

BRO-CR42A-0028 STRUCTURE QUANTITIES

ITEM 202E11002, STRUCTURE REMOVED, OVER 20 FOOT SPAN (LS)

(Lump Sum)

ITEM 202E23500, WEARING COURSE REMOVED (SY)

$$L_{bridge} := 89 \text{ ft}$$

$$w_{bridge} := 20 \text{ ft}$$

$$A_{wcr} := L_{bridge} \cdot w_{bridge} = 197.778 \text{ yd}^2$$

ITEM 503E11100, COFFERDAMS AND EXCAVATION BRACING (LS)

(Lump Sum)

ITEM 503E21100, UNCLASSIFIED EXCAVATION (CY)

Rear Abutment:

$$w_{ftg} := 5 \text{ ft} \quad bott_{ftg_RA} := 599.7 \text{ ft} \quad A_{ftg_RA} := 320 \text{ ft}^2$$

$$l_{ftg_RA} := 64 \text{ ft} \quad tor_RA := 601.2 \text{ ft} \quad A_{ee_RA} := 462 \text{ ft}^2$$

$$pg_{ex_RA} := 614.20 \text{ ft}$$

$$A_{earthex_RA} := (l_{ftg_RA} + 1 \text{ ft} + 1 \text{ ft}) \cdot (w_{ftg} + 1 \text{ ft} + 1 \text{ ft}) = 462 \text{ ft}^2$$

$$d_{earthex_RA} := pg_{ex_RA} - tor_RA = 13 \text{ ft}$$

$$V_{earth_exc_RA} := A_{earthex_RA} \cdot d_{earthex_RA} = 222.444 \text{ yd}^3$$

Forward Abutment:

$$w_{ftg} := 5 \text{ ft} \quad bott_{ftg_FA} := 597.7 \text{ ft} \quad A_{ftg_FA} := 308 \text{ ft}^2$$

$$l_{ftg_FA} := 62 \text{ ft} \quad tor_FA := 607.2 \text{ ft} \quad A_{ee_FA} := 445 \text{ ft}^2$$

$$pg_{ex_FA} := 612.55 \text{ ft}$$

$$A_{earthex_FA} := (l_{ftg_FA} + 1 \text{ ft} + 1 \text{ ft}) \cdot (w_{ftg} + 1 \text{ ft} + 1 \text{ ft}) = 448 \text{ ft}^2$$

$$d_{earthex_FA} := pg_{ex_FA} - tor_FA = 5.35 \text{ ft}$$

$$V_{earth_exc_FA} := A_{earthex_FA} \cdot d_{earthex_FA} = 88.77 \text{ yd}^3$$

$$V_{UE} := V_{earth_exc_RA} + V_{earth_exc_FA} = 311.215 \text{ yd}^3$$

ITEM 503E31100, ROCK EXCAVATION (CY)

Rear Abutment:

$$A_{rockex_RA} := 320 \text{ ft}^2$$

$$d_{rockex_RA} := tor_RA - bott_{ftg_RA} = 1.5 \text{ ft}$$

$$V_{rock_exc_RA} := A_{rockex_RA} \cdot d_{rockex_RA} + 14 \text{ ft}^2 \cdot 30 \text{ ft} = 33.333 \text{ yd}^3$$

Forward Abutment:

$$A_{rockex_FA} := 308 \text{ ft}^2$$

$$d_{rockex_FA} := tor_FA - bott_{ftg_FA} = 9.5 \text{ ft}$$

$$V_{rock_exc_FA} := A_{rockex_FA} \cdot d_{rockex_FA} + 4.5 \text{ ft} \cdot 4 \text{ ft} \cdot 30 \text{ ft} = 128.37 \text{ yd}^3 \quad (\text{Conservative})$$

$$V_{rock_exc} := V_{rock_exc_RA} + V_{rock_exc_FA} = 161.704 \text{ yd}^3$$

ITEM 509E10000, EPOXY COATED REINFORCING STEEL (LB)

$$W_{super} := 9343 \text{ lb} + 1794 \text{ lb} = 11137 \text{ lb}$$

$$W_{sub} := 16068 \text{ lb} = 16068 \text{ lb}$$

$$W_{total} := W_{super} + W_{sub} = 27205 \text{ lb}$$

ITEM 511E31610, CLASS QC2 CONCRETE, SUPERSTRUCTURE (CY)

$$t_{deck_avg} := 7.75 \text{ in}$$

$$d_{beam} := 33 \text{ in}$$

$$w_{deck} := 28 \text{ ft} + 3 \text{ in}$$

$$L_{deck} := 103 \text{ ft} + 0.5 \text{ in}$$

$$L_{dia} := 31.73 \text{ ft}$$

$$t_{as} := 15 \text{ in}$$

$$A_{dia} := (t_{as} - t_{deck_avg}) \cdot 1.0 \text{ ft} + (d_{beam} + t_{deck_avg} - t_{as}) \cdot 1.5 \text{ ft} = 3.823 \text{ ft}^2$$

$$V_{dia_oh} := 1 \text{ ft} \cdot 1.5 \text{ ft} \cdot (d_{beam} + t_{deck_avg}) = 0.189 \text{ yd}^3$$

$$V_{QC2} := t_{deck_avg} \cdot w_{deck} \cdot L_{deck} + 2 \cdot L_{dia} \cdot A_{dia} + 4 \cdot V_{dia_oh} = 79.369 \text{ yd}^3$$

ITEM 511E44110, CLASS QC1 CONCRETE, ABUTMENT NOT INCLUDING FOOTING (CY)

Rear Abutment:

$$A_{bs} := 96.22 \text{ ft}^2$$

$$h_{bs} := 8.05 \text{ ft}$$

$$A_{wall_L} := 8.7 \text{ ft}^2$$

$$h_{wall_L} := 10.91 \text{ ft}$$

$$t_{ftg} := 3 \text{ ft}$$

$$A_{wall_R} := 3.71 \text{ ft}^2$$

$$h_{wall_R} := 12.11 \text{ ft}$$

$$t_{wwall} := 1.5 \text{ ft}$$

$$l_{wwall_L} := 9 \text{ ft}$$

$$h_{wwall_L} := \frac{613.61 \text{ ft} + 609.5 \text{ ft}}{2} - bott_{ftg_RA} - t_{ftg} = 8.855 \text{ ft}$$

$$l_{wwall_R} := 18 \text{ ft}$$

$$h_{wwall_R} := \frac{614.81 \text{ ft} + 606.5 \text{ ft}}{2} - bott_{ftg_RA} - t_{ftg} = 7.955 \text{ ft}$$

$$V_{wall} := A_{bs} \cdot h_{bs} + A_{wall_L} \cdot h_{wall_L} + A_{wall_R} \cdot h_{wall_R} = 33.867 \text{ yd}^3$$

$$V_{wwall} := t_{wwall} \cdot (l_{wwall_L} \cdot h_{wall_L} + l_{wwall_R} \cdot h_{wwall_R}) = 13.41 \text{ yd}^3$$

$$V_{RA} := V_{wall} + V_{wwall} = 47.277 \text{ yd}^3$$

Forward Abutment:

$$A_{bs} := 96.2 \text{ ft}^2$$

$$h_{bs} := 8.35 \text{ ft}$$

$$A_{wall_L} := 8.5 \text{ ft}^2$$

$$h_{wall_L} := 11.09 \text{ ft}$$

$$A_{wall_R} := 8.7 \text{ ft}^2$$

$$h_{wall_R} := 12.62 \text{ ft}$$

$$t_{\text{wall}} := 1.5 \text{ ft}$$

$$l_{\text{wall}_L} := 13 \text{ ft}$$

$$h_{\text{wall}_L} := \frac{611.81 \text{ ft} + 606.50 \text{ ft}}{2} - \text{bott}_{\text{ftg}_{FA}} - t_{\text{ftg}} = 8.455 \text{ ft}$$

$$l_{\text{wall}_R} := 9 \text{ ft}$$

$$h_{\text{wall}_R} := \frac{613.32 \text{ ft} + 609.5 \text{ ft}}{2} - \text{bott}_{\text{ftg}_{FA}} - t_{\text{ftg}} = 10.71 \text{ ft}$$

$$V_{\text{wall}} := A_{\text{bs}} \cdot h_{\text{bs}} + A_{\text{wall}_L} \cdot h_{\text{wall}_L} + A_{\text{wall}_R} \cdot h_{\text{wall}_R} = 37.308 \text{ yd}^3$$

$$V_{\text{wwall}} := t_{\text{wall}} \cdot (l_{\text{wall}_L} \cdot h_{\text{wall}_L} + l_{\text{wall}_R} \cdot h_{\text{wall}_R}) = 13.364 \text{ yd}^3$$

$$V_{FA} := V_{\text{wall}} + V_{\text{wwall}} = 50.673 \text{ yd}^3$$

$$V_{\text{abut}} := V_{RA} + V_{FA} = 97.95 \text{ yd}^3$$

ITEM 511E46510, CLASS QC1 CONCRETE, FOOTING (CY)

$$t_{\text{ftg}} := 3 \text{ ft}$$

$$A_{\text{ftg}_{RA}} := 320 \text{ ft}^2$$

$$A_{\text{ftg}_{FA}} := 308 \text{ ft}^2$$

$$V_{\text{ftg}_{RA}} := A_{\text{ftg}_{RA}} \cdot t_{\text{ftg}} = 35.556 \text{ yd}^3$$

$$V_{\text{ftg}_{FA}} := A_{\text{ftg}_{FA}} \cdot t_{\text{ftg}} = 34.222 \text{ yd}^3$$

$$V_{\text{ftg}} := V_{\text{ftg}_{RA}} + V_{\text{ftg}_{FA}} = 69.778 \text{ yd}^3$$

ITEM 512E10100, SEALING OF CONCRETE SURFACES (EPOXY-URETHANE) (SY)

$$A_{RA} := (44 + 4 + 314 + 63 + 9 + 22) \text{ ft}^2 = 50.667 \text{ yd}^2 \quad (\text{CADD measured areas})$$

$$A_{FA} := (36 + 97 + 10 + 223 + 10 + 75 + 24) \text{ ft}^2 = 52.778 \text{ yd}^2 \quad (\text{CADD measured areas})$$

$$p_{\text{ss}} := 33 \text{ in} + t_{\text{deck}_{\text{avg}}} + 6 \text{ in} = 3.896 \text{ ft}$$

$$l_{\text{ss}} := 100 \text{ ft} - \left(\frac{2 \text{ ft}}{\cos(10 \text{ deg})} \right) = 97.969 \text{ ft}$$

$$A_{\text{diap}} := 12 \text{ ft}^2$$

$$A_{\text{SS}} := 2 \cdot A_{\text{diap}} + 2 \cdot p_{\text{ss}} \cdot l_{\text{ss}} = 87.483 \text{ yd}^2 \quad A_{\text{ABUT}} := A_{RA} + A_{FA} = 103.444 \text{ yd}^2$$

ITEM 512E33000, TYPE 2 WATERPROOFING(SY)

$$A_{RA} := 3 \text{ ft} \cdot (7 \text{ ft} + 9 \text{ ft}) = 5.333 \text{ yd}^2$$

$$A_{FA} := 3 \text{ ft} \cdot (9 \text{ ft} + 8 \text{ ft}) = 5.667 \text{ yd}^2$$

$$A_{ABUT} := 11 \text{ yd}^2$$

ITEM 515E12090, PRESTRESSED CONCRETE COMPOSITE BOX BEAM BRIDGE MEMBERS, LEVEL 1 CB33-48, 101'-0" LONG)

$$N_{beams} := 7$$

ITEM 516E13900, 2" PREFORMED EXPANSION JOINT FILLER (SF)

$$L_{PEJF} := \frac{3 \text{ ft}}{\cos(10 \text{ deg})} = 3.046 \text{ ft}$$

$$h_{PEJF} := d_{beam} + t_{deck_avg} = 3.396 \text{ ft}$$

$$A_{PEJF_RA} := 2 \cdot L_{PEJF} \cdot h_{PEJF} = 20.689 \text{ ft}^2$$

$$A_{PEJF_FA} := 2 \cdot L_{PEJF} \cdot h_{PEJF} = 20.689 \text{ ft}^2$$

$$A_{PEJF} := A_{PEJF_RA} + A_{PEJF_FA} = 41.379 \text{ ft}^2$$

ITEM 516E14020, SEMI-INTEGRAL ABUTMENT EXPANSION JOINT SEAL

$$L_{SIS_RA} := L_{dia} + 1.5 \text{ ft} + 1.5 \text{ ft} + 2 \cdot (d_{beam} + t_{deck_avg}) = 41.522 \text{ ft}$$

$$L_{SIS_FA} := L_{dia} + 1.5 \text{ ft} + 1.5 \text{ ft} + 2 \cdot (d_{beam} + t_{deck_avg}) = 41.522 \text{ ft}$$

$$L_{SIS} := L_{SIS_RA} + L_{SIS_FA} = 83.043 \text{ ft}$$

ITEM 516E31010, 2" DEEP JOINT SEALER

$$L_{JS} := 28 \text{ ft} + 29 \text{ ft} = 57 \text{ ft}$$

ITEM 516E41100, 1/8" PREFORMED BEARING PAD

$$N_{pbp} := 14$$

ITEM 516E43100, ELASTOMERIC BEARING WITH INTERNAL LAMINATES ONLY (NEOPRENE), (12" X 8" X 1.924"), (EACH)

$$N_{bearings} := 4 \cdot N_{beams} = 28$$

ITEM 517E70000, RAILING (TWIN STEEL TUBE) (FT)

$$L_{tst} := 2 \cdot (100 \text{ ft} + 4 \text{ ft} + 11 \text{ in}) = 209.833 \text{ ft}$$

ITEM 518E21200, POROUS BACKFILL WITH GEOTEXTILE FABRIC (CY)

$$t_{pb} := 2 \text{ ft}$$

$$h_{pb_RA} := 10.25 \text{ ft} \quad L_{pb_RA} := 36 \text{ ft}$$

$$h_{pb_FA} := 10.61 \text{ ft} \quad L_{pb_FA} := 37.7 \text{ ft}$$

$$h_{pb_RA_Lww} := 8.86 \text{ ft} - 1.5 \text{ ft} = 7.36 \text{ ft} \quad L_{pb_RA_Lww} := 9 \text{ ft}$$

$$V_{pb_RA_Lww} := h_{pb_RA_Lww} \cdot L_{pb_RA_Lww} \cdot t_{pb} = 4.907 \text{ yd}^3$$

$$h_{pb_RA_Rww} := 7.96 \text{ ft} - 1.5 \text{ ft} = 6.46 \text{ ft} \quad L_{pb_RA_Rww} := 18 \text{ ft}$$

$$V_{pb_RA_Rww} := h_{pb_RA_Rww} \cdot L_{pb_RA_Rww} \cdot t_{pb} = 8.613 \text{ yd}^3$$

$$h_{pb_FA_Lww} := 8.46 \text{ ft} - 1.5 \text{ ft} = 6.96 \text{ ft} \quad L_{pb_FA_Lww} := 13 \text{ ft}$$

$$V_{pb_FA_Lww} := h_{pb_FA_Lww} \cdot L_{pb_FA_Lww} \cdot t_{pb} = 6.702 \text{ yd}^3$$

$$h_{pb_FA_Rww} := 10.71 \text{ ft} - 1.5 \text{ ft} = 9.21 \text{ ft} \quad L_{pb_FA_Rww} := 9 \text{ ft}$$

$$V_{pb_FA_Rww} := h_{pb_FA_Rww} \cdot L_{pb_FA_Rww} \cdot t_{pb} = 6.14 \text{ yd}^3$$

$$V_{pb_RA} := h_{pb_RA} \cdot L_{pb_RA} \cdot t_{pb} + V_{pb_RA_Lww} + V_{pb_RA_Rww} = 40.853 \text{ yd}^3$$

$$V_{pb_FA} := h_{pb_FA} \cdot L_{pb_FA} \cdot t_{pb} + V_{pb_FA_Lww} + V_{pb_FA_Rww} = 42.472 \text{ yd}^3$$

$$V_{pb} := V_{pb_RA} + V_{pb_FA} = 83.325 \text{ yd}^3$$

ITEM 518E22300, SPECIAL, STEEL DRIP STRIP (FT)

$$N_{posts} := 15$$

$$L_{upperstrip} := 1.5 \text{ ft} \cdot N_{posts} = 22.5 \text{ ft}$$

$$L_{lowerstrip} := 100 \text{ ft} - 1.5 \text{ ft} - 1.5 \text{ ft} = 97 \text{ ft}$$

$$L_{ds} := 2 \cdot (L_{upperstrip} + L_{lowerstrip}) = 239 \text{ ft}$$

ITEM 518E40000, PERFORATED CORRUGATED PLASTIC PIPE (FT)

$$L_{RA} := 65 \text{ ft}$$

$$L_{FA} := 60 \text{ ft}$$

ITEM 518E40000, NON-PERFORATED CORRUGATED PLASTIC PIPE, INCLUDING SPECIALS, AS PER PLAN(FT)

$$L_{RA} := 10 \text{ ft}$$

$$L_{FA} := 40 \text{ ft}$$

ITEM 524E94904, DRILLED SHAFTS, 48" DIAMETER, INTO BEDROCK(FT)

$$L_{rs} := 10 \text{ ft}$$

$$N_{S_{RA}} := 7 \quad L_{DS_{RA}} := L_{rs} \cdot N_{S_{RA}} = 70 \text{ ft}$$

$$N_{S_{FA}} := 7 \quad L_{DS_{FA}} := L_{rs} \cdot N_{S_{FA}} = 70 \text{ ft}$$

$$L_{DS} := L_{DS_{RA}} + L_{DS_{FA}} = 140 \text{ ft}$$

ITEM 526E25000, REINFORCED CONCRETE APPROACH SLABS (T=15") (SY)

$$A_{as_{RA}} := 25 \text{ ft} \cdot 28 \text{ ft} = 77.778 \text{ yd}^2$$

$$A_{as_{FA}} := 25 \text{ ft} \cdot 28 \text{ ft} = 77.778 \text{ yd}^2$$

$$A_{as} := A_{as_{RA}} + A_{as_{FA}} = 155.556 \text{ yd}^2$$

ITEM 601E32100, ROCK CHANNEL PROTECTION, TYPE B WITH FILTER (CY)

$$V_{RCP_{RA}} := 2.5 \text{ ft} \cdot 806 \text{ ft}^2 = 74.63 \text{ yd}^3$$

$$V_{RCP_{FA}} := 2.5 \text{ ft} \cdot 600 \text{ ft}^2 = 55.556 \text{ yd}^3$$

$$V_{RCP} := V_{RCP_{RA}} + V_{RCP_{FA}} = 130.185 \text{ yd}^3$$