - DS1121	1 - DS SP517	20 SETS OF 2 - 1W501
18	1+10.07	712.00	712.00	703.17	692.17	654.67	58	18 SETS OF 1 - DS1101 AND 1 - DS1121	1 - DS SP517	20 SETS OF 2 - 1W501
19	1+14.24	712.00	712.00	703.23	692.31	654.81	58	18 SETS OF 1 - DS1101 AND 1 - DS1121	1 - DS SP517	20 SETS OF 2 - 1W501
20	1+18.40	712.00	712.00	703.32	692.44	654.94	58	18 SETS OF 1 - DS1101 AND 1 - DS1121	1 - DS SP517	20 SETS OF 2 - 1W501
21	1+22.57	712.00	712.00	703.47	692.58	655.08	57	18 SETS OF 1 - DS1101 AND 1 - DS1120	1 - DS SP516	20 SETS OF 2 - 1W501
22	1+26.74	712.00	712.00	703.62	692.72	655.22	57	18 SETS OF 1 - DS1101 AND 1 - DS1120	1 - DS SP516	20 SETS OF 2 - 1W501
23	1+30.90	712.00	712.00	703.76	692.86	655.36	57	18 SETS OF 1 - DS1101 AND 1 - DS1120	1 - DS SP516	20 SETS OF 2 - 1W501
24	1+35.07	712.00	712.00	703.91	693.00	655.50	57	18 SETS OF 1 - DS1101 AND 1 - DS1120	1 - DS SP516	19 SETS OF 2 - 1W501
25	1+39.24	712.00	712.00	704.06	693.14	655.64	57	18 SETS OF 1 - DS1101 AND 1 - DS1120	1 - DS SP516	19 SETS OF 2 - 1W501
26	1+43.40	712.00	712.00	704.06	693.28	655.78	57	18 SETS OF 1 - DS1101 AND 1 - DS1120	1 - DS SP516	19 SETS OF 2 - 1W501
27	1+47.57	712.00	712.00	704.01	693.42	655.92	57	18 SETS OF 1 - DS1101 AND 1 - DS1120	1 - DS SP516	19 SETS OF 2 - 1W501
28	1+51.74	712.00	712.00	703.95	693.56	656.06	56	18 SETS OF 1 - DS1101 AND 1 - DS1119	1 - DS SP515	19 SETS OF 2 - 1W501
29	1+55.90	712.00	712.00	703.90	693.70	656.20	56	18 SETS OF 1 - DS1101 AND 1 - DS1119	1 - DS SP515	19 SETS OF 2 - 1W501
30	1+60.07	712.00	712.00	703.84	693.84	656.34	56	18 SETS OF 1 - DS1101 AND 1 - DS1119	1 - DS SP515	19 SETS OF 2 - 1W501
31	1+64.24	712.00	712.00	703.79	693.98	656.48	56	18 SETS OF 1 - DS1101 AND 1 - DS1119	1 - DS SP515	19 SETS OF 2 - 1W501
32	1+68.40	712.00	712.00	703.72	694.12	656.62	56	18 SETS OF 1 - DS1101 AND 1 - DS1119	1 - DS SP515	18 SETS OF 2 - 1W501
33	1+72.57	712.00	712.00	703.56	694.26	656.76	56	18 SETS OF 1 - DS1101 AND 1 - DS1119	1 - DS SP515	18 SETS OF 2 - 1W501
34	1+76.74	712.00	712.00	703.40	694.40	656.90	56	18 SETS OF 1 - DS1101 AND 1 - DS1119	1 - DS SP515	18 SETS OF 2 - 1W501
35	1+80.90	712.00	712.00	703.24	694.54	657.04	55	18 SETS OF 1 - DS1101 AND 1 - DS1118	1 - DS SP514	18 SETS OF 2 - 1W501
36	1+85.07	712.00	712.00	703.08	694.68	657.18	55	18 SETS OF 1 - DS1101 AND 1 - DS1118	1 - DS SP514	18 SETS OF 2 - 1W501
37	1+89.24	712.00	712.00	702.92	694.81	657.31	55	18 SETS OF 1 - DS1101 AND 1 - DS1118	1 - DS SP514	18 SETS OF 2 - 1W501
38	1+93.40	712.00	712.00	702.76	694.95	657.45	55	18 SETS OF 1 - DS1101 AND 1 - DS1118	1 - DS SP514	18 SETS OF 2 - 1W501
39	1+97.57	712.00	712.00	702.60	695.09	657.59	55	18 SETS OF 1 - DS1101 AND 1 - DS1118	1 - DS SP514	17 SETS OF 2 - 1W501
40	2+01.74	712.00	712.00	702.44	695.23	657.73	55	18 SETS OF 1 - DS1101 AND 1 - DS1118	1 - DS SP514	17 SETS OF 2 - 1W501
41	2+05.90	712.00	712.00	702.28	695.37	657.87	55	18 SETS OF 1 - DS1101 AND 1 - DS1118	1 - DS SP514	17 SETS OF 2 - 1W501
42	2+10.07	712.00	712.00	702.12	695.51	658.01	54	18 SETS OF 1 - DS1101 AND 1 - DS1117	1 - DS SP513	17 SETS OF 2 - 1W501
43	2+14.24	712.00	712.00	701.96	695.65	658.15	54	18 SETS OF 1 - DS1101 AND 1 - DS1117	1 - DS SP513	17 SETS OF 2 - 1W501
44	2+18.40	712.00	712.00	701.80	695.79	658.29	54	18 SETS OF 1 - DS1101 AND 1 - DS1117	1 - DS SP513	17 SETS OF 2 - 1W501
45	2+22.57	712.00	712.00	701.64	695.93	658.43	54	18 SETS OF 1 - DS1101 AND 1 - DS1117	1 - DS SP513	17 SETS OF 2 - 1W501
46	2+26.74	712.00	712.00	701.43	696.07	658.57	54	18 SETS OF 1 - DS1101 AND 1 - DS1117	1 - DS SP513	16 SETS OF 2 - 1W501
47	2+30.90	712.00	712.00	701.18	696.21	658.71	54	18 SETS OF 1 - DS1101 AND 1 - DS1117	1 - DS SP513	16 SETS OF 2 - 1W501
48	2+35.07	712.00	712.00	700.95	696.35	658.85	54	18 SETS OF 1 - DS1101 AND 1 - DS1117	1 - DS SP513	16 SETS OF 2 - 1W501
49	2+39.24	712.00	712.00	701.10	696.49	658.99	54	18 SETS OF 1 - DS1101 AND 1 - DS1117	1 - DS SP513	16 SETS OF 2 - 1W501
50	2+43.40	712.00	712.00	700.98	696.63	659.13	53	18 SETS OF 1 - DS1101 AND 1 - DS1116	1 - DS SP512	16 SETS OF 2 - 1W501
51	2+47.57	712.90	707.87	700.85	696.73	665.23	43	18 SETS OF 1 - DS1101 AND 1 - DS1108	1 - DS SP508	12 SETS OF 2 - 1W501
52	2+51.74	710.76	705.73	700.55	696.84	665.34	41	18 SETS OF 1 - DS1101 AND 1 - DS1106	1 - DS SP506	9 SETS OF 2 - 1W501
53	2+55.90	708.62	703.59	700.23	696.94	665.44	39	18 - DS1104	1 - DS SP504	7 SETS OF 2 - 1W501
54	2+60.07	706.48	701.45	701.09	697.05	665.55	36	18 - DS1101	1 - DS SP501	5 SETS OF 2 - 1W501



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WALL 2 INFORMATION TABLE										
SHAFT NO.	STATION	TOP OF WALL ELEV.	TOP OF SHAFT ELEV.	APPROXIMATE EXISTING GROUND	BOT. OF CIP WALL ELEV.	BOT. OF DRILLED SHAFT ELEV.	ESTIMATED DRILLED SHAFT LENGTH (FT)	PRIMARY REINFORCING	CONFINEMENT REINFORCING	NUMBER OF DOWELS/ANCHORS
75	0+90.45	706.61	701.74	701.82	698.50	676.00	26	12 - DS1123	1 - DS SP519	4 SETS OF 2 - 2W501
76	0+94.62	708.43	703.56	701.95	698.70	676.20	28	12 - DS1124	1 - DS SP520	5 SETS OF 2 - 2W501
77	0+98.78	710.24	705.37	702.08	698.91	676.41	29	12 - DS1125	1 - DS SP521	7 SETS OF 2 - 2W501
78	1+02.95	712.06	707.18	702.21	699.11	676.61	31	12 - DS1126	1 - DS SP522	9 SETS OF 2 - 2W501
79	1+07.12	710.00	710.00	702.34	699.27	670.27	40	12 - DS1130	1 - DS SP505	11 SETS OF 2 - 2W501
80	1+11.28	710.00	710.00	702.48	699.37	670.37	40	12 - DS1130	1 - DS SP505	11 SETS OF 2 - 2W501
81	1+15.45	710.00	710.00	702.61	699.47	670.47	40	12 - DS1130	1 - DS SP505	11 SETS OF 2 - 2W501
82	1+19.62	710.00	710.00	702.74	699.57	670.57	40	12 - DS1130	1 - DS SP505	11 SETS OF 2 - 2W501
83	1+23.78	710.00	710.00	702.87	699.67	670.67	40	12 - DS1130	1 - DS SP505	11 SETS OF 2 - 2W501
84	1+27.95	710.00	710.00	703.02	699.77	670.77	40	12 - DS1130	1 - DS SP505	11 SETS OF 2 - 2W501
85	1+32.12	710.00	710.00	703.13	699.87	670.87	40	12 - DS1130	1 - DS SP505	11 SETS OF 2 - 2W501
86	1+36.28	710.00	710.00	703.10	699.97	670.97	40	12 - DS1130	1 - DS SP505	11 SETS OF 2 - 2W501
87	1+40.45	710.00	710.00	703.34	700.06	671.06	39	12 - DS1129	1 - DS SP504	10 SETS OF 2 - 2W501
88	1+44.62	710.00	710.00	703.59	700.16	671.16	39	12 - DS1129	1 - DS SP504	10 SETS OF 2 - 2W501
89	1+48.78	710.00	710.00	703.83	700.26	671.26	39	12 - DS1129	1 - DS SP504	10 SETS OF 2 - 2W501
90	1+52.95	710.00	710.00	704.07	700.36	671.36	39	12 - DS1129	1 - DS SP504	10 SETS OF 2 - 2W501
91	1+57.12	710.00	710.00	704.32	700.46	671.46	39	12 - DS1129	1 - DS SP504	10 SETS OF 2 - 2W501
92	1+61.28	710.00	710.00	704.56	700.56	671.56	39	12 - DS1129	1 - DS SP504	10 SETS OF 2 - 2W501
93	1+65.45	710.00	710.00	704.80	700.66	671.66	39	12 - DS1129	1 - DS SP504	10 SETS OF 2 - 2W501
94	1+69.62	710.00	710.00	705.04	700.76	671.76	39	12 - DS1129	1 - DS SP504	10 SETS OF 2 - 2W501
95	1+73.78	710.00	710.00	705.19	700.86	671.86	39	12 - DS1129	1 - DS SP504	10 SETS OF 2 - 2W501
96	1+77.95	710.00	710.00	705.08	700.96	671.96	39	12 - DS1129	1 - DS SP504	10 SETS OF 2 - 2W501
97	1+82.12	710.00	710.00	704.96	701.06	672.06	38	12 - DS1128	1 - DS SP503	9 SETS OF 2 - 2W501
98	1+86.28	710.00	710.00	704.84	701.16	672.16	38	12 - DS1128	1 - DS SP503	9 SETS OF 2 - 2W501
99	1+90.45	710.00	710.00	704.73	701.26	672.26	38	12 - DS1128	1 - DS SP503	9 SETS OF 2 - 2W501
100	1+94.62	710.00	710.00	704.61	701.36	672.36	38	12 - DS1128	1 - DS SP503	9 SETS OF 2 - 2W501
101	1+98.78	710.00	710.00	704.49	701.46	672.46	38	12 - DS1128	1 - DS SP503	9 SETS OF 2 - 2W501
102	2+02.95	710.00	710.00	704.38	701.56	672.56	38	12 - DS1128	1 - DS SP503	9 SETS OF 2 - 2W501
103	2+07.12	710.00	710.00	704.26	701.66	672.66	38	12 - DS1128	1 - DS SP503	9 SETS OF 2 - 2W501
104	2+11.28	710.00	710.00	704.39	701.76	672.76	38	12 - DS1128	1 - DS SP503	9 SETS OF 2 - 2W501
105	2+15.45	710.00	710.00	704.53	701.86	672.86	38	12 - DS1128	1 - DS SP503	9 SETS OF 2 - 2W501
106	2+19.62	710.00	710.00	704.67	701.96	672.96	38	12 - DS1128	1 - DS SP503	9 SETS OF 2 - 2W501
107	2+23.78	710.00	710.00	704.81	702.06	673.06	37	12 - DS1127	1 - DS SP502	8 SETS OF 2 - 2W501
108	2+27.95	710.00	710.00	704.96	702.16	673.16	37	12 - DS1127	1 - DS SP502	8 SETS OF 2 - 2W501
109	2+32.12	710.00	710.00	705.06	702.26	673.26	37	12 - DS1127	1 - DS SP502	8 SETS OF 2 - 2W501
110	2+36.28	710.00	710.00	705.18	702.36	673.36	37	12 - DS1127	1 - DS SP502	8 SETS OF 2 - 2W501
111	2+40.45	710.00	710.00	705.29	702.46	673.46	37	12 - DS1127	1 - DS SP502	8 SETS OF 2 - 2W501
112	2+44.62	711.99	707.36	705.26	702.51	680.01	28	12 - DS1124	1 - DS SP520	5 SETS OF 2 - 2W501
113	2+48.78	710.67	706.03	705.14	702.55	680.05	26	12 - DS1123	1 - DS SP519	4 SETS OF 2 - 2W501
114	2+52.95	709.34	704.71	705.01	702.58	680.08	25	12 - DS1122	1 - DS SP518	3 SETS OF 2 - 2W501



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Item 526E30010 - Reinforced Concrete Approach Slab w/ QC/QA (T=17")

Number of Approach Slabs: $N_{apr} := 2$

Width of Approach Slabs: $W_{apr} := 42 \text{ ft} + 4 \text{ in}$

Length of Approach Slabs: $L_{apr} = 30 \text{ ft}$

Total Item Quantity: $Q_{526_apr} := \text{Ceil}(N_{apr} \cdot W_{apr} \cdot L_{apr}, 1 \text{ yd}^2) = 2547.00 \text{ ft}^2$

$Q_{526_apr} = 283 \text{ yd}^2$

Item 526E90031 - Type C Installation, As Per Plan

Number of Approach Slabs: $N_{apr} = 2$

Length of Sleeper Slabs: $L_{sleep} := \text{Ceil}\left(\frac{40 \text{ ft} + 6 \text{ in}}{\cos(\theta)}, 1 \text{ ft}\right) = 75 \text{ ft}$

Total Item Quantity: $Q_{526_inst} := N_{apr} \cdot \text{Ceil}(L_{sleep}, 1 \text{ ft}) = 150.00 \text{ ft}$

$Q_{526_inst} = 150 \text{ ft}$

Item SPECIAL 53000200 - Structures Misc.: Preconstruction Condition Survey

Total Item Quantity: $Q_{Special} := 1 \text{ LS}$

Item 607E39901 - Vandal Protection Fence, 6' Straight, Coated Fabric, As Per Plan

Number of Bridge Railings: $N_{rail} := 2$

Length of Fence: $L_{fence} := 165 \text{ ft} + 0 \text{ in}$ (Per railing)

Total Item Quantity: $Q_{607} := N_{rail} \cdot L_{fence} = 330.00 \text{ ft}$

$Q_{607} = 330 \text{ ft}$

Item 625E33000 - Structure Grounding System

Total Item Quantity: $Q_{625} := 1 \text{ EA}$



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Item 894E10000 - Thermal Integrity Profiling (TIP) Test

Number at Rear Abutment: $N_{RearAbuts} := 6$

Number at Fwd. Abutment: $N_{FwdAbuts} := 4$

Total Item Quantity: $Q_{894} := N_{RearAbuts} + N_{FwdAbuts} = 10.00$

$$Q_{894} = 10$$



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Summary of Stage 3 Quantities:

Estimated Quantity

Item 202E11203 - Portion of Structure Removed, Over 20 Foot Span, As Per Plan	$Q_{202} = 1$ LS
Item 202E22900 - Approach Slab Removed	$Q_{202_app_slab} = 100 \text{ yd}^2$
Item 503E11100 - Cofferdams and Excavation Bracing	$Q_{503} = 1$ LS
Item 503E21100 - Unclassified Excavation	$Q_{503_unclassified} = 300 \text{ yd}^3$
Item 505E11100 - Pile Driving Equipment Mobilization	$Q_{505} = 1$ LS
Item 507E00700 - 16" Cast - In - Place Reinforced Concrete Piles, Driven	$Q_{507_16_CIP_driven} = 1900 \text{ ft}$
Item 507E00750 - 16" Cast - In - Place Reinforced Concrete Piles, Furnished	$Q_{507_16_CIP_furn} = 2000 \text{ ft}$
Item 509E10000 - Epoxy Coated Steel Reinforcement	$Q_{509} = 181699 \text{ lbf}$
Item 509E26000 - Galvanized Steel Reinforcement	$Q_{509_galv} = 10256 \text{ lbf}$
Item 510E10001 - Dowel Holes with Nonshrink, Nonmetallic Grout, As Per Plan	$Q_{510} = 2408$ EA
Item 511E33500 - Semi-Integral Diaphragm Guide	$Q_{511_diaG} = 4$ EA
Item 511E34447 - Class QC2 Concrete with QC/QA, Bridge Deck, As Per Plan	$Q_{511_deck} = 415 \text{ yd}^3$
Item 511E41012 - Class QC1 Concrete w/ QC/QA, Pier Above Footings	$Q_{511_pier} = 63 \text{ yd}^3$
Item 511E44112 - Class QC1 Concrete w/ QC/QA, Abutment Not Including Footings	$Q_{511_abut} = 131 \text{ yd}^3$
Item 511E46012 - Class QC1 Concrete w/ QC/QA, Retaining/Wingwall not including Footing	$Q_{511_wall} = 192 \text{ yd}^3$
Item 511E46512 - Class QC1 Concrete w/ QC/QA, Footing	$Q_{511_fig} = 202 \text{ yd}^3$
Item 512E10050 - Sealing of Concrete Surfaces (Non-Epoxy)	$Q_{512_non_seal} = 226 \text{ yd}^2$
Item 512E10100 - Sealing of Concrete Surfaces (Epoxy-Urethane)	$Q_{512_seal} = 1681 \text{ yd}^2$
Item 512E33000 - Type 2 Waterproofing	$Q_{512_water} = 60 \text{ yd}^2$
Item 513E10280 - Structural Steel Members, Level 4	$Q_{513_stl} = 480000 \text{ lb}$



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Summary of Stage 3 Quantities (Cont.):

Estimated Quantity

Item 513E20000 - Welded Stud Shear Connectors	$Q_{513_stud} = 5220$	EA
Item 516E10011 - Armorless Performed Joint Seal, As Per Plan	$Q_{516_Armorless} = 155$	ft
Item 516E12310 - Sidewalk Cover Plate	$Q_{516_CoverPlate} = 450$	lb
Item 516E13600 - 1" Preformed Expansion Joint Filler	$Q_{516_1in} = 120$	ft ²
Item 516E13900 - 2" Preformed Expansion Joint filler	$Q_{516_2in} = 100$	ft ²
Item 516E14020 - Semi-Integral Abutment Expansion Joint Seal	$Q_{516_semi_int} = 212$	ft
Item 516E44301 - Elastomeric Bearing with Internal Laminates and Load Plate (Neoprene), As Per Plan (14"x17"x4.0447" with 15"x19"x1.5" Load Plate)	$Q_{516_e_bearing14} = 12$	EA
Item 516E44301 - Elastomeric Bearing with Internal Laminates and Load Plate (Neoprene), As Per Plan (18"x22"x4.4322" with 19"x26"x1.688" Max. Load Plate)	$Q_{516_e_bearing18} = 6$	EA
Item 517E75122 - Railing (Concrete Parapet with Twin Steel Tube Railing and Vandal Protection Fence)	$Q_{517_railing} = 521$	ft
Item 518E20000 - Prefabricated Geocomposite Drain	$Q_{518_drain} = 580$	yd ²
Item 518E21200 - Porous Backfill with Geotextile Fabric	$Q_{518_backfill} = 314$	yd ³
Item 518E40000 - 6" Perforated Corrugated Plastic Pipe	$Q_{518_perforated} = 860$	ft
Item 518E40011 - 6" Non-Perforated Corrugated Plastic Pipe	$Q_{518_nonperforated} = 70$	ft
Item 523E20001 - Dynamic Load Testing, As Per Plan	$Q_{523_load_test} = 1$	EA
Item 523E20501 - Restrike, As Per Plan	$Q_{523_restrike} = 1$	EA
Item 524E94903 - Drilled Shafts, 48" diameter, above bedrock, as per plan	$Q_{524_drilled_shaft_48} = 4249$	ft
Item 526E30010 - Reinforced Concrete Approach Slabs with QC/QA (T=17")	$Q_{526_apr} = 283$	yd ²
Item 526E90031 - Type C Installation, As Per Plan	$Q_{526_inst} = 150$	ft
SPECIAL53000200 - Structures Misc.: Preconstruction Condition Survey	$Q_{Special} = 1$	
Item 607E39901 - Vandal Protection Fence, 6' Straight, Coated Fabric, As Per Plan	$Q_{607} = 330$	ft



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Item 625E33000 - Structure Grounding System

$Q_{625} = 1$ EA

Item 894E10000 - Thermal Integrity Profiling (TIP) Test

$Q_{894} = 10$ EA