APPENDIX A – STRUCTURAL SUPPORT DOCUMENTS

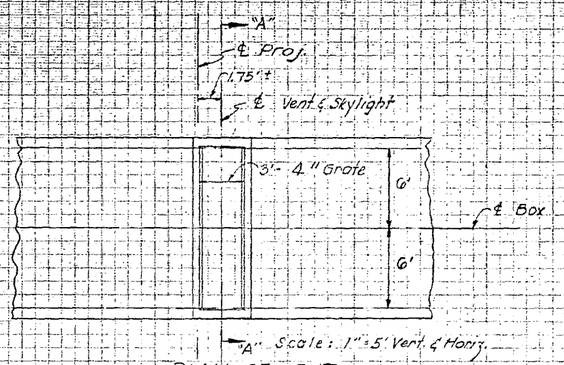
BEST AVAILABLE COPY

CROSS SECTIONS

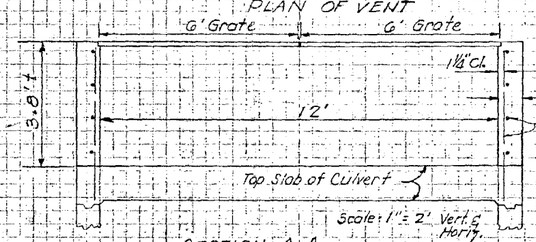
Scale 1 inch = 5 feet

Fed. Aid Proj. No.	State	County	Route	Proj. No.	Sheet No.
2	Fla.	MANATEE	55	~~BRIF-2302~~	54-B

STATE Job No. 13130-3202



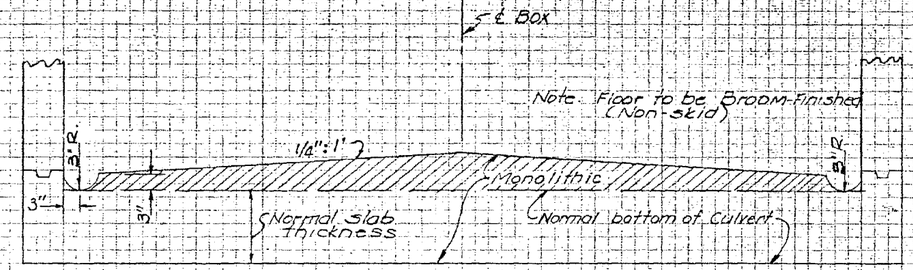
PLAN OF VENT



SECTION A-A

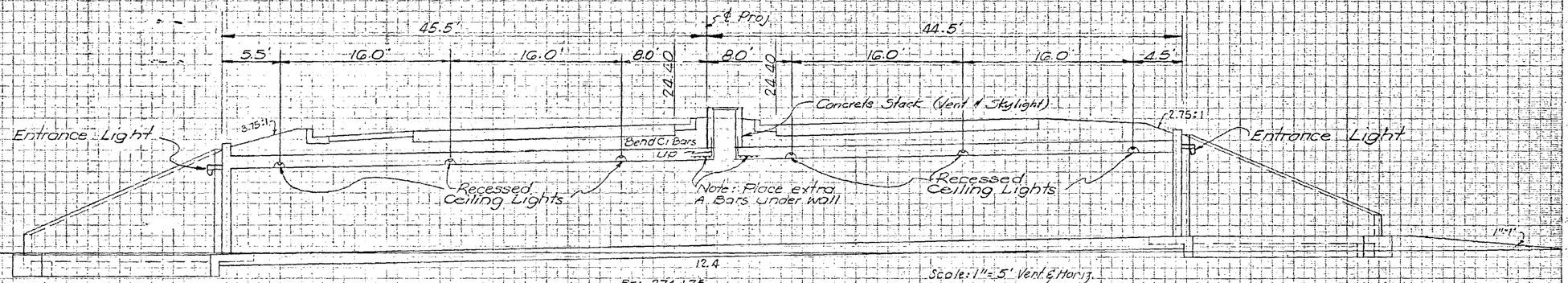
Note: Const 2 Grates, 6'-0" x 3'-3½" Each, 1' above top of Curb. Grates shall be Irving Type "V" Decking (or equal) Walls of Stock to be 8" thick, 3.8' in height.

For Grate Lock and Chain, See Index No 2445-B



DETAIL OF FLOOR PLAN

Note: Cost of Vent and Skylight to be included in the cost of Concrete Box.



STA. 274+75

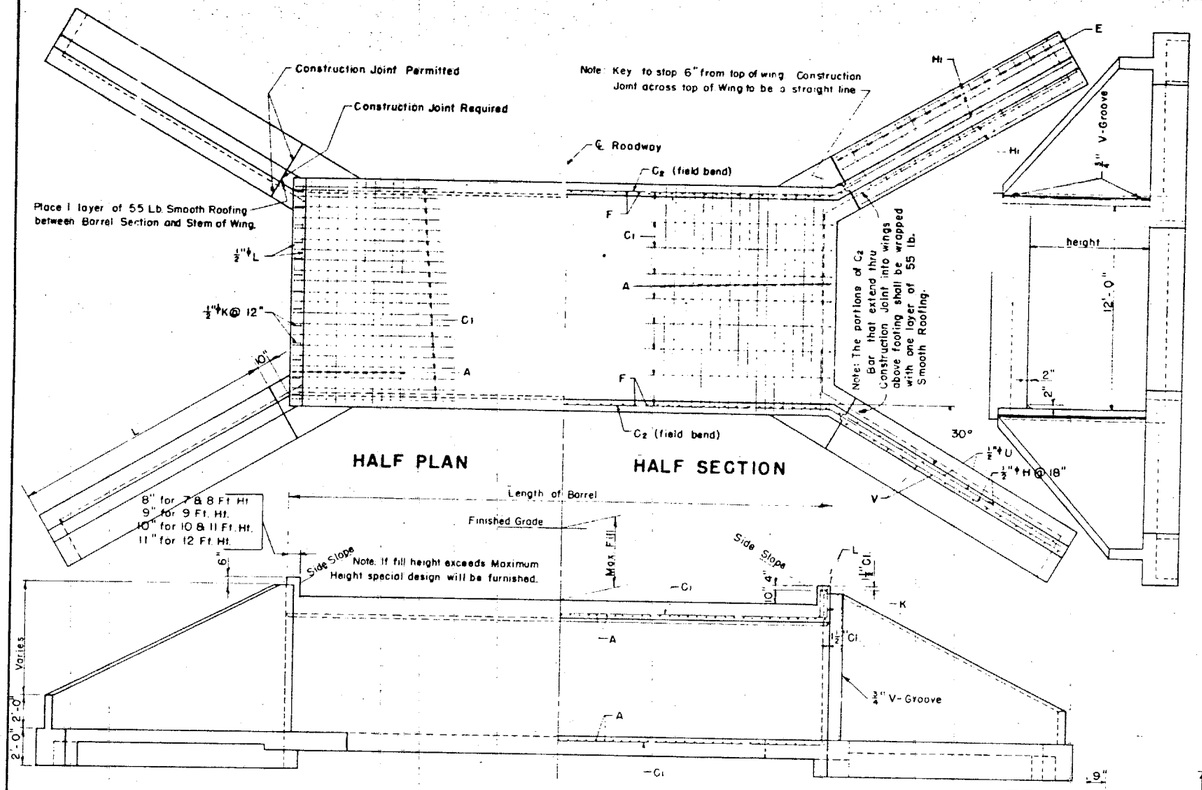
CONST. 90' OF 12'x8' CONC. BOX CULVERT (PEDESTRIAN UNDERPASS)

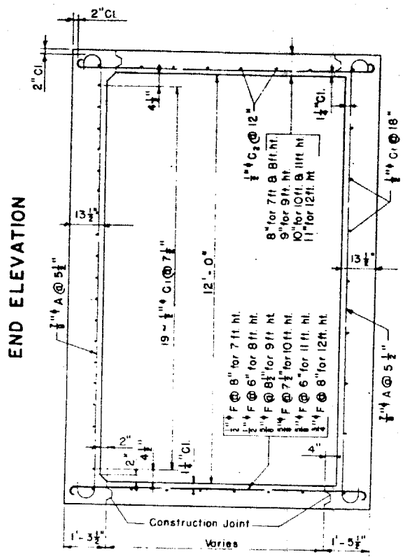
FLOOR EL. 12.3 LT., 14.0 RT.

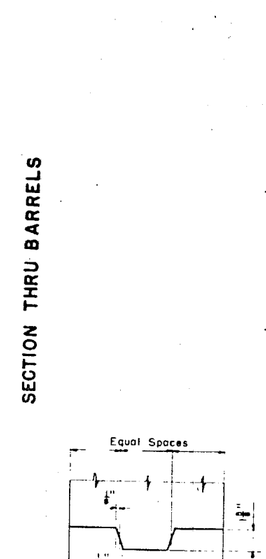
SPECIAL DETAIL (PEDESTRIAN UNDERPASS)

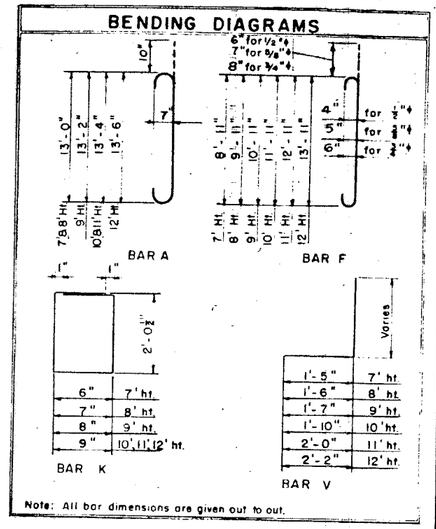
To be used in conjunction with Index No. 6020

FED. ROAD DIV. No.	STATE	SECTION	JOB No.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
3	FLA.	13130	3202	63	150	





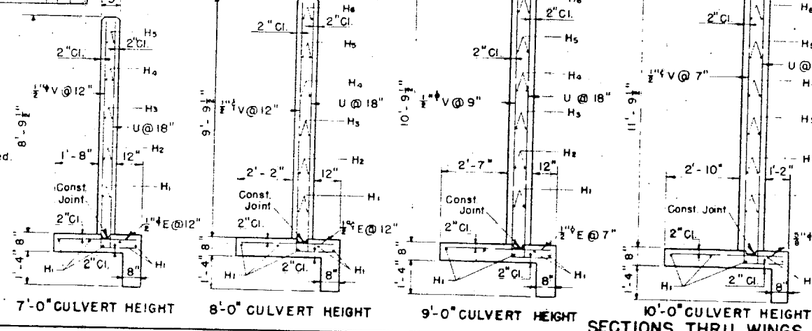




CULVERT HEIGHT	AREA OF OPENING	MAXIMUM FILL	L	32' BARREL LENGTH CONCRETE CU. YD.	32' BARREL LENGTH REINF. STEEL LBS.	ADDITIONAL LENGTH CONCRETE CU. YD. PER LIN. FT.	ADDITIONAL LENGTH REINF. STEEL LBS. PER LIN. FT.
7'-0"	83.97	5'-0"	15'-9"	66.82	6,940	1.46	178.74
8'-0"	95.97	5'-0"	18'-0"	74.91	7,581	1.51	189.37
9'-0"	107.97	5'-0"	20'-6"	86.41	8,483	1.63	198.61
10'-0"	119.97	5'-0"	22'-9"	99.04	9,612	1.76	209.52
11'-0"	131.97	5'-0"	25'-0"	108.34	11,340	1.82	225.94
12'-0"	143.97	5'-0"	27'-3"	122.63	13,375	1.97	238.73

GENERAL NOTES

DESIGN SPECIFICATIONS A.A.S.H.O. 1957
LOADING: H20-S16-44 Modified for Military Loading as required.
STRESSES: f_s = 20,000 f_c = 1,200.
CHAMFER: All edges and corners to be chamfered ¾" unless otherwise noted.
REINFORCING STEEL SPECIFICATIONS: A.A.S.H.O. M-137
FABRICATION OF REINFORCING STEEL: Reinforcing Steel shall be fabricated according to the A.A.S.H.O. Manual of Recommended Practice for Detailing Reinforced Concrete Highway Structures.



REINFORCING STEEL

CULVERT HEIGHT	BAR A NO.	BAR A LENGTH	BAR C1 NO.	BAR C1 LENGTH	BAR C2 NO.	BAR C2 LENGTH	BAR E NO.	BAR E LENGTH	BAR F NO.	BAR F LENGTH	BAR H1 NO.	BAR H1 LENGTH	BAR H2 NO.	BAR H2 LENGTH	BAR H3 NO.	BAR H3 LENGTH	BAR H4 NO.	BAR H4 LENGTH	BAR H5 NO.	BAR H5 LENGTH	BAR H6 NO.	BAR H6 LENGTH	BAR H7 NO.	BAR H7 LENGTH	BAR H8 NO.	BAR H8 LENGTH	BAR K NO.	BAR K LENGTH	BAR L NO.	BAR L LENGTH	BAR U1 NO.	BAR U1 LENGTH	BAR U2 NO.	BAR U2 LENGTH	BAR U3 NO.	BAR U3 LENGTH	BAR U4 NO.	BAR U4 LENGTH	BAR U5 NO.	BAR U5 LENGTH	BAR U6 NO.	BAR U6 LENGTH	BAR U7 NO.	BAR U7 LENGTH	BAR U8 NO.	BAR U8 LENGTH	BAR U9 NO.	BAR U9 LENGTH	BAR V1 NO.	BAR V1 LENGTH
7'-0"	Varies with Length of Barrel	14'-8"	30	Length of Barrel Minus 4"	12	Length of Barrel Plus 4'-2"	64	3'-1"	9	9'-11"	28	15'-5"	8	12'-10"	8	9'-4"	8	5'-10"	8	2'-4"							28	5'-1"	4	13'-0"	8	2'-6"	8	3'-9"	8	5'-1"	8	6'-4"	8	7'-8"	4	8'-11"											8	3'-10"
8'-0"		14'-8"	30		14		72	3'-8"	10	10'-11"	28	17'-8"	8	16'-3"	8	12'-9"	8	9'-4"	8	5'-10"	8	2'-5"					28	5'-4"	4	13'-0"	8	2'-7"	8	3'-11"	8	5'-3"	8	6'-6"	8	7'-10"	8	9'-1"											8	3'-11"
9'-0"		14'-10"	30		16		440	4'-2"	11	12'-1"	28	20'-2"	8	17'-7"	8	14'-1"	8	10'-7"	8	7'-1"	8	3'-7"					28	5'-7"	4	13'-2"	8	2'-6"	8	3'-10"	8	5'-1"	8	6'-4"	8	7'-8"	8	8'-11"	8	10'-3"							8	4'-0"
10'-0"		15'-0"	30		18		136	4'-8"	12	13'-	28	22'-5"	8	19'-10"	8	16'-4"	8	12'-10"	8	9'-4"	8	5'-11"	8	2'-5"			28	5'-10"	4	13'-4"	8	2'-6"	8	3'-10"	8	5'-1"	8	6'-5"	8	7'-8"	8	9'-0"	8	10'-3"	8	11'-7"	4	12'-10"	8	4'-5"
11'-0"		15'-0"	30		20		200	5'-2"	13	14'-1"	28	24'-8"	8	23'-3"	8	19'-9"	8	16'-3"	8	12'-10"	8	9'-4"	8	5'-10"	8	2'-5"	28	5'-10"	4	13'-4"	8	2'-6"	8	3'-10"	8	5'-1"	8	6'-5"	8	7'-8"	8	9'-2"	8	10'-5"	4	11'-9"					8	4'-2"
12'-0"		15'-2"	30		22		188	5'-8"	15	15'-3"	32	26'-11"	8	24'-4"	8	20'-10"	8	17'-5"	8	13'-11"	8	10'-6"	8	7'-0"	8	3'-6"	28	5'-10"	4	13'-6"	8	2'-9"	8	4'-1"	8	5'-4"	8	6'-8"	8	7'-11"	8	9'-3"	8	10'-7"	8	11'-10"	8	13'-2"	8	4'-8"

CULVERT HEIGHT	BAR V2 NO.	BAR V2 LENGTH	BAR V3 NO.	BAR V3 LENGTH	BAR V4 NO.	BAR V4 LENGTH	BAR V5 NO.	BAR V5 LENGTH	BAR V6 NO.	BAR V6 LENGTH	BAR V7 NO.	BAR V7 LENGTH	BAR V8 NO.	BAR V8 LENGTH	BAR V9 NO.	BAR V9 LENGTH	BAR V10 NO.	BAR V10 LENGTH	BAR V11 NO.	BAR V11 LENGTH	BAR V12 NO.	BAR V12 LENGTH	BAR V13 NO.	BAR V13 LENGTH	BAR V14 NO.	BAR V14 LENGTH	BAR V15 NO.	BAR V15 LENGTH	BAR V16 NO.	BAR V16 LENGTH	BAR V17 NO.	BAR V17 LENGTH	BAR V18 NO.	BAR V18 LENGTH	BAR V19 NO.	BAR V19 LENGTH	BAR V20 NO.	BAR V20 LENGTH	BAR V21 NO.	BAR V21 LENGTH	BAR V22 NO.	BAR V22 LENGTH	BAR V23 NO.	BAR V23 LENGTH	BAR V24 NO.	BAR V24 LENGTH	BAR V25 NO.	BAR V25 LENGTH	BAR V26 NO.	BAR V26 LENGTH
7'-0"	8	4'-8"	8	5'-6"	8	6'-5"	8	7'-3"	8	8'-1"	8	9'-0"	8	9'-10"																																								
8'-0"	8	4'-10"	8	5'-8"	8	6'-6"	8	7'-5"	8	8'-3"	8	9'-2"	8	10'-0"	8	10'-10"																																						
9'-0"	8	4'-8"	8	5'-4"	8	5'-11"	8	6'-7"	8	7'-3"	8	7'-11"	8	8'-6"	8	9'-2"	8	9'-10"	8	10'-5"	8	11'-1"	8	11'-9"	4	12'-5"																												
10'-0"	8	4'-8"	8	5'-2"	8	5'-8"	8	6'-2"	8	6'-8"	8	7'-2"	8	7'-8"	8	8'-2"	8	8'-8"	8	9'-2"	8	9'-8"	8	10'-2"	8	10'-8"	8	11'-2"	8	11'-8"	8	12'-2"	8	12'-9"	8	13'-3"	4	13'-9"																
11'-0"	8	5'-0"	8	5'-7"	8	6'-2"	8	6'-9"	8	7'-4"	8	7'-11"	8	8'-6"	8	9'-0"	8	9'-7"	8	10'-2"	8	10'-9"	8	11'-4"	8	11'-11"	8	12'-6"	8	13'-1"	8	13'-8"	8	14'-3"	4	14'-10"																
12'-0"	8	5'-1"	8	5'-6"	8	5'-11"	8	6'-4"	8	6'-10"	8	7'-3"	8	7'-8"	8	8'-1"	8	8'-6"	8	8'-11"	8	9'-5"	8	9'-10"	8	10'-3"	8	10'-8"	8	11'-1"	8	11'-7"	8	12'-0"	8	12'-5"	8	12'-10"	8	13'-3"	8	13'-9"	8	14'-2"	8	14'-7"	12	15'-0"	12	15'-8"

REVISIONS		
Names	Dates	Descriptions

STATE OF FLORIDA
STATE ROAD DEPARTMENT

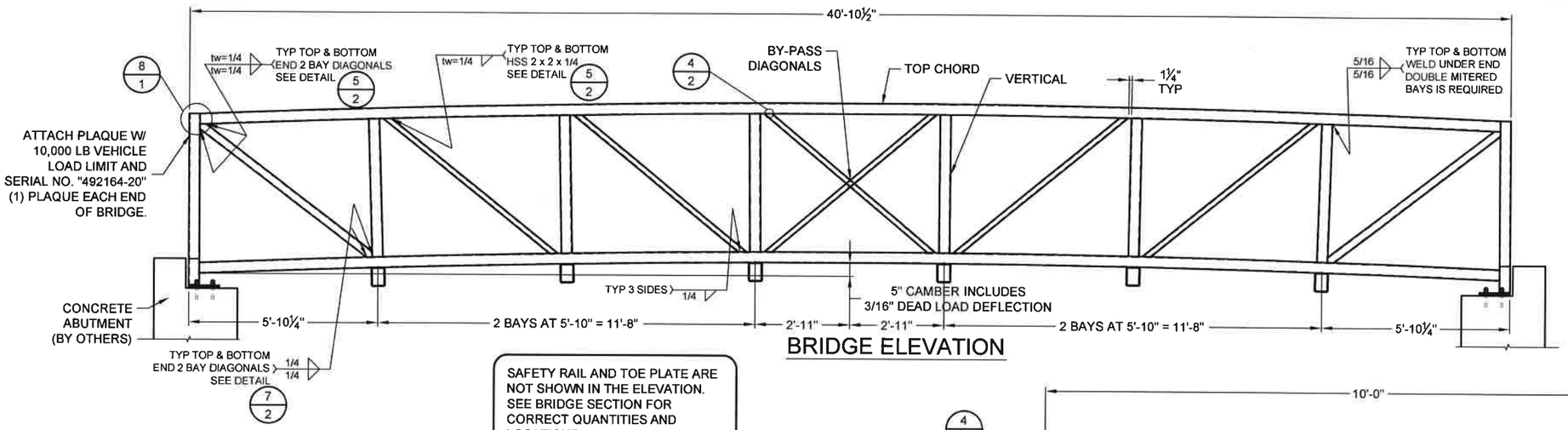
SINGLE 12 FT. SPAN CULVERT
7'-8'-9'-10'-11'-12 FT. HEIGHTS

ROAD NO.	COUNTY	SECTION	JOB NO.
	MANATEE	13130	3202

	Names	Dates
Designed by	W.H.M.	2-51
Checked by	R.M.M.	3-51
Drawn by	W.H.W.	9-51
Checked by	R.J.D.	12-52
Quantities by	P.H.S.	8-51
Checked by	R.J.D.	12-52
Traced by	W.H.W.	9-51

Drawing No. 1 of 1

Index No. 8020



BRIDGE ELEVATION

SAFETY RAIL AND TOE PLATE ARE NOT SHOWN IN THE ELEVATION. SEE BRIDGE SECTION FOR CORRECT QUANTITIES AND LOCATIONS.

GENERAL NOTES

1. DESIGN PROCEDURE IS IN ACCORDANCE WITH "LRFD BRIDGE DESIGN SPECIFICATIONS" 6TH EDITION & "GUIDE SPECIFICATIONS FOR DESIGN OF PEDESTRIAN BRIDGES" BY THE AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO) 2009.

2. BRIDGE MEMBERS ARE FABRICATED FROM HIGH STRENGTH, LOW ALLOY, ENHANCED ATMOSPHERIC CORROSION RESISTANT ASTM A847 COLD-FORMED WELDED SQUARE AND RECTANGULAR TUBING, AND ASTM A588, ASTM A606, OR ASTM A242 PLATE AND STRUCTURAL SHAPES (Fy=50,000 PSI).

3. BRIDGE DECKING NOMINAL 3-INCH THICK SELECT STRUCTURAL SOUTHERN YELLOW PINE (Fb=2,300 PSI min.). TIMBER DECK MATERIAL SHALL BE TREATED WITH ALKALINE COPPER QUATERNARY (ACQ) TO A 0.4 PCF RETENTION OR TO REFUSAL OR AZOLE BIOCIDE (MCA) TO A 0.06 PCF RETENTION OR TO REFUSAL.

4. THE GAS METAL ARC WELDING PROCESS OR FLUX CORED ARC WELDING PROCESS WILL BE USED. WELDING TO BE IN ACCORDANCE WITH AWS D1.1.

5. ALL TOP AND BOTTOM CHORD SHOP SPLICES TO BE COMPLETE PENETRATION TYPE WELDS. WELD BETWEEN TOP CHORD AND END VERTICAL SHALL BE AS DETAILED.

6. UNLESS OTHERWISE NOTED, WELDED CONNECTIONS SHALL BE FILLET WELDS (OR HAVE THE EFFECTIVE THROAT OF A FILLET WELD) OF A SIZE EQUAL TO THE THICKNESS OF THE LIGHTEST GAGE MEMBER IN THE CONNECTION. WELDS SHALL BE APPLIED AS FOLLOWS:

   A. BOTH ENDS OF VERTICALS, DIAGONALS, AND FLOOR BEAMS SHALL BE WELDED ALL AROUND.
   B. BRACE DIAGONALS WILL BE WELDED ALL AROUND.
   C. MISCELLANEOUS NON-STRUCTURAL MEMBERS WILL BE STITCH WELDED TO THEIR SUPPORTING MEMBERS.

7. BRIDGE DESIGN WAS ONLY BASED ON COMBINATIONS OF THE FOLLOWING LOADS WHICH WILL PRODUCE MAXIMUM CRITICAL MEMBER STRESSES.

   A. 90 PSF UNIFORM LIVE LOADING ON THE FULL DECK AREA OR ONE 10,000 LB VEHICLE LOAD. THE LOAD SHALL BE DISTRIBUTED AS A FOUR-WHEEL VEHICLE WITH 80% OF THE LOAD ON THE REAR WHEELS. THE WHEEL TRACK WIDTH OF THE VEHICLE SHALL BE 6'-0" AND THE WHEEL BASE SHALL BE 10'-0". THE VEHICLE SHALL BE POSITIONED SO AS TO PRODUCE THE MAXIMUM STRESSES IN EACH MEMBER, INCLUDING DECKING.
   B. 35 PSF WIND LOAD ON THE FULL HEIGHT OF THE BRIDGE, AS IF ENCLOSED.
   C. 20 PSF UPWARD FORCE APPLIED AT THE WINDWARD QUARTER POINT OF THE TRANVERSE BRIDGE WIDTH (AASHTO 3.15.3).
   D. 50 PLF PIPE LOAD.

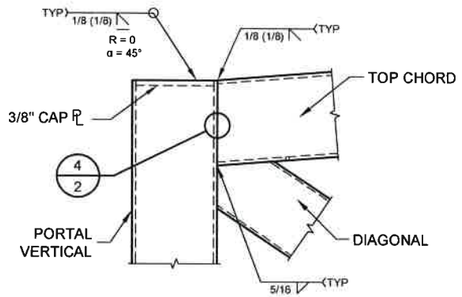
8. CLEANING: ALL EXPOSED SURFACES OF STEEL SHALL BE CLEANED IN ACCORDANCE WITH STEEL STRUCTURES PAINTING COUNCIL SURFACES PREPARATION SPECIFICATIONS NO. 7 BRUSH-OFF BLAST CLEANING. SSPC-SP7-LATEST EDITION.

9. MINIMUM MATERIAL THICKNESS OF 1/4" ON ALL STRUCTURAL MEMBERS.

SCHEDULE OF MEMBERS

TOP CHORD	HSS 4 x 4 x ¼
BOTTOM CHORD	HSS 4 x 4 x ¼
VERTICAL	HSS 4 x 4 x ¼
END VERTICAL	HSS 4 x 4 x ¼
DIAGONAL	HSS 2 x 2 x ¼
BRACE DIAGONAL	HSS 2 x 2 x ¼ ①
FLOOR BEAM	HSS 7 x 5 x ¼
STRINGER	HSS 3 x 3 x ¼
END FLOOR BEAM	HSS 10 x 4 x ¼
PLANK SUPPORT	∠ 2 x 1 ¼ x 10 GA
PLANK HOLDDOWN	∠ 2 x 1 ¼ x 10 GA
SAFETY RAIL	∠ 1 ¼ x 1 ¼ x ⅛

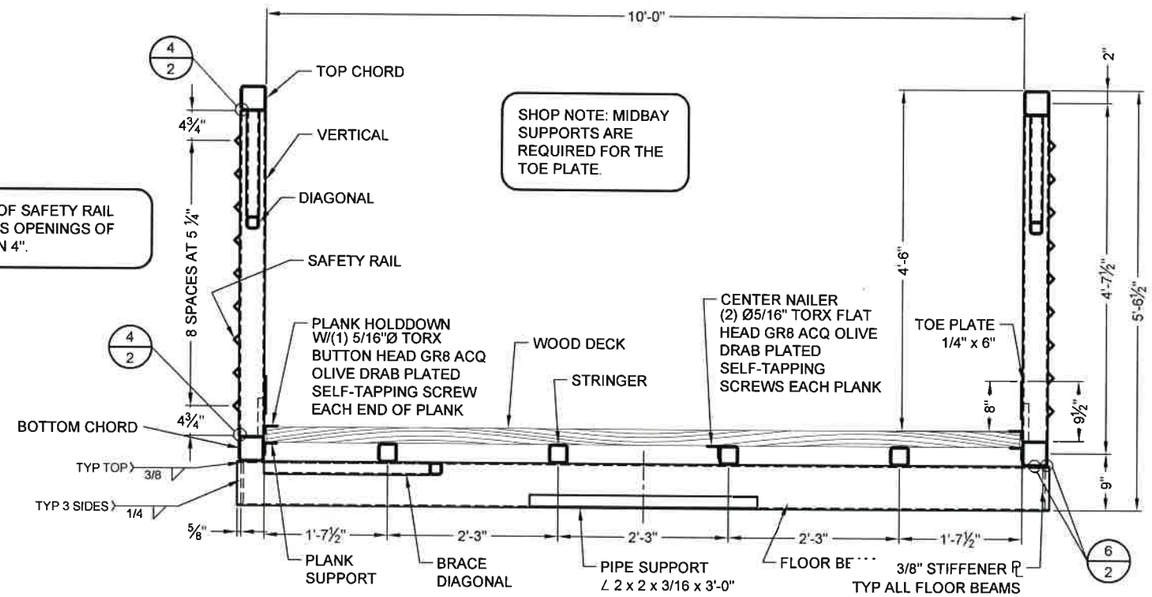
① USE HSS 3 x 2 x ¼ AND DOUBLE MITER THE END BAYS. TYP BOTH ENDS OF BRIDGE.



8/1 WELD DETAIL

SPACING OF SAFETY RAIL PRODUCES OPENINGS OF LESS THAN 4".

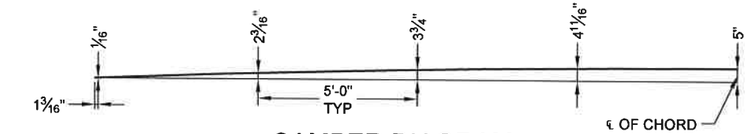
SHOP NOTE: MIDBAY SUPPORTS ARE REQUIRED FOR THE TOE PLATE.



1/2 BRIDGE SECTION

CAUTION:

WE ARE PROVIDING A WOOD DECK ON THIS STRUCTURE IN ACCORDANCE WITH THE SPECIFICATIONS AND/OR THE CONTRACT DOCUMENTS. BE AWARE THAT MOST PEDESTRIAN BRIDGE LIABILITY CLAIMS ARE STATISTICALLY SLIP AND FALL CLAIMS. IT IS THE OWNER'S RESPONSIBILITY TO KEEP THE DECK FREE FROM SLIP OR TRIP HAZARDS DUE TO CUPPING, SPLITS, GAPS AND SMOOTH SURFACES.



CAMBER DIAGRAM

CONTECH FABRICATION DRAWING

STEVEN EDWARD CHELL LICENSE No. 62603 STATE OF FLORIDA PROFESSIONAL ENGINEER

AISC CERTIFIED FABRICATOR

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If discrepancies between the supplied information upon which the drawing is based and actual field conditions are encountered, the owner must report these discrepancies must be reported to Contech immediately for re-evaluation of the design. Contech accepts no liability for designs based on missing, incomplete or inaccurate information supplied by others.

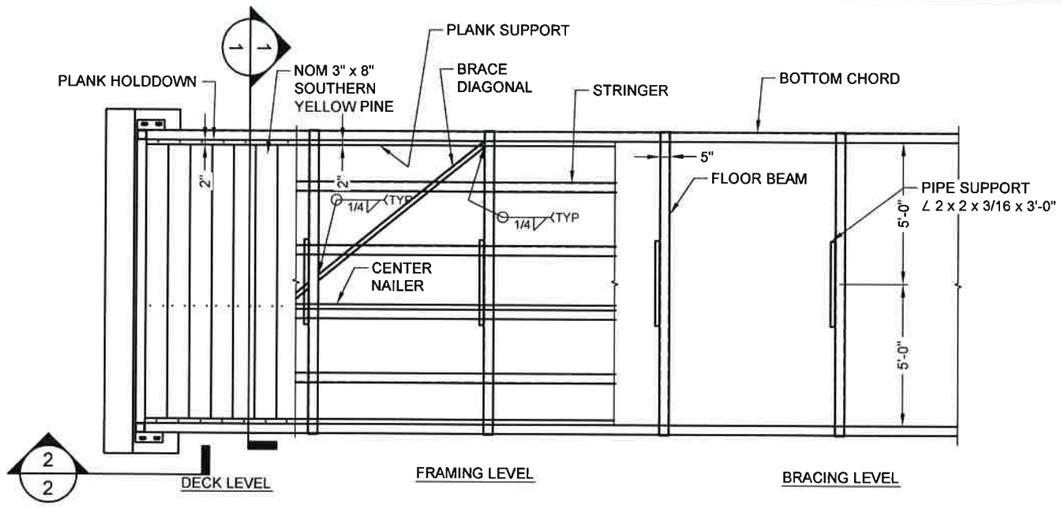
MARK	DATE	REVISION DESCRIPTION	BY
A	4/15/2014	NO REVISION THIS SHEET	CMA

40'-10 1/2" x 10'-0"
MARTIN LUTHER KING JR PARK
PEDESTRIAN BRIDGE
PALMETTO, FL

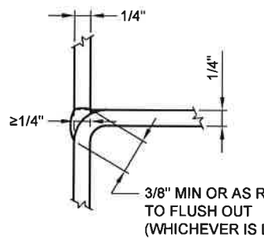
CONTECH ENGINEERED SOLUTIONS LLC
www.ContechES.com
8301 State Highway 29 North, Alexandria, MN 56308
800-328-3047 320-852-7500 320-852-7067 FAX
CONTINENTAL BRIDGE

DATE: 3/28/2014	
DESIGNED: SEC	DRAWN: CMA
CHECKED: AKH	APPROVED: SEC
PROJECT No. 492164	SEQUENCE No. 30
SHEET: 1 OF 2	

I:\MERLIN\PROJECTACTIVE\492100\492164\492164-30-CONTINENTAL_PEDESTRIAN\DRAWINGS\FABRICATION\492164-30 REV A.DWG 4/15/2014 3:49 PM



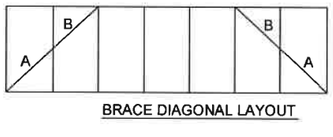
BRIDGE PLAN VIEW

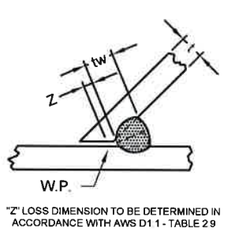


MATCHED EDGES OF:
1. VERTICALS TO BOTH CHORDS
2. CHORDS AND END FLOOR BEAMS TO END VERTICALS
3. CENTER DIAGONALS TO VERTICALS AND CHORDS

TO BE PARTIAL PENETRATION WELDS.

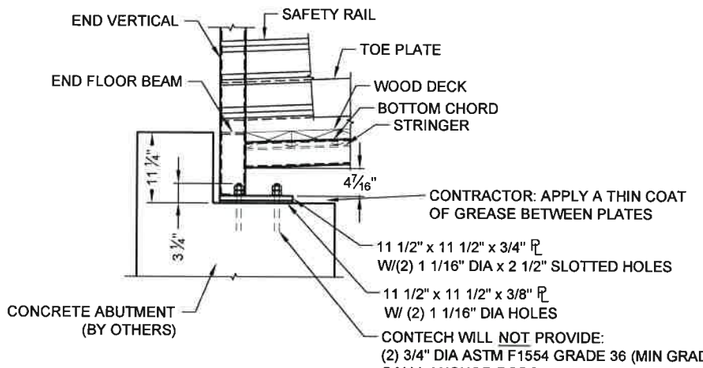
4/1,2 WELD DETAIL



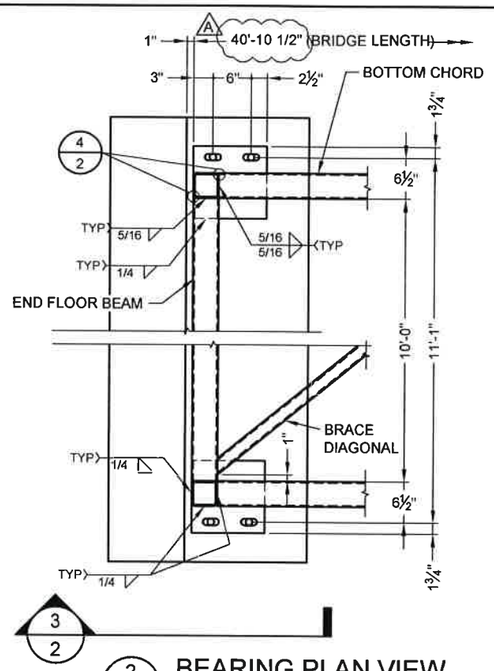


"Z" LOSS DIMENSION TO BE DETERMINED IN ACCORDANCE WITH AWS D1.1 - TABLE 2.9

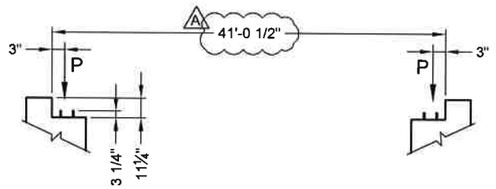
5/1 WELD DETAIL



3/2 BEARING ELELVATION



2/2 BEARING PLAN VIEW



ANCHOR BOLT ELEVATION

COMBINE REACTIONS AS PER LOCAL OR GOVERNING BUILDING CODES AS REQUIRED

BRIDGE REACTIONS		+ DOWNWARD LOAD - UPWARD LOAD	
	P (LBS)	H (LBS)	L (LBS)
DEAD LOAD ②	3,875		
UNIFORM LIVE LOAD	9,190		
VEHICLE LOAD	5,000		
WIND UPLIFT 20 PSF	-3,270		
WINDWARD LEEWARD	-1,090		
WIND	±845	2,830	
THERMAL ②			1,360

"P" - VERTICAL LOAD EACH BASE PLATE (4 PER BRIDGE)
"H" - HORIZONTAL LOAD EACH FOOTING (2 PER BRIDGE)
"L" - LONGITUDINAL LOAD EACH BASE PLATE (4 PER BRIDGE)

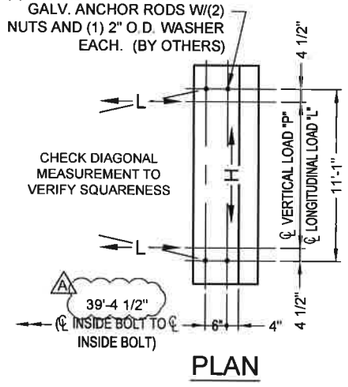
① BRIDGE LIFTING WEIGHT: 13,400 LBS

② BRIDGE FINAL WEIGHT: 15,500 LBS

① DOES NOT INCLUDE 50 PLF PIPE LOAD.

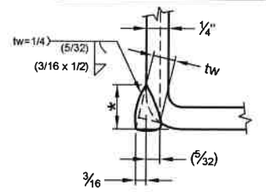
② INCLUDES 50 PLF PIPE LOAD.

CONTECH WILL NOT PROVIDE:
(8) Ø¾" ASTM F1554 GRADE 36 GALV. ANCHOR RODS W/(2) NUTS AND (1) 2" O.D. WASHER EACH. (BY OTHERS)



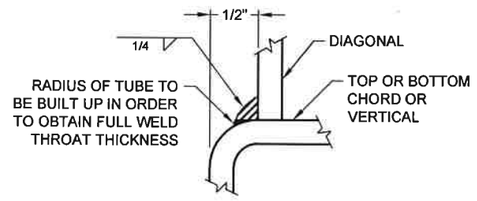
PLAN

NOTE: IF THE OUTSIDE RADIUS OF THE TUBE IS LESS THAN 1.5 TIMES THE WALL THICKNESS, CONTACT THE ENGINEER FOR APPROPRIATE WELD MODIFICATIONS

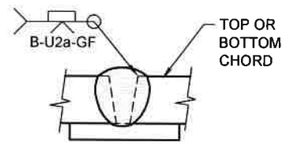


1/4" WALL THICKNESS
* ½" MINIMUM OR AS REQUIRED TO FLUSH OUT RADIUS, WHICHEVER IS GREATER

6/1 WELD DETAIL



7/1 WELD DETAIL



CHORD SHOP SPLICE

TYPICAL

QUALITY ASSURANCE NOTES

1. ALL WELDS TO BE VISUALLY INSPECTED.



CONTECH
FABRICATION
DRAWING

AISC CERTIFIED FABRICATOR

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MARK	DATE	REVISION DESCRIPTION	BY
A	4/15/2014	CORRECT BRIDGE LENGTH	CMA

40'-10 1/2" x 10'-0"
MARTIN LUTHER KING JR PARK
PEDESTRIAN BRIDGE
PALMETTO, FL

CONTECH ENGINEERED SOLUTIONS LLC
www.ContechES.com
8301 State Highway 29 North, Alexandria, MN 56308
800-338-1047 320-852-7500 320-852-7087 FAX
CONTINENTAL BRIDGE

DATE:	3/28/2014
DESIGNED: SEC	DRAWN: CMA
CHECKED: AKH	APPROVED: SEC
PROJECT No: 492164	SEQUENCE No: 30
SHEET: 2 OF 2	

I:\MERLIN\PROJECTACTIVE\492100\492164\492164-30-CONTINENTAL_PEDESTRIAN\DRAWINGS\FABRICATION\492164-30 REV A.DWG 4/15/2014 3:49 PM

INPUTS

BridgeNo := "Non-Bridge Culvert"

BridgeName := "Lincoln Tunnel Pedestrian Underpass"

BridgeDescription := "Index 8020, 90' Single 12'x8', Built 1960"

VehSet :=

HL93+9TRUCKS	LRFR-LRFD
HL93+FL120	LRFR-LRFD
HS20+9TRUCKS	LOAD FACTOR
HS20	LOAD FACTOR

$\psi_c := 1.00$ — ψ_c - condition factor

$D_{fills} := \begin{pmatrix} 2.0\,ft \\ 2.5\,ft \end{pmatrix}$ — D_{fills} - covering fill depths, roadway surface to top of the top slab

$cells := 1$ — cells - number of barrels

$W_c := 12ft$ — W_c - barrel width, length of clear span

$t_{slab} := 13.5in$ $t_{ExtWall} := 8in$ $t_{IntWall} := 8in$ — t_{slab} $t_{ExtWall}$ $t_{IntWall}$ - thicknesses: top slab, exterior wall, interior wall

$A_s := 0.6in^2 \cdot \frac{12in}{5.5in} = 1.309 \cdot in^2$ — A_s - area of tension reinforcement per strip foot, top slab

$d := t_{slab} - \left(2.0in + \frac{1}{2} \cdot \frac{7}{8}in\right) = 11.06 \cdot in$ — d - distance from compression face to centroid of tension steel, top slab

$A_{s.wall} := 0.2in^2 \cdot \frac{12in}{6in} = 0.40 \cdot in^2$ — $A_{s.wall}$ - area of positive moment reinforcement per strip foot, exterior wall

$d_{wall} := t_{ExtWall} - \left(1.25in + \frac{1}{2} \cdot \frac{4}{8}in\right) = 6.50 \cdot in$ — d_{wall} - distance from compression face to centroid of tension steel, exterior wall

$f_y := 40ksi$ $f_c := 3.0ksi$ — f_y - steel yield and f_c - concrete strength (BLRM Tables 6A.5.2.1-1 and 6A.5.2.2-1)

$h_{clear} := 8ft$ — h_{clear} - clear height of box opening

$h_{haunch.top} := 2in$ $h_{haunch.bot} := 4in$ — $h_{haunch.top}$ & $h_{haunch.bot}$ - haunch heights, top and bottom

$L_{wall} := h_{clear} - \left(h_{haunch.top} + h_{haunch.bot}\right) = 7.50\,ft$ — L_{wall} - effective length of the exterior wall, pin-to-pin

Instructions

(1) INPUT. Adjust inputs on the 1st page. All primary inputs are confined to this one page.
(2) CALCULATE. This worksheet exports results to "1. SUMMARY.xlsm" sheet "DATA."
(3) PRINT this MathCAD worksheet.
(4) PRINT Excel file "FDOT HINGED-END CULVERT (YEAR MO-DD).xlsm" as follows:
Open sheet "SUMMARY." Review, adjust as necessary, and print.
Open sheet "SUMMARY_DETAILED," select print area, adjust page breaks, and print details.

Disclaimer

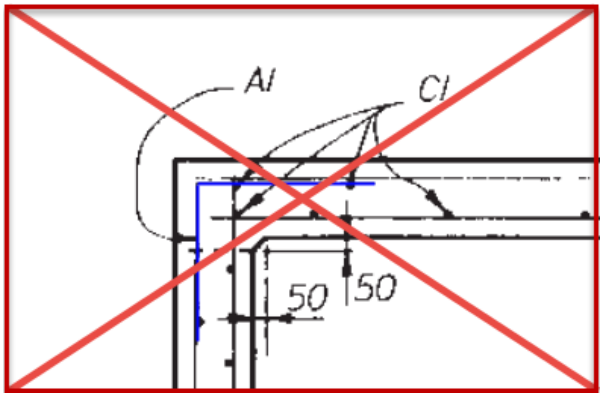
No warranty, expressed or implied, is made by the Florida Department of Transportation (FDOT) as to the accuracy and functioning of this program or the results it produces, nor shall the fact of distribution constitute any such warranty, and no responsibility is assumed by the Florida Department of Transportation in any connection there with.

References

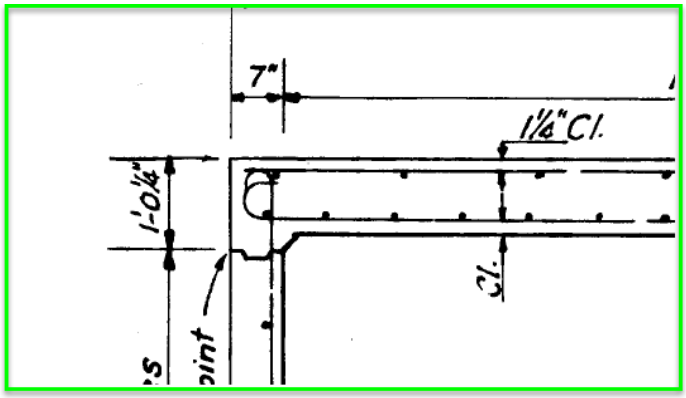
ACI 318, Current. Building Code Requirements for Structural Concrete (ACI)
FDOT Bridge Management System Coding Guide, 2018 (FDOT BMS Coding)
FDOT Bridge Load Rating Manual, 2019 (BLRM)
FDOT Structures Design Guidelines Volume 1, 2019 (SDG)
AASHTO LRFD Bridge Design Specifications, 8th Ed. 2017 (LRFD)
AASHTO Manual for Bridge Evaluation, 3rd Ed. 2018 with 2019 Interims (MBE)
AASHTO Standard Specifications for Highway Bridges, 17th Ed. 2002 with 2005 Interims (Std.Spec.)

Applicability

Inapplicable. Frame corners are reinforced.



Applicable. Outside corners are unreinforced; ends are hinged.



EXPAND THIS AREA TO PRINT

Discussion

APPLICABILITY. This program applies to typical old-style hinged-end cast-in-place box culverts in Florida built to Standard Indices prior to 1970, where (1) the outside corners omit reinforcement, (2) the top and bottom slabs are identically reinforced and uniformly thick, (3) positive moment reinforcement in the slabs is the same as negative moment reinforcement, thanks to "crank bars," (4) span lengths are less than 15 feet, and (5) the shoulder is adequate; the distance from any lane centerline to its nearest culvert end is greater than one half of the lateral distribution strip width.

ASSUMPTIONS, TOP SLAB. (1) Neglect the bottom slab. The bottom slab experiences less live load than the top slab, because the live load is distributed laterally through the walls before reaching the bottom slab. (2) Neglect top-slab-to-exterior-wall continuity. The outside face of the exterior wall omits reinforcement, which renders the connection pinned. Also neglect top-slab-to-interior-wall continuity. Minimal reinforcement, typically #4 at 12 in. OC, is insufficient to fix the connection. (3) Neglect mildly beneficial axial action onto the top slab, from horizontal earth pressures. (4) Approximate the governing location for positive moment as 40% span length for multi-span culverts, and 50% span length for single-span culverts. (5) For all top slab distribution calculations, take the effective span length as the clear span. Meanwhile for load calculations, take the effective span lengths as the distances between wall centerlines. (6) Use singly-reinforced flexural capacity, which is trivially less than doubly-reinforced capacity among typical 1.25 inch clear covers.

ASSUMPTIONS, EXTERIOR WALL. (1) Include axial loading, verify that $\varepsilon.steel > \varepsilon.yield$, and apply concepts from MBE Appendix G6A. (2) Reduce the effective span length to construction joint keys. (3) Adapt the HL93 Inventory Rating to all vehicles. Where γ = live load factor, GVW = gross vehicle weight, and GVW.HL93 is assumed to be 36 tons:
$RF.Exterior.Wall.Vehicle = (RF.Exterior.Wall.HL93.Inventory)(\gamma.HL93.Inventory/\gamma.Vehicle)(GVW.HL93/GVW.Vehicle)$.

DISTRIBUTION. For LFR and LRFR lateral distribution through earth fill, consider one wheel-line and two wheel-lines (one truck). For LFR distribution through earth fill, additionally consider two adjacent trucks, and two trucks fully overlapped (two trucks), wherein adjacent truck spacing is 4 feet. For both LFR and LRFR, take the best of (slab distribution, earth distribution). For LFR tire distribution, use point loading (conservative); for LRFR, use tire patch loading (code). Apply longitudinal distribution, regardless of fill depth. For LFR, this controverts a narrow reading of Std.Spec 6.4.2, which specifies point loading for culverts under less than 2 feet of fill. However, Std. Spec. provides for alternate rational analyses at 1.1.1, and LRFD C4.6.2.10.2 provides that alternative when it explains why longitudinal distribution is reasonable and warranted, even for shallower fills.

LIVE LOAD. LFR appraisals use all axle effects, whereas LRFR ratings use extreme axle effects (LRFD C.3.6.1.3.1). LFR impact is interpolated to a linear, rather than step-wise, factor. LRFR lane loading does not apply to barrel widths less than 15 feet in length (LRFD 3.6.1.3.3), and lane loading has been removed from this worksheet.

SHEAR. Shear is taken at a distance "d" away from the face of the support. Reinforcement is assumed to be fully developed at d away from face, since FDOT hinged-end culvert indices used sensible bearing lengths and reinforcement details. For reference, the development length for a hooked 40ksi No. 7 bar in 3 ksi concrete is less than 12 inches (LRFD 5.10.8.2.4a-1); say 12 inches.

METHODOLOGY. All loading is interpolated to an influence matrix, whose precision is guided by "ips" (increments per span). A one foot equivalent strip is analyzed throughout. Consider minimum and maximum load factors to achieve the worst-case loading, however apply only one load factor per load case type at a time. For example, do not vary the vertical earth load factor across different span lengths.

Revision Notes

CHANGE NOTES, JULY 2013
(1) speeded up LL routine - dismissed needless increments
(2) added true coincidency shear capacity (previously vectorization conservatively took max moment for Vn equation)
(3) removed point load simulation; substituted area influence
(3) added check plots for select vehicle
(4) added explicit RF output for all vehicles
(6) LRFD 12.5.5.1 shear strength reduction factor to 0.85
(7) updated to 2013 LRFD Interim (adjust tire width to 20in. + 0.06*L)

CHANGE NOTES FEBRUARY 2015
(1) the program last verified 09-09-13; see #750083 review in EDMS, which compares independent calcs.
(2) excluded the Std.Spec. 24kip Military Tandem, as LFR evaluation omits this truck from HS20 evaluation (FDOT clarification for 2015)
(3) clarified that $\phi V = 0.85$ for all shear, even for LRFD slab-type fills less than 2feet.
(4) changed shear capacity note to cite simplified shear (LRFD - 5.8.3.4.3, which is by inference the $0.06 \cdot \sqrt{fc \cdot ksi} = 1.9 \cdot \sqrt{fc \cdot psi}$ terms in Vci Vcw)
(5) changed note for mpf = "...1.00 for FL120 routine permit (MBE 6A.4.5.4.2a-1, footnote a)," removing reference to 2011 FDOT Load Rating Manual.

CHANGE NOTES JULY - NOVEMBER 2015
(1) greatly simplify the governing output, only keeping what is needed to inform the Excel summary
(2) develop exterior wall assessment
(3) discard exact uniform load engine; use point approximations instead
(4) offer truly coincident loading with the possibility of varying load factors - min & max among same element.
(5) use one location per test, i.e. 1.40 for positive moment multi-cell or 1.50 for positive moment single-cell.
(6) reduce discussion, and make a separate LRFR code summary worksheet
(7) make companion Excel summary form and adjust for direct output
(8) adopt SDG and MBE DF - one lane only, mpf.legal = 1.00
(9) adopt General Method shear capacity for LRFD shallow fills

CHANGE NOTES JULY - JANUARY 2016
(1) edit preficial notes - disclaimer, intent and outline.
(2) update companion summary (Excel) and LRFR code summary

CHANGE NOTES - MARCH 2016
(1) in vehicle list CLVT_VEH_SET(L), row 3 column 2, subrow 2 subcol 1, change "HL93.OPR" to "HS20.OPR."
(2) remove calculations for depth of fill by auto-level; retain this as a separate worksheet
(3) change name from "FDOT OLD CBC" to "FDOT Hinged-End Culvert"
(4) re-arrange order of topics on Page 2
(5) include [quick-start] instructions, top of Page 2
(6) provide slider-bar on Page 6, to select the test vehicle, the vehicle to check on the last 8 pages
(7) move "applicability" section from Page 3 to Page 2
(8) add s.xe < 80in LRFD 8.5.3.4.2-5 (no change for d.v ~ 10in., but makes fidelity to code clearer)
(9) remove 3ksi hard code f.c at exterior wall "a" effective depth of the compression block; substitute with f.c (genuine change)
(10) add "Assumptions, Exterior Wall" section to Page 3
(11) add cartoon examples to Page 3, for inapplicable (frame) and applicable (hinged-end)

CHANGE NOTES - MARCH 2019
(1) Update the "References" section to BLRM 2019, etc.
(2) Update the "Discussion" section. Apply minor code number updates. Edit the shear subsection.
(3) Add emergency vehicles. Add live load category 5 - FAST Act Emergency Vehicles (EVs). Add trucks EV2 and EV3.
(4) Change the single-lane multiple presence factor for HL93 Operating to 1.00, per BLRM 6A.5.12.

VEHICLES

$$\text{HS20_FT}(L) := \begin{array}{l} \text{SPACING} \leftarrow L_1 \cdot (0.6 + 1 + 0.4) \\ \text{SPACING} \leftarrow \max\left[14, L_1 \cdot (0.6 + 1 + 0.4)\right] \\ \text{SPACING} \leftarrow \min(30, \text{SPACING}) \end{array}$$

$$\text{HS20}(L) := \begin{array}{l} T \leftarrow \begin{pmatrix} 0 & 8 \\ 14 & 32 \\ 14 & 32 \end{pmatrix} \\ \text{return } T \text{ if } \text{rows}(L) < 3 \\ \text{return } T \text{ if } \text{HS20_FT}(L) = 14 \\ \left[T \begin{pmatrix} 0 & 8 \\ 14 & 32 \\ \text{HS20_FT}(L) & 32 \end{pmatrix} \right]^T \end{array}$$

$$\text{HL93}(L) := \begin{array}{l} \text{HS20} \leftarrow \text{HS20}(L) \\ \text{TAND} \leftarrow \begin{pmatrix} 0 & 25 \\ 4 & 25 \end{pmatrix} \\ \text{return } (\text{HS20} \quad \text{TAND})^T \text{ if } \text{rows}(\text{HS20}) = 3 \\ \text{stack}[\text{HS20}, (\text{TAND})] \end{array}$$

$$\begin{pmatrix} \text{SU2} \\ \text{SU3} \\ \text{SU4} \\ \text{ST5} \end{pmatrix} := \begin{bmatrix} \begin{pmatrix} 0 & 12 \\ 13 & 22 \end{pmatrix} \\ \begin{pmatrix} 0 & 22 \\ 11 & 22 \\ 4.17 & 22 \end{pmatrix} \\ \begin{pmatrix} 0 & 13.9 \\ 9.17 & 18.7 \\ 4.17 & 18.7 \\ 4.17 & 18.7 \end{pmatrix} \\ \begin{pmatrix} 0 & 8 \\ 27 & 18 \\ 4 & 18 \\ 12 & 18 \\ 24 & 18 \end{pmatrix} \end{bmatrix} \qquad \begin{pmatrix} \text{C3} \\ \text{C4} \\ \text{C5} \\ \text{FL120} \end{pmatrix} := \begin{bmatrix} \begin{pmatrix} 0 & 12 \\ 10 & 22 \\ 20 & 22 \end{pmatrix} \\ \begin{pmatrix} 0 & 7.3 \\ 10 & 22 \\ 21.83 & 22 \\ 4.17 & 22 \end{pmatrix} \\ \begin{pmatrix} 0 & 10 \\ 10 & 20 \\ 4.17 & 20 \\ 17.67 & 15 \\ 4.17 & 15 \end{pmatrix} \\ \begin{pmatrix} 0 & 13.334 \\ 14 & 53.333 \\ 14 & 53.333 \end{pmatrix} \end{bmatrix} \qquad \begin{pmatrix} \text{EV2} \\ \text{EV3} \end{pmatrix} := \begin{bmatrix} \begin{pmatrix} 0 & 24 \\ 15 & 33.5 \end{pmatrix} \\ \begin{pmatrix} 0 & 24 \\ 15 & 31 \\ 4 & 31 \end{pmatrix} \end{bmatrix}$$

$$\text{CLVT_VEH_SET}(L) := \begin{bmatrix} 1 & \begin{pmatrix} \text{"HL93.INV"} & \text{HL93}(L) & 1 \\ \text{"HL93.OPR"} & \text{HL93}(L) & 2 \\ \text{"FL120"} & \text{FL120} & 4 \\ \text{"SU2"} & \text{SU2} & 3 \\ \text{"SU3"} & \text{SU3} & 3 \\ \text{"SU4"} & \text{SU4} & 3 \\ \text{"C3"} & \text{C3} & 3 \\ \text{"C4"} & \text{C4} & 3 \\ \text{"C5"} & \text{C5} & 3 \\ \text{"ST5"} & \text{ST5} & 3 \\ \text{"EV2"} & \text{EV2} & 5 \\ \text{"EV3"} & \text{EV3} & 5 \end{pmatrix} \\ 1 & \begin{pmatrix} \text{"HL93.INV"} & \text{HL93}(L) & 1 \\ \text{"HL93.OPR"} & \text{HL93}(L) & 2 \\ \text{"FL120"} & \text{FL120} & 4 \end{pmatrix} \\ 0 & \begin{pmatrix} \text{"HS20.INV"} & \text{HS20}(L) & 1 \\ \text{"HS20.OPR"} & \text{HS20}(L) & 2 \\ \text{"SU2"} & \text{SU2} & 3 \\ \text{"SU3"} & \text{SU3} & 3 \\ \text{"SU4"} & \text{SU4} & 3 \\ \text{"C3"} & \text{C3} & 3 \\ \text{"C4"} & \text{C4} & 3 \\ \text{"C5"} & \text{C5} & 3 \\ \text{"ST5"} & \text{ST5} & 3 \\ \text{"EV2"} & \text{EV2} & 5 \\ \text{"EV3"} & \text{EV3} & 5 \end{pmatrix} \\ 0 & \begin{pmatrix} \text{"HS20.INV"} & \text{HS20}(L) & 1 \\ \text{"HS20.OPR"} & \text{HS20}(L) & 2 \end{pmatrix} \\ 1 & \left[\text{"CUSTM"} \quad \begin{pmatrix} 0.00 & 12.00 \\ 13.00 & 22.00 \end{pmatrix} \quad 4 \right] \end{bmatrix}$$

CLVT_VEH_SET(L) - standard vehicle sets
COL 1 = Method. 0 means LFR-Std.Spec.-Load Factor; 1 means LRFR-LRFD
COL 2 = Vehicle descriptions: Name, Trucks, Rating Level
Rating Level:
1 - Design Inventory
2 - Design Operating
3 - Legal Operating
4 - Permit
5 - Emergency Vehicle

NOTES
Trucks follow this format (ft spacing, kip axle loading).
No lane loading, for the HL93 (LRFD 3.6.1.3.3).
A vehicle can have one or more trucks (Truck and Tandem).

DIMENSIONS

$$L := \left| \begin{array}{l} \text{for } i \in 1..\text{cells} \\ \quad L_i \leftarrow \left| \begin{array}{ll} 0.5 \cdot t_{ExtWall} + W_c + 0.5 \cdot t_{IntWall} & \text{if } i = 1 \vee i = \text{cells} \\ 0.5 \cdot t_{IntWall} + W_c + 0.5 \cdot t_{IntWall} & \text{otherwise} \end{array} \right. \\ L \cdot ft^{-1} \end{array} \right.$$

$L = (\,12.67\,)$ - span lengths (feet)

$$\rho := \frac{A_s}{d \cdot 12in}$$

$\rho = 0.0099$ - steel/concrete ratio

$$B_c := t_{ExtWall} + \sum L \cdot ft$$

$B_c = 13.33\,ft$ - out-to-out bridge length parallel to the effective span lengths

DECLARE VEHICLE SELECTION, ANALYSIS METHOD, AND PRECISION

$$D_{fills} := \overrightarrow{\text{round}\left(\frac{D_{fills}}{ft}, 2\right) \cdot ft}$$

$D_{fills} = \begin{pmatrix} 2.00 \\ 2.50 \end{pmatrix} ft$ - round fills to 0.01 ft.; standardize significant figures for check calcs

$$TRUCKS := \left| \begin{array}{l} T1 \leftarrow CLVT_VEH_SET(L)_{VehSet,\,2} \\ T2(K) \leftarrow \text{if}[\text{cols}(K) = 2, (\,K\,), K] \\ \overrightarrow{\quad} \\ T2(T1) \end{array} \right.$$

TRUCKS - select method and vehicles

$$LRFR := CLVT_VEH_SET(1)_{VehSet,\,1}$$

$LRFR = 1.00$ - method is $Method := (\text{"LFR"}\quad\text{"LRFR"})_{1,\,LRFR+1} = \text{"LRFR"}$

$$AV := \left| \begin{array}{l} T \leftarrow TRUCKS^{\langle 1 \rangle} \\ \text{augment}(\text{matrix}(\text{rows}(T), 1, f(i,j) \leftarrow i + 1), T) \end{array} \right.$$

$$AV^T = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 & 9 & 10 \\ \text{"HL93.INV"} & \text{"HL93.OPR"} & \text{"FL120"} & \text{"SU2"} & \text{"SU3"} & \text{"SU4"} & \text{"C3"} & \text{"C4"} & \text{"C5"} & \text{"ST5"} \end{pmatrix}$$

select the test vehicle :



$testVEH = 2.00$ - check this vehicle, last 8 pages: $AV_{testVEH,\,2} = \text{"HL93.OPR"}$

$ips := 20$

$ips = 20$ - precision, increments per span (10 is OK, 20 is good, and 40 is best)

$ips_{LL} := 50$

$ips_{LL} = 50$ - increments of truck travel (20 is OK, 50 is good, and 100 is best)

$$d_{AFF} := \left| \begin{array}{ll} 0.5 \cdot t_{ExtWall} + d & \text{if cells} = 1 \\ 0.5 \cdot t_{IntWall} + d & \text{otherwise} \end{array} \right.$$

$d_{AFF} = 1.26\,ft$ - distance CL of bearing to "d" away from face, for shear RF location

Load Factors

$$\gamma_{LL_MAT} := \begin{pmatrix} \text{"VEH TYPE"} & \text{"}\gamma\text{DESC"} & \text{"}\gamma\text{.LF"} & \text{"}\gamma\text{.LRFD"} \\ 1 & \text{"}\gamma\text{.INV "} & 2.17 & 1.75 \\ 2 & \text{"}\gamma\text{.OPR "} & 1.30 & 1.35 \\ 3 & \text{"}\gamma\text{.OPR "} & 1.30 & 1.35 \\ 4 & \text{"}\gamma\text{.PERM"} & 1.30 & 1.35 \\ 5 & \text{"}\gamma\text{.EV"} & 1.30 & 1.30 \end{pmatrix}$$

γ_{LL_MAT} - live load factor matrix (BLRM 6A.5.12)

$\gamma_{LLmin} := (1 \quad 0)_{1,LRFR+1}$

$\gamma_{LLmin} = 0.00$ - for LFR, apply all effects; for LRFR, apply extreme effects

$veh_type(iv) := TRUCKS_{iv,3}$

veh_type(iv) - vehicle type equation (1=Des.INV, 2=Des.OPR, 3=Legal.OPR, 4=PERMIT)

$mpf_eq(iv) := if(LRFR = 1 \wedge veh_type(iv) = 1, 1.20, 1.00)$

mpf_eq(iv) - single lane multiple presence factor equation

$\gamma LL_eq(iv) := \gamma_{LL_MAT_{veh_type(iv)+1,3+LRFR}}$

$\gamma LL_eq(iv)$ - live load factor equation

$\gamma_{LL} := \overrightarrow{\gamma LL_eq\left(AV^{\langle 1 \rangle}\right)}$ $\quad mpf := \overrightarrow{mpf_eq\left(AV^{\langle 1 \rangle}\right)}$

γ_{LL} - live load factors, vector for all vehicles

$AV2 :=$ (LBL Nos) $\leftarrow \left[\left(\text{"#"} \quad \text{"VEH"} \quad \text{"TYPE"} \quad \text{"mpf"} \quad \text{"}\gamma\text{.LL"}\right) \quad AV^{\langle 1 \rangle}\right]$ - available vehicles: No., name, type No., mpf, γ.LL

DAT $\leftarrow$ augment$\left(AV, \overrightarrow{veh_type(Nos)}, \overrightarrow{mpf_eq(Nos)}, \overrightarrow{\gamma LL_eq(Nos)}\right)$

stack(LBL, DAT)

$AV3 := augment\left(AV2^{\langle 2 \rangle}, AV2^{\langle 4 \rangle}, AV2^{\langle 5 \rangle}\right)$

AV3 - available vehicles: name, mpf, γ.LL

$$AV2 = \begin{pmatrix} \text{"#"} & \text{"VEH"} & \text{"TYPE"} & \text{"mpf"} & \text{"}\gamma\text{.LL"} \\ 1.00 & \text{"HL93.INV"} & 1.00 & 1.20 & 1.75 \\ 2.00 & \text{"HL93.OPR"} & 2.00 & 1.00 & 1.35 \\ 3.00 & \text{"FL120"} & 4.00 & 1.00 & 1.35 \\ 4.00 & \text{"SU2"} & 3.00 & 1.00 & 1.35 \\ 5.00 & \text{"SU3"} & 3.00 & 1.00 & 1.35 \\ 6.00 & \text{"SU4"} & 3.00 & 1.00 & 1.35 \\ 7.00 & \text{"C3"} & 3.00 & 1.00 & 1.35 \\ 8.00 & \text{"C4"} & 3.00 & 1.00 & 1.35 \\ 9.00 & \text{"C5"} & 3.00 & 1.00 & 1.35 \\ 10.00 & \text{"ST5"} & 3.00 & 1.00 & 1.35 \\ 11.00 & \text{"EV2"} & 5.00 & 1.00 & 1.30 \\ 12.00 & \text{"EV3"} & 5.00 & 1.00 & 1.30 \end{pmatrix}$$

Dead Load

$$\begin{pmatrix} \gamma_{DCmin} \\ \gamma_{DCmax} \\ \eta\gamma_{EVmin} \\ \eta\gamma_{EVmax} \\ \eta\gamma_{EHmin} \\ \eta\gamma_{EHmax} \end{pmatrix} := \begin{pmatrix} 1.30 & 0.90 \\ 1.30 & 1.25 \\ 1.30 & 1.00\cdot 0.90 \\ 1.30 & 1.00\cdot 1.30 \\ 0.50\cdot 1.30 & 1.00\cdot 0.90 \\ 1.30 & 1.00\cdot 1.35 \end{pmatrix}^{\langle LRFR+1 \rangle}$$

$$\begin{pmatrix} \gamma_{DCmin} \\ \gamma_{DCmax} \\ \eta\gamma_{EVmin} \\ \eta\gamma_{EVmax} \\ \eta\gamma_{EHmin} \\ \eta\gamma_{EHmax} \end{pmatrix} = \begin{pmatrix} 0.90 \\ 1.25 \\ 0.90 \\ 1.30 \\ 0.90 \\ 1.35 \end{pmatrix}$$ Load factors (Std.Spec. 3.22.1.A, BLRM 6A.5.12)

$\omega_{DC} := 150pcf\cdot 12in\cdot t_{slab}$

$\omega_{DC} = 0.169\cdot klf$ - component/slab load (SDG 3.15.4)

$\gamma_{soil} := 120pcf$

$\gamma_{soil} = 120\cdot pcf$ - unit weight of soil (SDG 3.15.4)

$F_{e.eq}(D) := \min\left(1.15, 1 + 0.20\cdot\frac{D}{B_c}\right)$

$\overrightarrow{F_{e.eq}(D_{fills})} = \begin{pmatrix} 1.030 \\ 1.038 \end{pmatrix}$ - soil interaction factor (Std.Spec.Eq. 16-16, LRFD 12.11.2.2.1-2)

$\omega_{EV}(D) := F_{e.eq}(D)\cdot D\cdot\gamma_{soil}\cdot ft$

$\overrightarrow{\omega_{EV}(D_{fills})} = \begin{pmatrix} 0.247 \\ 0.311 \end{pmatrix}\cdot klf$ - vertical earth loading

$\omega_{EH}(D) := \frac{\gamma_{soil}}{2}\cdot D\cdot ft$

$\overrightarrow{\omega_{EH}(D_{fills})} = \begin{pmatrix} 0.120 \\ 0.150 \end{pmatrix}\cdot klf$ - lateral earth pressure

$\omega_{DL}(D) := \left(\omega_{DC} + \omega_{EV}(D)\right)\cdot klf^{-1}$

$\overrightarrow{\omega_{DL}(D_{fills})} = \begin{pmatrix} 0.416 \\ 0.480 \end{pmatrix}$ - total unfactored vertical DL (klf)

Top Slab, Distribution & Impact (1 of 2)

DISTRIBUTION

LRFR = 1.00 Method = "LRFR"

$gage := 6ft$ — gage - gage width, spacing between wheel lines (BLRM Appendix)

$lane_w := 12ft$ — $lane_w$ - lane width (Std.Spec.17th Ed. Fig. 3.7.A, LRFD Fig. 3.6.1.2.2-1)

$tire_{width} := if(LRFR = 0, 0, 20in + 0.06 \cdot W_c)$ — $tire_{width} = 28.64 \cdot in$ - tire width (Std.Spec.6.4.1, LRFD 3.6.1.2.6b)

$tire_{length} := if(LRFR = 0, 0, 10in)$ — $tire_{length} = 10.00 \cdot in$ - tire length (Std.Spec. 3.30, LRFD 3.6.1.2.5)

$DF_{earth} := if(LRFR = 0, 1.75, 1.15)$ — $DF_{earth} = 1.15$ distribution, earth (Std.Spec.17th Ed. 6.4.1, LRFD Table 3.6.1.2.6a-1)

Eeq(mpf_1LANE, D_fill) - equivalent strip width for lateral distribution. mpf_1LANE - single-lane multiple presence factor, D - covering fill, from the roadway surface to the top of the top slab, (Slab distribution from Std.Spec. 3.24.3.2 & LRFD Eq. 4.6.2.10.2-1. Earth distribution from Std.Spec. 6.4 & LRFD 3.6.1.2.6). For effective span length, say clear span (Std.Spec. 3.24.1.1 & LRFD 4.6.2.10.2-1).

$$Eeq(mpf_1LANE, D_{fill}) := \begin{array}{l} E_SLAB \leftarrow 8ft + 0.12 \cdot W_c \\ E_EARTH_1TRUCK \leftarrow \min\left[2 \cdot \left(tire_{width} + D_{fill} \cdot DF_{earth}\right), 1 \cdot \left(tire_{width} + DF_{earth} \cdot D_{fill} + gage\right)\right] \\ E_EARTH_2TRUCKS \leftarrow \min\left[1 \cdot \left(tire_{width} + D_{fill} \cdot DF_{earth} + 4ft\right), 0.5 \cdot \left(tire_{width} + D_{fill} \cdot DF_{earth} + 2 \cdot gage + 4ft\right)\right] \\ \left(\begin{array}{c} \max\left(\frac{E_SLAB}{1.00}, \min\left(\frac{E_EARTH_1TRUCK}{1.00}, \frac{E_EARTH_2TRUCKS}{1.00}\right)\right) \\ \max\left(\frac{E_SLAB}{mpf_1LANE}, \min\left(\frac{E_EARTH_1TRUCK}{mpf_1LANE}\right)\right) \end{array} \right)_{LRFR+1} \end{array}$$

$$E(D_{fill}) := \begin{array}{l} T \leftarrow \left(concat\left("D.fill =", num2str\left(D_{fill} \cdot ft^{-1}\right), "ft"\right) \quad "mpf, 1\ lane" \quad "E\ (ft)"\right) \\ \text{return } stack\left[T, \left("INV/OPR" \quad 1 \quad Eeq\left(1, D_{fill}\right) \cdot ft^{-1}\right)\right] \text{ if } LRFR = 0 \\ \text{return } stack\left[T, \begin{pmatrix} "HL93" & 1.2 & Eeq\left(1.2, D_{fill}\right) \cdot ft^{-1} \\ "LGL/FL120" & 1 & Eeq\left(1, D_{fill}\right) \cdot ft^{-1} \end{pmatrix}\right] \text{ if } LRFR = 1 \end{array}$$

$$\overrightarrow{E(D_{fills})} = \begin{bmatrix} \begin{pmatrix} "D.fill =2ft" & "mpf, 1\ lane" & "E\ (ft)" \\ "HL93" & 1.20 & 7.87 \\ "LGL/FL120" & 1.00 & 9.44 \end{pmatrix} \\ \begin{pmatrix} "D.fill =2.5ft" & "mpf, 1\ lane" & "E\ (ft)" \\ "HL93" & 1.20 & 8.77 \\ "LGL/FL120" & 1.00 & 10.52 \end{pmatrix} \end{bmatrix}$$

$$LLDFeq(mpf_1LANE, D_{fill}) := \frac{ft}{Eeq(mpf_1LANE, D_{fill})}$$ — LLDFeq(mpf_1LANE, D_fill) - lateral distribution factor (axles per 1 foot strip)

$E_{long.eq}(D) := DF_{earth} \cdot D + tire_{length}$ — $E_{long}(D)$ - longitudinal distribution length (Std.Spec. 1.1.1 & 6.4.1, LRFD 4.6.2.10.2-2)

Top Slab, Distribution & Impact (2 of 2)

IMPACT

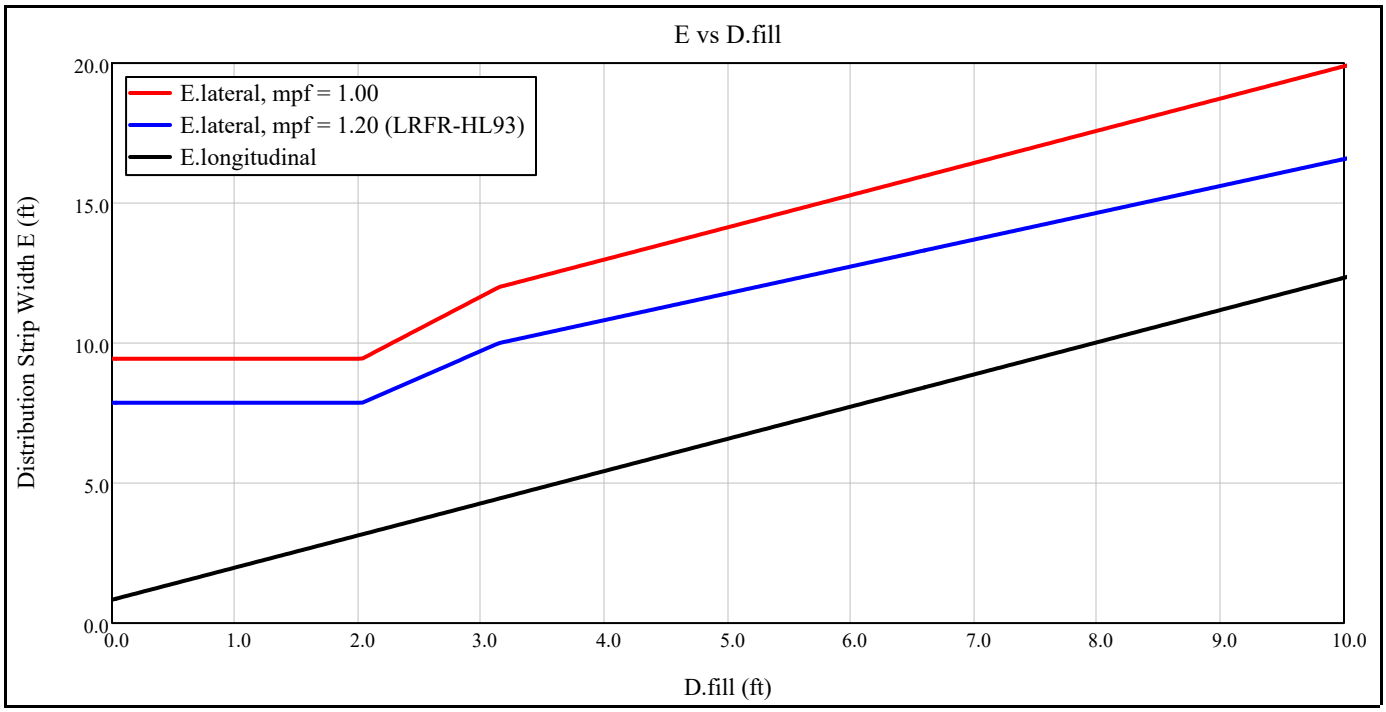
LRFR = 1.00 Method = "LRFR"

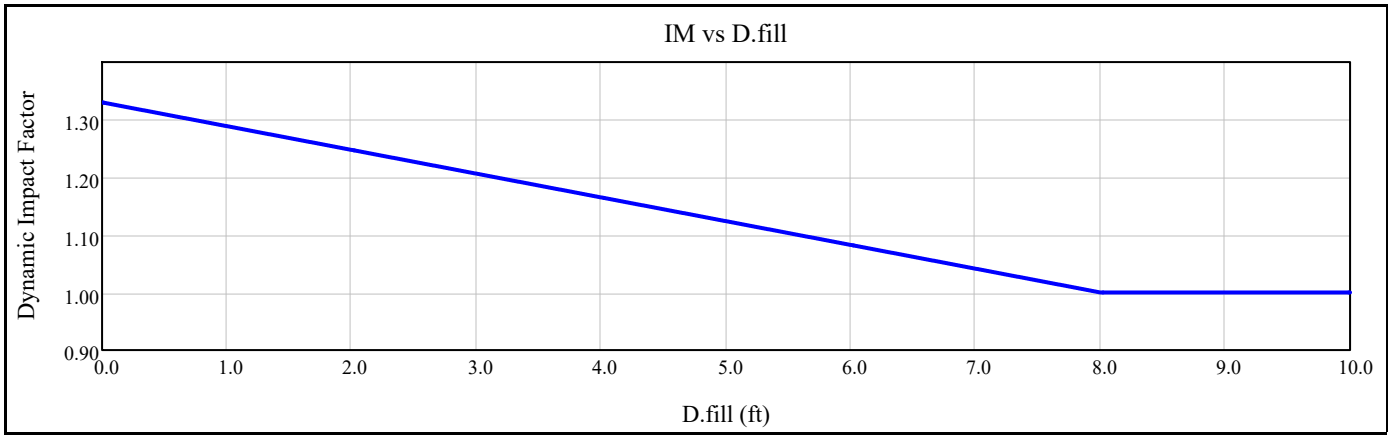
$IM_{CLVT.Std.Spec.} := \begin{pmatrix} 0 & 1 & 1 & 2 & 2 & 3 & 3 & 20 \\ 1.3 & 1.3 & 1.2 & 1.2 & 1.1 & 1.1 & 1 & 1 \end{pmatrix}^T$

$IM_{CLVT.Std.Spec.}$ - plot points, step-wise LFR impact (Std.Spec. 3.8.2.3)

$IMeq(D_{fill}) :=$
if LRFR = 0
  $IM \leftarrow \min\left[1.30, 1.30 - \frac{0.30}{3} \cdot \left(\frac{D_{fill}}{ft} - 0.5\right)\right]$
  max(1.00, IM)
if LRFR = 1
  $IM \leftarrow \min\left[1.33, 1 + 0.33 \cdot \left(1 - \frac{D_{fill}}{8ft}\right)\right]$
  max(1.00, IM)

$IMeq(D_{fill})$ - live load impact (Std.Spec. 3.8.2.3 interpolated, LRFD 3.6.2.2-1)





Top Slab, Make Influence Table (1 of 8)

match2(n, M) - for exact match

$$\text{match2}(n, M) := \text{match}\left(n \cdot 10^{10}, M \cdot 10^{10}\right)_{1,1}$$

Vinc - shear check location at d away from face of bearing at Pier 2

$$\text{Vinc} := \min\left[1.999, \left(L_1 - \frac{d_{AFF}}{ft}\right) \cdot \left(L_1\right)^{-1} + 1\right] = 1.90$$

BrIncs_{eq1} BrIncs_{eq2} & BrIncs - bridge increments: span No. + % span length

$$\text{BrIncs}_{eq1}(L, ips) := \left| \begin{array}{l} r \leftarrow 0 \\ \text{for } \text{SpanNo} \in 1..\text{rows}(L) \\ \quad \text{for } i \in 1..ips + 1 \\ \quad\quad \left| \begin{array}{l} \text{row} \leftarrow i + (ips + 1) \cdot (\text{SpanNo} - 1) \\ T2 \leftarrow \left| \begin{array}{ll} (i-1) + 10^{-9} & \text{if } i = 1 \\ i - 1 & \text{if } i > 1 \wedge i < ips + 1 \\ (i-1) - 10^{-9} & \text{if } i = ips + 1 \end{array} \right. \\ r \leftarrow r + 1 \\ T1_r \leftarrow \text{SpanNo} + \frac{T2}{ips} \end{array} \right. \\ T1 \end{array} \right.$$

$$\text{BrIncs}_{eq2}(L, ips) := \left| \begin{array}{l} \text{BrINCS} \leftarrow \text{csort}\left[\text{stack}\left[\begin{pmatrix} \text{Vinc} - 0.0001 \\ \text{Vinc} \\ \text{Vinc} + 0.0001 \end{pmatrix}, \text{BrIncs}_{eq1}(L, ips)\right], 1\right] \\ T \leftarrow \left(\text{BrINCS}_1\right) \\ \text{for } i \in 2..\text{rows}(\text{BrINCS}) \\ \quad T \leftarrow \text{if}\left(\text{BrINCS}_{i-1} = \text{BrINCS}_i, T, \text{stack}\left(T, \text{BrINCS}_i\right)\right) \\ T \end{array} \right.$$

$$\text{BrIncs} := \text{BrIncs}_{eq2}(L, ips)$$

RSIF_{eq} & RSIF - influence locations: (R)ow, (S)pan, (I)ncrement, (F)eet

$$\text{RSIF}_{eq}(L, \text{BrIncs}) := \left| \begin{array}{l} Lt \leftarrow \text{stack}[(0), L] \\ \text{for } i \in 1..\text{rows}(\text{BrIncs}) \\ \quad \left| \begin{array}{l} \text{span} \leftarrow \text{trunc}\left(\text{BrIncs}_i\right) \\ ft \leftarrow \left(\sum_{k=1}^{\text{span}} Lt_k\right) + \left[L_{\text{span}} \cdot \left(\text{BrIncs}_i - \text{span}\right)\right] \\ T^{\langle i \rangle} \leftarrow \left(i + 1 \quad \text{span} \quad \text{BrIncs}_i \quad ft\right)^T \end{array} \right. \\ T \leftarrow T^T \\ T2 \leftarrow \begin{bmatrix} 1 & \text{rows}(T) + 2 \\ 0 & \text{rows}(L) + 1 \\ \left(1 - \frac{0.001}{L_1}\right) & \left(\text{rows}(L) + 1 + \frac{0.001}{L_{\text{rows}(L)}}\right) \\ -0.001 \cdot L_1 & \sum L + 0.001 \cdot L_1 \end{bmatrix}^T \\ T \leftarrow \text{stack}(T, T2) \\ \text{csort}(T, 1) \end{array} \right.$$

$$\text{RSIF} := \text{RSIF}_{eq}(L, \text{BrIncs})$$

Top Slab, Make Influence Table (2 of 8)

RSIF_CHK_LOCS - check locations: (R)ow, (S)pan, (I)ncrement, (F)eet

$$\begin{aligned}
&\text{RSIF_CHK_LOCS} := \left| \begin{array}{l}
\text{r(BrINC)} \leftarrow \text{match2}\left(\text{BrINC}, \text{RSIF}^{\langle 3 \rangle}\right) \\
\text{Get} \leftarrow \begin{pmatrix}
\text{match2}\left(\begin{cases} 1.50 & \text{if cells} = 1 \\ 1.40 & \text{otherwise} \end{cases}, \text{RSIF}^{\langle 3 \rangle}\right) \\
\text{match}\left(2.00, \text{RSIF}^{\langle 3 \rangle}\right)_1 \\
\text{match2}\left(\text{Vinc}, \text{RSIF}^{\langle 3 \rangle}\right) \\
\text{match2}\left(\text{Vinc}, \text{RSIF}^{\langle 3 \rangle}\right)
\end{pmatrix} \\
\text{for } i \in 1 .. \text{rows(Get)} \\
\quad \text{T2}^{\langle i \rangle} \leftarrow \left(\text{RSIF}^{\text{T}}\right)^{\langle \left(\text{Get}_i\right) \rangle} \\
\text{T2}^{\text{T}}
\end{array} \right.
\end{aligned}$$

$$\left| \begin{array}{l} \text{HDR} \leftarrow (\text{"ROW"} \quad \text{"SPAN"} \quad \text{"INC"} \quad \text{"FT"}) \\ \text{stack(HDR, RSIF_CHK_LOCS)} \end{array} \right. = \begin{pmatrix} \text{"ROW"} & \text{"SPAN"} & \text{"INC"} & \text{"FT"} \\ 12.00 & 1.00 & 1.50 & 6.33 \\ 25.00 & 1.00 & 2.00 & 12.67 \\ 22.00 & 1.00 & 1.90 & 11.41 \\ 22.00 & 1.00 & 1.90 & 11.41 \end{pmatrix}$$

pM_{BrINC} - positive moment location

$$\text{pM}_{\text{BrINC}} := \text{RSIF}_{\text{RSIF_CHK_LOCS}_{1,1},3} = 1.50$$

pier location

$$\text{SUML}(L) := \left| \begin{array}{l} \text{for } i \in 1 .. \text{rows}(L) \\ \quad \text{SUML}_i \leftarrow \sum_{k=1}^{i} L_k \\ \text{SUML} \end{array} \right.$$

bridge length

$$\text{ENDPIER}(L) := \sum L$$

is x over a pier?

$$\text{axlatpier}(x, L) := \left| \begin{array}{l} T_1 \leftarrow 1 \text{ if } x = 0 \\ T_1 \leftarrow 0 \text{ otherwise} \\ \text{for } i \in 1 .. \text{rows}(L) \\ \quad \left| \begin{array}{l} T_{i+1} \leftarrow i + 1 \text{ if } x = \sum_{k=1}^{i} L_k \\ T_{i+1} \leftarrow 0 \text{ otherwise} \end{array} \right. \\ \max(T) \end{array} \right.$$

x is in what span?

$$\text{axlspan}(x, L) := \left| \begin{array}{l} T \leftarrow 0 \text{ if } x < 0 \vee x > \text{ENDPIER}(L) \\ \text{otherwise} \\ \quad \left| \begin{array}{l} T \leftarrow 1 \\ \text{while } \frac{x}{T} > 1 \\ \qquad \sum_{k=1} L_k \\ \quad T \leftarrow T + 1 \end{array} \right. \\ \text{rows}(L) + 1 \text{ if } x = \sum_{k=1}^{\text{rows}(L)} L_k \\ T \text{ otherwise} \end{array} \right.$$

local distance to nearest left pier

$$a(x, L) := \left| \begin{array}{l} x \text{ if } \text{axlspan}(x, L) = 1 \vee \text{rows}(L) = 1 \\ x - \sum_{k=1}^{\text{axlspan}(x,L)-1} L_k \text{ otherwise} \end{array} \right.$$

EI - stiffness

$$\text{EI} := 10 \cdot 10^4$$

Top Slab, Make Influence Table (3 of 8)

what's the sign of theta?

$$\text{signtheta}(x,L) := \begin{cases} 1 & \text{if } \text{round}\left(\frac{\text{axlspan}(x,L)}{2},0\right) = 0 \\ -1 & \text{otherwise} \end{cases}$$

simple moment

$$MP(x,L) := \begin{cases} \text{spanNo} \leftarrow \text{axlspan}(x,L) \\ \frac{L_{\text{spanNo}} - a(x,L)}{L_{\text{spanNo}}} \cdot a(x,L) \end{cases}$$

MEQ1 - unknown θ.1 & areas of moments

$$MEQ1p(x,L) := \begin{cases} \text{for } i \in 1..\text{rows}(L) \\ \quad T_{i,1} \leftarrow \text{signtheta}(x,L)\cdot EI\cdot(-1) \\ \text{for } i \in 1..\text{rows}(L) \\ \quad \begin{cases} 0 & \text{if } \text{rows}(L) = 1 \\ \text{otherwise} \\ \quad \text{for } j \in 2..\text{rows}(L) \\ \quad\quad T_{i,j} \leftarrow \begin{cases} 0 & \text{if } j > i \\ \text{otherwise} \\ \quad \begin{cases} 0.5\cdot L_{j-1} & \text{if } j = i \\ 0.5\cdot\left(L_{j-1} + L_j\right) & \text{otherwise} \end{cases} \end{cases} \\ \quad T \\ T \end{cases}$$

MEQ2 - unknown area moments * known distance

$$MEQ2p(x,L) := \begin{cases} \text{for } i \in 1..\text{rows}(L) \\ \quad \text{for } j \in 1..\text{rows}(L) \\ \quad\quad \begin{cases} \text{if } i = 1 \\ \quad \begin{cases} AM_{i,j} \leftarrow \frac{L_i}{6} & \text{if } j = 2 \\ AM_{i,j} \leftarrow 0 & \text{otherwise} \end{cases} \\ \text{otherwise} \\ \quad \begin{cases} AM_{i,j} \leftarrow \frac{L_i}{6} & \text{if } j = i+1 \\ \text{otherwise} \\ \quad \begin{cases} AM_{i,j} \leftarrow \frac{L_i}{3} & \text{if } j = i \\ AM_{i,j} \leftarrow 0 & \text{otherwise} \end{cases} \end{cases} \end{cases} \\ AM \end{cases}$$

MEQ3p(x,L) - sum unknowns

$$MEQSUMp(x,L) := MEQ1p(x,L) + MEQ2p(x,L)$$

MEQ3ap - known simple point load area

$$MEQ3ap(x,L) := \begin{cases} T_{1,1} \leftarrow 0 & \text{if } \text{rows}(L) = 1 \\ \text{otherwise} \\ \quad \text{row} \leftarrow \text{axlspan}(x,L) \\ \quad \text{for } i \in 1..\text{rows}(L) \\ \quad\quad \begin{cases} T_{i,1} \leftarrow \frac{L_{\text{row}}}{2} & \text{if } \text{row} < i \\ T_{i,1} \leftarrow -0 & \text{otherwise} \end{cases} \\ \quad T \\ T \end{cases}$$

MEQbp - known simple point load moment

$$MEQ3bp(x,L) := \begin{cases} \text{for } i \in 1..\text{rows}(L) \\ \quad T_{i,1} \leftarrow 0 \\ \text{row} \leftarrow \text{axlspan}(x,L) \\ T_{\text{row},1} \leftarrow \frac{L_{\text{row}}}{3} - \frac{a(x,L)}{6} \\ T \end{cases}$$

MEQ3p(x,L) - sum knowns, and multiply by point moment

$$MEQ3p(x,L) := (MEQ3ap(x,L) + MEQ3bp(x,L))\cdot MP(x,L)\cdot \text{signtheta}(x,L)$$

Top Slab, Make Influence Table (4 of 8)

MeqGO(x, L) whether moment solution can run

$$\text{MeqGO}(x,L) := \begin{cases} 0 & \text{if } x \le 0 \vee x \ge \text{ENDPIER}(L) \\ 1 & \text{otherwise} \end{cases}$$

SOLNp(x, L) - theta, pier moments

$$\text{SOLNp}(x,L) := \begin{cases} \text{if } \text{MeqGO}(x,L) = 0 \\ \quad \begin{cases} \text{for } i \in 1..\text{rows}(L) \\ \quad T_i \leftarrow 0 \\ T \end{cases} \\ \text{MEQSUMp}(x,L)^{-1} \cdot \text{MEQ3p}(x,L) \quad \text{otherwise} \end{cases}$$

axlspanpier(x, L) - get span No. if on endpier, report last span. else if on pier, report pier no.

$$\text{axlspanpier}(x,L) := \begin{cases} SPA \leftarrow \text{axlspan}(x,L) \\ PIER \leftarrow \text{axlatpier}(x,L) \\ \min(\text{rows}(L), \max(SPA, PIER)) \end{cases}$$

ReturnAXLonPIER(xaxl, L, xtst, OnPier, span) - if the axle is on a pier, report influence (M,V+,V-)

$$\text{ReturnAXLonPIER}(xaxl,L,xtst,OnPier,span) := \begin{cases} \text{return } \begin{pmatrix} 0 \\ 1 \\ 0 \end{pmatrix} & \text{if } OnPier = 1 \wedge xaxl = xtst = 0 \\ \text{return } \begin{pmatrix} 0 \\ 1 \\ 0 \end{pmatrix} & \text{if } OnPier = span \wedge xaxl = xtst \\ \text{return } \begin{pmatrix} 0 \\ 0 \\ -1 \end{pmatrix} & \text{if } OnPier = span + 1 \wedge xaxl = xtst \\ \begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix} \end{cases}$$

Top Slab, Make Influence Table (5 of 8)

$R3_{local}(xaxl, L, xtst)$ - simple span influence (moment, positive shear, negative shear) at xtst span, from 1 kip load at xaxl)

$$
\begin{aligned}
&R3_{local}(xaxl, L, xtst, span) := \\
&\quad SPANnoAXL \leftarrow axlspanpier(xaxl, L) \\
&\quad SPANnoTST \leftarrow span \\
&\quad \text{return } \begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix} \text{ if } SPANnoAXL \neq SPANnoTST \vee SPANnoTST = 0 \\
&\quad XlocAXL \leftarrow \begin{cases} xaxl & \text{if } SPANnoAXL = 1 \\ xaxl - SUML(L)_{SPANnoAXL-1} & \text{otherwise} \end{cases} \\
&\quad XlocTST \leftarrow \begin{cases} xtst & \text{if } SPANnoTST = 1 \\ xtst - SUML(L)_{SPANnoTST-1} & \text{otherwise} \end{cases} \\
&\quad R_{left} \leftarrow \frac{L_{SPANnoAXL} - XlocAXL}{L_{SPANnoAXL}} \\
&\quad R_{right} \leftarrow \frac{XlocAXL}{L_{SPANnoAXL}} \\
&\quad \text{if } XlocTST < XlocAXL \\
&\qquad M_{local} \leftarrow XlocTST \cdot R_{left} \\
&\qquad V_{local_pos} \leftarrow R_{left} \\
&\qquad V_{local_neg} \leftarrow R_{left} \\
&\quad \text{if } XlocTST > XlocAXL \\
&\qquad M_{local} \leftarrow \left(L_{SPANnoAXL} - XlocTST\right) \cdot R_{right} \\
&\qquad V_{local_pos} \leftarrow -R_{right} \\
&\qquad V_{local_neg} \leftarrow -R_{right} \\
&\quad \text{if } XlocTST = XlocAXL \\
&\qquad M_{local} \leftarrow XlocTST \cdot R_{left} \\
&\qquad V_{local_pos} \leftarrow R_{left} \\
&\qquad V_{local_neg} \leftarrow -R_{right} \\
&\quad \begin{pmatrix} M_{local} \\ V_{local_pos} \\ V_{local_neg} \end{pmatrix}
\end{aligned}
$$

Top Slab, Make Influence Table (6 of 8)

R3a(xaxl, L, xtst, span) - get simple and pier influence

$$
\begin{aligned}
&R3a\left(L, T_{SOLNp}, xtst, span\right) := \\
&\quad SPANnoTST \leftarrow span \\
&\quad \text{return } (0\ \ 0\ \ 0)^T \text{ if } SPANnoTST < 1 \vee SPANnoTST > rows(L) \\
&\quad XlocTST \leftarrow \begin{cases} xtst & \text{if } SPANnoTST = 1 \\ xtst - SUML(L)_{SPANnoTST-1} & \text{otherwise} \end{cases} \\
&\quad \left(M_{left}\ \ M_{right}\ \ V_{pier}\right) \leftarrow (0\ \ 0\ \ 0) \\
&\quad \text{return } \left[\left(M_{left} + M_{right}\right)\ \ V_{pier}\ \ V_{pier}\right]^T \text{ if } SPANnoTST = 1 \\
&\qquad M_{right} \leftarrow T_{SOLNp_2} \cdot \frac{XlocTST}{L_1} \\
&\qquad V_{pier} \leftarrow \left(\frac{T_{SOLNp_2}}{L_1}\right) \\
&\quad \text{return } \left[\left(M_{left} + M_{right}\right)\ \ V_{pier}\ \ V_{pier}\right]^T \text{ if } SPANnoTST \geq rows(L) \\
&\qquad M_{right} \leftarrow 0 \\
&\qquad Ltemp \leftarrow L_{rows(L)} \\
&\qquad T \leftarrow \begin{cases} 0 & \text{if } SPANnoTST = rows(L) + 1 \\ 1 & \text{otherwise} \end{cases} \\
&\qquad M_{left} \leftarrow T_{SOLNp_{rows(L)}} \cdot \left(1 - \frac{XlocTST}{Ltemp}\right) \cdot T \\
&\qquad V_{pier} \leftarrow -\left(\frac{T_{SOLNp_{rows(L)}}}{Ltemp}\right) \\
&\quad \text{return } \left[\left(M_{left} + M_{right}\right)\ \ V_{pier}\ \ V_{pier}\right]^T \text{ if } 1 < SPANnoTST < rows(L) \\
&\qquad M_{left} \leftarrow T_{SOLNp_{(SPANnoTST)}} \cdot \left(1 - \frac{XlocTST}{L_{SPANnoTST}}\right) \\
&\qquad M_{right} \leftarrow T_{SOLNp_{(SPANnoTST+1)}} \cdot \left(\frac{XlocTST}{L_{SPANnoTST}}\right) \\
&\qquad V_{pier} \leftarrow \frac{-T_{SOLNp_{(SPANnoTST)}} + T_{SOLNp_{(SPANnoTST+1)}}}{L_{SPANnoTST}}
\end{aligned}
$$

MVVa(L, xaxl, xtst, span, SLN) - if 1 span, use simple solution; otherwise use continuous

$$
\begin{aligned}
&MVVa(L, xaxl, xtst, span, SLN) := \\
&\quad R3local \leftarrow R3_{local}(xaxl, L, xtst, span) \\
&\quad \text{return } R3local \text{ if } rows(L) = 1 \\
&\quad R3a(L, SLN, xtst, span) + R3local
\end{aligned}
$$

MVVb(xaxl, xtst) - get +M +V -V for one test location and one axle location

$$
\begin{aligned}
&MVVb(xaxl, xtst) := \\
&\quad span \leftarrow axlspan(xtst, L) \\
&\quad SLN \leftarrow SOLNp(xaxl, L) \\
&\quad MVVa(L, xaxl, xtst, span, SLN)
\end{aligned}
$$

Top Slab, Make Influence Table (7 of 8)

R4(xaxl, L) - influence (+M, +V, -V) from 1kip load at location xaxl in bridge feet, when RSIF (bridge geometry matrix) is known.

```
R4(xaxl, L, RSIF) :=
    SLN ← SOLNp(xaxl, L)
    MVV(xtst, span) ← MVVa(L, xaxl, xtst, span, SLN)
    for j ∈ 1.. rows(RSIF)
        (span  xtst) ← (RSIF[j,2  RSIF[j,4])
        T^⟨j⟩ ← MVV(xtst, span)
        T^⟨j⟩ ← (0  0  0)^T  if xtst < 0 ∨ xtst > ∑L
    T
```

$INF2_{eq}$ & INF2 - - regular influence table (+M, -M, +V, -V)

```
INF2eq(L, RSIF) :=
    for i ∈ 1.. rows(RSIF)
        T ← R4(RSIF[i,4, L, RSIF)^T
        (M^⟨i⟩  Vp^⟨i⟩  Vn^⟨i⟩) ← (T^⟨1⟩  T^⟨2⟩  T^⟨3⟩)
    (M^T  M^T  Vp^T  Vn^T)
```

```
INF2 := INF2eq(L, RSIF)
```

INF_{show} - an abbreviated influence matrix, with few increments, for display.

```
INFshow :=
    L ← L
    ips ← 5
    RSIF ← RSIFeq(L, BrIncseq2(L, ips))
    S(r) ← matrix(r, 1, f(i, j) ← "")
    I ← INF2eq(L, RSIF)
    SIDE ← stack[("#"  "SPAN"  "BrINC"  "FT"), RSIF]
    DAT ← augment(diag(I[1,3)), diag(I[1,4)), I[1,1))
    LBL ← ("V+"  "V-")
    HDR ← augment(LBL, RSIF^⟨3⟩^T)
    T ← augment(SIDE, stack(HDR, DAT))
```

TOP SLAB, MAKE INFLUENCE TABLE (8 OF 8)

ABBREVIATED INFLUENCE TABLE , FOR CHECKING

#	SPAN	BrNC	FT	V+	V-	0.9999	1.0000	1.2000	1.4000	1.6000	1.8000	1.9008	1.9009	1.9010	2.0000
1	0	**1.00**	0.0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	1	**1.00**	0.0	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
3	1	**1.20**	2.5	0.8000	-0.2000	0.0000	0.0000	2.0267	1.5200	1.0133	0.5067	0.2513	0.2510	0.2508	0.0000
4	1	**1.40**	5.1	0.6000	-0.4000	0.0000	0.0000	1.5200	3.0400	2.0267	1.0133	0.5026	0.5021	0.5016	0.0000
5	1	**1.60**	7.6	0.4000	-0.6000	0.0000	0.0000	1.0133	2.0267	3.0400	1.5200	0.7539	0.7531	0.7524	0.0000
6	1	**1.80**	10.1	0.2000	-0.8000	0.0000	0.0000	0.5067	1.0133	1.5200	2.0267	1.0052	1.0042	1.0032	0.0000
7	1	**1.90**	11.4	0.0992	-0.9008	0.0000	0.0000	0.2513	0.5026	0.7539	1.0052	1.1318	1.1307	1.1296	0.0000
8	1	**1.90**	11.4	0.0991	-0.9009	0.0000	0.0000	0.2510	0.5021	0.7531	1.0042	1.1307	1.1308	1.1297	0.0000
9	1	**1.90**	11.4	0.0990	-0.9010	0.0000	0.0000	0.2508	0.5016	0.7524	1.0032	1.1296	1.1297	1.1298	0.0000
10	1	**2.00**	12.7	0.0000	-1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
11	2	**2.00**	12.7	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

$\left(\text{matrix}(40,20,f(i,j) \leftarrow \text{""})\ \ \text{INF}_{\text{show}}\right)$

Top Slab, Influence Vectors (1 of 2)

While LRFR does apply simultaneous minimum and maximum live load factors among a given element or span (extreme effects, neglecting axles not contributing to the force under consideration, and patch lane loading), LRFR does not vary minimum and maximum permanent load factors for one load type, within the same calculation. "In the application of permanent loads, force effects for each of the specified six load types should be computed separately. It is unnecessary to assume that one type of load varies by span, length, or component within a bridge" (LRFD C3.4.1). At a two-span culvert, for example, when considering positive moment in the top slab of span 1, maximize vertical dead load throughout the entire top slab. Consistently apply maximum component (DC) and vertical earth (EV) load factors to both spans. However use the minimum horizontal earth (EH) pressure, if its effects benefit the top slab with axial force.

$iMpos := \left(INF2_{1,1}\right)^{\langle RSIF_CHK_LOCS_{1,1}\rangle}$ (1) iMpos - unfactored influence vector at $pM_{BrINC} = 1.50$ for positive moment (+M)

$iMneg := \left(INF2_{1,1}\right)^{\langle RSIF_CHK_LOCS_{2,1}\rangle}$ (2) iMneg - unfactored influence vector at 2.00 for negative moment (-M)

$iVneg := \left(INF2_{1,4}\right)^{\langle RSIF_CHK_LOCS_{3,1}\rangle}$ (3) iVneg - unfactored influence vector at $Vinc = 1.90$ for negative shear (-V)

$iMv := \left(INF2_{1,1}\right)^{\langle RSIF_CHK_LOCS_{4,1}\rangle}$ (4) iMv - unfactored influence vector at $Vinc = 1.90$ for M coincident with V (Mv)

$maxINF(INF, \gamma_{max}, \gamma_{min}) := if(INF \geq 0, \gamma_{max} \cdot INF, \gamma_{min} \cdot INF)$ $maxINF(INF, \gamma_{max}, \gamma_{min})$ - apply γ_{max} or γ_{min} to emphasize positive influence

$minINF(INF, \gamma_{max}, \gamma_{min}) := if(INF \leq 0, \gamma_{max} \cdot INF, \gamma_{min} \cdot INF)$ $minINF(INF, \gamma_{max}, \gamma_{min})$ - apply γ_{max} or γ_{min} to emphasize negative influence

$COINC(Vneg, \gamma_{max}, \gamma_{min}) := if(Vneg < 0, \gamma_{max}, \gamma_{min})$ $COINC(Vneg, \gamma_{max}, \gamma_{min})$ - use Vneg as guidance on whether to use γ_{max} or γ_{min}

$INF_LL_Mpos := \overrightarrow{maxINF(iMpos, 1, \gamma_{LLmin})}$ (1) INF_LL_Mpos - live load (LL) influence vector at $pM_{BrINC} = 1.50$ for +M

$INF_LL_Mneg := \overrightarrow{minINF(iMneg, 1, \gamma_{LLmin})}$ (2) INF_LL_Mneg - LL influence vector at 2.00 for -M

$INF_LL_Vneg := \overrightarrow{minINF(iVneg, 1, \gamma_{LLmin})}$ (3) INF_LL_Vneg - LL influence vector at $Vinc = 1.90$ for -V

$INF_LL_Mv := \overrightarrow{COINC(iVneg, iMv, 0 \cdot iMv)}$ (4) INF_LL_Mv - LL influence vector at $Vinc = 1.90$ for Mv

$INF_\gamma DC_Mpos := \gamma_{DCmax} \cdot iMpos$ (1) INF_γDC_Mpos - factored (γ) component DL (DC) infl. at $pM_{BrINC} = 1.50$ for +M

$INF_\gamma DC_Mneg := \gamma_{DCmax} \cdot iMneg$ (2) INF_γDC_Mneg - γDC influence vector at 2.00 for -M

$INF_\gamma DC_Vneg := \gamma_{DCmax} \cdot iVneg$ (3) INF_γDC_Vneg - γDC influence vector at $Vinc = 1.90$ for -V

$INF_\gamma DC_Mv := \gamma_{DCmax} \cdot iMv$ (4) INF_γDC_Mv - γDC influence vector at $Vinc = 1.90$ for Mv

$INF_\gamma EV_Mpos := \eta\gamma_{EVmax} \cdot iMpos$ (1) INF_γEV_Mpos - factored (γ) vertical earth (EV) influence at $pM_{BrINC} = 1.50$ for +M

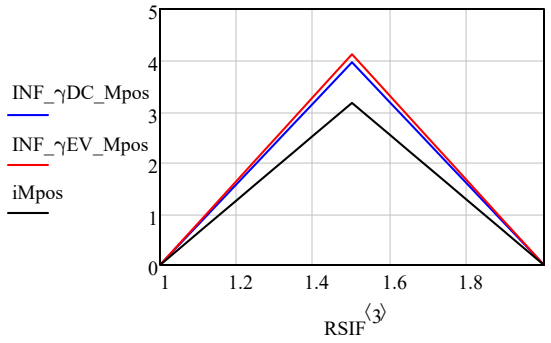
$INF_\gamma EV_Mneg := \eta\gamma_{EVmax} \cdot iMneg$ (2) INF_γEV_Mneg - γEV influence vector at 2.00 for -M

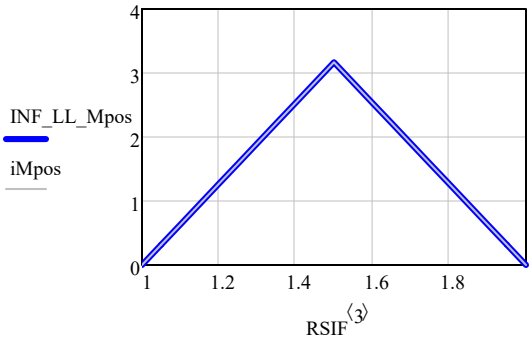
$INF_\gamma EV_Vneg := \eta\gamma_{EVmax} \cdot iVneg$ (3) INF_γEV_Vneg - γEV influence vector at $Vinc = 1.90$ for -V

$INF_\gamma EV_Mv := \eta\gamma_{EVmax} \cdot iMv$ (4) INF_γEV_Mv - γEV influence vector at $Vinc = 1.90$ for Mv

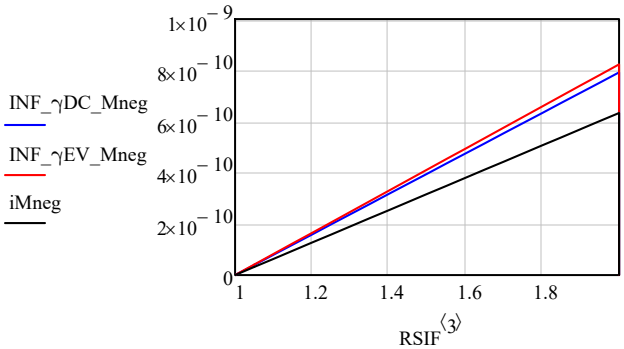
Top Slab, Influence Vectors (2 of 2)

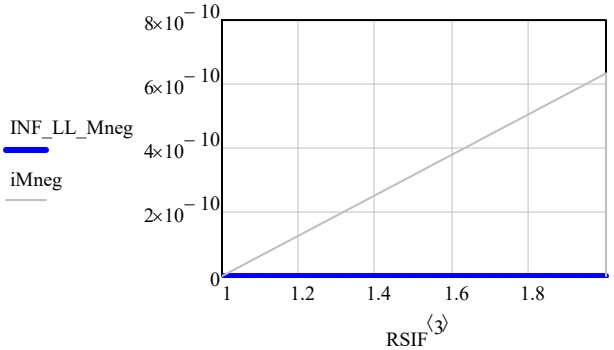
POSITIVE MOMENT



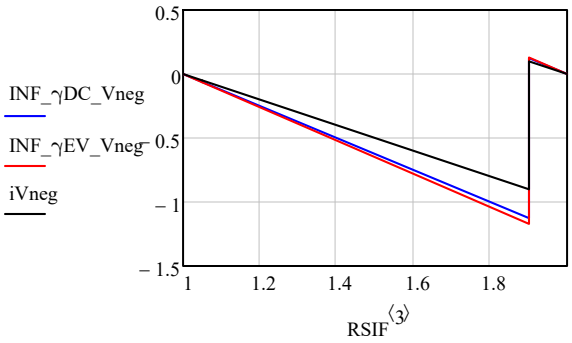


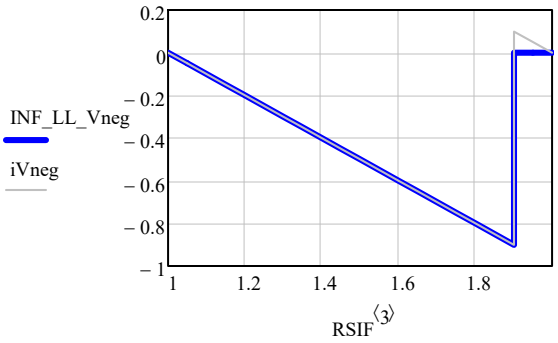
NEGATIVE MOMENT



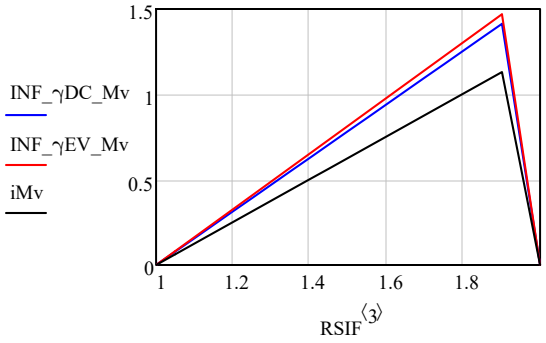


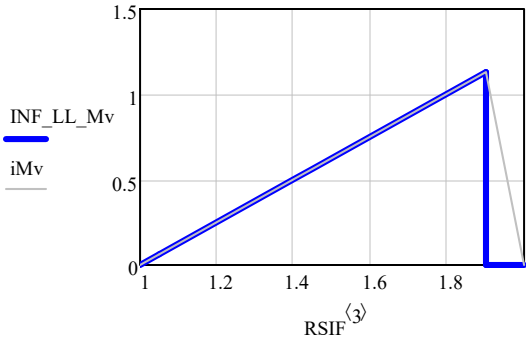
SHEAR





MOMENT ASSOCIATED WITH SHEAR





TOP SLAB, APPLY LOAD TO INFLUENCE (1 OF 4)

UTILITIES

iftoi(FT) - given FEET, get Brinc

$$iftoi(FT) := linterp\left(RSIF^{\langle 4\rangle}, RSIF^{\langle 3\rangle}, FT\right)$$

iioft(BrINC) - given BrINC, get FEET

$$iioft(BrINC) := linterp\left(RSIF^{\langle 3\rangle}, RSIF^{\langle 4\rangle}, BrINC\right)$$

iftor(FT) - given FEET, get NODE No.

$$iftor(FT) := linterp\left(RSIF^{\langle 4\rangle}, RSIF^{\langle 1\rangle}, FT\right)$$

APPLY ω TO AN INFLUENCE VECTOR

INFx1x2a - add four nodes to an influence vector, one pair of new nodes adjacent to x1, and another new pair adjacent to x2. Add a column with bridge feet location. Output is (feet, influence).

$INFx1x2(I, x1, x2) :=$

"if the load is not on the bridge, return 0"

return $\begin{pmatrix} 0 & 0 \\ 0.1 & 0 \end{pmatrix}$ if $x1 \geq \sum L \vee x2 \leq 0$

"x1 can't be less than 0; x2 can't be greater than ΣL"

$(x1 \quad x2) \leftarrow \left(\max(0, x1) \quad \min\left(x2, \sum L\right)\right)$

"add 2 new nodes, before and after x1 &x2"

$FTadd \leftarrow stack\left[\begin{pmatrix} x1 - 10^{-6} \\ x1 + 10^{-6} \end{pmatrix}, \begin{pmatrix} x2 - 10^{-6} \\ x2 + 10^{-6} \end{pmatrix}\right]$

"get influence for all nodes, including FTadd"

for $j \in 1..cols(I)$

$T(x) \leftarrow linterp\left(RSIF^{\langle 4\rangle}, I^{\langle j\rangle}, x\right)$

$INFt^{\langle j\rangle} \leftarrow stack\left(I^{\langle j\rangle}, \overrightarrow{T(FTadd)}\right)$

"combine FT & INFLUENCE, sort by FT"

$ftINF \leftarrow augment\left(stack\left(RSIF^{\langle 4\rangle}, FTadd\right), INFt\right)$

$ftINF \leftarrow csort(ftINF, 1)$

"zero out any increment not within the range x1 to x2"

$ZeroLeftRight(x, INF) \leftarrow if(x < x1 \vee x > x2, 0, INF)$

for $j \in 2..cols(ftINF)$

$ftINF^{\langle j\rangle} \leftarrow \overrightarrow{ZeroLeftRight\left(ftINF^{\langle 1\rangle}, ftINF^{\langle j\rangle}\right)}$

ftINF

INFx1x2ω(INF, x1x2ω) - for each row in x1x2ω, apply ω (klf) to influence from x1 to x2 (ft). Output is the force effect of the loading.

$INFx1x2\omega(INF, x1x2\omega) :=$

$T1 \leftarrow matrix(1, cols(INF), f(i, j) \leftarrow 0)$

for $i \in 1..rows(x1x2\omega)$

$T2 \leftarrow INFx1x2\left(INF, x1x2\omega_{i,1}, x1x2\omega_{i,2}\right)$

$\Delta(k) \leftarrow T2_{k,1} - T2_{k-1,1}$

$I(k, j) \leftarrow \dfrac{\left(T2_{k,j} + T2_{k-1,j}\right)}{2}$

$\omega \leftarrow x1x2\omega_{i,3}$

for $j \in 2..cols(T2)$

$T3 \leftarrow \sum_{k=2}^{rows(T2)} [\Delta(k) \cdot (I(k, j) \cdot \omega)]$

$T1_{1,j-1} \leftarrow T1_{1,j-1} + T3$

T1

Top Slab, Apply Load to Influence (2 of 4)

DEAD LOAD

$$DLeq(INF,\omega) := INFx1x2\omega\left[INF,\left(0 \quad \sum L \quad \frac{\omega}{klf}\right)\right]$$

$$DL(D) := \begin{pmatrix} DLeq(iMpos,\omega_{DC}) + DLeq(iMpos,\omega_{EV}(D)) \\ DLeq(iMneg,\omega_{DC}) + DLeq(iMneg,\omega_{EV}(D)) \\ DLeq(iVneg,\omega_{DC}) + DLeq(iVneg,\omega_{EV}(D)) \\ DLeq(iMv,\omega_{DC}) + DLeq(iMv,\omega_{EV}(D)) \end{pmatrix}^T$$

$$\gamma DL(D) := \begin{pmatrix} DLeq(INF_\gamma DC_Mpos,\omega_{DC}) + DLeq(INF_\gamma EV_Mpos,\omega_{EV}(D)) \\ DLeq(INF_\gamma DC_Mneg,\omega_{DC}) + DLeq(INF_\gamma EV_Mneg,\omega_{EV}(D)) \\ DLeq(INF_\gamma DC_Vneg,\omega_{DC}) + DLeq(INF_\gamma EV_Vneg,\omega_{EV}(D)) \\ DLeq(INF_\gamma DC_Mv,\omega_{DC}) + DLeq(INF_\gamma EV_Mv,\omega_{EV}(D)) \end{pmatrix}^T$$

$DL :=$ for $iD \in 1..rows(D_{fills})$: $T^{\langle iD \rangle} \leftarrow DL(D_{fills_{iD}})^T$; return T^T

$\gamma DL :=$ for $iD \in 1..rows(D_{fills})$: $T^{\langle iD \rangle} \leftarrow \gamma DL(D_{fills_{iD}})^T$; return T^T

$$DL = \begin{bmatrix} (8.34) & (0.00) & (-2.11) & (2.98) \\ (9.63) & (0.00) & (-2.44) & (3.44) \end{bmatrix}$$

$$\gamma DL = \begin{bmatrix} (10.68) & (0.00) & (-2.70) & (3.81) \\ (12.35) & (0.00) & (-3.13) & (4.41) \end{bmatrix}$$

DISTRIBUTED TRUCK

OLAPTRK2(TRK, D) - given a truck (ft kip), make a longitudinally distributed truck (x_start x_end klf). Where axle distribution lengths overlap, the tributary axles are uniformly distributed over the net length (Std.Spec. 6.4.2 & LRFD MBE C6A.5.12.10.3a). When axle overlapping does occur, heavy axle areas may be irrationally distributed to light axle areas. However, such overlapping occurs under deep fills, where DL supercedes LL.

$OLAPTRK2(TRK, D) :=$

$E_{long} \leftarrow E_{long.eq}(D) \cdot ft^{-1}$

return $\left(-0.5 \cdot E_{long} \quad 0.5 \cdot E_{long} \quad \frac{TRK_{1,2}}{E_{long}}\right)$ if $rows(TRK) = 1$

$(T \quad CL_AXLE) \leftarrow \left[\left(-0.5 \cdot E_{long} \quad 0.5 \cdot E_{long} \quad TRK_{1,2}\right) \quad (0)\right]$

for $i \in 2..rows(TRK)$

$(r \quad CL_AXLE) \leftarrow \left[rows(T) \quad \left(CL_AXLE - TRK_{i,1}\right)\right]$

$T \leftarrow$ stack$\left[T, \left[\left(CL_AXLE - 0.5 \cdot E_{long}\right) \quad \left(CL_AXLE + 0.5 \cdot E_{long}\right) \quad TRK_{i,2}\right]\right]$ if $TRK_{i,1} > E_{long}$

$\left(T_{r,1} \quad T_{r,2} \quad T_{r,3}\right) \leftarrow \left[\left(CL_AXLE - 0.5 \cdot E_{long}\right) \quad \left(T_{r,2}\right) \quad \left(T_{r,3} + TRK_{i,2}\right)\right]$ otherwise

for $i \in 1..rows(T)$

$T_{i,3} \leftarrow \frac{T_{i,3}}{T_{i,2} - T_{i,1}}$

return T

Top Slab, Apply Load to Influence (3 of 4)

MAKE DISTRIBUTED TRUCKS

TKLOCS2 - (x_start, x_end, unfactored pressure) and (locations of first wheel in bridge feet), no lateral distribution, no IM, and no load factor)

```
TKLOCS2(TK, D) :=
    T ← OLAPTRK2(TK, D)
    TRK_LEN ← max(T^⟨2⟩) − min(T^⟨1⟩)
    RUN_LEN ← TRK_LEN + 1.2·L_1
    for i ∈ 1.. ips_LL + 1
        x_i ← (RUN_LEN / ips_LL)·(i − 1) + 0.4·L_1
    for i ∈ 1.. rows(x)
        T2_i ← augment(T^⟨1⟩ + x_i, T^⟨2⟩ + x_i, T^⟨3⟩)
    T2
```

MIRROR(TRK) - reverse the truck for two-way traffic

```
MIRROR(TRK) :=
    for i ∈ 1.. rows(TRK)
        T2_{i,1} ← 0 if i = 1
                   TRK_{rows(TRK)−i+2,1} otherwise
        T2_{i,2} ← TRK_{rows(TRK)−i+1,2}
    return T2 if cols(TRK) = 2
    augment(T2, TRK^⟨3⟩)
```

Top Slab, Apply Load to Influence (4 of 4)

RUN LIVE LOAD

γLLwLBL(D) - factored live load with distribution and impact for one fill depth. 1 vehicle per row.

Main columns are:
(1) LL details
(2) M.positive
(3) M.negative
(4) V.negative
(5) M.coincident.with.Vnegative

Submatrix (1) LL detail columns:
(1) Row No.
(2) Veh No.
(3) Veh Name
(4) Truck No.
(5) Forward/Reverse 0/1
(6) 0
(7) Factored Truck

Submatrix (7) Factored Truck Columns are:
(1) x.start - the place in bridge feet at which the loading begins
(2) x.end - the place in bridge feet at which the loading ends
(3) klf loading - γ.LL*DF*IM*(AXLE, or ΣAXLES for overlapped axles)

$\gamma LLwLBL(D) :=$

VEHS $\leftarrow$ TRUCKS

IM $\leftarrow$ IMeq(D)

for $iv \in 1..\text{rows}(VEHS)$

$VEH \leftarrow VEHS_{iv,1}$

$DF \leftarrow LLDFeq(mpf_{iv}, D)$

$(Mp\ \ Mn\ \ Vn\ \ M_Vn\ \ row) \leftarrow (0\ \ 0\ \ 0\ \ 0\ \ 0)$

for $iTRK \in 1..\text{rows}(VEHS_{iv,2})$

$TRK1 \leftarrow (TRUCKS_{iv,2})_{iTRK,1}$

for $iMIRR \in 1..2$

$TRK2 \leftarrow \begin{cases} TRK1 & \text{if } iMIRR = 1 \\ MIRROR(TRK1) & \text{otherwise} \end{cases}$

$TKS \leftarrow TKLOCS2(TRK2, D)$

for $itrk \in 1..\text{rows}(TKS)$

$r \leftarrow r + 1$

$x_lead \leftarrow (TKS_{itrk})_{\text{rows}(TKS_{itrk}),3}$

$(TKS_{itrk})^{\langle 3 \rangle} \leftarrow \gamma LL_{iv} \cdot DF \cdot IM \cdot (TKS_{itrk})^{\langle 3 \rangle}$

$TK \leftarrow TKS_{itrk}$

$T^{\langle r \rangle} \leftarrow (r\ \ iv\ \ VEH\ \ iTRK\ \ iMIRR - 1\ \ 0\ \ TKS_{itrk})^T$

$\begin{pmatrix} Mp^{\langle r \rangle} \\ Mn^{\langle r \rangle} \\ Vn^{\langle r \rangle} \\ M_Vn^{\langle r \rangle} \end{pmatrix} \leftarrow \begin{pmatrix} INFx1x2\omega(INF_LL_Mpos, TK)^T \\ INFx1x2\omega(INF_LL_Mneg, TK)^T \\ INFx1x2\omega(INF_LL_Vneg, TK)^T \\ INFx1x2\omega(INF_LL_Mv, TK)^T \end{pmatrix}$

$\gamma LL^{\langle iv \rangle} \leftarrow (T^T\ \ Mp^T\ \ Mn^T\ \ Vn^T\ \ M_Vn^T)^T$

$(T\ \ Mp\ \ Mn\ \ Vn\ \ Mc\phi oincVn) \leftarrow (0\ \ 0\ \ 0\ \ 0\ \ 0)$

$r \leftarrow 0$

γLL^T

Top Slab, Capacity

MOMENT, LFR OR LRFR

$$Mn := f_y \cdot A_s \cdot \left(d - \frac{1}{2} \cdot \frac{f_y \cdot A_s}{0.85 \cdot f_c \cdot ft} \right)$$

$Mn = 44.54 \cdot kip \cdot ft$ - nominal flexural capacity (Std.Spec. Eq.8-16, LRFD Eq. 5.6.3.2.2-1)

$\phi_M := 0.90$

$\phi_M = 0.90$ - flexural strength reduction (Std.Spec. 8.16.1.2.2, LRFD Table 12.5.5-1)

$\psi\phi Mn := \psi_c \cdot \phi_M \cdot Mn$

$\psi\phi Mn = 40.09 \cdot kip \cdot ft$ - factored flexural strength; condition factor is $\psi_c = 1.00$

SHEAR, LFR OR LRFR D.FILL > 2 FEET

$$Vn_{DeepFills}(Mu, Vu) := \begin{| \sigma \leftarrow if\left(cells = 1, 2.5 \cdot \sqrt{f_c \cdot psi}, 0\right) \\ \sigma \leftarrow \max\left(\sigma, 2.14 \cdot \sqrt{f_c \cdot psi} + 4600 \cdot psi\, \rho \cdot \min\left(1, \frac{|Vu| \cdot d}{|Mu|}\right)\right) \\ \min\left(\sigma, 4.0 \cdot \sqrt{f_c \cdot psi}\right) \cdot ft \cdot d}$$

- nominal shear strength, D.fill > 2 feet (Std.Spec. 8.16.6.7.1, LRFD 5.12.7.3)

SHEAR, LFR D.FILL < 2 FEET

$$Vn_{LFR_Shallow}(Mu, Vu) := \begin{| \sigma \leftarrow 1.9 \cdot \sqrt{f_c \cdot psi} + 2500 \cdot psi\, \rho \cdot \min\left(1, \frac{|Vu| \cdot d}{|Mu|}\right) \\ \min\left(\sigma, 3.5 \cdot \sqrt{f_c \cdot psi}\right) \cdot ft \cdot d}$$

- nominal shear strength for LFR when D.fill < 2 feet (Std.Spec. Eq. 8-48)

SHEAR, LRFR D.FILL < 2 FEET

For LRFR D.fill < 2 feet, use LRFD 5.7.3.4.1. For box culverts that neglect axial loading, LRFD reduces to:

$$d_v := \frac{Mn}{A_s \cdot f_y}$$

$d_v = 10.21 \cdot in$ - distance between tension and compression centroids at full strength

$$\varepsilon_{s.min}(Mu, Vu) := \frac{\frac{\max\left(|Mu|, |Vu| \cdot d_v\right)}{d_v} + |Vu|}{29000ksi \cdot A_s}$$

$\varepsilon_{s.min}(Mu, Vu)$- strain at the centroid of reinforcement

$$s_{xe} := \min\left(\max\left(12in, d_v \cdot \frac{1.38}{0.375 + 0.63}\right), 80in\right)$$

$s_{xe} = 14.02 \cdot in$ - crack spacing parameter, assuming max aggregate size = 3/8in.

$$\beta(Mu, Vu) := \frac{4.8}{1 + 750 \cdot \min\left(\varepsilon_{s.min}(Mu, Vu), 6 \cdot 10^{-3}\right)} \cdot \frac{51in}{39in + s_{xe}}$$

$\beta(Mu, Vu)$- shear capacity factor

$$Vn_{LRFR_Shallow}(Mu, Vu) := \beta(Mu, Vu) \cdot \sqrt{f_c \cdot psi} \cdot ft \cdot d_v$$

$Vn_{LRFR_Shallow}(Mu, Vu)$ - concrete shear capacity

FACTORED SHEAR CAPACITY

$\phi_V := 0.85$ - strength reduction factor for shear (Std.Spec. 8.16.1.2.2, LRFD Table 12.5.5-1. Neglect LRFD 5.5.4.2 ϕ.V = 0.90 for slabs & shallow fills.

$$\psi\phi Vn(Mu, Vu, D) := \begin{| \text{return } \psi_c \cdot \phi_V \cdot Vn_{DeepFills}(Mu, Vu) \text{ if } D \geq 2ft \\ \text{return } \psi_c \cdot \phi_V \cdot Vn_{LFR_Shallow}(Mu, Vu) \text{ if } LRFR = 0 \\ \text{return } \psi_c \cdot \phi_V \cdot Vn_{LRFR_Shallow}(Mu, Vu) \text{ if } LRFR = 1 \\ \text{"ERROR"}}$$

- factored shear strength; condition factor is $\psi_c = 1.00$

Exterior Wall (1 of 6)

$D_{fill} := \max(D_{fills})$

$D_{fill} = 2.50\,ft$ - covering fill

$\gamma_{LL.Inventory} := \gamma_{LL_1}$

$\gamma_{LL.Inventory} = 1.75$ - live load factor, Inventory Level

$\omega_{DC} = 0.169 \cdot klf \quad \gamma_{soil} = 120 \cdot pcf$

ω_{DC} & γ_{soil} - previously defined terms

$\omega_{EV.Wall} := \omega_{EV}(D_{fill})$

$\omega_{EV.Wall} = 0.311 \cdot klf$ - vertical earth (EV) loading for exterior wall

VERTICAL LOADS

Axial loads, designated by "P," are positive for tension, and negative for compression.

$INF\omega := (0.5000 \quad 0.3750 \quad 0.4000 \quad 0.3928)_{1,\min(cells,4)} \cdot L_1 \cdot \frac{kip}{klf}$

$INF\omega = 6.33 \cdot \frac{kip}{klf}$ - influence, klf (ω) top slab to ext. wall rxn: +Area, -Area, ΣArea

$INFp := (0 \quad -0.096 \quad -0.08 \quad -0.0789)_{1,\min(cells,4)}$

$INFp = 0.00 \cdot \frac{kip}{kip}$ - uplifting influence, kip onto exterior wall per 1 kip axle in span 2

$DC_P := -\omega_{DC} \cdot INF\omega$

$DC_P = -1.07 \cdot kip$ - slab component load (DC), axial compression (P) onto exterior wall

$\gamma DC_P := -\gamma_{DCmin} \cdot \omega_{DC} \cdot INF\omega$

$\gamma DC_P = -0.96 \cdot kip$ - minimized factored DC_P

$EV_P := -\omega_{EV.Wall} \cdot INF\omega$

$EV_P = -1.97 \cdot kip$ - vertical earth (EV) axial comp. (P) onto ext wall. $F_{e.eq}(D_{fill}) = 1.04$

$\gamma EV_P := -\eta\gamma_{EVmin} \cdot \omega_{EV.Wall} \cdot INF\omega$

$\gamma EV_P = -1.77 \cdot kip$ - minimized factored EV_P

$LV_P := -IMeq(D_{fill}) \cdot LLDFeq(mpf_1, D_{fill}) \cdot (32kip \cdot INFp)$

$LV_P = 0.00 \cdot kip$ - vertical live load (LV) axial tension (P), 32 kip axle load, where:
$IMeq(D_{fill}) = 1.227 \quad mpf_1 = 1.20 \quad LLDFeq(mpf_1, D_{fill}) = 0.1140$

$\gamma LV_P := \gamma_{LL.Inventory} \cdot LV_P$

$\gamma LV_P = 0.00 \cdot kip$ - minimized factored LV_P.

$F_s := A_{s.wall} \cdot f_y = 16.00 \cdot kip$

F_s - force of steel at yield

$a := \frac{F_s + (\gamma DC_P + \gamma EV_P + \gamma LV_P)}{0.85 \cdot f_c \cdot 12in}$

$a = 0.43 \cdot in$ - effective depth of the compression block

$d_{ax.to.c} := \frac{d_{wall}}{2} - \frac{a}{2}$

$d_{ax.to.c} = 3.03 \cdot in$ - axial load to CG compression

$DC_M := DC_P \cdot d_{ax.to.c} \qquad \gamma DC_M := \gamma DC_P \cdot d_{ax.to.c}$

$DC_M = -0.27 \cdot kip \cdot ft$ & $\gamma DC_M = -0.24 \cdot kip \cdot ft$
Unfactored and factored moment from slab component load (DC)

$EV_M := EV_P \cdot d_{ax.to.c} \qquad \gamma EV_M := \gamma EV_P \cdot d_{ax.to.c}$

$EV_M = -0.50 \cdot kip \cdot ft$ &
Unfactored and factored moment from vertical earth (EV)

$LV_M := LV_P \cdot d_{ax.to.c} \qquad \gamma LV_M := \gamma LV_P \cdot d_{ax.to.c}$

$LV_M = 0.00 \cdot kip \cdot ft$ & $\gamma LV_M = 0.00 \cdot kip \cdot ft$
Unfactored and factored moment from vertical live load (LV)

$\psi c\phi Mn_wall := \psi_c \cdot \phi_M \cdot F_s \cdot \left(d_{wall} - \frac{a}{2}\right)$

$\psi c\phi Mn_wall = 7.54 \cdot kip \cdot ft$ - factored flexural capacity, exterior wall

Exterior Wall (2 of 6)

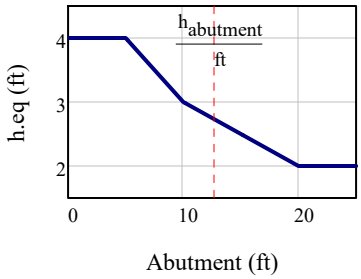
EQUIVALENT HEIGHT

$h_{abutment} := D_{fill} + 2 \cdot t_{slab} + h_{clear}$

$h_{abutment} = 12.75\,ft$ - overall height of the abutment

$h_{eq.equation}(h_{abutment}) :=$
$h \leftarrow h_{abutment}$
return 2ft if LRFR = 0
return 4ft if h < 5ft
return 2ft if h > 20ft
$\text{linterp}\left[\begin{pmatrix}5\\10\\20\end{pmatrix}ft, \begin{pmatrix}4\\3\\2\end{pmatrix}ft, h\right]$

$h_{eq.equation}$ - equivalent surcharge for LL (Std.Spec. 3.20.3, LRFD 3.11.6.4-1)



$h_{eq} := h_{eq.equation}(h_{abutment})$

$h_{eq} = 2.73\,ft$ - equivalent surcharge height for live load

SIMPLE SPAN EQUATIONS

$\omega_{\omega1.\omega2.eq}(\omega_{start}, \omega_{end}, L, x) := \text{if}\left[0 \le x \le L, \omega_{start} + (\omega_{end} - \omega_{start}) \cdot \left(\frac{x}{L}\right), 0\right]$

$V_{\omega1.\omega2.eq}(\omega_{start}, \omega_{end}, L, x) := \text{if}\left[0 \le x \le L, \left[\omega_{start} \cdot \left(\frac{L}{2} - x\right) + (\omega_{end} - \omega_{start}) \cdot \left(\frac{L}{6} - \frac{x^2}{2 \cdot L}\right)\right], 0\right]$

$M_{\omega1.\omega2.eq}(\omega_{start}, \omega_{end}, L, x) := \text{if}\left[0 \le x \le L, \left[\omega_{start} \cdot \left(\frac{L}{2} \cdot x - \frac{x^2}{2}\right)\right] + (\omega_{end} - \omega_{start}) \cdot \left(\frac{L \cdot x}{6} - \frac{x^3}{6 \cdot L}\right), 0\right]$

$ix := 1..41$

$FT_{ix} := \frac{ix - 1}{40} \cdot L_{wall}$

$FT := \text{stack}\left[\left(-10^{-3} \cdot ft\right), FT, \left(\max(FT) + 10^{-3} \cdot ft\right)\right]$

$x_{origin} := h_{abutment} - t_{slab} - h_{haunch.bot}$

$x_{origin} = 11.29\,ft$ - the depth of "x origin," at the bottom construction joint

HORIZONTAL EARTH (EH)

$\omega_{EH.start} := \omega_{EH}(x_{origin}) = 0.678 \cdot klf$

$\omega_{EH.end} := \omega_{EH}(x_{origin} - L_{wall}) = 0.228 \cdot klf$

$EH_{\omega} := \overrightarrow{\omega_{\omega1.\omega2.eq}(\omega_{EH.start}, \omega_{EH.end}, L_{wall}, FT)}$

$EH_{V} := \overrightarrow{V_{\omega1.\omega2.eq}(\omega_{EH.start}, \omega_{EH.end}, L_{wall}, FT)}$

$EH_{M} := \overrightarrow{M_{\omega1.\omega2.eq}(\omega_{EH.start}, \omega_{EH.end}, L_{wall}, FT)}$

$\gamma EH_{M} := \eta\gamma_{EHmax} \cdot EH_{M} \quad \max(\gamma EH_{M}) = 4.32 \cdot kip \cdot ft$

HORIZONTAL LL FROM SURCHARGE (LS)

$\omega_{LS.start} := \omega_{EH}(h_{eq}) = 0.164 \cdot klf$

$\omega_{LS.end} := \omega_{EH}(h_{eq}) = 0.164 \cdot klf$

$LS_{\omega} := \overrightarrow{\omega_{\omega1.\omega2.eq}(\omega_{LS.start}, \omega_{LS.end}, L_{wall}, FT)}$

$LS_{V} := \overrightarrow{V_{\omega1.\omega2.eq}(\omega_{LS.start}, \omega_{LS.end}, L_{wall}, FT)}$

$LS_{M} := \overrightarrow{M_{\omega1.\omega2.eq}(\omega_{LS.start}, \omega_{LS.end}, L_{wall}, FT)}$

$\gamma LS_{M} := \gamma_{LL.Inventory} \cdot LS_{M} \quad \max(\gamma LS_{M}) = 2.01 \cdot kip \cdot ft$

Exterior Wall (3 of 6)

APPROXIMATE RATING FACTOR, DESIGN INVENTORY

$\psi c\phi Mn_wall = 7.54 \cdot kip \cdot ft$

$DC_M = -0.27 \cdot kip \cdot ft$ $\quad \gamma DC_M = -0.24 \cdot kip \cdot ft$ $\quad DC_M$ - component dead load, reduces the wall moment (-)

$EV_M = -0.50 \cdot kip \cdot ft$ $\quad \gamma EV_M = -0.45 \cdot kip \cdot ft$ $\quad EV_M$ - vertical earth, reduces the wall moment (-)

$\max(EH_M) = 3.20 \cdot kip \cdot ft$ $\quad \max(\gamma EH_M) = 4.32 \cdot kip \cdot ft$ $\quad EH_M$ - horizontal earth, increases the wall moment (+)

$LV_M = 0.00 \cdot kip \cdot ft$ $\quad \gamma LV_M = 0.00 \cdot kip \cdot ft$ $\quad LV_M$ - vertical live load uplift, from axle in span 2, increases the wall moment (+)

$\max(LS_M) = 1.15 \cdot kip \cdot ft$ $\quad \max(\gamma LS_M) = 2.01 \cdot kip \cdot ft$ $\quad LS_M$ - horizontal LL from a vertical surcharge increases wall moment (+)

$$RF_{approx} := \frac{\psi c\phi Mn_wall - (\gamma DC_M + \gamma EV_M + \max(\gamma EH_M))}{\gamma LV_M + \max(\gamma LS_M)} = 1.943$$ RF_{approx} - approximate the Design Vehicle RF at the Inventory Level

RATING FACTOR, DESIGN INVENTORY

$DL_{wall} := DC_M + EV_M + EH_M$ $\quad \gamma DL_{wall} := \gamma DC_M + \gamma EV_M + \gamma EH_M$ $\quad DL_{wall}$ & γDL_{wall} - unfactored and factored DL

$LL_{wall} := LV_M + LS_M$ $\quad \gamma LL_{wall} := \gamma LV_M + \gamma LS_M$ $\quad LL_{wall}$ & γLL_{wall} - unfactored and factored LL

$$RFs := \left| \begin{array}{l} mx(A,B) \leftarrow \max(A,B) \\ \dfrac{\psi c\phi Mn_wall - \gamma DL_{wall}}{mx\left(10^{-6} kip \cdot ft, \gamma LL_{wall}\right)} \rightarrow \end{array} \right.$$

$RF_{Des.Inv} := \min(RFs)$ $\quad RF_{Des.Inv} = 1.949$ - exterior wall rating factor, Design Inventory

$$ROW_ExtWall := \left| \begin{array}{l} T \leftarrow RF_{Des.Inv} \\ match2(T, RFs) \end{array} \right.$$

$ROW_ExtWall = 21.00$ - governing row No.

$$\frac{LL_{wall_{ROW_ExtWall}}}{DL_{wall_{ROW_ExtWall}}} = 0.47$$

Exterior Wall (4 of 6)

VERIFY ϕ.M = 0.90

$\beta_{1.eq}(f_c) := \text{if}\left(f_c \le 4\text{ksi}, 0.85, \max\left(0.65, 0.85 - 0.20\cdot\frac{f_c - 4\text{ksi}}{4\text{ksi}}\right)\right)$

$\beta_1 := \beta_{1.eq}(f_c) = 0.85$ - a/c (LRFD 5.6.2.2)

$c := \frac{a}{\beta_1} = 0.51\cdot\text{in}$

c - distance to the neutral axis, under factored loading

$\varepsilon_t := 0.003\cdot\frac{d - c}{c} = 0.062$

ε_t - steel tension when ε_{conc} = 0.003

CHECK := if(ε.t ≥ f.y / 29000ksi, "OK: ε.steel > ε.yield", "ERROR: ε.steel < ε.yield; revise calculations") ... CHECK = "OK: ε.steel > ε.yield"

$RF_{Des.Inv} := \text{if}(\text{CHECK} = \text{"OK: } \varepsilon\text{.steel} > \varepsilon\text{.yield"}, RF_{Des.Inv}, 0) = 1.95$

$RF_{Des.Inv} = 1.95$ - if ε.steel < ε.yield, revise the rating factor to 0

$\phi eq(\varepsilon_t, \varepsilon_{cl}, \varepsilon_{tl}) := \text{if}\left(\varepsilon_t \le \varepsilon_{cl}, 0.75, \min\left(0.90, 0.75 + 0.15\cdot\frac{\varepsilon_t - \varepsilon_{cl}}{\varepsilon_{tl} - \varepsilon_{cl}}\right)\right)$

$\phi eq(\varepsilon_t, \varepsilon_{cl}, \varepsilon_{tl})$ - flexural resistance factor equation (LRFD 5.5.4.2-1)

$\varepsilon_{cl} := \frac{f_y}{29000\text{ksi}} = 0.0014$

ε_{cl} - compression controlled limit; when ε_{conc} = 0.003 and $\varepsilon_t = \varepsilon_{yield}$

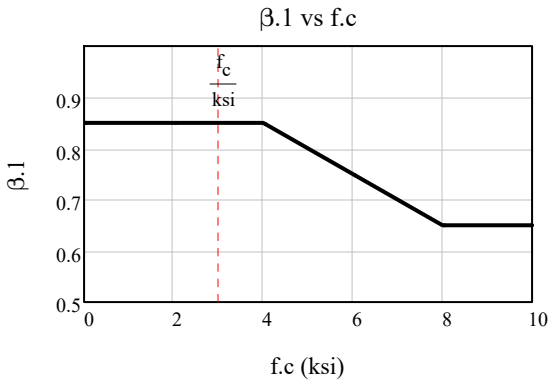
$\varepsilon_{tl} := 0.005$

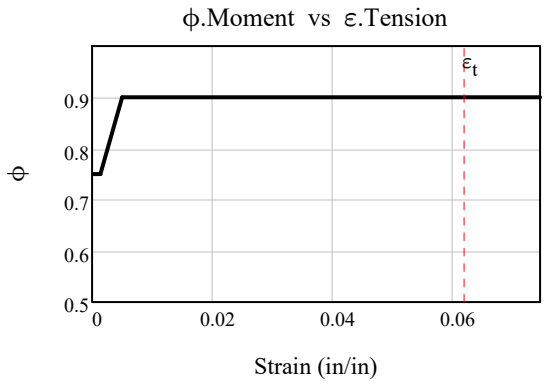
ε_{tl} - tension controlled limit; when ε_{conc} = 0.003 and ε_t = 0.005

$\phi := \phi eq(\varepsilon_t, \varepsilon_{cl}, \varepsilon_{tl}) = 0.90$

$\phi = 0.90$ - flexural resistance/reduction factor (also see Std.Spec. 8.16.1.2.2)

Also see Std.Spec. 8.16.1.2.2, and ACI 10.3.5. For factored axial loading less than $n\ 0.1\cdot f_c\cdot t_{ExtWall}\cdot ft = 28.80\cdot kip$, if ε.t > 0.004, then ϕ=0.90.





Exterior Wall (5 of 6)

DRAW EXTERIOR WALL

$$KEY := \begin{pmatrix} 0 & 0 \\ 0.333 \cdot t_{ExtWall} - 0.125in & 0 \\ 0.375in & -1.625in \\ 0.333 \cdot t_{ExtWall} - 0.375in & 0 \\ 0.375in & 1.625in \\ 0.333 \cdot t_{ExtWall} - 0.125in & 0 \end{pmatrix}$$

$$DRAWxy(xy) := \left| \begin{array}{l} T \leftarrow \left(xy^{T}\right)^{\langle 1 \rangle} \\ \text{for } i \in 2..\text{rows}(xy) \\ \quad T^{\langle i \rangle} \leftarrow T^{\langle i-1 \rangle} + \left(xy^{T}\right)^{\langle i \rangle} \\ T^{T} \end{array} \right.$$

$$MIRRORX(MATRX) := \left| \begin{array}{l} T \leftarrow MATRX \\ \text{for } i \in 1..\text{rows}(T) \\ \quad T_{i,1} \leftarrow -T_{i,1} \\ T \end{array} \right.$$

$$CBC := \left| \begin{array}{l} T \leftarrow \text{stack}\left[\begin{bmatrix} 0 & 0 \\ \left(t_{ExtWall} + 0.5 \cdot W_c\right) & 0 \\ -\left(t_{ExtWall} + 0.5 \cdot W_c\right) & 0 \\ 0 & \left(t_{slab} + 4in\right) \end{bmatrix}, KEY, \begin{pmatrix} 0 & -4in \\ 0.5 \cdot W_c & 0 \\ -0.5 \cdot W_c & 0 \end{pmatrix}\right] \\ DRAWxy\left[\text{stack}\left[T, \begin{bmatrix} 0 & \left(h_{clear} - 2in\right) \\ 2in & 2in \\ \left(0.5 \cdot W_c - 2in\right) & 0 \\ -\left(0.5 \cdot W_c - 2in\right) & 0 \\ -2in & -2in \end{bmatrix}, MIRRORX(KEY), \begin{bmatrix} 0 & \left(2in + t_{slab}\right) \\ \left(0.5 \cdot W_c + t_{ExtWall}\right) & 0 \\ -\left(0.5 \cdot W_c + t_{ExtWall}\right) & 0 \\ 0 & -\left(h_{clear} + t_{slab}\right) \end{bmatrix}\right]\right] \end{array} \right.$$

$$CBC^{\langle 2 \rangle} := CBC^{\langle 2 \rangle} - \left(h_{abutment} - x_{origin}\right)$$

DRAW ROADWAY SURFACE

$$ROAD := \left| \begin{array}{l} T \leftarrow (-2 \quad 0) \\ \text{for } i \in 1..200 \\ \quad \left| \begin{array}{l} (Tx \quad Ty) \leftarrow \left(T_{\text{rows}(T),1} \quad T_{\text{rows}(T),2}\right) \\ T \leftarrow \text{stack}\left[T, \begin{pmatrix} Tx + 0.5 & Ty \\ Tx + 0.25 & Ty - 0.5 \\ Tx + 0.5 & Ty \end{pmatrix}\right] \end{array} \right. \\ T^{\langle 2 \rangle} \leftarrow T^{\langle 2 \rangle} + \frac{x_{origin}}{ft} \\ T^{\langle 1 \rangle} \leftarrow T^{\langle 1 \rangle} - 40 \\ T \end{array} \right.$$

DRAW CULVERT TOP SLAB

$$CBC2 := \left| \begin{array}{l} T \leftarrow \text{stack}[(0), SUML(L)] \cdot ft \\ T2 \leftarrow (0 \quad 0) \\ LEG(t,x) \leftarrow \begin{pmatrix} x - 0.5 \cdot t & 0 \\ x - 0.5 \cdot t & -2ft \\ x - 0.5 \cdot t & 0 \\ x + 0.5 \cdot t & 0 \\ x + 0.5 \cdot t & -2ft \\ x + 0.5 \cdot t & 0 \end{pmatrix} \\ \text{for } i \in 1..\text{rows}(T) \\ \quad T2 \leftarrow \text{stack}\left(T2, LEG\left(\left| \begin{array}{ll} t_{ExtWall} & \text{if } i = 1 \vee i = \text{rows}(T) \\ t_{IntWall} & \text{otherwise} \end{array} \right., T_i\right)\right) \\ T2 \leftarrow \text{stack}\left[T2, \begin{bmatrix} \max\left(T2^{\langle 1 \rangle}\right) & t_{slab} \\ -0.5 \cdot t_{ExtWall} & t_{slab} \\ -0.5 \cdot t_{ExtWall} & 0 \end{bmatrix}\right] \\ T2^{\langle 2 \rangle} \leftarrow T2^{\langle 2 \rangle} - \max\left(T2^{\langle 2 \rangle}\right) \\ T2 \end{array} \right.$$

PLOT RANGES

$$plt_\omega min := 1.2 \cdot \min\left(-EH_\omega, -LS_\omega\right) = -0.81 \cdot klf$$

$$plt_Vmin := 1.2 \cdot \min\left(-EH_V, -LS_V\right) = -2.37 \cdot kip$$

$$plt_Vmax := 1.2 \cdot \max\left(-EH_V, -LS_V\right) = 1.70 \cdot kip$$

$$plt_Mmin := 1.2 \cdot \min\left(-EH_M, -LS_M\right) = -3.84 \cdot kip \cdot ft$$

$$FT_ExtWall := FT$$

Exterior Wall (6 of 6)

RATING FACTOR DETAILS

n2s(N, DP) - number to string; show trailing zeroes

```
n2s(N, DP) :=  N2str ← num2str(round(N, DP))
               N2str ← concat(N2str, "." )  if  search(N2str, "." , 0) = −1
               while  strlen(N2str) − search(N2str, "." , 0) < DP + 1
                 N2str ← concat(N2str, "0" )
               N2str
```

GVW - gross vehicle weights in tons

$$GVW := \begin{bmatrix} GVWeq1(TRK) \leftarrow 0.5 \cdot \sum TRK^{\langle 2 \rangle} \\ GVWeq2(TRKS) \leftarrow \max\left(\overrightarrow{GVWeq1(TRKS)}\right) \\ \text{augment}\left(TRUCKS^{\langle 1 \rangle}, \overrightarrow{GVWeq2\left(TRUCKS^{\langle 2 \rangle}\right)}\right) \end{bmatrix}$$

RF_ExtWall(iv) -exterior wall rating factor details for each vehicle No." iv"

$$RF_ExtWall(iv) := \begin{bmatrix} r \leftarrow ROW_ExtWall \\ RF \leftarrow \frac{\gamma LL_eq(1)}{\gamma LL_eq(iv)} \cdot \frac{mpf_eq(1)}{mpf_eq(iv)} \cdot \frac{GVW_{1,2}}{GVW_{iv,2}} \cdot RF_{Des.Inv} \\ MSSG_{RF} \leftarrow \begin{bmatrix} T \leftarrow concat("RF = [" , n2s(\gamma LL_eq(1), 2), "/" , n2s(\gamma LL_eq(iv), 2), "][" , n2s(mpf_eq(1), 2), "/" , n2s(mpf_eq(iv), 2), "][") \\ T \leftarrow concat\left[T, num2str\left(GVW_{1,2}\right), ("/") , num2str\left(GVW_{iv,2}\right), "][("\right] \\ concat\left[T, n2s\left(\frac{\psi c \phi Mn_wall}{kip \cdot ft}, 2\right), " - " , n2s\left(\frac{\gamma DC_M + \gamma EV_M + \gamma EH_{M_r}}{kip \cdot ft}, 2\right), ") / (" , n2s\left(\frac{\gamma LV_M + \gamma LS_{M_r}}{kip \cdot ft}, 2\right), ")] = " , (n2s(RF, 2))\right] \end{bmatrix} \\ MSSG_{LOC} \leftarrow concat\left("Ext Wall at " , n2s\left(\frac{FT_r}{L_{wall}}, 2\right), ", D.fill = " , n2s\left(\frac{\max\left(D_{fills}\right)}{ft}, 2\right), "ft."\right) \\ \begin{bmatrix} 1 & "GOV (row\#)" & 1 \\ 2 & "VEH (\#)" & iv \\ 3 & "VEH (name)" & TRUCKS_{iv,1} \\ 4 & "TRUCK (\#)" & 1 \\ 5 & "TRUCK mirror" & 0 \\ 6 & "TRUCK, (ft, kip)" & \left(TRUCKS_{iv,2}\right)_1 \\ 7 & "TRUCK (h.eq, 0, 0)" & \begin{pmatrix} \frac{h_{eq}}{ft} & 0 & 0 \end{pmatrix} \\ 8 & "LOC (inc)" & \frac{FT_r}{L_{wall}} \\ 9 & "LOC (ft)" & \frac{FT_r}{ft} \\ 10 & "TEST" & "M.wall" \\ 11 & "LOC message, Excel" & MSSG_{LOC} \\ 12 & "RF message" & MSSG_{RF} \\ 13 & "RF" & RF \\ 14 & "RATING (tons)" & RF \cdot GVW_{iv,2} \\ 15 & "LL/DL" & \frac{GVW_{iv,2}}{GVW_{1,2}} \cdot \frac{LV_M + LS_{M_r}}{DC_M + EV_M + EH_{M_r}} \\ 16 & "LOC message, CAD" & concat\left(n2s\left(\frac{t_{slab} + h_{haunch.bot} + FT_r}{ft}, 2\right), " from the bottom of the slab"\right) \end{bmatrix} \end{bmatrix}$$

```
RFs5EXTWALL :=  for  iv ∈ 1.. rows(TRUCKS)
                  T^⟨iv⟩ ← RF_ExtWall(iv)^⟨3⟩
                T^T
```

Top SLab Rating Factors (1 of 2)

RFpos(Mr, γDL, γLL) & RFneg(Mr, γDL, γLL) - rating factor equations for positive and negative loads

$$\text{RFpos}(C, DL, LL) := \begin{cases} \text{return } 99 \text{ if } LL < 0.001 \\ \min\left(99, \dfrac{C - DL}{LL}\right) \end{cases}$$

$$\text{RFneg}(C, DL, LL) := \begin{cases} \text{return } 99 \text{ if } LL > -0.001 \\ \min\left(99, \dfrac{C - DL}{LL}\right) \end{cases}$$

RFs1(iD) - run rating factors for one depth of fill

$$\text{RFs1}(iD) := \begin{cases} \gamma LL \leftarrow \gamma LLwLBL\left(D_{fills_{iD}}\right) \\ \text{for } iv \in 1..\text{rows}(TRUCKS) \\ \quad RF_Mp(\gamma LLMp) \leftarrow \text{RFpos}\left(\dfrac{\psi\phi Mn}{kip \cdot ft}, \gamma DL_{iD,1}, \gamma LLMp\right) \\ \quad RF_Mn(\gamma LLMn) \leftarrow \text{RFneg}\left(\dfrac{-\psi\phi Mn}{kip \cdot ft}, \gamma DL_{iD,2}, \gamma LLMn\right) \\ \quad V(\gamma LLV, \gamma LLM) \leftarrow \begin{cases} Mu \leftarrow \left(\gamma LLM + \gamma DL_{iD,4}\right) \cdot kip \cdot ft \\ Vu \leftarrow \left(\gamma LLV + \gamma DL_{iD,3}\right) \cdot kip \\ C \leftarrow \dfrac{-\psi\phi Vn\left(Mu, Vu, D_{fills_{iD}}\right)}{kip} \\ \text{RFneg}\left(C, \gamma DL_{iD,3}, \gamma LLV\right) \end{cases} \\ \quad RF_{iv,1} \leftarrow \overrightarrow{RF_Mp\left(\gamma LL_{iv,2}\right)} \\ \quad RF_{iv,2} \leftarrow \overrightarrow{RF_Mn\left(\gamma LL_{iv,3}\right)} \\ \quad RF_{iv,3} \leftarrow \overrightarrow{V\left(\gamma LL_{iv,4}, \gamma LL_{iv,5}\right)} \\ \text{augment}(\gamma LL, RF) \end{cases}$$

RFs2(iD) - run rating factors for one depth of fill, and report the governing row

$$\text{RFs2}(iD) := \begin{cases} T \leftarrow \text{RFs1}(iD) \\ \text{for } iRF \in 1..3 \\ \quad \text{for } iv \in 1..\text{rows}(TRUCKS) \\ \quad\quad minRF_{iv,iRF} \leftarrow \min\left(T_{iv,iRF+5}\right) \\ \quad\quad MATCH_{iv,iRF} \leftarrow \text{match2}\left(minRF_{iv,iRF}, T_{iv,iRF+5}\right) \\ \quad\quad R_{iv,iRF} \leftarrow MATCH_{iv,iRF} \\ \text{augment}(T, minRF, R) \end{cases}$$

γDFIMshow(iv, D, γLL) - show live load factors (γ.LL, DF, IM, and LL)

$$\gamma\text{DFIMshow}\left(iv, D_{fill}, \gamma LL\right) := \begin{cases} (DF \quad IM) \leftarrow \left(\dfrac{ft}{\text{Eeq}\left(\text{mpf}_{iv}, D_{fill}\right)} \quad \text{IMeq}\left(D_{fill}\right)\right) \\ \text{concat}\left(\text{n2s}\left(\gamma LL_{iv}, 2\right), "* \ ", \text{n2s}(DF, 4), "*", \text{n2s}(IM, 3), "*", \text{n2s}\left(\dfrac{\gamma LL}{\gamma LL_{iv} \cdot DF \cdot IM}, 1\right)\right) \end{cases}$$

Top SLab Rating Factors (2 of 2)

RFdetails1(iv, MMV, DL, γDL, LL, γLL, C, RF, BrINC, D) - show rating factor details for one vehicle and one depth of fill

$$\begin{aligned}
&\text{RFdetails1}(iv, MMV, DL, \gamma DL, LL, \gamma LL, C, RF, BrINC, D) := \\
&\quad MMV \leftarrow (\text{"M.pos"} \quad \text{"M.neg"} \quad \text{"V.neg"})_{1,MMV} \\
&\quad RFeq \leftarrow \text{concat}[\text{"RF = ("}, \text{n2s}(C,2), \text{" - "}, \text{n2s}(\gamma DL,2), \text{") / ("}, \gamma\text{DFIMshow}(iv, D, \gamma LL), \text{") = "}, (\text{n2s}(RF,2))] \\
&\quad LOC \leftarrow \text{concat}\left(\text{"Top Slab at "}, \text{n2s}(BrINC,2), \text{", D.fill = "}, \text{n2s}\left(\frac{D}{ft},2\right), \text{"ft."}\right) \\
&\quad \left(MMV \quad LOC \quad RFeq \quad RF \quad RF{\cdot}GVW_{iv,2} \quad \frac{LL}{DL} \quad \text{concat}\left(\text{n2s}\left(\text{iioft}(BrINC) + \frac{t_{ExtWall}}{ft},1\right), \text{"ft. to face of Ext Wall"}\right)\right)
\end{aligned}$$

RFs3(iD) - show rating factors for all vehicles, for depth of fill $D_{fills_{iD}}$

$$\begin{aligned}
&\text{RFs3}(iD) := \\
&\quad T1 \leftarrow \text{RFs2}(iD) \\
&\quad T3 \leftarrow \text{matrix}(1, 16, f(i,j) \leftarrow 0) \\
&\quad \text{for } iv \in 1..\text{rows}(TRUCKS) \\
&\quad\quad \text{for } MMV \in 1..3 \\
&\quad\quad\quad (ROW \quad COL) \leftarrow \left[\left(T1_{iv,11+MMV}\right) \quad (1)\right] \\
&\quad\quad\quad (DLt \quad \gamma DLt \quad LLt \quad \gamma LLt) \leftarrow \left[\left(DL_{iD,MMV}\right)_{1,1} \quad \left(\gamma DL_{iD,MMV}\right)_{1,1} \quad \frac{\left(T1_{iv,1+MMV}\right)_{ROW}}{\gamma LL_eq(iv)} \quad \left(T1_{iv,1+MMV}\right)_{ROW}\right] \\
&\quad\quad\quad C \leftarrow \left[\left(\frac{\psi\phi Mn}{kip{\cdot}ft}\right) \quad \left(\frac{-\psi\phi Mn}{kip{\cdot}ft}\right) \quad \left[\frac{-\psi\phi Vn\left[\left[\left(T1_{iv,5}\right)_{ROW} + \left(\gamma DL_{iD,4}\right)_{1,1}\right]{\cdot}kip{\cdot}ft\right], \left[\left[\left(T1_{iv,4}\right)_{ROW} + \left(\gamma DL_{iD,3}\right)_{1,1}\right]{\cdot}kip\right], D_{fills_{iD}}\right]}{kip}\right]_{1,MMV} \\
&\quad\quad\quad T2 \leftarrow \text{RFdetails1}\left[iv, MMV, DLt, \gamma DLt, LLt, \gamma LLt, C, \left(T1_{iv,8+MMV}\right), RSIF_CHK_LOCS_{MMV,3}, D_{fills_{iD}}\right] \\
&\quad\quad\quad DET_LABEL \leftarrow \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 & 7 \\ \text{"ROW\#"} & \text{"VEH\#"} & \text{"NAME"} & \text{"TRUCK\#"} & \text{"MIRROR"} & 0 & \text{"x1x2}\gamma\omega\text{"} \end{pmatrix} \\
&\quad\quad\quad DET \leftarrow \left(T1_{iv,1}^{T}\right)^{\langle ROW \rangle} \\
&\quad\quad\quad (DLt \quad \gamma DLt) \leftarrow \left[\left[\left(DL_{iD,MMV}\right)_{1,COL}\right] \quad \left[\left(\gamma DL_{iD,MMV}\right)_{1,COL}\right]\right] \\
&\quad\quad\quad (LLt \quad \gamma LLt) \leftarrow \left[\left[\frac{IMeq\left(D_{fills_{iD}}\right){\cdot}ft}{Eeq\left(mpf_{iv}, D_{fills_{iD}}\right)}{\cdot}INFx1x2\omega\left[\left(iMpos \quad iMneg \quad iVneg\right)_{1,MMV}, DET_7\right]\right] \quad \left[\left(T1_{iv,1+MMV}\right)_{ROW,COL}\right]\right] \\
&\quad\quad\quad TRUCK \leftarrow \text{if}\left[DET_5 = 0, \left(TRUCKS_{iv,2}\right)_{DET_4}, \text{MIRROR}\left[\left(TRUCKS_{iv,2}\right)_{DET_4}\right]\right] \\
&\quad\quad\quad \left(DET_6 \quad DET_8 \quad DET_9\right) \leftarrow \left(TRUCK \quad RSIF_CHK_LOCS_{MMV,3} \quad RSIF_CHK_LOCS_{MMV,4}\right) \\
&\quad\quad\quad T3 \leftarrow \text{stack}\left(T3, \text{augment}\left(DET^{T}, T2\right)\right) \\
&\quad \text{submatrix}(T3, 2, \text{rows}(T3), 1, \text{cols}(T3))
\end{aligned}$$

RFs5 - run all rating factors for all depths of fill, and stack on top of the exterior wall rating factors

$$\begin{aligned}
&RFs5 := \\
&\quad RFs4 \leftarrow \left| \begin{array}{l} \text{for } i \in 1..\text{rows}\left(D_{fills}\right) \\ \quad T1 \leftarrow \left| \begin{array}{ll} \text{RFs3}(i) & \text{if } i = 1 \\ \text{stack}(T1, \text{RFs3}(i)) & \text{otherwise} \end{array} \right. \\ T1 \end{array} \right. \\
&\quad (r \quad RowsPerDfill) \leftarrow \begin{pmatrix} 0 & \frac{\text{rows}(RFs4)}{\text{rows}\left(D_{fills}\right)} \end{pmatrix} \\
&\quad \text{for } i \in 1..RowsPerDfill \\
&\quad\quad \text{for } iD \in 1..\text{rows}\left(D_{fills}\right) \\
&\quad\quad\quad \left| \begin{array}{l} r \leftarrow r + 1 \\ T2^{\langle r \rangle} \leftarrow \left(RFs4^{T}\right)^{\langle (iD-1){\cdot}RowsPerDfill + i \rangle} \end{array} \right. \\
&\quad \text{stack}\left(T2^{T}, RFs5EXTWALL\right)
\end{aligned}$$

Rating Factor Assembly (2 of 4)

MAKE OUTPUT SUMMARIES

```
DESIGN_ROW_minRF(iv, MorV) := | (minRF  minRFrow) ← (999  1)
                              | for i ∈ 1 .. rows(RFs5)
                              |   if substr(RFs5[i,10], 0, 1) = MorV ∧ iv = RFs5[i,2]
                              |     | minRF ← min(minRF, RFs5[i,13])
                              |     | minRFrow ← i  if  minRF = RFs5[i,13]
                              | minRFrow
```

```
OUT_CAD := | DET(MorV) ← | for iv ∈ 1 .. rows(TRUCKS)
                         |   T^⟨iv⟩ ← | r ← DESIGN_ROW_minRF(iv, MorV)
                         |            | (RFs5[r,15]  RFs5[r,13]  RFs5[r,14]  RFs5[r,11]  RFs5[r,16])^T
                         | T
           | HDR ← ("LL/DL"  "RF"  "TONS"  "LOCATION"  "DIMENSION")
           | R1 ← augment[stack[("TEST:"  "VEH")^T, TRUCKS^⟨1⟩], stack(matrix(1, 5, f(i,j) ← "MOMENT"), HDR, DET("M")^T)]
           | R3 ← augment[stack[("TEST:"  "VEH")^T, TRUCKS^⟨1⟩], stack(matrix(1, 5, f(i,j) ← "SHEAR"), HDR, DET("V")^T)]
           | stack(R1, matrix(1, 6, f(i,j) ← ""), R3)
```

```
OUT_Excel_Verbose := | for r ∈ 1 .. rows(RFs5)
                     |   T^⟨r⟩ ← (RFs5[r,3]  RFs5[r,13]  RFs5[r,11]  RFs5[r,10]  RFs5[r,12])^T
                     | stack[("VEH"  "RF"  "LOCATION"  "TEST"  "RF.equation"), T^T]
```

```
RFsGOV := | row(iv) ← | (minRF  minRFrow) ← (999  1)
                      | for i ∈ 1 .. rows(RFs5)
                      |   if iv = RFs5[i,2]
                      |     | minRF ← min(minRF, RFs5[i,13])
                      |     | minRFrow ← i  if  minRF = RFs5[i,13]
                      | minRFrow
          | for iv ∈ 1 .. rows(TRUCKS)
          |   T^⟨iv⟩ ← | r ← row(iv)
          |            | (RFs5[r,3]  RFs5[r,13]  RFs5[r,11]  RFs5[r,10]  RFs5[r,12])^T
          | stack[("VEH"  "Gov.RF"  "Governing.LOCATION"  "Gov.TEST"  "Governing.RF.equation"), T^T]
```

Rating Factor Assembly (3 of 4)

SHOW DETAILED RESULTS

```
CHECKeq(iv) := | for MMVE ∈ 1..4
               |   TEST ← ("M.pos" "M.neg" "V.neg" "M.wall")[1,MMVE]
               |   RF ← 999
               |   for i ∈ 1..rows(RFs5)
               |     if RFs5[i,13] ≤ RF ∧ RFs5[i,2] = iv ∧ RFs5[i,10] = TEST
               |       RF ← RFs5[i,13]
               |       T^⟨MMVE⟩ ← (RFs5^T)^⟨i⟩
               | T^T
```

```
CHECKallD(iv) := | c ← 0
                 | for MMVE ∈ 1..4
                 |   TEST ← ("M.pos" "M.neg" "V.neg" "M.wall")[1,MMVE]
                 |   for i ∈ 1..rows(RFs5)
                 |     if RFs5[i,2] = iv ∧ RFs5[i,10] = TEST
                 |       c ← c + 1
                 |       T^⟨c⟩ ← (RFs5^T)^⟨i⟩
                 | T^T
```

```
CHECK_DeGook(T) := | T ← augment(T^⟨3⟩, T^⟨6⟩, T^⟨7⟩, submatrix(T,1,rows(T),10,12))
                   | for i ∈ 1..rows(T)
                   |   T[i,2] ← stack[("ft" "kip"), T[i,2]]
                   |   T[i,3] ← stack[("start(ft)" "end(ft)" "klf"), T[i,3]]
                   |   T[i,5] ← (T[i,5] T[i,6])^T
                   | T[rows(T),3] ← [ "h.eq(ft)"          ""  ""
                   |                (T[rows(T),3])[2,1]  ""  "" ]
                   | submatrix(T,1,rows(T),1,5)
```

```
CHECKeq(iv) := CHECK_DeGook(CHECKeq(iv))
```

```
CHECKallD(iv) := CHECK_DeGook(CHECKallD(iv))
```

```
QCHECK := CHECKeq(testVEH)
```

Rating Factor Assembly (4 of 4)

RF TABLE, ALL TESTS AT THE GOVERNING FILL

```
RFs := | HDR ← ("+M.slab"  "-M.slab"  "V.slab"  "M.wall")
       | T1(iv) ← | for j ∈ 1..4
       |          |   RFt ← 999
       |          |   for i ∈ 1..rows(RFs5)
       |          |     RFt ← min(RFt, RFs5[i,13])  if RFs5[i,2] = iv ∧ RFs5[i,10] = ("M.pos"  "M.neg"  "V.neg"  "M.wall")[1,j]
       |          |   RF[j] ← RFt
       |          | RF^T
       | for iv ∈ 1..rows(TRUCKS)
       |   T2^⟨iv⟩ ← T1(iv)^T
       | augment(AV2^⟨2⟩, stack(HDR, T2^T))
```

RF & TONS, ALL TESTS AT THE GOVERNING FILL

```
TONS := | HDR ← ("+M.slab"  "-M.slab"  "V.slab"  "M.wall")
        | T1(iv) ← submatrix(RFs, iv + 1, iv + 1, 2, 5)·GVW[iv,2]
        | for iv ∈ 1..rows(TRUCKS)
        |   T2^⟨iv⟩ ← T1(iv)^T
        | augment(AV2^⟨2⟩, stack(HDR, T2^T))
```

```
RF_TN := | SUB(M) ← submatrix(M, 1, rows(M), 2, 5)
         | HDR(LBL) ← matrix(1, 4, f(i,j) ← LBL)
         | C1 ← stack[("VEH"  "VEH"  "VEH"), AV3]
         | C2 ← stack(HDR("RF"), SUB(RFs))
         | C3 ← stack(HDR("TON"), SUB(TONS))
         | augment(C1, C2)
```

EXPAND SUB-MATRICES FOR EXCEL OUTPUT

DeFunk1(M, Rows) - add some blank rows to matrix M

```
DeFunk1(M, Rows) := | S(r,c) ← matrix(r, c, f(i,j) ← "")
                    | rM ← rows(M)
                    | return stack[(M), S(Rows − 1, 1)]  if rM = 0
                    | return M  if rM = Rows
                    | stack(M, S(Rows − rows(M), cols(M)))
```

DeFunk2(M) - expand submatrices in matrix M with stack and augment

```
DeFunk2(M) := | for i ∈ 1..rows(M)
              |   for j ∈ 1..cols(M)
              |     T1[i] ← if(j = 1, M[i,1], augment(T1[i], M[i,j]))
              | for i ∈ 1..rows(T1)
              |   T2 ← if(i = 1, T1[1], stack(T2, T1[i]))
              | T2
```

DeFunk3 - governing details for one vehicle

```
DeFunk3(M) := | for itest ∈ 1..rows(M)
              |   ROWS ← max(rows(M^T))
              |   for j ∈ 1..cols(M)
              |     T1[itest,j] ← DeFunk1(M[itest,j], ROWS)
              | DeFunk2(T1)
```

DeFunkCheck_4 - details for all vehicles and all fill depths

```
DeFunk4(M) := | for iv ∈ 1..rows(M)
              |   T ← | DeFunk3(M[iv])  if iv = 1
              |       | stack(T, DeFunk3(M[iv]))  otherwise
              | T
```

CHECK - details for testVEH at the governing fill depths

```
CHECK := DeFunk3(CHECKeq(testVEH))
```

Details_Verbose - details for all vehicles and all fill depths

```
OUT_Verbose := DeFunk4(CHECKallD(AV^⟨1⟩))
```

Prepare Export to Excel

$$\text{Description} := \begin{bmatrix} \text{"Bridge No"} & \text{BridgeNo} \\ \text{"Name"} & \text{BridgeName} \\ \text{"Description"} & \text{BridgeDescription} \\ \text{"Method"} & \begin{pmatrix} \text{"LFR - Load Factor"} \\ \text{"LRFR-LRFD"} \end{pmatrix}_{\text{LRFR+1}} \\ \text{"Impact"} & \left| \begin{array}{l} n \leftarrow \text{search}\left(\text{RFsGOV}_{3,3}, \text{"D.fill"}, 1\right) \\ \left(\text{IMeq}\left(\text{str2num}\left(\text{substr}\left(\text{RFsGOV}_{3,3}, n+9, 4\right)\right)\cdot \text{ft}\right) - 1\right) \end{array} \right. \\ \text{"Span Length"} & L_1 \end{bmatrix} = \begin{pmatrix} \text{"Bridge No"} & \text{"Non-Bridge Culvert"} \\ \text{"Name"} & \text{"Lincoln Tunnel Pedestrian Underpass"} \\ \text{"Description"} & \text{"Index 8020, 90' Single 12'x8', Built 1960"} \\ \text{"Method"} & \text{"LRFR-LRFD"} \\ \text{"Impact"} & 0.25 \\ \text{"Span Length"} & 12.67 \end{pmatrix}$$

$$\text{NULL}(r, c) := \text{matrix}(r, c, f(i, j) \leftarrow \text{""})$$

$$\text{maxROWS_maxCOLS}(\text{Matrices}) := \left| \begin{array}{l} \text{mx}(M) \leftarrow \max(M) \\ \left(\text{mx}\left(\overrightarrow{\text{rows}(\text{Matrices})}\right) \quad \text{mx}\left(\overrightarrow{\text{cols}(\text{Matrices})}\right)\right) \end{array} \right.$$

AugmentFill(Names, Matrices) - combine Matrices, horizontal direction

$$\text{AugmentFill}(\text{Names}, \text{Matrices}) := \left| \begin{array}{l} \text{MaxRows} \leftarrow \text{maxROWS_maxCOLS}(\text{Matrices})_{1,1} \\ \text{STACK}(\text{Matrix}) \leftarrow \text{Matrix} \quad \text{on error} \quad \text{stack}(\text{Matrix}, \text{NULL}(\text{MaxRows} - \text{rows}(\text{Matrix}), \text{cols}(\text{Matrix}))) \\ \text{for} \quad i \in 1 .. \text{rows}(\text{Matrices}) \\ \quad \left| \begin{array}{l} \text{HEADER} \leftarrow \text{Names}_i \quad \text{on error} \quad \text{augment}\left(\text{Names}_i, \text{NULL}\left(1, \text{cols}\left(\text{Matrices}_i\right) - 1\right)\right) \\ \text{T} \leftarrow \text{stack}\left(\text{HEADER}, \text{STACK}\left(\text{Matrices}_i\right)\right) \quad \text{on error} \quad \text{augment}\left(\text{T}, \text{NULL}(\text{MaxRows} + 1, 1), \text{stack}\left(\text{HEADER}, \text{STACK}\left(\text{Matrices}_i\right)\right)\right) \end{array} \right. \\ \text{T} \end{array} \right.$$

StackFill(Names, Matrices) - combine Matrices, vertical direction

$$\text{StackFill}(\text{Names}, \text{Matrices}) := \left| \begin{array}{l} \text{MaxCols} \leftarrow \text{maxROWS_maxCOLS}(\text{Matrices})_{1,2} \\ \text{AUGMENT}(\text{Matrix}) \leftarrow \text{augment}(\text{Matrix}, \text{NULL}(\text{rows}(\text{Matrix}), \text{MaxCols} - \text{cols}(\text{Matrix}) + 1)) \\ \text{for} \quad i \in 1 .. \text{rows}(\text{Matrices}) \\ \quad \left| \begin{array}{l} \text{HEADER} \leftarrow \text{augment}\left(\text{Names}_i, \text{NULL}(1, \text{MaxCols})\right) \\ \text{T} \leftarrow \text{stack}\left(\text{HEADER}, \text{AUGMENT}\left(\text{Matrices}_1\right)\right) \quad \text{on error} \quad \text{stack}\left(\text{T}, \text{NULL}(1, \text{MaxCols} + 1), \text{HEADER}, \text{AUGMENT}\left(\text{Matrices}_i\right)\right) \end{array} \right. \\ \text{T} \end{array} \right.$$

WRITE_DATA_TO_EXCEL(Name_of_Worksheet) - write all output matrices to one Excel sheet. Use Excel formulas to link that data to secondary sheets formatted for printing. To force Excel formula updating, apply a VBA macro: Private Sub Workbook_Open(), Application.CalculateFull, End Sub.

$$\text{WRITE_DATA_TO_EXCEL}(\text{Name_of_Worksheet}) := \left| \begin{array}{l} \text{Worksheet} \leftarrow \text{Name_of_Worksheet} \\ \text{WRITEEXCEL}(\text{matrix}(500, 50, f(i, j) \leftarrow \text{""}), \text{Worksheet}, \text{"DATA!A1"}) \\ \text{WRITEEXCEL}\left[\text{AugmentFill}\left[\begin{pmatrix} \text{"Decription"} \\ \text{"RFs"} \\ \text{"RFs.GOV"} \\ \text{"RFs.VERBOSE"} \\ \text{"CAD"} \end{pmatrix}, \begin{pmatrix} \text{Description} \\ \text{RFs} \\ \text{RFsGOV} \\ \text{OUT_Verbose} \\ \text{OUT_CAD} \end{pmatrix}\right], \text{Worksheet}, \text{"DATA!A1"}\right] \end{array} \right.$$

Quick Check Setup (1 of 2)

MAKE INFLUENCE MATRIX, AND ASSIGN RF CHECK OUTPUTS

$RF_Mpos := (QCHECK^T)^{\langle 1 \rangle^T}$ $RF_Mneg := (QCHECK^T)^{\langle 2 \rangle^T}$ $RF_Vneg := (QCHECK^T)^{\langle 3 \rangle^T}$ $RF_ExtWall := (QCHECK^T)^{\langle 4 \rangle^T}$

$ips := 20$ $RSIF_check := RSIF_{eq}(L, BrIncs_{eq2}(L, ips))$ $INF2_check := INF2_{eq}(L, RSIF_check)$

$ROWS := RSIF_check^{\langle 1 \rangle}$ $BrINCS := RSIF_check^{\langle 3 \rangle}$ $FT := RSIF_check^{\langle 4 \rangle} \cdot ft$ $TK := TRUCKS_{testVEH,\,1}$

$(MpCol\ \ MnCol\ \ VnCol) := \left(match2\left(pM_{BrINC}, RSIF_check^{\langle 3 \rangle}\right)\ \ match\left(2.00, RSIF_check^{\langle 3 \rangle}\right)_1\ \ match2\left(Vinc, RSIF_check^{\langle 3 \rangle}\right)\right) = (12\ \ 25\ \ 22)$

$Mpos := \left(INF2_check_{1,1}\right)^{\langle MpCol \rangle} \cdot \frac{kip \cdot ft}{kip}$ $Mneg := \left(INF2_check_{1,1}\right)^{\langle MnCol \rangle} \cdot \frac{kip \cdot ft}{kip}$ $Vneg := \left(INF2_check_{1,4}\right)^{\langle VnCol \rangle} \cdot \frac{kip}{kip}$ $Mv := \left(INF2_check_{1,1}\right)^{\langle VnCol \rangle} \cdot \frac{kip \cdot ft}{kip}$

$\gamma LL_{show}(\gamma_{LL}, DF, IM, LL) := concat\left["(", n2s(\gamma_{LL}, 2), ")(", n2s(DF, 4), ")(1+", n2s[(IM - 1) \cdot 100, 0], "\%)(", n2s(LL, 1), ") = ", n2s(\gamma_{LL} \cdot DF \cdot IM \cdot LL, 2)\right]$ - show live load

STATE VARIABLES COMMON TO ALL RF CHECKS FOR TEST VEHICLE TK = "HL93.OPR"

$Dfilleq(CHK) :=$
$T \leftarrow \left(CHK_{1,5}\right)_1$
$(start\ \ end) \leftarrow (search(T, "=", 1)\ \ search(T, "ft", 1))$
$str2num(substr(T, start + 1, end - start - 1)) \cdot ft$

Dfilleq(CHK) - extract depth of fill from a check output

$mpf := mpf_{testVEH}$

mpf = 1.00 - single-lane multiple presence factor

$\gamma_{LL} := \gamma LL_{testVEH} = 1.35$

$\gamma_{LL} = 1.35$ - live load factor

QUICK CHECK SETUP (2 OF 2)

MAKE PLOTS

PLTCIRCLE(r, θ) - plot a circle: r - radius, θ - starting angle

```
PLTCIRCLE(r, θ) :=
    for i ∈ 1..13
        θ2 ← θ + (360deg / 12)·(i − 1)
        (T_{i,1}  T_{i,2}) ← r·(cos(θ2)  sin(θ2))
    T
```

PLTAXL(x, r, P, CIRCLE) - plot an axle weight P at location x

```
PLTAXL(x, r, P, CIRCLE) :=
    Scale ← 0.1768·√P
    CIRCLE ← CIRCLE·Scale
    augment(CIRCLE^⟨1⟩ + x, CIRCLE^⟨2⟩ + r·Scale)
```

PLTaxles(TKr, TRKdist, D) - plot the truck axles, and scale for size

```
PLTaxles(TKr, TRKdist, D) :=
    CIRCLE ← PLTCIRCLE(18in, −90deg)
    AXL(x, P) ← PLTAXL(x, 18in, P, CIRCLE)
    x ← min(TRKdist^⟨1⟩)·ft + 0.5·(D·DF_earth + tire_length)
    TRKraw ← MIRROR(TKr)
    T ← AXL(x, TRKraw_{1,2})
    for i ∈ 1..rows(TRKraw)
        x ← x + TRKraw_{i,1}·ft
        T ← T  if i = 1
            stack(T, AXL(x, TRKraw_{i,2}))  otherwise
    T^⟨2⟩ ← T^⟨2⟩ + D
    T
```

PLTdist(TKd, D) - plot longitudinal distribution

```
PLTdist(TKd, D) :=
    Side ← 0.5·D·DF_earth
    PLT1DIST(x1, x2) ← [ x1 + Side   D
                         x1          0
                         x1 + Side   D
                         x2 − Side   D
                         x2          0
                         x2 − Side   D ]
    T ← PLT1DIST(TKd_{1,1}·ft, TKd_{1,2}·ft)
    return T  if rows(TKd) = 1
    for i ∈ 2..rows(TKd)
        T ← stack(T, PLT1DIST(TKd_{i,1}·ft, TKd_{i,2}·ft))
    T
```

PLTTRK(CHECK) - plot axles and longitudinal distribution for a RF check output, which contains details for the governing location

```
PLTTRK(CHECK) :=
    D ← Dfilleq(CHECK)
    (T1  T2) ← (CHECK_{1,2}  CHECK_{1,3})
    (TRKraw  TRKdist) ← (submatrix(T1, 2, rows(T1), 1, 2)  submatrix(T2, 2, rows(T2), 1, 2))
    (PLTaxles  PLTdist) ← (PLTaxles(TRKraw, TRKdist, D)  PLTdist(TRKdist, D))
    TRUCK ← stack(PLTdist, PLTaxles)·ft^−1
    range ← max(TRUCK^⟨1⟩, Σ L·1.1) − min(TRUCK^⟨1⟩, −0.1·Σ L)
    PlotRatio ← 3
    (Xmin  Xmax  Ymax) ← [(min(TRUCK^⟨1⟩ − range/10, −0.1·Σ L))  (max(TRUCK^⟨1⟩ + range/10, Σ L·1.1))  (range/PlotRatio − 2)]
    ROAD ← augment(ROAD^⟨1⟩, ROAD^⟨2⟩ − max(ROAD^⟨2⟩) + D·ft^−1)
    if Ymax < 1.1·max(TRUCK^⟨2⟩)
        ΔY ← 1.1·max(TRUCK^⟨2⟩) − Ymax
        (range  Xmin  Xmax  Ymax) ← [(range + PlotRatio·ΔY)  (Xmin − PlotRatio/2·ΔY)  (Xmax + PlotRatio/2·ΔY)  (Ymax + ΔY)]
    (range  Xmin  Xmax  Ymax  TRUCK  ROAD)
```

EXPAND THIS AREA TO PRINT

RESULTS

Z := WRITE_DATA_TO_EXCEL("1. SUMMARY.xlsm") - output to Excel, to a sheet named DATA.

RF_TN =

"VEH"	"VEH"	"VEH"	"RF"	"RF"	"RF"	"RF"
"VEH"	"mpf"	"γ.LL"	"+M.slab"	"-M.slab"	"V.slab"	"M.wall"
"HL93.INV"	1.20	1.75	0.98	99.00	1.67	1.95
"HL93.OPR"	1.00	1.35	1.52	99.00	2.60	3.03
"FL120"	1.00	1.35	1.12	99.00	1.94	1.82
"SU2"	1.00	1.35	2.70	99.00	4.72	6.42
"SU3"	1.00	1.35	1.76	99.00	2.97	3.31
"SU4"	1.00	1.35	1.79	99.00	3.18	3.12
"C3"	1.00	1.35	2.70	99.00	4.64	3.90
"C4"	1.00	1.35	1.76	99.00	3.05	2.98
"C5"	1.00	1.35	1.94	99.00	3.39	2.73
"ST5"	1.00	1.35	2.11	99.00	3.61	2.73
"EV2"	1.00	1.30	1.84	99.00	3.19	3.94
"EV3"	1.00	1.30	1.27	99.00	2.23	2.64

$$\begin{pmatrix} \gamma_{DCmin} \\ \gamma_{DCmax} \\ \eta\gamma_{EVmin} \\ \eta\gamma_{EVmax} \\ \eta\gamma_{EHmin} \\ \eta\gamma_{EHmax} \end{pmatrix} = \begin{pmatrix} 0.90 \\ 1.25 \\ 0.90 \\ 1.30 \\ 0.90 \\ 1.35 \end{pmatrix}$$

L = (12.67)

RFsGOV =

"VEH"	"Gov.RF"	"Governing.LOCATION"	"Gov.TEST"	"Governing.RF.equation"
"HL93.INV"	0.98	"Top Slab at 1.50, D.fill = 2.00ft."	"M.pos"	"RF = (40.09 - 10.68) / (1.75* 0.1271*1.248*108.3) = 0.98"
"HL93.OPR"	1.52	"Top Slab at 1.50, D.fill = 2.00ft."	"M.pos"	"RF = (40.09 - 10.68) / (1.35* 0.1059*1.248*108.3) = 1.52"
"FL120"	1.12	"Top Slab at 1.50, D.fill = 2.00ft."	"M.pos"	"RF = (40.09 - 10.68) / (1.35* 0.1059*1.248*147.0) = 1.12"
"SU2"	2.70	"Top Slab at 1.50, D.fill = 2.00ft."	"M.pos"	"RF = (40.09 - 10.68) / (1.35* 0.1059*1.248*61.0) = 2.70"
"SU3"	1.76	"Top Slab at 1.50, D.fill = 2.00ft."	"M.pos"	"RF = (40.09 - 10.68) / (1.35* 0.1059*1.248*93.5) = 1.76"
"SU4"	1.79	"Top Slab at 1.50, D.fill = 2.00ft."	"M.pos"	"RF = (40.09 - 10.68) / (1.35* 0.1059*1.248*92.1) = 1.79"
"C3"	2.70	"Top Slab at 1.50, D.fill = 2.00ft."	"M.pos"	"RF = (40.09 - 10.68) / (1.35* 0.1059*1.248*61.1) = 2.70"
"C4"	1.76	"Top Slab at 1.50, D.fill = 2.00ft."	"M.pos"	"RF = (40.09 - 10.68) / (1.35* 0.1059*1.248*93.5) = 1.76"
"C5"	1.94	"Top Slab at 1.50, D.fill = 2.00ft."	"M.pos"	"RF = (40.09 - 10.68) / (1.35* 0.1059*1.248*85.0) = 1.94"
"ST5"	2.11	"Top Slab at 1.50, D.fill = 2.00ft."	"M.pos"	"RF = (40.09 - 10.68) / (1.35* 0.1059*1.248*78.0) = 2.11"
"EV2"	1.84	"Top Slab at 1.50, D.fill = 2.00ft."	"M.pos"	"RF = (40.09 - 10.68) / (1.30* 0.1059*1.248*92.9) = 1.84"
"EV3"	1.27	"Top Slab at 1.50, D.fill = 2.00ft."	"M.pos"	"RF = (40.09 - 10.68) / (1.30* 0.1059*1.248*134.3) = 1.27"

CHECK =

"HL93.OPR"	"ft"	"kip"	"start(ft)"	"end(ft)"	"klf"	"M.pos"	"Top Slab at 1.50, D.fill = 2.00ft."
""	0.00	25.00	6.63	9.76	1.42	""	"RF = (40.09 - 10.68) / (1.35* 0.1059*1.248*108.3) = 1.52"
""	4.00	25.00	2.63	5.76	1.42	""	""
""	""	""	""	""	""	""	""
"HL93.OPR"	"ft"	"kip"	"start(ft)"	"end(ft)"	"klf"	"M.neg"	"Top Slab at 2.00, D.fill = 2.50ft."
""	0.00	8.00	3.21	6.92	0.34	""	"RF = (-40.09 - 0.00) / (1.35* 0.0950*1.227*0.0) = 99.00"
""	14.00	32.00	−10.79	−7.08	1.36	""	""
""	14.00	32.00	−24.79	−21.08	1.36	""	""
"HL93.OPR"	"ft"	"kip"	"start(ft)"	"end(ft)"	"klf"	"V.neg"	"Top Slab at 1.90, D.fill = 2.00ft."
""	0.00	25.00	8.41	11.55	1.42	""	"RF = (-16.84 - -2.70) / (1.35* 0.1059*1.248*-30.5) = 2.60"
""	4.00	25.00	4.41	7.55	1.42	""	""
""	""	""	""	""	""	""	""
"HL93.OPR"	"ft"	"kip"	"h.eq(ft)"	""	""	"M.wall"	"Ext Wall at 0.48, D.fill = 2.50ft."
""	0.00	8.00	2.73	""	""	""	"RF = [1.75/1.35][1.20/1.00][36/36][(7.54 - 3.63) / (2.01)] = 3.03"
""	14.00	32.00	""	""	""	""	""
""	14.00	32.00	""	""	""	""	""

Quick Check (1 of 8), Positive Moment

$$RF_Mpos = \left[\begin{array}{l} \text{"HL93.OPR"} \\ \begin{pmatrix} \text{"ft"} & \text{"kip"} \\ 0.00 & 25.00 \\ 4.00 & 25.00 \end{pmatrix} \\ \begin{pmatrix} \text{"start(ft)"} & \text{"end(ft)"} & \text{"klf"} \\ 6.63 & 9.76 & 1.42 \\ 2.63 & 5.76 & 1.42 \end{pmatrix} \\ \text{"M.pos"} \\ \begin{pmatrix} \text{"Top Slab at 1.50, D.fill = 2.00ft."} \\ \text{"RF = (40.09 - 10.68) / (1.35* 0.1059*1.248*108.3) = 1.52"} \end{pmatrix} \end{array} \right]$$

$\psi c\phi Mn := \psi_c \cdot 0.90 \cdot f_y \cdot A_s \cdot \left(d - \frac{1}{2} \cdot \frac{f_y \cdot A_s}{0.85 \cdot f_c \cdot 12in} \right)$

$\psi c\phi Mn = 40.09 \cdot kip \cdot ft$ - factored capacity; $\psi_c = 1.00$, $d = 11.06 \cdot in$, $A_s = 1.309 \cdot in^2$

$D_{fill} := Dfilleq(RF_Mpos)$

$D_{fill} = 2.00\,ft$ - depth of fill, roadway surface to top of top slab

$F_e := \min\left(1.15 , 1 + 0.20 \cdot \frac{D_{fill}}{\sum L \cdot ft + t_{ExtWall}} \right)$

$F_e = 1.030$ - earth interaction factor

$\gamma\omega DLmax := \gamma_{DCmax} \cdot t_{slab} \cdot 150pcf \cdot ft + F_e \cdot \eta\gamma_{EVmax} \cdot D_{fill} \cdot 120pcf \cdot ft$

$\gamma\omega DLmax = 0.532 \cdot klf$ - maximum factored DL, $\gamma_{DCmax} = 1.25$ $\eta\gamma_{EVmax} = 1.30$

$\gamma DL_{pM} := \int_{0ft}^{\sum L\,ft} linterp(FT, Mpos, x) \cdot \gamma\omega DLmax \, dx$

$\gamma DL_{pM} = 10.68 \cdot kip \cdot ft$ - factored dead load

$DF := LLDFeq(mpf, D_{fill})$

$DF = 0.1059$ - live load distribution factor, axles per strip foot

$IM := IMeq(D_{fill})$

$IM = 1.248$ - dynamic impact factor

$E_{long} := DF_{earth} \cdot D_{fill} + tire_{length}$

$E_{long} = 3.13\,ft$ - longitudinal distribution, where $DF_{earth} = 1.15$ $tire_{length} = 10.00 \cdot in$

$x\omega := submatrix(RF_Mpos_{1,3}, 2, rows(RF_Mpos_{1,3}), 1, 3)$

$start := x\omega^{\langle 1 \rangle} \cdot ft = \begin{pmatrix} 6.6 \\ 2.6 \end{pmatrix} ft$ $end := x\omega^{\langle 2 \rangle} \cdot ft = \begin{pmatrix} 9.8 \\ 5.8 \end{pmatrix} ft$ $\omega := \frac{x\omega^{\langle 3 \rangle} \cdot klf}{\gamma_{LL} \cdot DF \cdot IM} = \begin{pmatrix} 7.98 \\ 7.98 \end{pmatrix} \cdot klf$

$LL_{pM} := \overrightarrow{\sum \left(\omega \cdot \int_{start}^{end} \max(linterp(FT, Mpos, x), 0 \cdot klf) \, dx \right)}$

$LL_{pM} = 108.3 \cdot kip \cdot ft$ - raw live load (no γ_{LL}, no DF, no IM)

$\gamma LL_{show}\left(\gamma_{LL}, DF, IM, \frac{LL_{pM}}{kip \cdot ft} \right) = \text{"(1.35)(0.1059)(1+25.\%)(108.3) = 19.33"}$ $\left(\psi c\phi Mn \;\; \gamma DL_{pM} \;\; \gamma_{LL} \cdot DF \cdot IM \cdot LL_{pM} \right) = (40.09 \;\; 10.68 \;\; 19.33) \cdot kip \cdot ft$

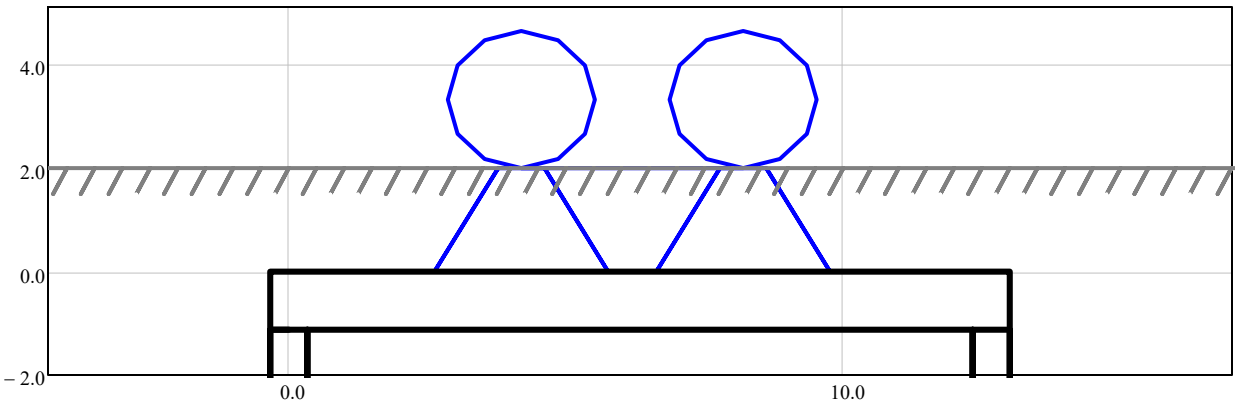
$$\frac{\psi c\phi Mn - \gamma DL_{pM}}{\gamma_{LL} \cdot DF \cdot IM \cdot LL_{pM}} = 1.52$$

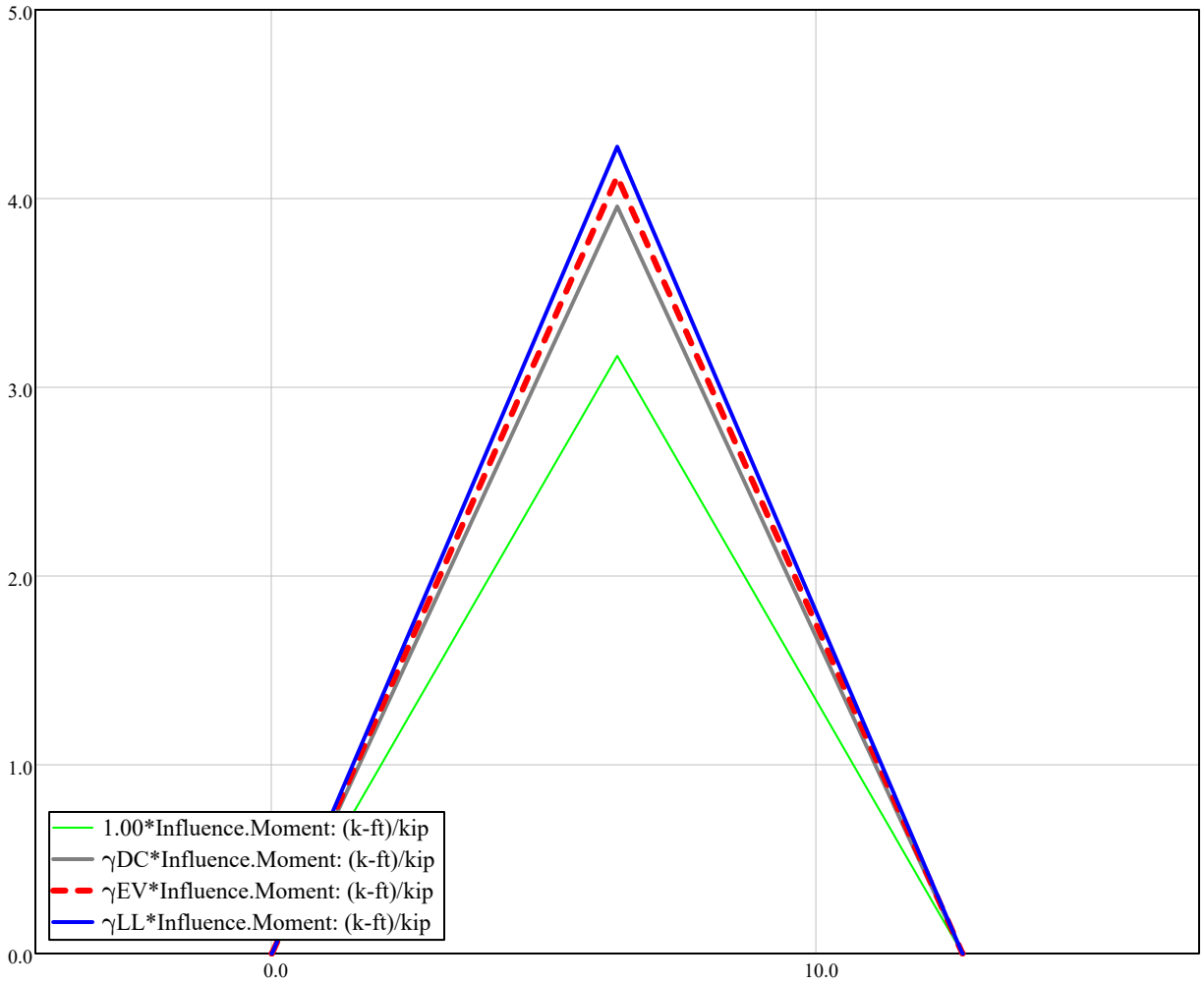
Unfactored ratio LL/DL: $LL := DF \cdot IM \cdot LL_{pM} = 14.32 \cdot kip \cdot ft$ and $DL := \left(DL_{match}(D_{fill}, D_{fills}) 1, 1 \right)_1 \cdot kip \cdot ft = 8.34\,ft \cdot kip$, so $= \frac{LL}{DL} = 1.72$

Quick Check (2 of 8), Positive Moment Plot

$$RF_Mpos = \left[\begin{array}{cccc} \text{"HL93.OPR"} & \begin{pmatrix} \text{"ft"} & \text{"kip"} \\ 0.00 & 25.00 \\ 4.00 & 25.00 \end{pmatrix} & \begin{pmatrix} \text{"start(ft)"} & \text{"end(ft)"} & \text{"klf"} \\ 6.63 & 9.76 & 1.42 \\ 2.63 & 5.76 & 1.42 \end{pmatrix} & \text{"M.pos"} \end{array} \begin{pmatrix} \text{"Top Slab at 1.50, D.fill = 2.00ft."} \\ \text{"RF = (40.09 - 10.68) / (1.35* 0.1059*1.248*108.3) = 1.52"} \end{pmatrix} \right]$$

PLT_truck := PLTTRK(RF_Mpos)





Quick Check (3 of 8), Negative Moment

$$RF_Mneg = \left[\text{"HL93.OPR"} \quad \begin{pmatrix} \text{"ft"} & \text{"kip"} \\ 0.00 & 8.00 \\ 14.00 & 32.00 \\ 14.00 & 32.00 \end{pmatrix} \quad \begin{pmatrix} \text{"start(ft)"} & \text{"end(ft)"} & \text{"klf"} \\ 3.21 & 6.92 & 0.34 \\ -10.79 & -7.08 & 1.36 \\ -24.79 & -21.08 & 1.36 \end{pmatrix} \quad \text{"M.neg"} \quad \begin{pmatrix} \text{"Top Slab at 2.00, D.fill = 2.50ft."} \\ \text{"RF = (-40.09 - 0.00) / (1.35* 0.0950*1.227*0.0) = 99.00"} \end{pmatrix} \right]$$

$\psi c\phi Mn := -\psi c\phi Mn$

$\psi c\phi Mn = -40.09 \cdot kip \cdot ft$ - factored capacity; $\psi_c = 1.00$, $d = 11.06 \cdot in$, $A_s = 1.309 \cdot in^2$

$D_{fill} := Dfilleq(RF_Mneg)$

$D_{fill} = 2.50\,ft$ - depth of fill, roadway surface to top of top slab

$F_e := \min\left(1.15, 1 + 0.20 \cdot \frac{D_{fill}}{\sum L \cdot ft + t_{ExtWall}}\right)$

$F_e = 1.038$ - earth interaction factor

$\gamma\omega DLmax := \gamma_{DCmax} \cdot t_{slab} \cdot 150pcf \cdot ft + F_e \cdot \eta\gamma_{EVmax} \cdot D_{fill} \cdot 120pcf \cdot ft$

$\gamma\omega DLmax = 0.616 \cdot klf$ - max factored dead load, $\gamma_{DCmax} = 1.25$ $\eta\gamma_{EVmax} = 1.30$

$\gamma DL_{nM} := \int_{0ft}^{\sum L\,ft} linterp(FT, Mneg, x) \cdot \gamma\omega DLmax\, dx$

$\gamma DL_{nM} = 0.00 \cdot kip \cdot ft$ - factored dead load

$DF := LLDFeq(mpf, D_{fill})$

$DF = 0.0950$ - live load distribution factor, axles per strip foot

$IM := IMeq(D_{fill})$

$IM = 1.227$ - dynamic impact factor

$E_{long} := DF_{earth} \cdot D_{fill} + tire_{length}$

$E_{long} = 3.71\,ft$ - longitudinal distribution, where $DF_{earth} = 1.15$ $tire_{length} = 10.00 \cdot in$

$x\omega := submatrix(RF_Mneg_{1,3}, 2, rows(RF_Mneg_{1,3}), 1, 3)$

$start := x\omega^{\langle 1 \rangle} \cdot ft = \begin{pmatrix} 3.2 \\ -10.8 \\ -24.8 \end{pmatrix} ft$ $end := x\omega^{\langle 2 \rangle} \cdot ft = \begin{pmatrix} 6.9 \\ -7.1 \\ -21.1 \end{pmatrix} ft$ $\omega := \frac{x\omega^{\langle 3 \rangle} \cdot klf}{\gamma_{LL} \cdot DF \cdot IM} = \begin{pmatrix} 2.16 \\ 8.63 \\ 8.63 \end{pmatrix} \cdot klf$

$LL_{nM} := \overrightarrow{\sum \left(\omega \cdot \int_{start}^{end} \min(linterp(FT, Mneg, x), 0 \cdot klf)\, dx \right)}$

$LL_{nM} = 0.0 \cdot kip \cdot ft$ - raw live load (no γ_{LL}, no DF, no IM)

$\gamma LL_{show}\left(\gamma_{LL}, DF, IM, \frac{LL_{nM}}{kip \cdot ft}\right) = \text{"(1.35)(0.0950)(1+23.%)(0.0) = 0.00"}$

$\left(\psi c\phi Mn \quad \gamma DL_{nM} \quad \gamma_{LL} \cdot DF \cdot IM \cdot LL_{nM}\right) = (-40.09 \quad 0.00 \quad 0.00) \cdot kip \cdot ft$

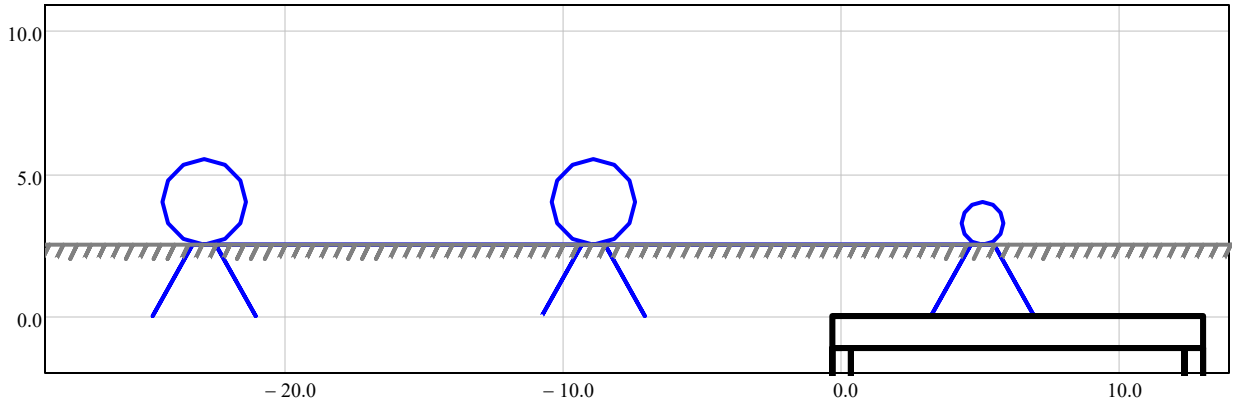
$$\frac{\psi c\phi Mn - \gamma DL_{nM}}{\gamma_{LL} \cdot DF \cdot IM \cdot LL_{nM}} = 10.00 \times 10^{16}$$

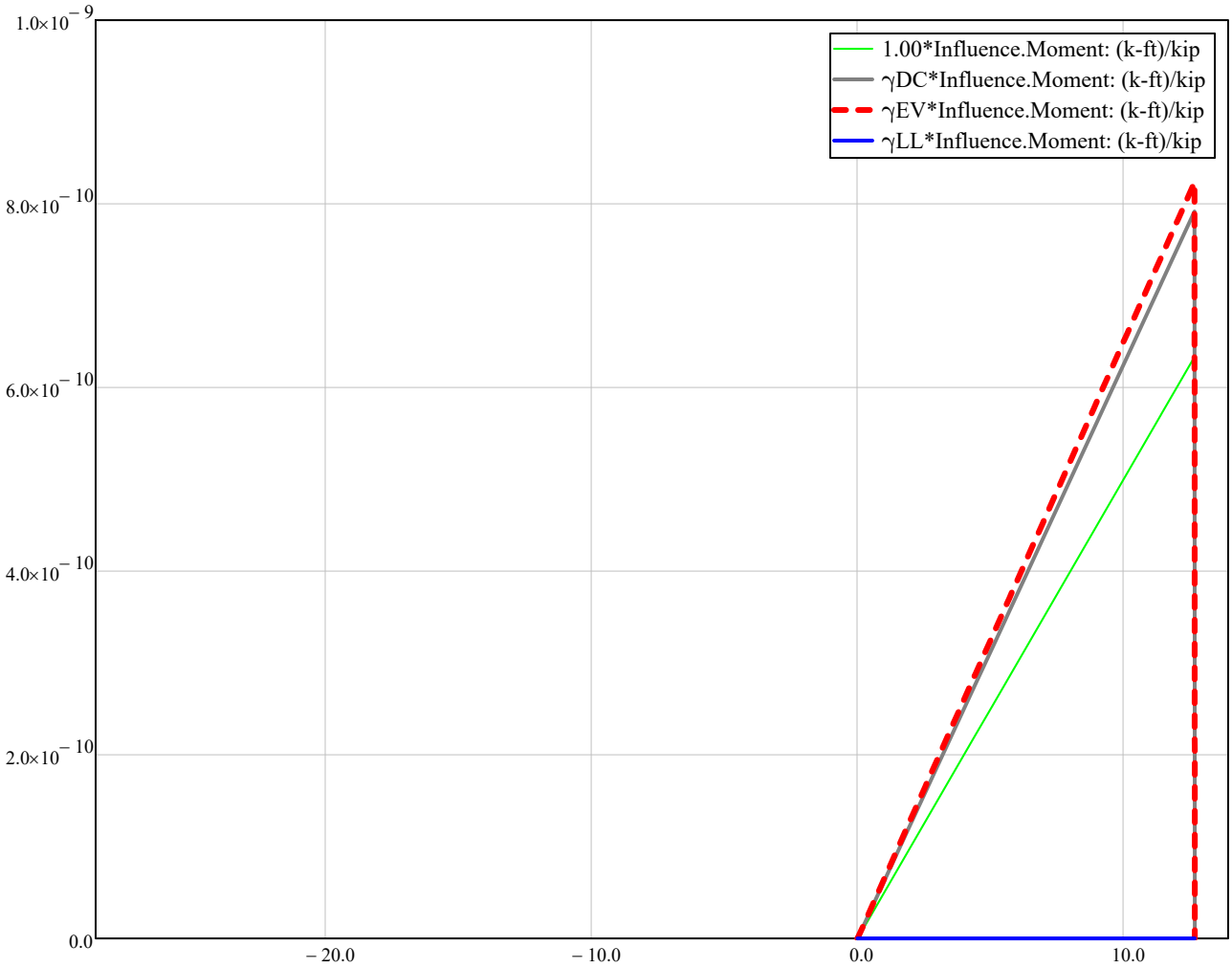
Unfactored ratio LL/DL: $LL := DF \cdot IM \cdot LL_{nM} = 0.00 \cdot kip \cdot ft$ and $DL := \left(DL_{match}(D_{fill}, D_{fills})_{1,2}\right)_1 \cdot kip \cdot ft = 0.00\,ft \cdot kip$, so $= \frac{LL}{DL} = 0.00$

Quick Check (4 of 8), Negative Moment Plot

$$RF_Mneg = \left[\begin{array}{l} \text{"HL93.OPR"} \\ \begin{pmatrix} \text{"ft"} & \text{"kip"} \\ 0.00 & 8.00 \\ 14.00 & 32.00 \\ 14.00 & 32.00 \end{pmatrix} \\ \begin{pmatrix} \text{"start(ft)"} & \text{"end(ft)"} & \text{"klf"} \\ 3.21 & 6.92 & 0.34 \\ -10.79 & -7.08 & 1.36 \\ -24.79 & -21.08 & 1.36 \end{pmatrix} \\ \text{"M.neg"} \\ \begin{pmatrix} \text{"Top Slab at 2.00, D.fill = 2.50ft."} \\ \text{"RF = (-40.09 - 0.00) / (1.35* 0.0950*1.227*0.0) = 99.00"} \end{pmatrix} \end{array} \right]$$

PLT_truck := PLTTRK(RF_Mneg)





Quick Check (5 of 8), Shear

$$RF_Vneg = \left[\begin{array}{l} \text{"HL93.OPR"} \\ \end{array} \quad \begin{pmatrix} \text{"ft"} & \text{"kip"} \\ 0.00 & 25.00 \\ 4.00 & 25.00 \end{pmatrix} \quad \begin{pmatrix} \text{"start(ft)"} & \text{"end(ft)"} & \text{"klf"} \\ 8.41 & 11.55 & 1.42 \\ 4.41 & 7.55 & 1.42 \end{pmatrix} \quad \text{"V.neg"} \quad \begin{pmatrix} \text{"Top Slab at 1.90, D.fill = 2.00ft."} \\ \text{"RF = (-16.84 - -2.70) / (1.35* 0.1059*1.248*-30.5) = 2.60"} \end{pmatrix} \right]$$

$D_{fill} := Dfilleq(RF_Vneg) = 2.00\,ft$ $\qquad F_e := \min\left(1.15, 1 + 0.20 \cdot \frac{D_{fill}}{\sum L \cdot ft + t_{ExtWall}}\right) = 1.030$ $\qquad COINC(Vneg, \gamma MAX, \gamma MIN) := if(Vneg < 0, \gamma MAX, \gamma MIN)$

$$\gamma DLM := \int_0^{\sum L \cdot ft} linterp\left(FT, \gamma_{DCmax} \cdot Mv, x\right) \cdot \left(t_{slab} \cdot 150pcf \cdot ft\right) + linterp\left(FT, \eta\gamma_{EVmax} \cdot Mv, x\right) \cdot \left(F_e \cdot D_{fill} \cdot 120pcf \cdot ft\right) dx \qquad \gamma DLM = 3.81 \cdot kip \cdot ft$$

$$\gamma DLV := \int_0^{\sum L \cdot ft} linterp\left(FT, \gamma_{DCmax} \cdot Vneg, x\right) \cdot \left(t_{slab} \cdot 150pcf \cdot ft\right) + linterp\left(FT, \eta\gamma_{EVmax} \cdot Vneg, x\right) \cdot \left(F_e \cdot D_{fill} \cdot 120pcf \cdot ft\right) dx \qquad \gamma DLV = -2.70 \cdot kip$$

$\gamma_{LL} = 1.35$ $\qquad mpf := mpf_eq(testVEH) = 1.00$ $\qquad DF := LLDFeq\left(mpf, D_{fill}\right) = 0.1059$ $\qquad IM := IMeq\left(D_{fill}\right) = 1.248$

$$x\omega := submatrix\left(RF_Vneg_{1,3}, 2, rows\left(RF_Vneg_{1,3}\right), 1, 3\right) \qquad start := x\omega^{\langle 1 \rangle} \cdot ft = \begin{pmatrix} 8.41 \\ 4.41 \end{pmatrix} ft \qquad end := x\omega^{\langle 2 \rangle} \cdot ft = \begin{pmatrix} 11.55 \\ 7.55 \end{pmatrix} ft \qquad \omega := \frac{x\omega^{\langle 3 \rangle} \cdot klf}{\gamma_{LL} \cdot DF \cdot IMeq\left(D_{fill}\right)} = \begin{pmatrix} 7.98 \\ 7.98 \end{pmatrix} \cdot klf$$

$$LL_M := \left| \begin{array}{l} McoincVLL \leftarrow \overrightarrow{COINC(Vneg, Mv, 0 \cdot Mv)} \\ \sum \left(\omega \cdot \overrightarrow{\int_{start}^{end} linterp(FT, McoincVLL, x)\, dx} \right) \end{array} \right. = 38.32 \cdot kip \cdot ft \qquad \gamma LL_M := \gamma_{LL} \cdot DF \cdot IM \cdot LL_M = 6.84 \cdot kip \cdot ft \qquad Mu := \gamma DLM + \gamma LL_M = 10.65 \cdot kip \cdot ft$$

$$LL_V := \left| \begin{array}{l} VnegLL \leftarrow \overrightarrow{COINC(Vneg, Vneg, 0 \cdot Vneg)} \\ \sum \left(\omega \cdot \overrightarrow{\int_{start}^{end} linterp(FT, VnegLL, x)\, dx} \right) \end{array} \right. = -30.53 \cdot kip \qquad \gamma LL_V := \gamma_{LL} \cdot DF \cdot IM \cdot LL_V = -5.45 \cdot kip \qquad Vu := \gamma DLV + \gamma LL_V = -8.15 \cdot kip$$

$$Vn_{DeepFill} := -\min\left(\max\left(2.5 \cdot \sqrt{f_c \cdot psi}, 2.14 \cdot \sqrt{f_c \cdot psi} + 4600 \cdot psi\, \rho \cdot \min\left(1, \frac{|Vu| \cdot d}{|Mu|}\right)\right), 4.0 \cdot \sqrt{f_c \cdot psi}\right) \cdot (ft \cdot d) = -19.81 \cdot kip \qquad \rho = 0.0099 \qquad d = 11.06 \cdot in$$

$$Vn_{LFR_ShallowFill} := -\min\left(1.9 \cdot \sqrt{\frac{f_c}{psi}} + 2500\rho \cdot \min\left(1, \frac{|Vu| \cdot d}{|Mu|}\right), 3.5 \cdot \sqrt{\frac{f_c}{psi}}\right) \cdot ft \cdot d \cdot psi = -16.12 \cdot kip \qquad f_c = 3.0 \cdot ksi$$

$$Vn_{LRFR_ShallowFill} := \frac{-4.8}{1 + 750 \cdot \frac{\max\left(\frac{A_s \cdot f_y}{Mn} \cdot |Mu|, |Vu|\right) + |Vu|}{29000ksi \cdot A_s}} \cdot \frac{51in}{39in + \max\left(12in, d_v \cdot \frac{1.38in}{0.375in + 0.63in}\right)} \cdot \left[\sqrt{f_c \cdot psi} \cdot ft \cdot \left(d - \frac{1}{2} \cdot \frac{f_y \cdot A_s}{0.85 \cdot f_c \cdot 12in}\right)\right] = -22.00 \cdot kip$$

$$\psi c\phi Vn := \left| \begin{array}{l} \text{return } \psi_c \cdot 0.85 \cdot Vn_{DeepFill} \text{ if } D_{fill} \geq 2ft \\ \text{return } \psi_c \cdot 0.85 \cdot Vn_{LFR_ShallowFill} \text{ if } LRFR = 0 \\ \psi_c \cdot 0.85 \cdot Vn_{LRFR_ShallowFill} \end{array} \right.$$

$\gamma LL_{show}\left(\gamma_{LL}, DF, IM, \frac{LL_V}{kip}\right) = \text{"(1.35)(0.1059)(1+25.%)(-30.5) = -5.45"}$

$\left(\psi c\phi Vn \quad \gamma DLV \quad \gamma_{LL} \cdot DF \cdot IM \cdot LL_V\right) = \left(-16.84 \quad -2.70 \quad -5.45\right) \cdot kip$ $\qquad \frac{\psi c\phi Vn - \gamma DLV}{\gamma_{LL} \cdot DF \cdot IM \cdot LL_V} = 2.60$

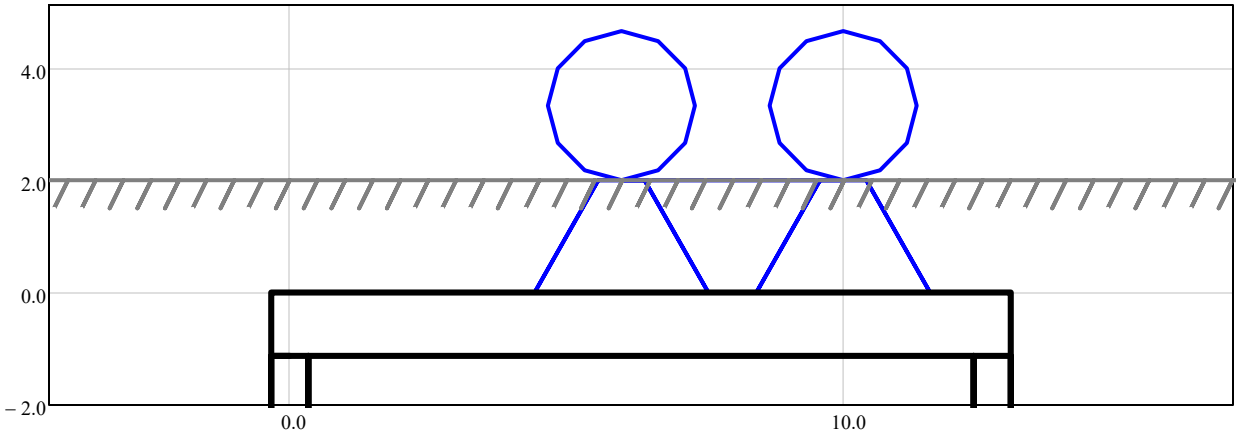
Unfactored ratio LL/DL: $LL := DF \cdot IM \cdot LL_V = -4.03 \cdot kip$ and $DL := \left(DL_{match}\left(D_{fill}, D_{fills}\right)_{1,3}\right)_1 \cdot kip = -2.11 \cdot kip$, so $= \frac{LL}{DL} = 1.91$

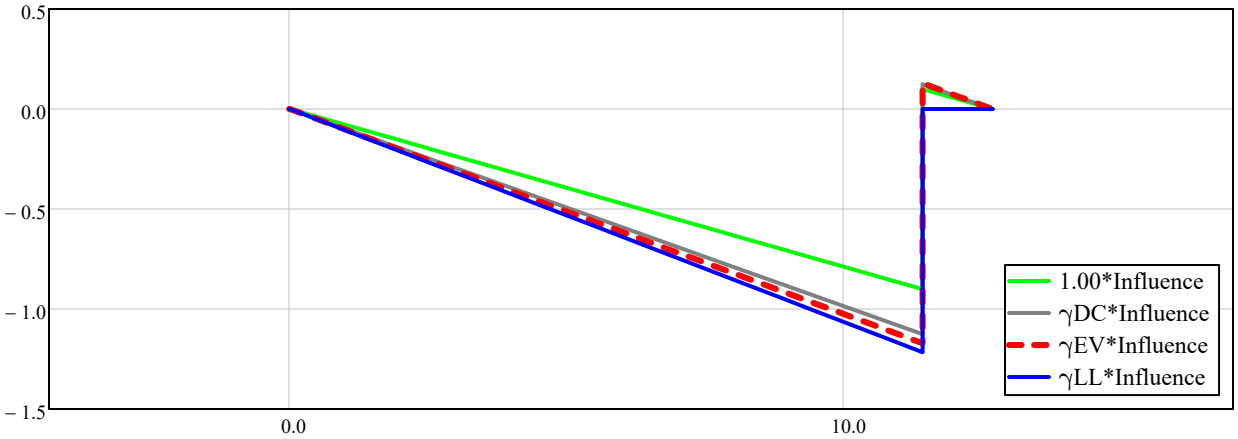
Quick Check (6 of 8), Shear Plots

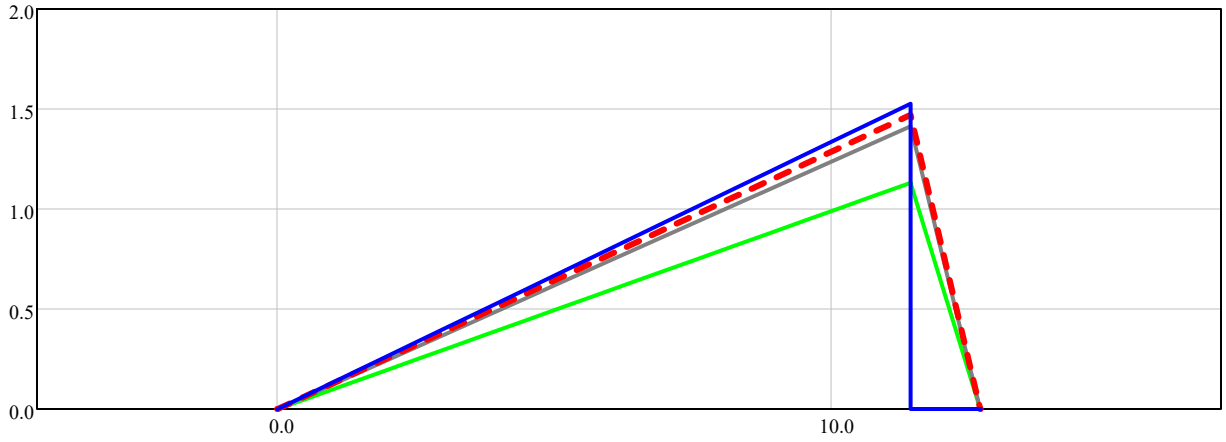
$$RF_Vneg = \left[\begin{array}{c} \text{"HL93.OPR"} \\ \\ \end{array} \begin{pmatrix} \text{"ft"} & \text{"kip"} \\ 0.00 & 25.00 \\ 4.00 & 25.00 \end{pmatrix} \begin{pmatrix} \text{"start(ft)"} & \text{"end(ft)"} & \text{"klf"} \\ 8.41 & 11.55 & 1.42 \\ 4.41 & 7.55 & 1.42 \end{pmatrix} \text{"V.neg"} \begin{pmatrix} \text{"Top Slab at 1.90, D.fill = 2.00ft."} \\ \text{"RF = (-16.84 - -2.70) / (1.35* 0.1059*1.248*-30.5) = 2.60"} \end{pmatrix} \right]$$

PLT_truck := PLTTRK(RF_Vneg)

For LRFR, neglect live load not contributing to the force under consideration ($\gamma_{LL.LRFR.min} = 0$). Meanwhile for LFR, apply all axles.







Quick Check (7 of 8), Exterior Wall

$$RF_ExtWall = \left[\begin{array}{l} \text{"HL93.OPR"} \\ \begin{pmatrix} \text{"ft"} & \text{"kip"} \\ 0.00 & 8.00 \\ 14.00 & 32.00 \\ 14.00 & 32.00 \end{pmatrix} \\ \begin{pmatrix} \text{"h.eq(ft)"} & \text{""} & \text{""} \\ 2.73 & \text{""} & \text{""} \end{pmatrix} \\ \text{"M.wall"} \\ \begin{pmatrix} \text{"Ext Wall at 0.48, D.fill = 2.50ft."} \\ \text{"RF = [1.75/1.35][1.20/1.00][36/36][(7.54 - 3.63) / (2.01)] = 3.03"} \end{pmatrix} \end{array} \right]$$

$D_{fill} := \max(D_{fills}) = 2.50\,ft$

$F_e := \min\left(1.15, 1 + 0.20 \cdot \frac{D_{fill}}{\sum L \cdot ft + t_{ExtWall}}\right) = 1.038$

$\gamma_{soil} = 120 \cdot pcf$

$INF_\omega := (0.5 \quad 0.375 \quad 0.4 \quad 0.3928)_{1,\min(4,cells)} \cdot L_1 \cdot ft = 6.333 \cdot \frac{kip}{klf}$ - axial force onto wall from uniform DL on top slab

$A_{s.wall} = 0.40 \cdot in^2$

$INF_P := (0 \quad 0.096 \quad 0.080)_{1,\min(3,cells)} = 0.000 \cdot \frac{kip}{kip}$ - uplifting axial force onto wall from point load on top slab

$f_y = 40 \cdot ksi$

$\gamma P_{DC} := -\gamma_{DCmin} \cdot (150pcf \cdot t_{slab} \cdot ft) \cdot INF_\omega = -0.96 \cdot kip$

$\gamma P_{EV} := -\eta\gamma_{EVmin} \cdot (F_e \cdot \gamma_{soil} \cdot D_{fill} \cdot ft) \cdot INF_\omega = -1.77 \cdot kip$

$f_c = 3.0 \cdot ksi$

$P_{LL} := 32kip$

$DF := LLDFeq(mpf_eq(1), D_{fill}) = 0.1140$

$IM := IMeq(D_{fill}) = 1.227$

$\gamma P_{LV} := \gamma_{LL.Inventory} \cdot DF \cdot IM \cdot P_{LL} \cdot INF_P = 0.00 \cdot kip$

$F_{s.wall} := A_{s.wall} \cdot f_y = 16.00 \cdot kip$

$a := \frac{F_{s.wall} + \gamma P_{DC} + \gamma P_{EV} + \gamma P_{LV}}{0.85 \cdot f_c \cdot ft} = 0.43 \cdot in$

$M_arm := \frac{d_{wall}}{2} - \frac{a}{2} = 3.03 \cdot in$ - axial force to CG comp.

$h_{abutment} := D_{fill} + 2 \cdot t_{slab} + h_{clear} = 12.75\,ft$

$h_{LL.surcharge} := h_{eq.equation}(h_{abutment}) = 2.73\,ft$ - LL surcharge

$x_{origin} := D_{fill} + t_{slab} + h_{clear} - h_{haunch.bot} = 11.29\,ft$

$ix := 1, 2 .. 41$

$x_{ix} := L_{wall} \cdot \frac{ix - 1}{40}$

$$\gamma EH := \left| \begin{array}{l} \omega_{EH}(x) \leftarrow \eta\gamma_{EHmax} \cdot \frac{\gamma_{soil}}{2} \cdot (x_{origin} - x) \cdot ft \\ \int_0^x \int_0^{L_{wall}} \frac{\omega_{EH}(x) \cdot (L_{wall} - x)}{L_{wall}} dx - \int_0^x \omega_{EH}(x)\, dx\, dx \end{array} \right.$$

$$\gamma LS := \left| \begin{array}{l} \omega_{LH}(x) \leftarrow \gamma_{LL.Inventory} \cdot \frac{\gamma_{soil}}{2} \cdot h_{eq} \cdot ft \\ \int_0^x \int_0^{L_{wall}} \frac{\omega_{LH}(x) \cdot (L_{wall} - x)}{L_{wall}} dx - \int_0^x \omega_{LH}(x)\, dx\, dx \end{array} \right.$$

$\psi\phi Mn_{wall} := \psi_c \cdot 0.90 \cdot A_{s.wall} \cdot f_y \cdot \left(d_{wall} - \frac{a}{2}\right) = 7.54 \cdot kip \cdot ft$

$\gamma DC := \gamma P_{DC} \cdot M_arm = -0.243 \cdot kip \cdot ft$ - factored component slab load, axial compression (-) reduces moment

$\gamma EV := \gamma P_{EV} \cdot M_arm = -0.448 \cdot kip \cdot ft$ - factored vertical earth load, axial compression (-) reduces moment

γEH: $\max(\gamma EH) = 4.32 \cdot kip \cdot ft$ - maximum factored horizontal earth (+) increases moment

$\gamma LV := \gamma P_{LV} \cdot M_arm = 0.000 \cdot kip \cdot ft$ - factored vertical LL, uplift for multi-cell CBCs, axial tension (+) increases moment

γLS: $\max(\gamma LS) = 2.01 \cdot kip \cdot ft$ - maximum factored LL surcharge (+) increases moment

$RF_{Inv} := \frac{\psi\phi Mn_{wall} - (\gamma DC + \gamma EV + \gamma EH)}{\gamma LV + \gamma LS}$

$r := match(\min(RF_{Inv}), RF_{Inv})1 =$ ▮

$RF := \frac{\gamma_{LL.Inventory}}{\gamma_{LL}} \cdot \frac{mpf_eq(1)}{mpf} \cdot \frac{36}{GVW_{testVEH,2}} \cdot RF_{Inv_r}$

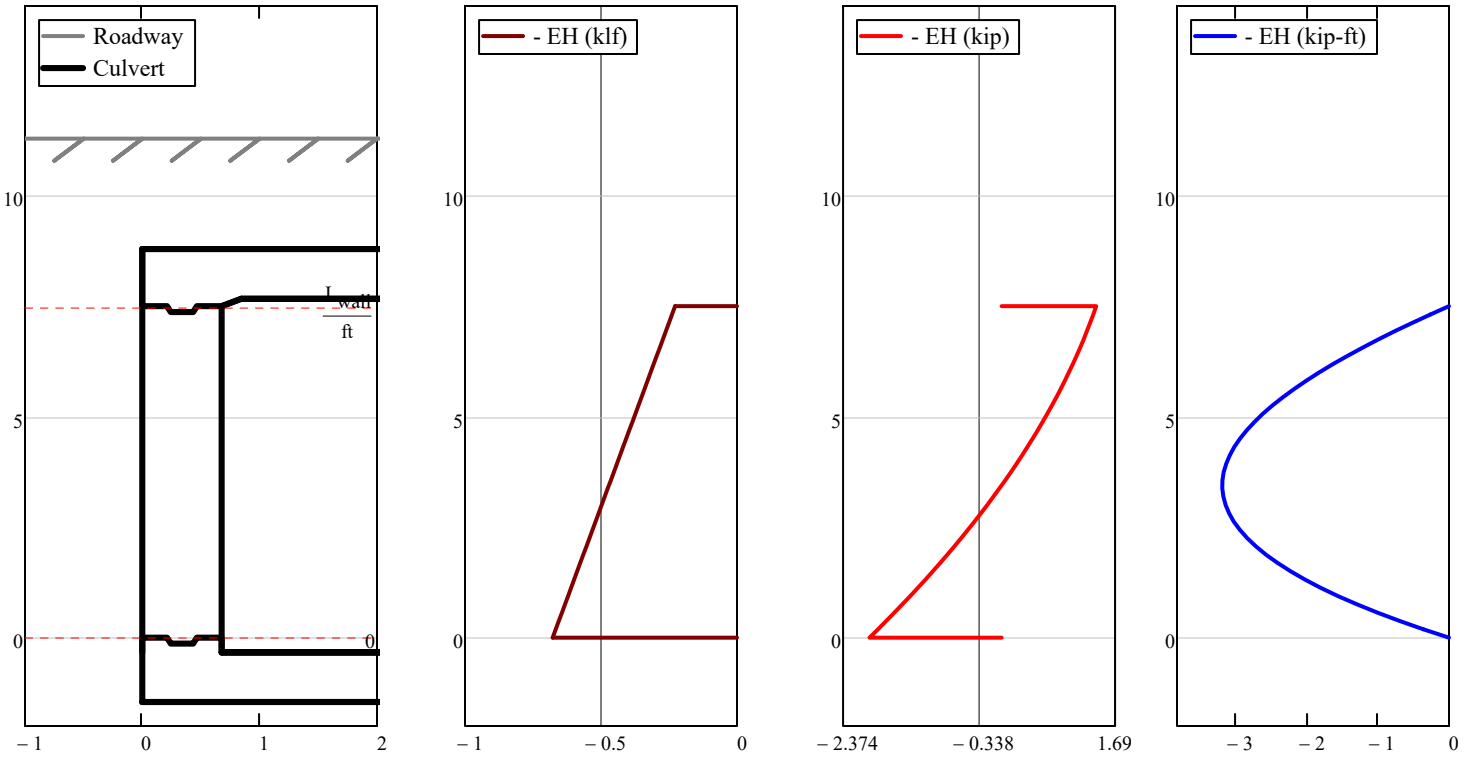
RF = ▮

$\left[\psi\phi Mn_{wall} \quad \left(\left(\gamma DC + \gamma EV + \gamma EH_r\right)\right) \quad \max\left(\gamma LV + \gamma LS_r\right)\right] =$ ▮ $\cdot kip \cdot ft$

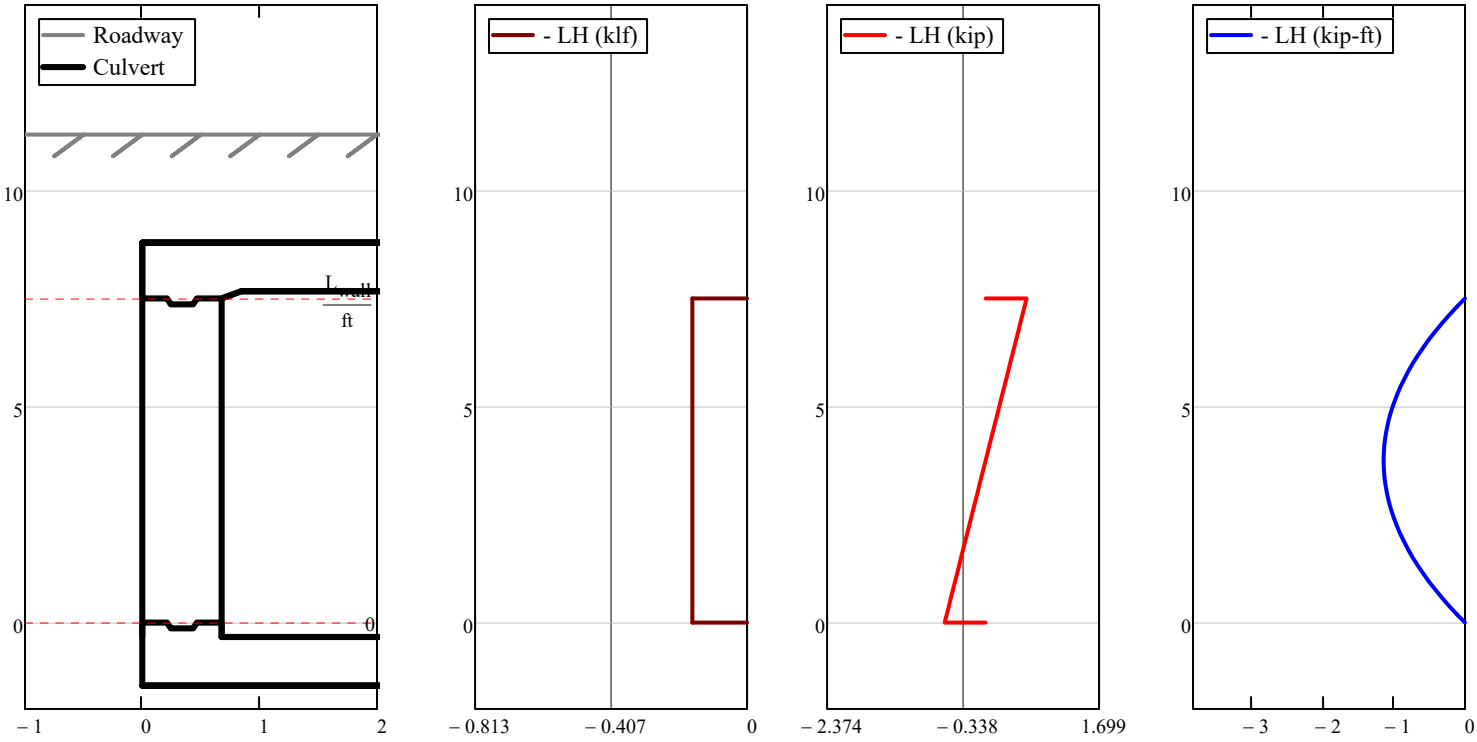
$\gamma_{LL} = 1.35$ $mpf_eq(1) = 1.20$ $mpf = 1.00$ $GVW_{testVEH,2} = 36$

Quick Check (8 of 8), Exterior Wall Plots

Horizontal Earth Load (EH)



Horizontal Live Load with Impact (LH)

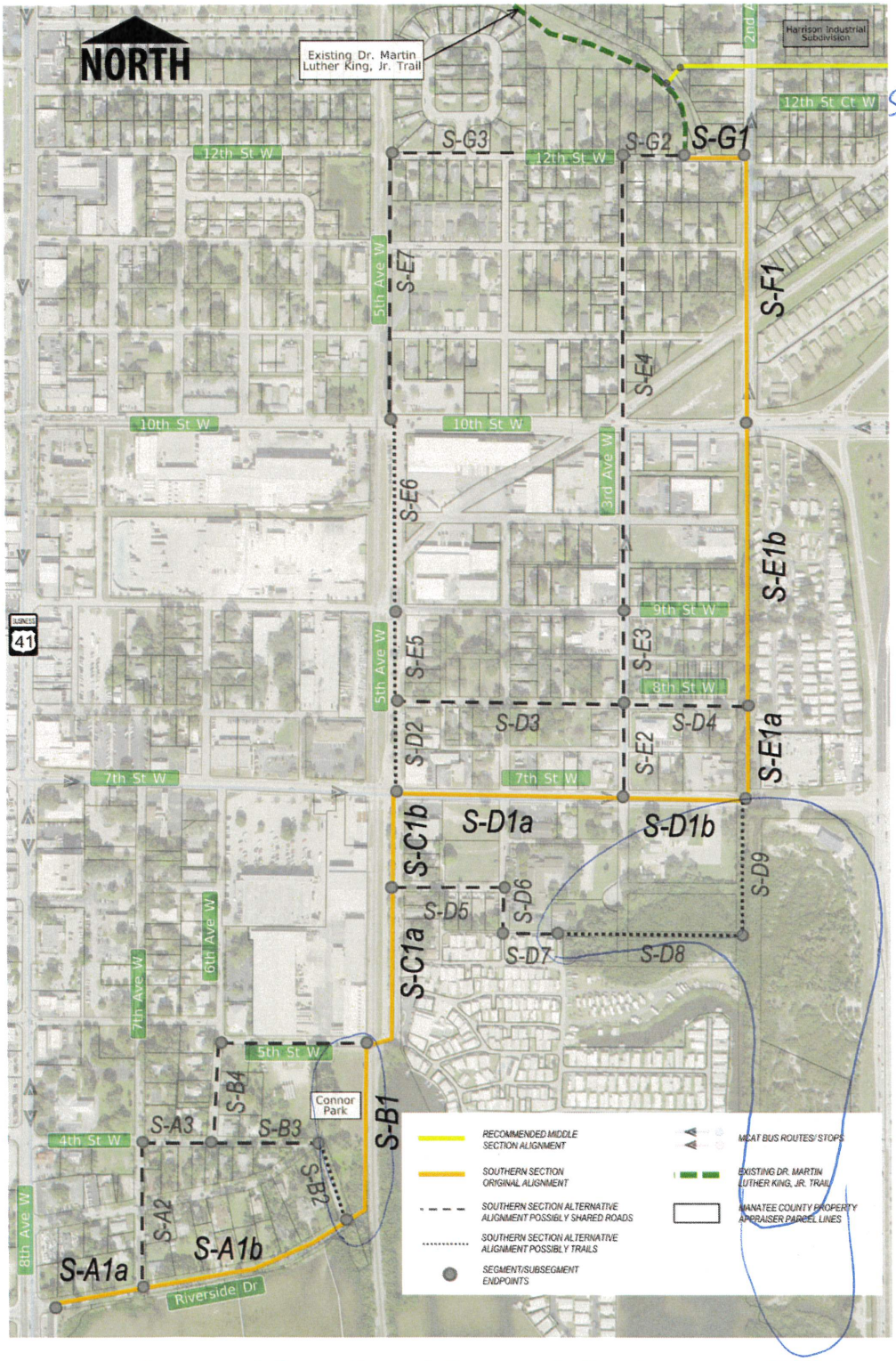


APPENDIX B – PUBLIC INVOLVEMENT

Palmetto Trails NETWORK | PD&E STUDY

Questionnaire – October 2024 | **Manatee County – FPID No.: 444857-1-22-01**

Name: Francesco Lagana



Question 1: Which segments of the Southern Section (A1 through G3) do you like the most and why?

S-B1 Because it utilizes the land designated for public use and Does not obstuct road ways / people property use for there own enjoyment

Question 2: Which segments of the Southern Section (A1 through G3) do you dislike the most and why?

S-A1a - A1b ~~Beg~~ Because traffic pools through those road at rush Hr / people run Stop Signs Speed.

Question 3: Please provide any additional feedback, comments, or suggestions.

S-D7 - SD9 and utilize more of the preserve In Front of civic center as set up for Public use, ~~or~~ I dont want to see money wasted on program that Infstucti Can not Support, I would like to see circled area Better utilized as It is more appropriate

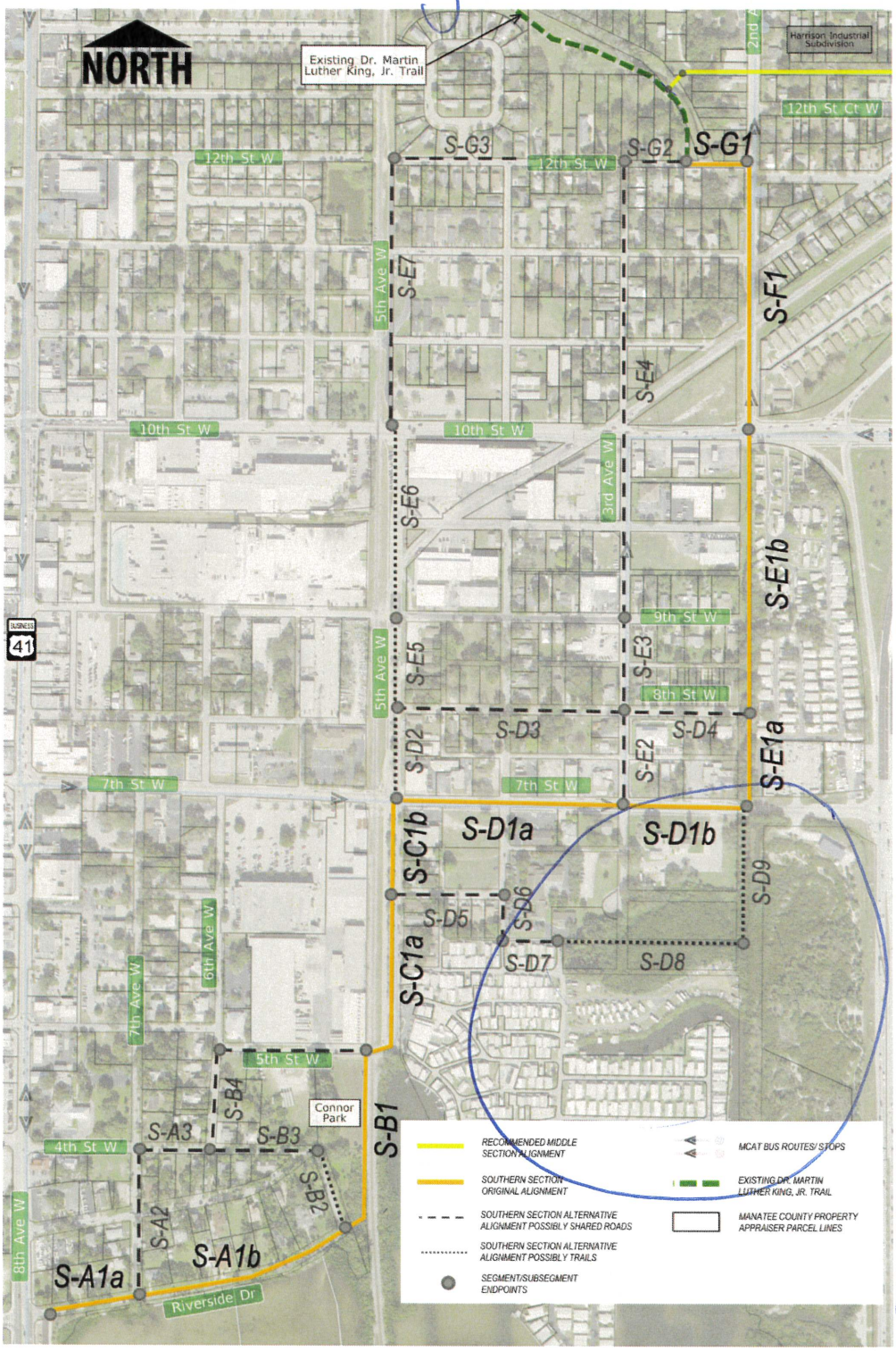
For more information, visit our website at: **www.swflroads.com/palmettotrailsnetwork**

FDOT

Palmetto Trails NETWORK | PD&E STUDY

Questionnaire – October 2024 | **Manatee County – FPID No.: 444857-1-22-01**

Name: Constance Lagana



Question 1: Which segments of the Southern Section (A1 through G3) do you like the most and why?

B1 utilizes park apropriate for public use not residental area wouldnt ubstruck roadways

Question 2: Which segments of the Southern Section (A1 through G3) do you dislike the most and why?

Question 3: Please provide any additional feedback, comments, or suggestions.

Public areas Parks existing Conections, as not to interfer with existing residents in Historic areas with over populated traffic causeing pedistrion hasards

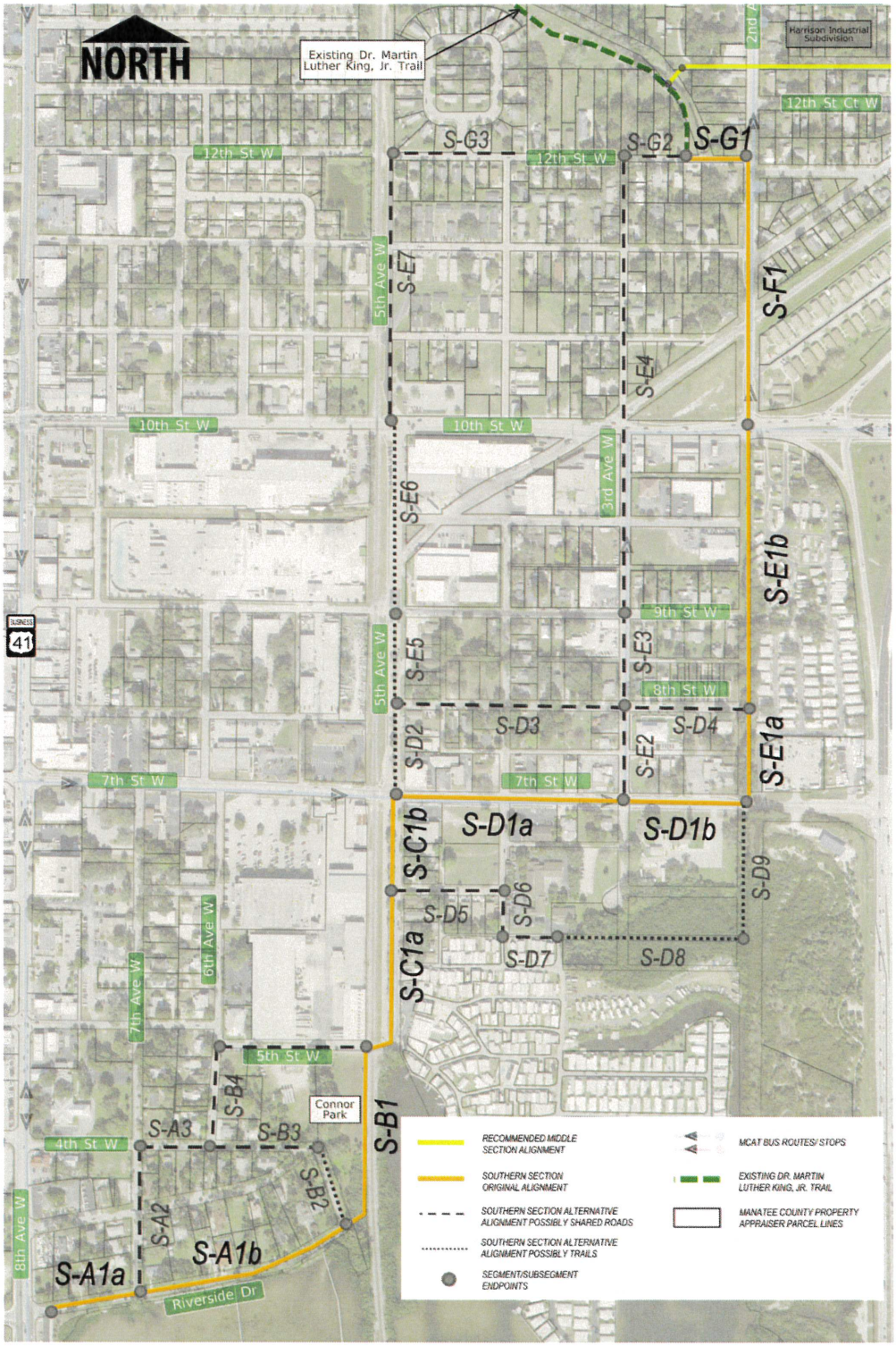
- SD7 S D9 utilise already existing preserve in Front of Civic Cente already set up public use of

For more information, visit our website at: **www.swflroads.com/palmettotrailsnetwork**

Palmetto Trails NETWORK | PD&E STUDY

Questionnaire – October 2024 | **Manatee County – FPID No.: 444857-1-22-01**

Name: Ron Berma



Question 1: Which segments of the Southern Section (A1 through G3) do you like the most and why?

SO-5 SO-9

FAMILY SAFETY ON 7TH BEING BUSSY

Question 2: Which segments of the Southern Section (A1 through G3) do you dislike the most and why?

SO-1

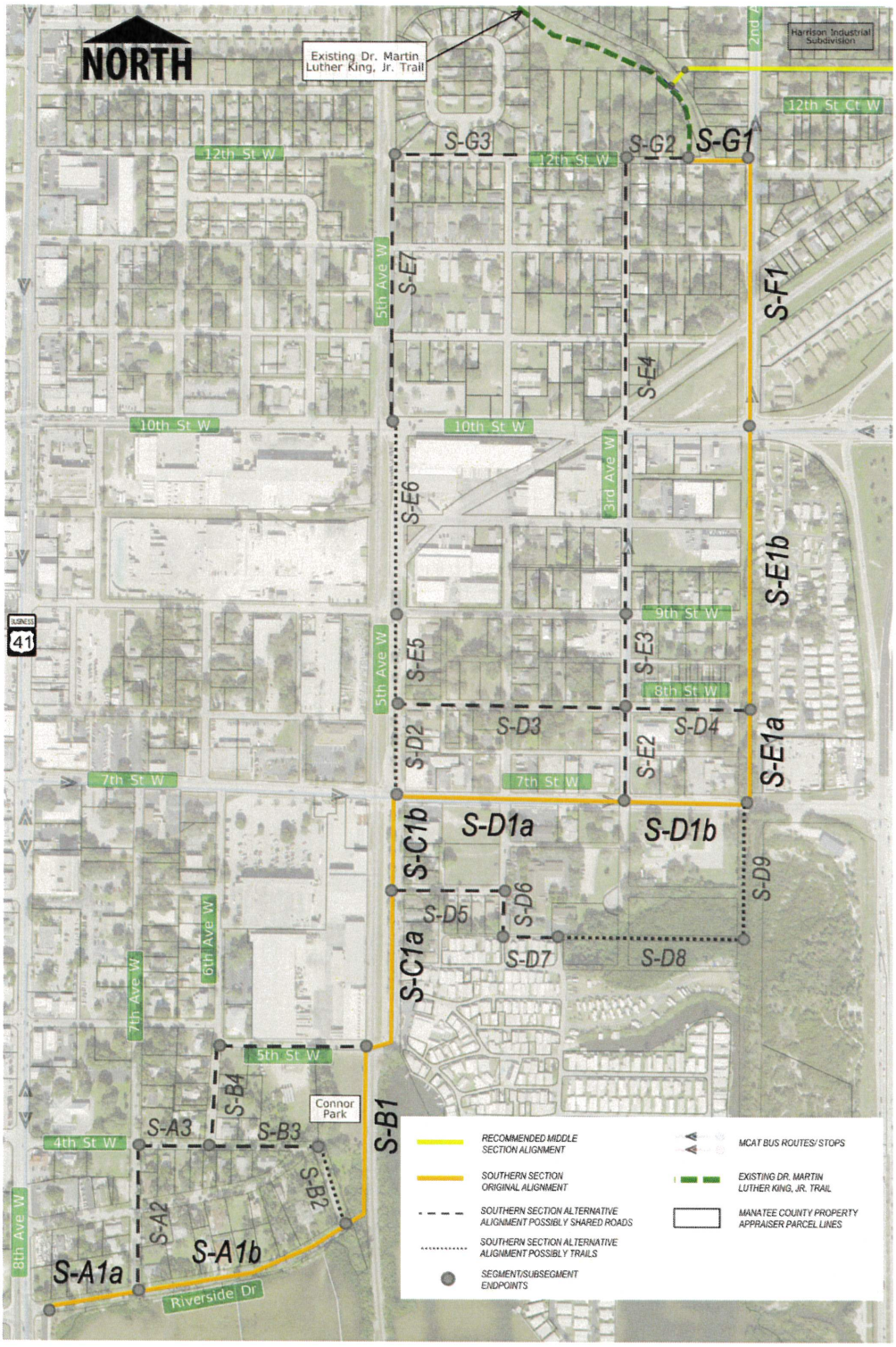
Question 3: Please provide any additional feedback, comments, or suggestions.

For more information, visit our website at: **www.swflroads.com/palmettotrailsnetwork**

Palmetto Trails NETWORK | PD&E STUDY

Questionnaire – October 2024 | **Manatee County – FPID No.: 444857-1-22-01**

Name: Kera Hill & Brandon Mettinger



Question 1: Which segments of the Southern Section (A1 through G3) do you like the most and why?

We are excited for the connection between Conner Park & opening up Riverside Dr to public walking improvements.

Question 2: Which segments of the Southern Section (A1 through G3) do you dislike the most and why?

The northern section above the railway on 2nd Ave; concerned w/ residents, space & available roadway.

Question 3: Please provide any additional feedback, comments, or suggestions.

We would like to see the connection in the walking/biking Trail from US-41 to 5th Ave E on 17th St E.

For more information, visit our website at: **www.swflroads.com/palmettotrailsnetwork**

FDOT

Palmetto Trails
NETWORK | PD&E STUDY

August 2026

Manatee County – FPID No.: 444857-1-22-01

PD&E STUDY COMPLETE

The Florida Department of Transportation (FDOT), District One, on behalf of Manatee County, conducted a Project Development and Environment (PD&E) Study for a proposed shared use pathway through the City of Palmetto and Manatee County. The pathway is one of six transportation improvements proposed in Manatee County's BUILD* (now branded RAISE**) and T-HUD*** grant applications, known collectively as the Palmetto Trails Network Plan (PTNP). The purpose of the project is to reestablish multimodal, community connections throughout the City of Palmetto and Manatee County. Other goals of the project are to provide safe and viable travel options for the community to access area destinations and support quality of life and economic objectives of the surrounding area.

PROJECT OVERVIEW

The Palmetto Trails Network PD&E Study began in spring 2020 with an evaluation of the Middle Section, which includes trail connections between the Manatee County Area Transit Center, Palmetto Youth Center, Dr. Martin Luther King, Jr. Trail, Lincoln Memorial Middle School, and Lincoln Park (Coach Eddie Shannon Park). The Study also evaluated the Northern Section, which proposes trail connections between Coach Eddie Shannon Park and Washington Park through neighborhoods east of U.S. 41. In summer 2024, the Study expanded to include the Southern Section, extending the Study network from the Green Bridge at U.S. 41 Business to Connor Park and Dr. Martin Luther King, Jr. Park **(see Figure 1)**.

Originally focused on establishing the Middle and Northern Section trail alignments, the FDOT Study has since evolved to encompass nearly the entire network envisioned in Manatee County's federal grant applications. Once this Study is complete, Manatee County will take over the design, any right-of-way acquisition, and construction of the project. Following the County's successful T-HUD grant award, one of the first federally funded efforts is anticipated to be the design of key portions of the Middle Section near Lincoln Memorial Middle School, the Lincoln Tunnel, and Coach Eddie Shannon Park.

FOR MORE INFORMATION, CONTACT:

Michelle Rutishauser
FDOT Project Manager

Palmetto Trails Network PD&E Study
Florida Department of Transportation
Environmental Management Office
801 N. Broadway Avenue
Bartow, FL 33830

Michelle.Rutishauser@dot.state.fl.us

(813) 380-7121

For more information and to review all Engineering and Environmental documents developed during the Palmetto Trails Network PD&E Study please visit the project website at: swflroads.com/palmettotrailsnetwork

SCAN QR CODE TO VISIT PROJECT WEBSITE

***BUILD = Better Utilizing Investments to Leverage Development**

****RAISE = Rebuilding American Infrastructure with Sustainability and Equity**

***** T-HUD = Transportation, Housing and Urban Development**

The environmental review, consultation, and other actions required by applicable federal environmental laws for this project are being, or have been, carried out by FDOT pursuant to 23 U.S.C. §327 and a Memorandum of Understanding dated May 26, 2022 and executed by the Federal Highway Administration and FDOT.

The Palmetto Trails Network PD&E Study was conducted through three parallel efforts: preliminary engineering and design, environmental analysis, and an extensive public involvement program. Together, these efforts, and the valuable input provided by local agencies, community stakeholders, and residents, helped shape the recommended alignment and facility alternatives for the Northern, Middle, and Southern sections **(see Figures 2 - 4)**.

PUBLIC INVOLVEMENT

Middle and Northern Sections

In early 2021, FDOT hosted a series of neighborhood focus group meetings to introduce the Study and gather local input. Four outdoor meetings were held at community locations including Eternity Temple First Born Church of the Living God, Mt. Raymond Full Gospel Baptist Church, the Palmetto Youth Center, and Lincoln Park (Coach Eddie Shannon Park) along with a virtual meeting to enable broad participation.

Building on these discussions, local elected officials and community leaders organized a series of community meetings to help shape the Northern Section alignment. At these meetings, residents shared their vision for a trail network that would better connect neighborhoods, parks, schools, and community resources while creating new opportunities for local youth. A second community meeting, held in December 2021, included elected officials who voiced their support for the Palmetto Trails Network and highlighted the importance of creating a connected trail system that could eventually span the length of Manatee County.

FDOT then hosted an in-person public workshop in January 2022 at the Palmetto Youth Center, along with an online workshop, to present preliminary trail alternatives based on the community meetings' alignment. Attendees reviewed exhibits, shared feedback, and used interactive software to compare potential trail concepts in real time. Public input, combined with engineering and environmental analyses, helped shape the recommended Middle and Northern Section alignments.

Southern Section

When the Study expanded to include the Southern Section in summer 2024, the collaborative planning process continued with input from partner agencies and the public. FDOT worked closely with the City of Palmetto, Manatee County, and other partner agencies through numerous coordination meetings to develop feasible trail alignments and low stress shared roadways (i.e., traffic calming, shared bicycle markings on the roadway) with sidewalk improvements.

An in-person neighborhood focus group meeting was held in October 2024 at Sutton Park to present information about the Southern Section of the project. Later, a public workshop, held in-person at the Manatee County Fairgrounds in January 2025 and online, gave residents additional opportunities to review preliminary concepts and provide input. Feedback from the public, together with coordination meetings involving City of Palmetto leadership, City Commissioners, and Manatee County Public Works staff, helped shape the alignment of the Southern Section and its Recommended Alternatives.

RESULTS OF THE STUDY

Through close collaboration with local agencies, community organizations, and residents, the FDOT's Study advances a connected network of multi-use pathways and shared use roadways with sidewalks linking Connor Park in the south to Washington Park in the north. Along the way, the network will connect key community destinations and resources throughout the City of Palmetto and Manatee County. Following this study, Manatee County will take over the design, any right-of-way acquisition, and construction of the project. Detailed project information, such as typical sections, can be found on the project website at swflroads.com/palmettotrailsnetwork.



FIGURE 1 - Palmetto Trails Network PD&E Study Limits



FIGURE 2 - Northern Section Recommended Alternative



FIGURE 3 - Middle Section Recommended Alternative

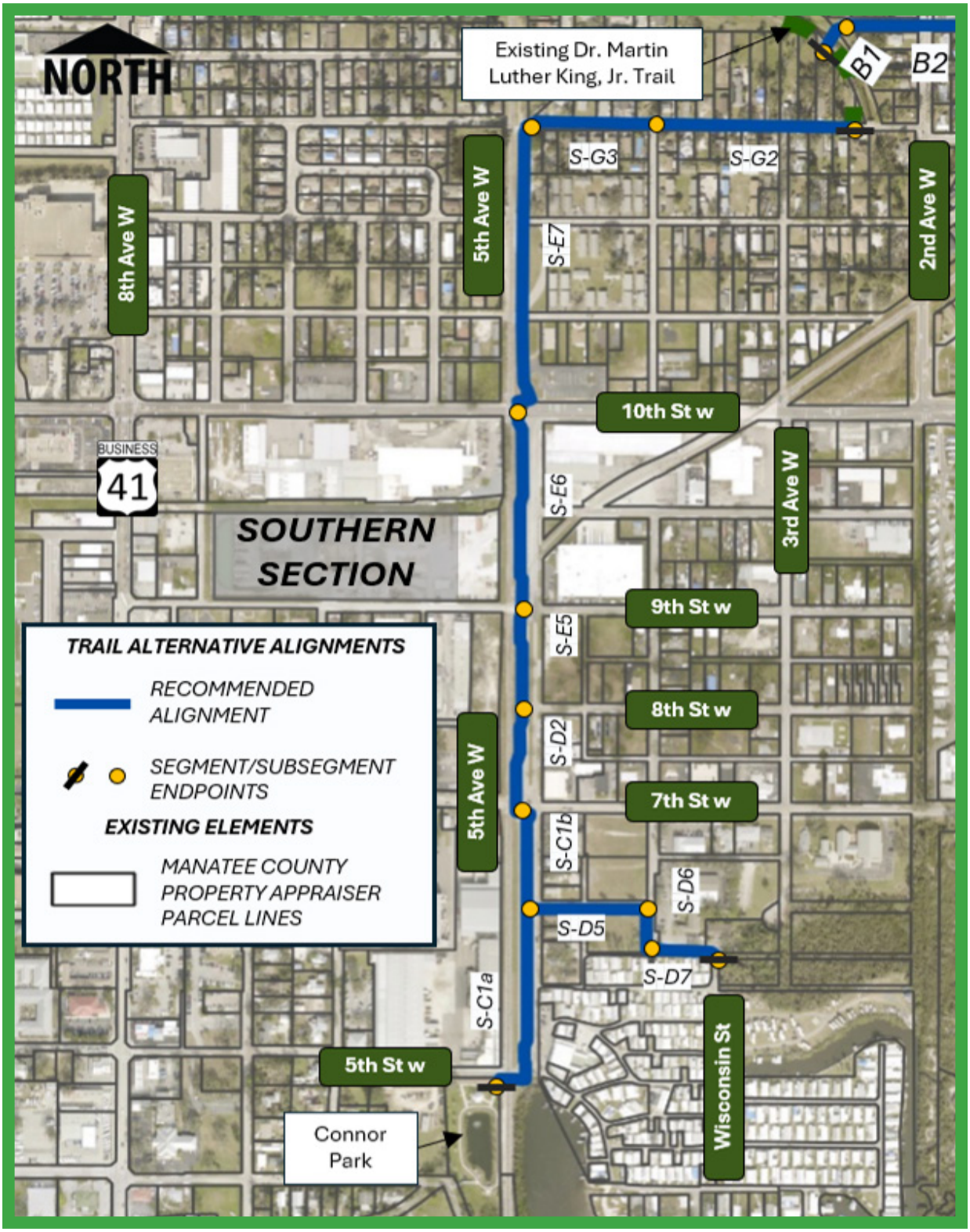


FIGURE 4 - Southern Section Recommended Alternative

APPENDIX C – TYPICAL SECTIONS

PROJECT CONTROLS

CONTEXT CLASSIFICATION

( )	C1 : NATURAL	( )	C3C : SUBURBAN COMM.
( )	C2 : RURAL	(X)	C4 : URBAN GENERAL
( )	C2T : RURAL TOWN	( )	C5 : URBAN CENTER
( )	C3R : SUBURBAN RES.	( )	C6 : URBAN CORE
( )	N/A : L.A. FACILITY		

FUNCTIONAL CLASSIFICATION

( )	INTERSTATE	( )	MAJOR COLLECTOR
( )	FREEWAY/EXPWY.	( )	MINOR COLLECTOR
( )	PRINCIPAL ARTERIAL	(X)	LOCAL
( )	MINOR ARTERIAL		

HIGHWAY SYSTEM

- ( ) NATIONAL HIGHWAY SYSTEM
- ( ) STRATEGIC INTERMODAL SYSTEM
- ( ) STATE HIGHWAY SYSTEM
- (X) OFF-STATE HIGHWAY SYSTEM

ACCESS CLASSIFICATION

- ( ) 1 - FREEWAY
- ( ) 2 - RESTRICTIVE w/Service Roads
- ( ) 3 - RESTRICTIVE w/660 ft. Connection Spacing
- ( ) 4 - NON-RESTRICTIVE w/2640 ft. Signal Spacing
- ( ) 5 - RESTRICTIVE w/440 ft. Connection Spacing
- ( ) 6 - NON-RESTRICTIVE w/1320 ft. Signal Spacing
- (X) 7 - BOTH MEDIAN TYPES

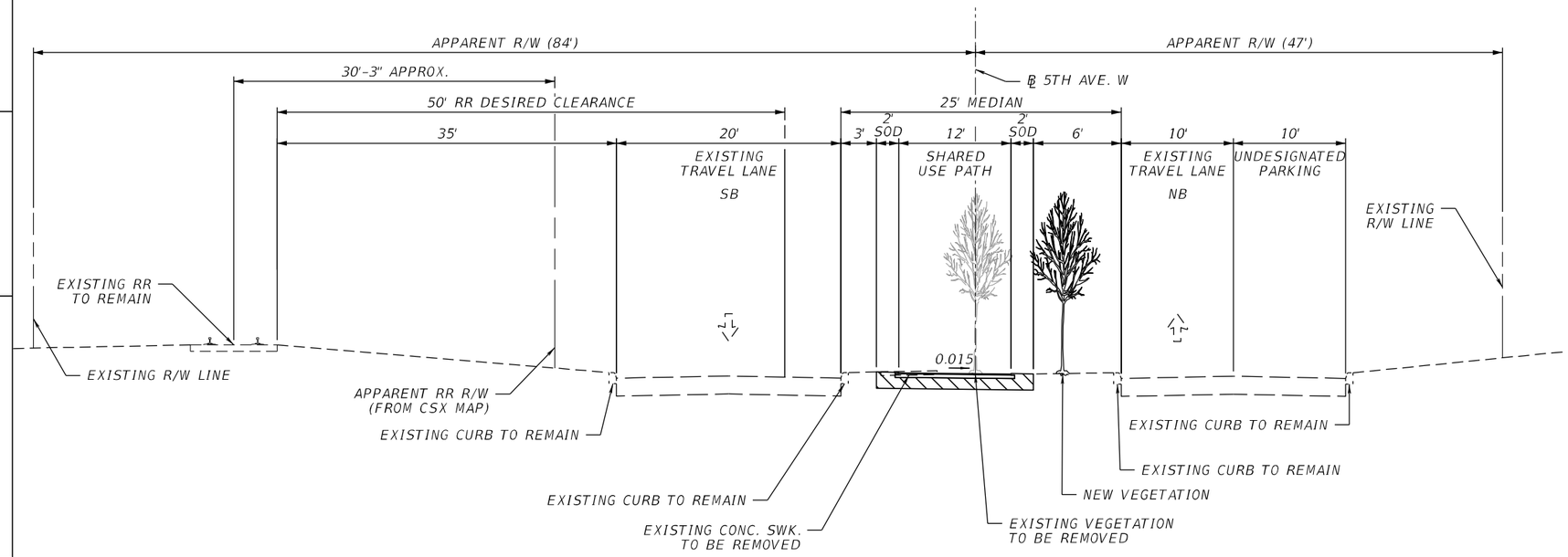
CRITERIA

- (X) NEW CONSTRUCTION / RECONSTRUCTION
- ( ) RESURFACING (LA FACILITIES)
- ( ) RRR (ARTERIALS & COLLECTORS)

POTENTIAL EXCEPTIONS AND VARIATIONS RELATED TO TYPICAL SECTION:

NONE

TYPICAL SECTION No. 3A-S



TYPICAL SECTION 3A-S
SEGMENT: S-C1a AND S-C1b
(NTS)

TRAFFIC DATA

POSTED SPEED 30 MPH

NOTES:

1. R/W LINES WERE OBTAINED FROM MANATEE COUNTY'S PROPERTY APPRAISER.
2. APPARENT RR R/W (FROM CSX MAP) OBTAINED FROM DOCUMENT RECIEVED FROM CSX.

FINANCIAL PROJECT ID	SHEET NO.
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PROJECT CONTROLS

CONTEXT CLASSIFICATION

( )	C1 : NATURAL	( )	C3C : SUBURBAN COMM.
( )	C2 : RURAL	(X)	C4 : URBAN GENERAL
( )	C2T : RURAL TOWN	( )	C5 : URBAN CENTER
( )	C3R : SUBURBAN RES.	( )	C6 : URBAN CORE
( )	N/A : L.A. FACILITY		

FUNCTIONAL CLASSIFICATION

( )	INTERSTATE	( )	MAJOR COLLECTOR
( )	FREEWAY/EXPWY.	( )	MINOR COLLECTOR
( )	PRINCIPAL ARTERIAL	(X)	LOCAL
( )	MINOR ARTERIAL		

HIGHWAY SYSTEM

( )	NATIONAL HIGHWAY SYSTEM
( )	STRATEGIC INTERMODAL SYSTEM
( )	STATE HIGHWAY SYSTEM
(X)	OFF-STATE HIGHWAY SYSTEM

ACCESS CLASSIFICATION

( )	1 - FREEWAY
( )	2 - RESTRICTIVE w/Service Roads
( )	3 - RESTRICTIVE w/660 ft. Connection Spacing
( )	4 - NON-RESTRICTIVE w/2640 ft. Signal Spacing
( )	5 - RESTRICTIVE w/440 ft. Connection Spacing
( )	6 - NON-RESTRICTIVE w/1320 ft. Signal Spacing
(X)	7 - BOTH MEDIAN TYPES

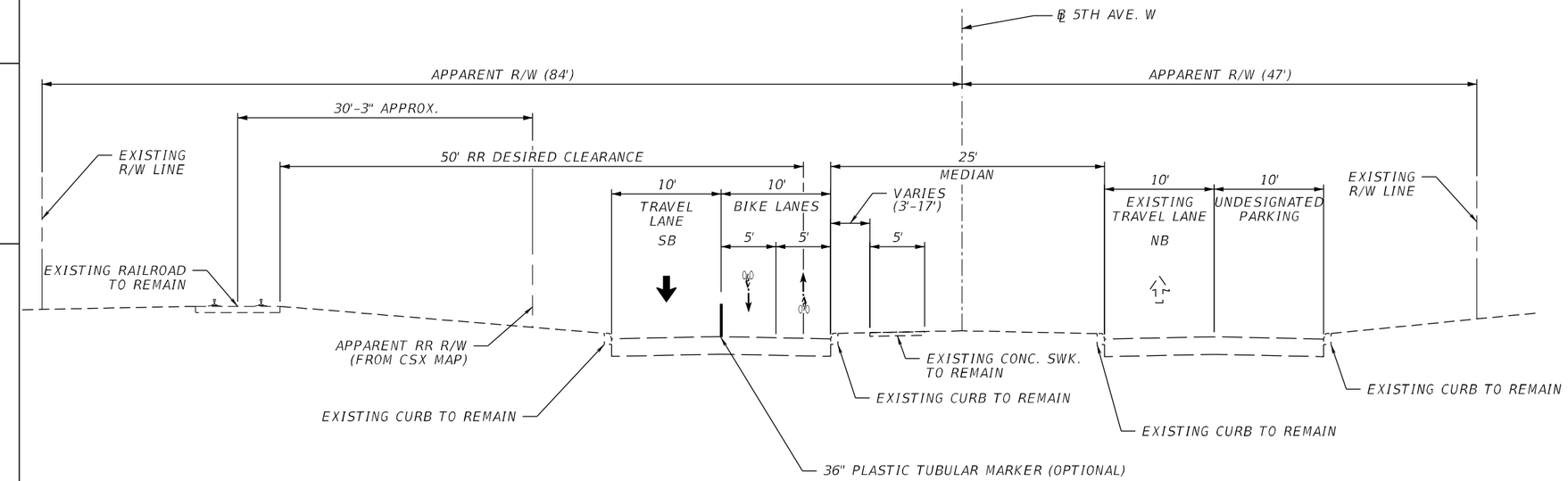
CRITERIA

(X)	NEW CONSTRUCTION / RECONSTRUCTION
( )	RESURFACING (LA FACILITIES)
( )	RRR (ARTERIALS & COLLECTORS)

POTENTIAL EXCEPTIONS AND VARIATIONS RELATED TO TYPICAL SECTION:

NONE

TYPICAL SECTION No. 3B-S



TYPICAL SECTION 3B-S
SEGMENT: S-C1a AND S-C1b
(NTS)

TRAFFIC DATA

POSTED SPEED 30 MPH

NOTES:

1. R/W LINES WERE OBTAINED FROM MANATEE COUNTY'S PROPERTY APPRAISER.
2. APPARENT RR R/W (FROM CSX MAP) OBTAINED FROM DOCUMENT RECIEVED FROM CSX.

FINANCIAL PROJECT ID	SHEET NO.
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PROJECT CONTROLS

CONTEXT CLASSIFICATION

( ) C1 : NATURAL
( ) C2 : RURAL
( ) C2T : RURAL TOWN
( ) C3R : SUBURBAN RES.
( ) C3C : SUBURBAN COMM.
(X) C4 : URBAN GENERAL
( ) C5 : URBAN CENTER
( ) C6 : URBAN CORE
( ) N/A : L.A. FACILITY

FUNCTIONAL CLASSIFICATION

( ) INTERSTATE
( ) FREEWAY/EXPWY.
( ) PRINCIPAL ARTERIAL
( ) MINOR ARTERIAL
( ) MAJOR COLLECTOR
( ) MINOR COLLECTOR
(X) LOCAL

HIGHWAY SYSTEM

( ) NATIONAL HIGHWAY SYSTEM
( ) STRATEGIC INTERMODAL SYSTEM
( ) STATE HIGHWAY SYSTEM
(X) OFF-STATE HIGHWAY SYSTEM

ACCESS CLASSIFICATION

( ) 1 - FREEWAY
( ) 2 - RESTRICTIVE w/Service Roads
( ) 3 - RESTRICTIVE w/660 ft. Connection Spacing
( ) 4 - NON-RESTRICTIVE w/2640 ft. Signal Spacing
( ) 5 - RESTRICTIVE w/440 ft. Connection Spacing
( ) 6 - NON-RESTRICTIVE w/1320 ft. Signal Spacing
(X) 7 - BOTH MEDIAN TYPES

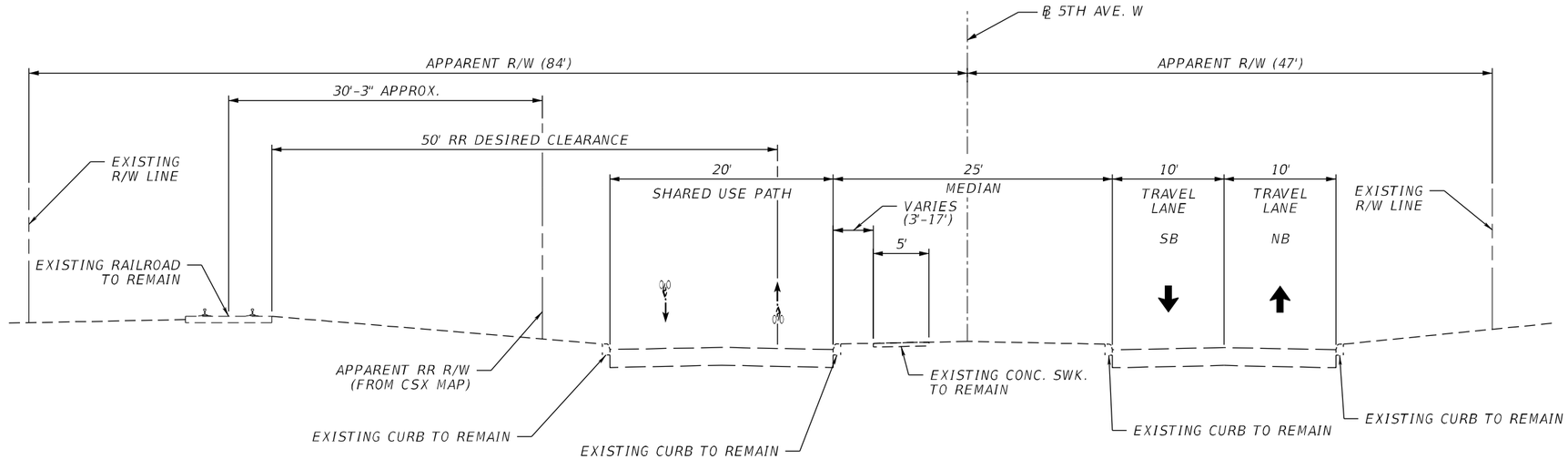
CRITERIA

(X) NEW CONSTRUCTION / RECONSTRUCTION
( ) RESURFACING (LA FACILITIES)
( ) RRR (ARTERIALS & COLLECTORS)

POTENTIAL EXCEPTIONS AND VARIATIONS RELATED TO TYPICAL SECTION:

NONE

TYPICAL SECTION No. 3C-S



TYPICAL SECTION 3C-S
SEGMENT: S-C1a AND S-C1b
(NTS)

TRAFFIC DATA

POSTED SPEED 30 MPH

NOTES:

1. R/W LINES WERE OBTAINED FROM MANATEE COUNTY'S PROPERTY APPRAISER.
2. APPARENT RR R/W (FROM CSX MAP) OBTAINED FROM DOCUMENT RECIEVED FROM CSX.

FINANCIAL PROJECT ID	SHEET NO.
444857-1-22-01	4

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PROJECT CONTROLS

CONTEXT CLASSIFICATION

( )	C1 : NATURAL	( )	C3C : SUBURBAN COMM.
( )	C2 : RURAL	(X)	C4 : URBAN GENERAL
( )	C2T : RURAL TOWN	( )	C5 : URBAN CENTER
( )	C3R : SUBURBAN RES.	( )	C6 : URBAN CORE
( )	N/A : L.A. FACILITY		

FUNCTIONAL CLASSIFICATION

( )	INTERSTATE	( )	MAJOR COLLECTOR
( )	FREEWAY/EXPWY.	( )	MINOR COLLECTOR
( )	PRINCIPAL ARTERIAL	(X)	LOCAL
( )	MINOR ARTERIAL		

HIGHWAY SYSTEM

( ) NATIONAL HIGHWAY SYSTEM
( ) STRATEGIC INTERMODAL SYSTEM
( ) STATE HIGHWAY SYSTEM
(X) OFF-STATE HIGHWAY SYSTEM

ACCESS CLASSIFICATION

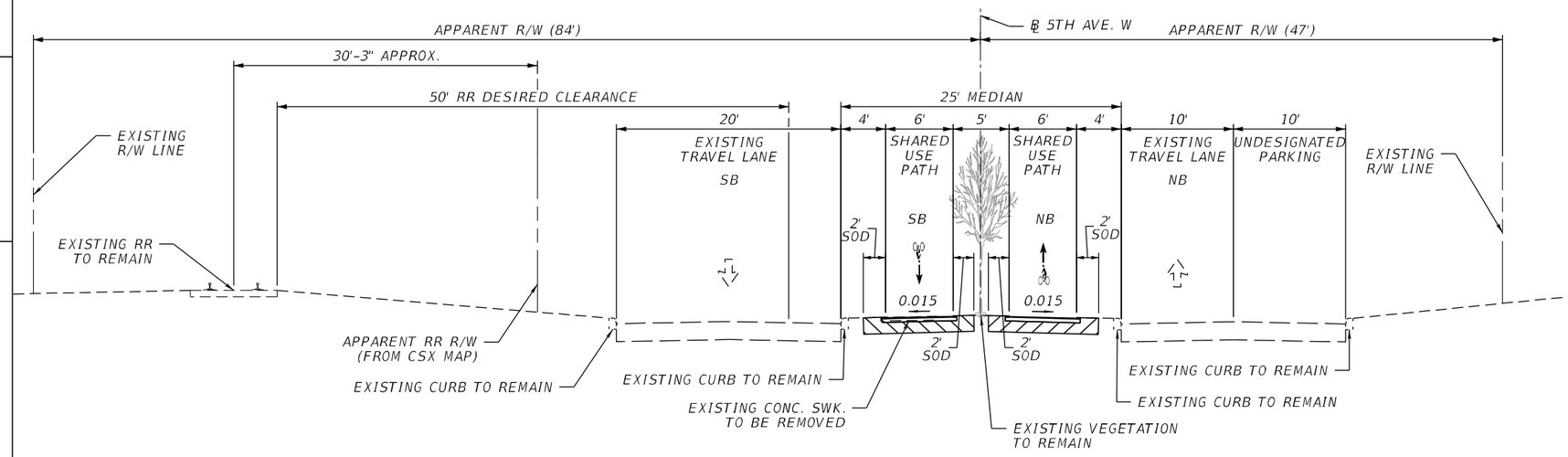
( ) 1 - FREEWAY
( ) 2 - RESTRICTIVE w/Service Roads
( ) 3 - RESTRICTIVE w/660 ft. Connection Spacing
( ) 4 - NON-RESTRICTIVE w/2640 ft. Signal Spacing
( ) 5 - RESTRICTIVE w/440 ft. Connection Spacing
( ) 6 - NON-RESTRICTIVE w/1320 ft. Signal Spacing
(X) 7 - BOTH MEDIAN TYPES

CRITERIA

(X) NEW CONSTRUCTION / RECONSTRUCTION
( ) RESURFACING (LA FACILITIES)
( ) RRR (ARTERIALS & COLLECTORS)

POTENTIAL EXCEPTIONS AND VARIATIONS RELATED TO TYPICAL SECTION:

TYPICAL SECTION No. 3D-S



TYPICAL SECTION 3D-S
SEGMENT: S-C1a AND S-C1b
(NTS)

TRAFFIC DATA

POSTED SPEED 30 MPH

NOTES:

1. R/W LINES WERE OBTAINED FROM MANATEE COUNTY'S PROPERTY APPRAISER.
2. APPARENT RR R/W (FROM CSX MAP) OBTAINED FROM DOCUMENT RECIEVED FROM CSX.

FINANCIAL PROJECT ID	SHEET NO.
444857-1-22-01	5

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PROJECT CONTROLS

CONTEXT CLASSIFICATION

( ) C1 : NATURAL
( ) C2 : RURAL
( ) C2T : RURAL TOWN
( ) C3R : SUBURBAN RES.
( ) C3C : SUBURBAN COMM.
(X) C4 : URBAN GENERAL
( ) C5 : URBAN CENTER
( ) C6 : URBAN CORE
( ) N/A : L.A. FACILITY

FUNCTIONAL CLASSIFICATION

( ) INTERSTATE
( ) FREEWAY/EXPWY.
( ) PRINCIPAL ARTERIAL
( ) MINOR ARTERIAL
( ) MAJOR COLLECTOR
( ) MINOR COLLECTOR
(X) LOCAL

HIGHWAY SYSTEM

( ) NATIONAL HIGHWAY SYSTEM
( ) STRATEGIC INTERMODAL SYSTEM
( ) STATE HIGHWAY SYSTEM
(X) OFF-STATE HIGHWAY SYSTEM

ACCESS CLASSIFICATION

( ) 1 - FREEWAY
( ) 2 - RESTRICTIVE w/Service Roads
( ) 3 - RESTRICTIVE w/660 ft. Connection Spacing
( ) 4 - NON-RESTRICTIVE w/2640 ft. Signal Spacing
( ) 5 - RESTRICTIVE w/440 ft. Connection Spacing
( ) 6 - NON-RESTRICTIVE w/1320 ft. Signal Spacing
(X) 7 - BOTH MEDIAN TYPES

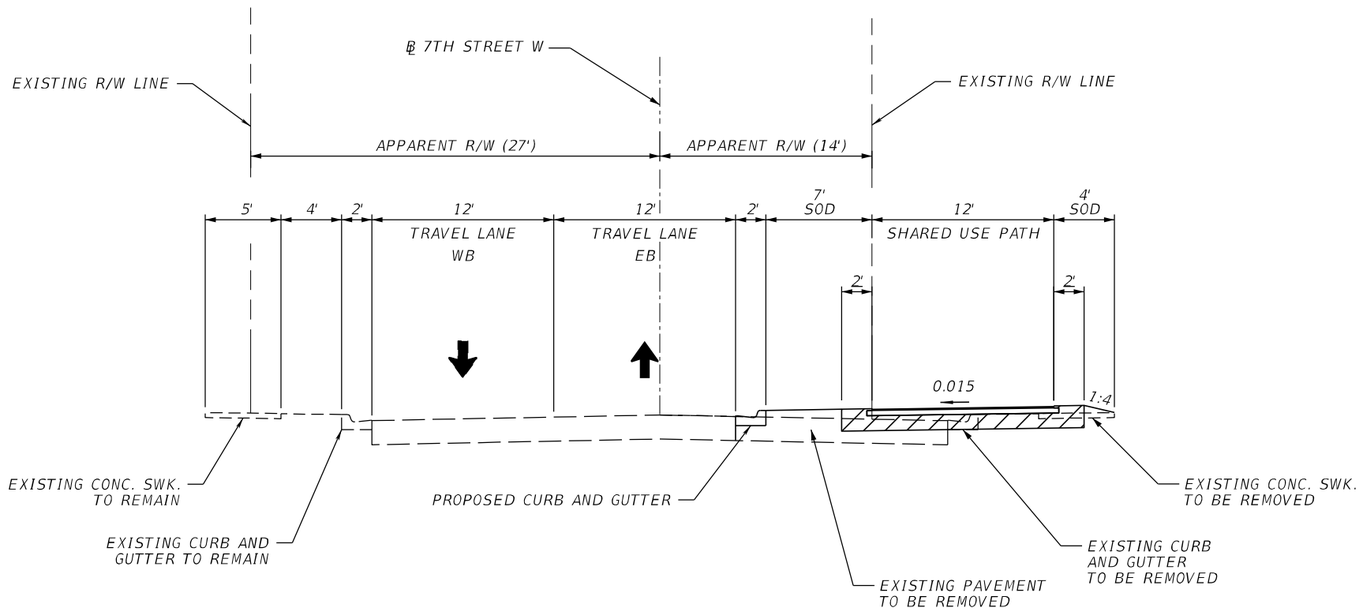
CRITERIA

(X) NEW CONSTRUCTION / RECONSTRUCTION
( ) RESURFACING (LA FACILITIES)
( ) RRR (ARTERIALS & COLLECTORS)

POTENTIAL EXCEPTIONS AND VARIATIONS RELATED TO TYPICAL SECTION:

NONE

TYPICAL SECTION No. 4A-S



TYPICAL SECTION 4A-S
SEGMENT: S-D1a AND S-D1b
(NTS)

TRAFFIC DATA

POSTED SPEED 35 MPH

NOTES:

1. TYPICAL SECTION PROPOSED IMPROVEMENTS DEVELOPED FROM THE BACK OF EXISTING SIDEWALK.
2. R/W LINES WERE OBTAINED FROM MANATEE COUNTY'S PROPERTY APPRAISER AND DEPICTED AT THE WIDEST LOCATIONS. ACTUAL R/W NEEDED TO DETERMINE IF ADDITIONAL R/W IS REQUIRED TO IMPLEMENT TYPICAL SECTION.
3. DEPENDANT ON EXISTING R/W WIDTHS, THE SHARED USE PATH COULD BE LOCATED ON THE OPPOSITE SIDE OF THE ROADWAY.
4. EXISTING TWO-WAY LEFT TURN LANE WILL BE REMOVED.
5. A LANE REPURPOSING STUDY WILL NEED TO BE CONDUCTED TO IMPLEMENT THIS TYPICAL SECTION.

FINANCIAL PROJECT ID	SHEET NO.
444857-1-22-01	6

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PROJECT CONTROLS

CONTEXT CLASSIFICATION

( )	C1 : NATURAL	( )	C3C : SUBURBAN COMM.
( )	C2 : RURAL	(X)	C4 : URBAN GENERAL
( )	C2T : RURAL TOWN	( )	C5 : URBAN CENTER
( )	C3R : SUBURBAN RES.	( )	C6 : URBAN CORE
( )	N/A : L.A. FACILITY		

FUNCTIONAL CLASSIFICATION

( )	INTERSTATE	( )	MAJOR COLLECTOR
( )	FREEWAY/EXPWY.	( )	MINOR COLLECTOR
( )	PRINCIPAL ARTERIAL	(X)	LOCAL
( )	MINOR ARTERIAL		

HIGHWAY SYSTEM

( )	NATIONAL HIGHWAY SYSTEM
( )	STRATEGIC INTERMODAL SYSTEM
( )	STATE HIGHWAY SYSTEM
(X)	OFF-STATE HIGHWAY SYSTEM

ACCESS CLASSIFICATION

( )	1 - FREEWAY
( )	2 - RESTRICTIVE w/Service Roads
( )	3 - RESTRICTIVE w/660 ft. Connection Spacing
( )	4 - NON-RESTRICTIVE w/2640 ft. Signal Spacing
( )	5 - RESTRICTIVE w/440 ft. Connection Spacing
( )	6 - NON-RESTRICTIVE w/1320 ft. Signal Spacing
(X)	7 - BOTH MEDIAN TYPES

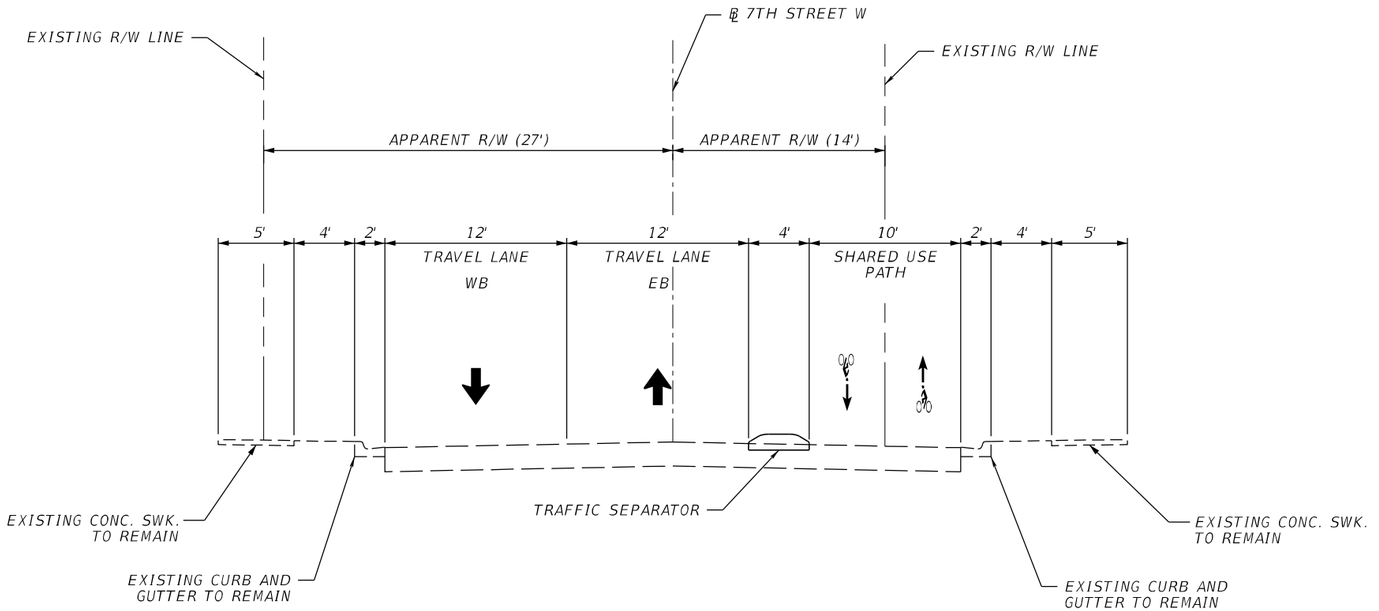
CRITERIA

(X)	NEW CONSTRUCTION / RECONSTRUCTION
( )	RESURFACING (LA FACILITIES)
( )	RRR (ARTERIALS & COLLECTORS)

POTENTIAL EXCEPTIONS AND VARIATIONS RELATED TO TYPICAL SECTION:

NONE

TYPICAL SECTION No. 4B-S



TYPICAL SECTION 4B-S
SEGMENT: S-D1a AND S-D1b
(NTS)

TRAFFIC DATA

POSTED SPEED 35 MPH

NOTES:

1. R/W LINES WERE OBTAINED FROM MANATEE COUNTY'S PROPERTY APPRAISER AND DEPICTED AT THE WIDEST LOCATIONS. ACTUAL R/W NEEDED TO DETERMINE IF ADDITIONAL R/W IS REQUIRED TO IMPLEMENT TYPICAL SECTION.
2. EXISTING TWO-WAY LEFT TURN LANE TO BE REMOVED.
3. TRAFFIC SEPARATOR WILL BE DESIGNED TO ACCOMMODATE EXISTING DRIVEWAYS AND PAVEMENT SURFACE DRAINAGE.
4. A LANE REPURPOSING STUDY WILL NEED TO BE CONDUCTED TO IMPLEMENT THIS TYPICAL SECTION.

FINANCIAL PROJECT ID	SHEET NO.
444857-1-22-01	7

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PROJECT CONTROLS

CONTEXT CLASSIFICATION

( ) C1 : NATURAL
( ) C2 : RURAL
( ) C2T : RURAL TOWN
( ) C3R : SUBURBAN RES.
( ) C3C : SUBURBAN COMM.
(X) C4 : URBAN GENERAL
( ) C5 : URBAN CENTER
( ) C6 : URBAN CORE
( ) N/A : L.A. FACILITY

FUNCTIONAL CLASSIFICATION

( ) INTERSTATE
( ) FREEWAY/EXPWY.
( ) PRINCIPAL ARTERIAL
( ) MINOR ARTERIAL
( ) MAJOR COLLECTOR
( ) MINOR COLLECTOR
(X) LOCAL

HIGHWAY SYSTEM

( ) NATIONAL HIGHWAY SYSTEM
( ) STRATEGIC INTERMODAL SYSTEM
( ) STATE HIGHWAY SYSTEM
(X) OFF-STATE HIGHWAY SYSTEM

ACCESS CLASSIFICATION

( ) 1 - FREEWAY
( ) 2 - RESTRICTIVE w/Service Roads
( ) 3 - RESTRICTIVE w/660 ft. Connection Spacing
( ) 4 - NON-RESTRICTIVE w/2640 ft. Signal Spacing
( ) 5 - RESTRICTIVE w/440 ft. Connection Spacing
( ) 6 - NON-RESTRICTIVE w/1320 ft. Signal Spacing
(X) 7 - BOTH MEDIAN TYPES

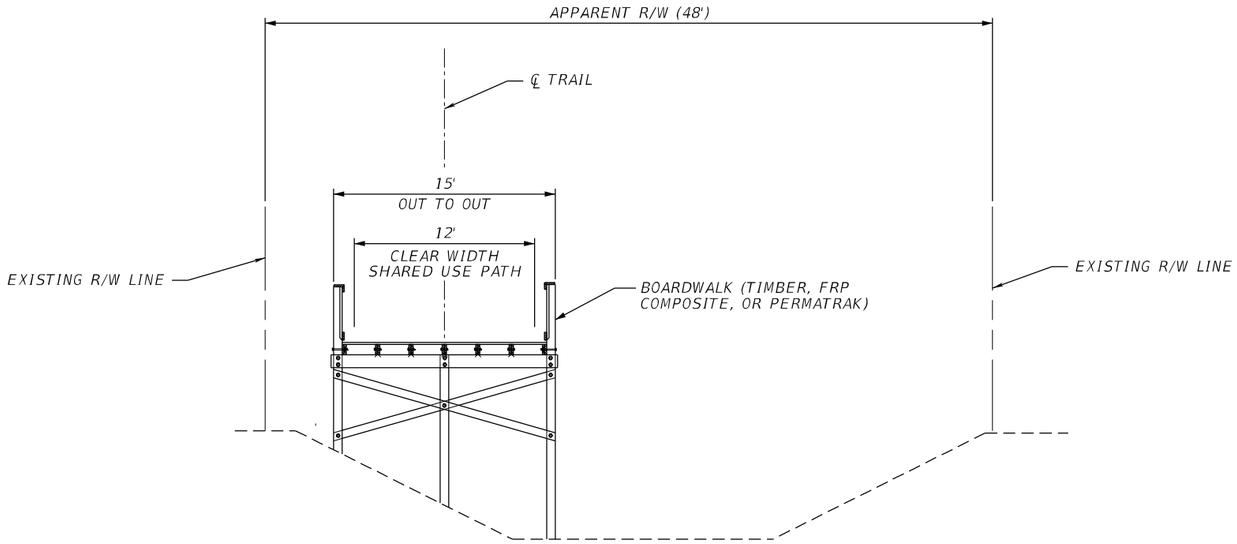
CRITERIA

(X) NEW CONSTRUCTION / RECONSTRUCTION
( ) RESURFACING (LA FACILITIES)
( ) RRR (ARTERIALS & COLLECTORS)

POTENTIAL EXCEPTIONS AND VARIATIONS RELATED TO TYPICAL SECTION:

NONE

TYPICAL SECTION No. 5A-S



TYPICAL SECTION 5A-S
SEGMENT: S-E1a AND S-E1b
(NTS)

FINANCIAL PROJECT ID	SHEET NO.
444857-1-22-01	8

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PROJECT CONTROLS

CONTEXT CLASSIFICATION

( ) C1 : NATURAL
( ) C2 : RURAL
( ) C2T : RURAL TOWN
( ) C3R : SUBURBAN RES.
( ) C3C : SUBURBAN COMM.
(X) C4 : URBAN GENERAL
( ) C5 : URBAN CENTER
( ) C6 : URBAN CORE
( ) N/A : L.A. FACILITY

FUNCTIONAL CLASSIFICATION

( ) INTERSTATE
( ) FREEWAY/EXPWY.
( ) PRINCIPAL ARTERIAL
( ) MINOR ARTERIAL
( ) MAJOR COLLECTOR
( ) MINOR COLLECTOR
(X) LOCAL

HIGHWAY SYSTEM

( ) NATIONAL HIGHWAY SYSTEM
( ) STRATEGIC INTERMODAL SYSTEM
( ) STATE HIGHWAY SYSTEM
(X) OFF-STATE HIGHWAY SYSTEM

ACCESS CLASSIFICATION

( ) 1 - FREEWAY
( ) 2 - RESTRICTIVE w/Service Roads
( ) 3 - RESTRICTIVE w/660 ft. Connection Spacing
( ) 4 - NON-RESTRICTIVE w/2640 ft. Signal Spacing
( ) 5 - RESTRICTIVE w/440 ft. Connection Spacing
( ) 6 - NON-RESTRICTIVE w/1320 ft. Signal Spacing
(X) 7 - BOTH MEDIAN TYPES

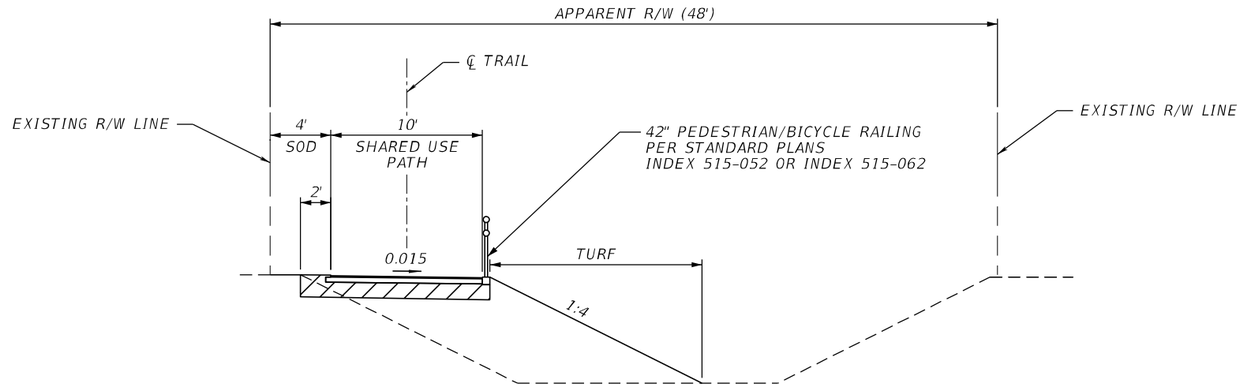
CRITERIA

(X) NEW CONSTRUCTION / RECONSTRUCTION
( ) RESURFACING (LA FACILITIES)
( ) RRR (ARTERIALS & COLLECTORS)

POTENTIAL EXCEPTIONS AND VARIATIONS RELATED TO TYPICAL SECTION:

NONE

TYPICAL SECTION No. 5B-S



TYPICAL SECTION 5B-S
SEGMENT: S-E1a AND S-E1b
(NTS)

NOTE:

1. SWALE WIDTH ANTICIPATED TO MATCH MIDDLE AND NORTHERN SECTIONS.
2. CANAL/DITCH WOULD NEED TO BE RESHAPED TO MAINTAIN VOLUME/CONVEYANCE.

FINANCIAL PROJECT ID	SHEET NO.
444857-1-22-01	9

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PROJECT CONTROLS

CONTEXT CLASSIFICATION

( ) C1 : NATURAL
( ) C2 : RURAL
( ) C2T : RURAL TOWN
( ) C3R : SUBURBAN RES.
( ) C3C : SUBURBAN COMM.
(X) C4 : URBAN GENERAL
( ) C5 : URBAN CENTER
( ) C6 : URBAN CORE
( ) N/A : L.A. FACILITY

FUNCTIONAL CLASSIFICATION

( ) INTERSTATE
( ) FREEWAY/EXPWY.
( ) PRINCIPAL ARTERIAL
( ) MINOR ARTERIAL
( ) MAJOR COLLECTOR
( ) MINOR COLLECTOR
(X) LOCAL

HIGHWAY SYSTEM

( ) NATIONAL HIGHWAY SYSTEM
( ) STRATEGIC INTERMODAL SYSTEM
( ) STATE HIGHWAY SYSTEM
(X) OFF-STATE HIGHWAY SYSTEM

ACCESS CLASSIFICATION

( ) 1 - FREEWAY
( ) 2 - RESTRICTIVE w/Service Roads
( ) 3 - RESTRICTIVE w/660 ft. Connection Spacing
( ) 4 - NON-RESTRICTIVE w/2640 ft. Signal Spacing
( ) 5 - RESTRICTIVE w/440 ft. Connection Spacing
( ) 6 - NON-RESTRICTIVE w/1320 ft. Signal Spacing
(X) 7 - BOTH MEDIAN TYPES

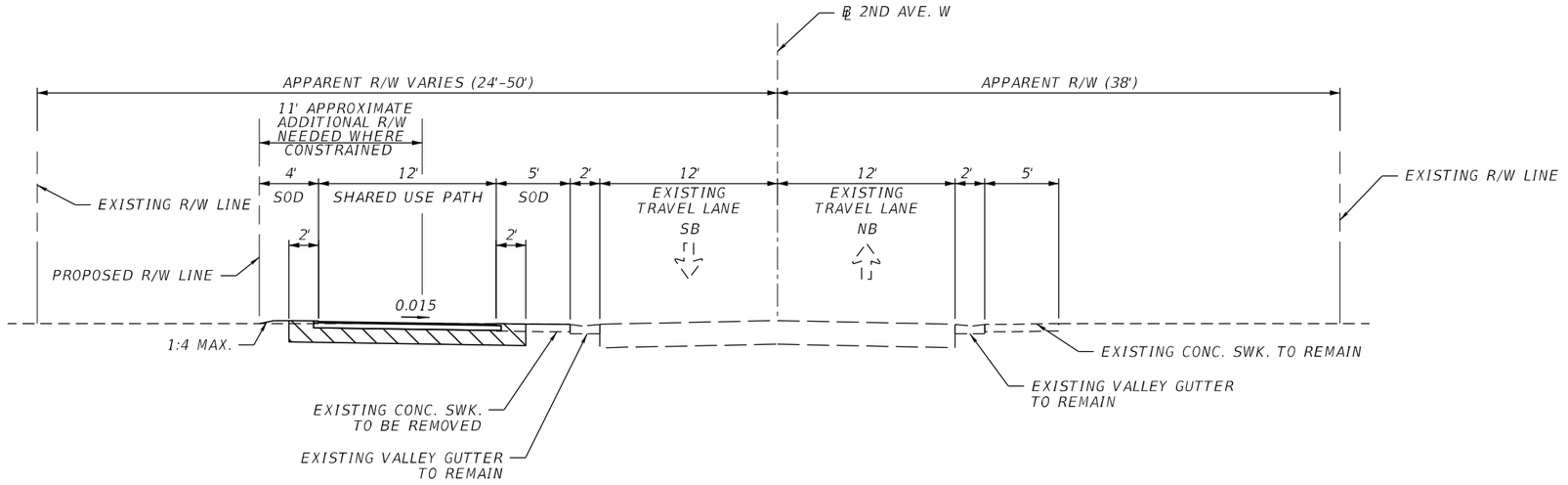
CRITERIA

(X) NEW CONSTRUCTION / RECONSTRUCTION
( ) RESURFACING (LA FACILITIES)
( ) RRR (ARTERIALS & COLLECTORS)

POTENTIAL EXCEPTIONS AND VARIATIONS RELATED TO TYPICAL SECTION:

NONE

TYPICAL SECTION No. 6A-S



TYPICAL SECTION 6A-S

SEGMENT: S-F1
(NTS)

TRAFFIC DATA:

POSTED SPEED 25 MPH

NOTES:

1. R/W DEPICTED AT THE WIDEST LOCATIONS. ADDITIONAL R/W MAY BE REQUIRED TO IMPLEMENT TYPICAL SECTION.
2. R/W LINES WERE OBTAINED FROM MANATEE COUNTY'S PROPERTY APPRAISER.
3. DEPENDANT ON EXISTING R/W WIDTHS, THE SHARED USE PATH COULD BE LOCATED ON THE OPPOSITE SIDE OF THE ROADWAY.

FINANCIAL PROJECT ID	SHEET NO.
444857-1-22-01	10

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PROJECT CONTROLS

CONTEXT CLASSIFICATION

( )	C1 : NATURAL	( )	C3C : SUBURBAN COMM.
( )	C2 : RURAL	(X)	C4 : URBAN GENERAL
( )	C2T : RURAL TOWN	( )	C5 : URBAN CENTER
( )	C3R : SUBURBAN RES.	( )	C6 : URBAN CORE
( )	N/A : L.A. FACILITY		

FUNCTIONAL CLASSIFICATION

( )	INTERSTATE	( )	MAJOR COLLECTOR
( )	FREEWAY/EXPWY.	( )	MINOR COLLECTOR
( )	PRINCIPAL ARTERIAL	(X)	LOCAL
( )	MINOR ARTERIAL		

HIGHWAY SYSTEM

( ) NATIONAL HIGHWAY SYSTEM
( ) STRATEGIC INTERMODAL SYSTEM
( ) STATE HIGHWAY SYSTEM
(X) OFF-STATE HIGHWAY SYSTEM

ACCESS CLASSIFICATION

( ) 1 - FREEWAY
( ) 2 - RESTRICTIVE w/Service Roads
( ) 3 - RESTRICTIVE w/660 ft. Connection Spacing
( ) 4 - NON-RESTRICTIVE w/2640 ft. Signal Spacing
( ) 5 - RESTRICTIVE w/440 ft. Connection Spacing
( ) 6 - NON-RESTRICTIVE w/1320 ft. Signal Spacing
(X) 7 - BOTH MEDIAN TYPES

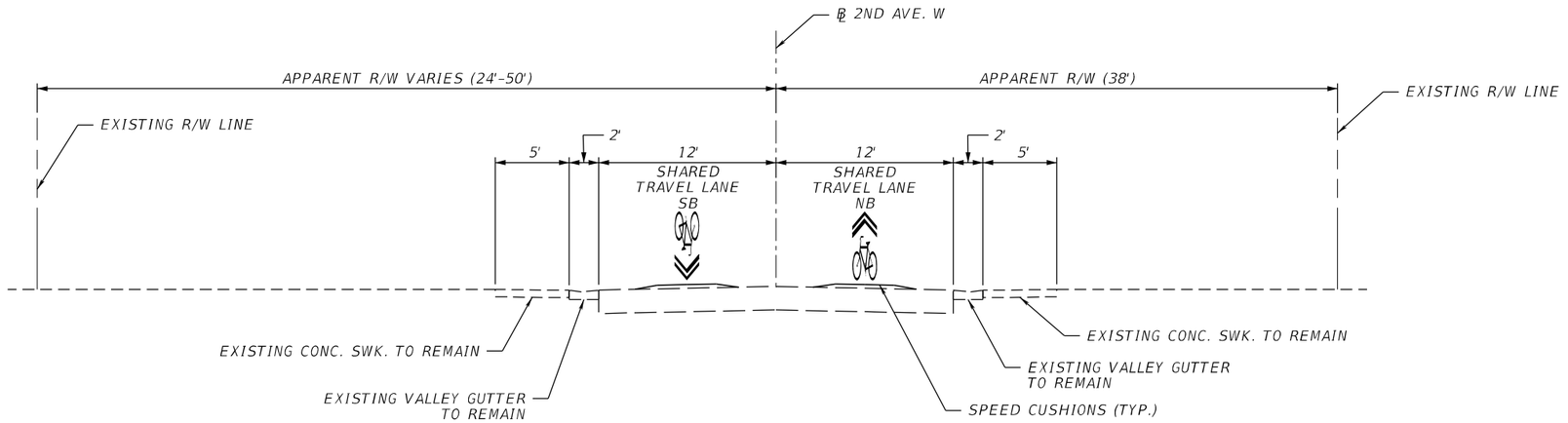
CRITERIA

(X) NEW CONSTRUCTION / RECONSTRUCTION
( ) RESURFACING (LA FACILITIES)
( ) RRR (ARTERIALS & COLLECTORS)

POTENTIAL EXCEPTIONS AND VARIATIONS RELATED TO TYPICAL SECTION:

NONE

TYPICAL SECTION No. 6B-S



TYPICAL SECTION 6B-S

SEGMENT: S-F1
(NTS)

TRAFFIC DATA:

POSTED SPEED 25 MPH

NOTES:

1. R/W DEPICTED AT THE WIDEST LOCATIONS. ADDITIONAL R/W MAY BE REQUIRED TO IMPLEMENT TYPICAL SECTION.
2. R/W LINES WERE OBTAINED FROM MANATEE COUNTY'S PROPERTY APPRAISER.

FINANCIAL PROJECT ID	SHEET NO.
444857-1-22-01	11

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PROJECT CONTROLS

CONTEXT CLASSIFICATION

( ) C1 : NATURAL
( ) C2 : RURAL
( ) C2T : RURAL TOWN
( ) C3R : SUBURBAN RES.
( ) C3C : SUBURBAN COMM.
(X) C4 : URBAN GENERAL
( ) C5 : URBAN CENTER
( ) C6 : URBAN CORE
( ) N/A : L.A. FACILITY

FUNCTIONAL CLASSIFICATION

( ) INTERSTATE
( ) FREEWAY/EXPWY.
( ) PRINCIPAL ARTERIAL
( ) MINOR ARTERIAL
( ) MAJOR COLLECTOR
( ) MINOR COLLECTOR
(X) LOCAL

HIGHWAY SYSTEM

( ) NATIONAL HIGHWAY SYSTEM
( ) STRATEGIC INTERMODAL SYSTEM
( ) STATE HIGHWAY SYSTEM
(X) OFF-STATE HIGHWAY SYSTEM

ACCESS CLASSIFICATION

( ) 1 - FREEWAY
( ) 2 - RESTRICTIVE w/Service Roads
( ) 3 - RESTRICTIVE w/660 ft. Connection Spacing
( ) 4 - NON-RESTRICTIVE w/2640 ft. Signal Spacing
( ) 5 - RESTRICTIVE w/440 ft. Connection Spacing
( ) 6 - NON-RESTRICTIVE w/1320 ft. Signal Spacing
(X) 7 - BOTH MEDIAN TYPES

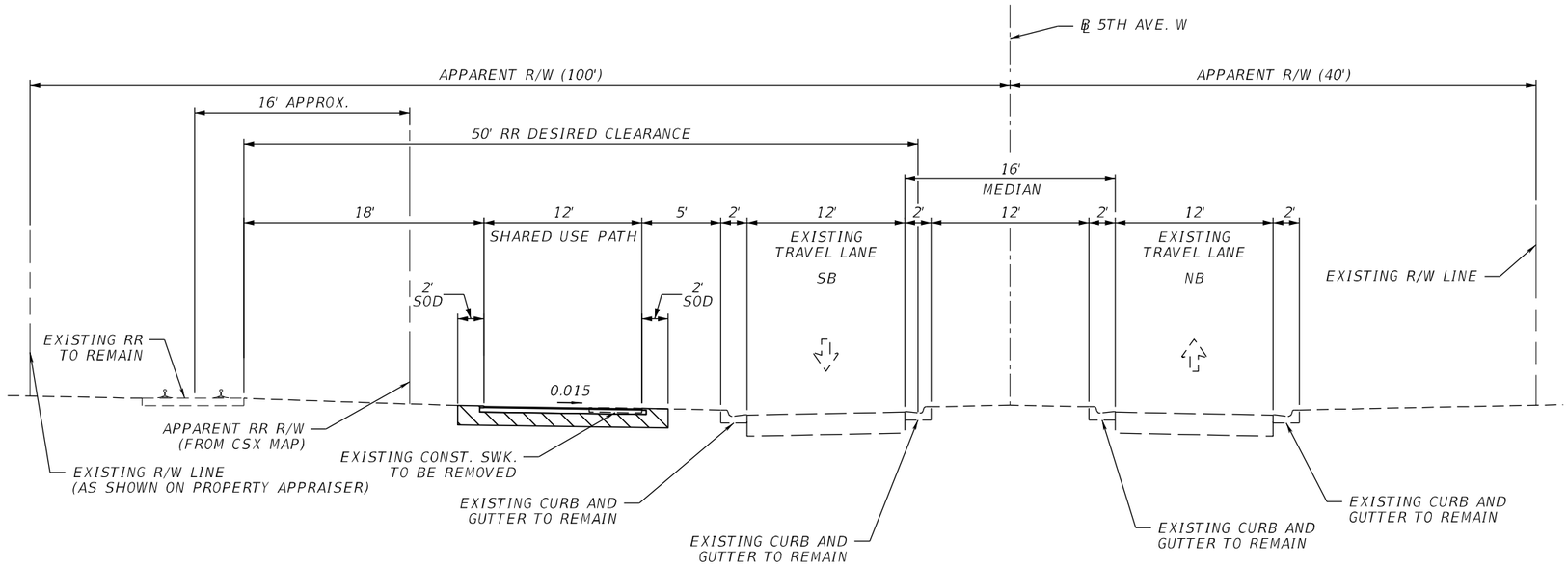
CRITERIA

(X) NEW CONSTRUCTION / RECONSTRUCTION
( ) RESURFACING (LA FACILITIES)
( ) RRR (ARTERIALS & COLLECTORS)

POTENTIAL EXCEPTIONS AND VARIATIONS RELATED TO TYPICAL SECTION:

VARIATION FOR RR 50' CLEARANCE REQUIREMENT
(SIDEWALK CURRENTLY WITHIN CLEARANCE)

TYPICAL SECTION No. 7-S



TYPICAL SECTION 7-S

SEGMENT: S-D2 AND S-E6
(NTS)

TRAFFIC DATA:

POSTED SPEED 30 MPH

NOTES:

1. R/W LINES WERE OBTAINED FROM MANATEE COUNTY'S PROPERTY APPRAISER.
2. APPARENT RR R/W (FROM CXS MAP) OBTAINED FROM DOCUMENT RECIEVED FROM CXS.

FINANCIAL PROJECT ID	SHEET NO.
444857-1-22-01	12

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PROJECT CONTROLS

CONTEXT CLASSIFICATION

( )	C1 : NATURAL	( )	C3C : SUBURBAN COMM.
( )	C2 : RURAL	(X)	C4 : URBAN GENERAL
( )	C2T : RURAL TOWN	( )	C5 : URBAN CENTER
( )	C3R : SUBURBAN RES.	( )	C6 : URBAN CORE
( )	N/A : L.A. FACILITY		

FUNCTIONAL CLASSIFICATION

( )	INTERSTATE	( )	MAJOR COLLECTOR
( )	FREEWAY/EXPWY.	( )	MINOR COLLECTOR
( )	PRINCIPAL ARTERIAL	(X)	LOCAL
( )	MINOR ARTERIAL		

HIGHWAY SYSTEM

( ) NATIONAL HIGHWAY SYSTEM
( ) STRATEGIC INTERMODAL SYSTEM
( ) STATE HIGHWAY SYSTEM
(X) OFF-STATE HIGHWAY SYSTEM

ACCESS CLASSIFICATION

( ) 1 - FREEWAY
( ) 2 - RESTRICTIVE w/Service Roads
( ) 3 - RESTRICTIVE w/660 ft. Connection Spacing
( ) 4 - NON-RESTRICTIVE w/2640 ft. Signal Spacing
( ) 5 - RESTRICTIVE w/440 ft. Connection Spacing
( ) 6 - NON-RESTRICTIVE w/1320 ft. Signal Spacing
(X) 7 - BOTH MEDIAN TYPES

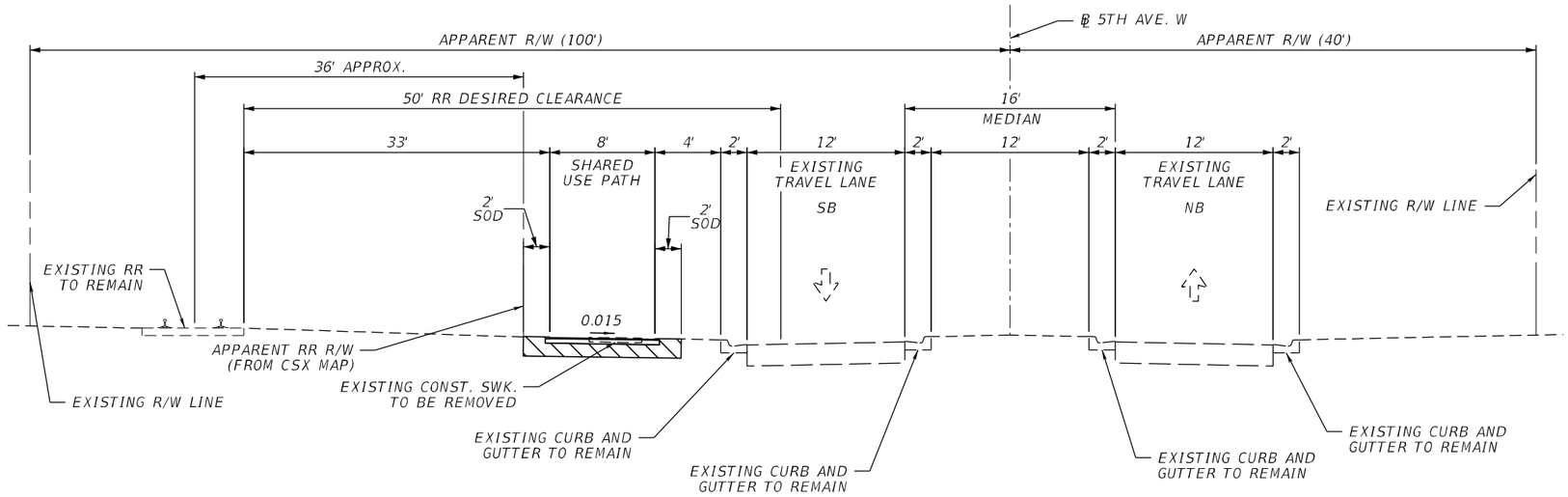
CRITERIA

(X) NEW CONSTRUCTION / RECONSTRUCTION
( ) RESURFACING (LA FACILITIES)
( ) RRR (ARTERIALS & COLLECTORS)

POTENTIAL EXCEPTIONS AND VARIATIONS RELATED TO TYPICAL SECTION:

VARIATION FOR RR 50' CLEARANCE REQUIREMENT
(SIDEWALK CURRENTLY WITHIN CLEARANCE)

TYPICAL SECTION No. 8-S



TYPICAL SECTION 8-S

SEGMENT: S-E5
(NTS)

TRAFFIC DATA:

POSTED SPEED 30 MPH

NOTES:

1. R/W LINES WERE OBTAINED FROM MANATEE COUNTY'S PROPERTY APPRAISER.
2. APPARENT RR R/W (FROM CXS MAP) OBTAINED FROM DOCUMENT RECIEVED FROM CXS.

FINANCIAL PROJECT ID	SHEET NO.
444857-1-22-01	13

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PROJECT CONTROLS

CONTEXT CLASSIFICATION

( )	C1 : NATURAL	( )	C3C : SUBURBAN COMM.
( )	C2 : RURAL	(X)	C4 : URBAN GENERAL
( )	C2T : RURAL TOWN	( )	C5 : URBAN CENTER
( )	C3R : SUBURBAN RES.	( )	C6 : URBAN CORE
( )	N/A : L.A. FACILITY		

FUNCTIONAL CLASSIFICATION

( )	INTERSTATE	( )	MAJOR COLLECTOR
( )	FREEWAY/EXPWY.	( )	MINOR COLLECTOR
( )	PRINCIPAL ARTERIAL	(X)	LOCAL
( )	MINOR ARTERIAL		

HIGHWAY SYSTEM

( )	NATIONAL HIGHWAY SYSTEM
( )	STRATEGIC INTERMODAL SYSTEM
( )	STATE HIGHWAY SYSTEM
(X)	OFF-STATE HIGHWAY SYSTEM

ACCESS CLASSIFICATION

( )	1 - FREEWAY
( )	2 - RESTRICTIVE w/Service Roads
( )	3 - RESTRICTIVE w/660 ft. Connection Spacing
( )	4 - NON-RESTRICTIVE w/2640 ft. Signal Spacing
( )	5 - RESTRICTIVE w/440 ft. Connection Spacing
( )	6 - NON-RESTRICTIVE w/1320 ft. Signal Spacing
(X)	7 - BOTH MEDIAN TYPES

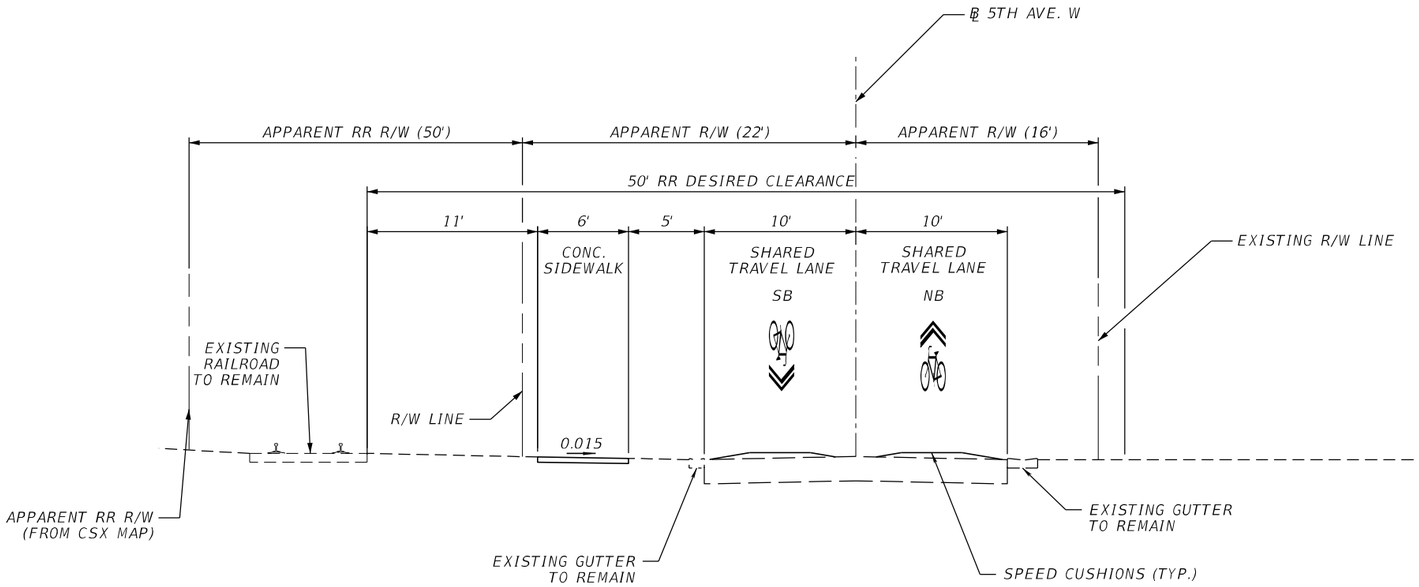
CRITERIA

(X)	NEW CONSTRUCTION / RECONSTRUCTION
( )	RESURFACING (LA FACILITIES)
( )	RRR (ARTERIALS & COLLECTORS)

POTENTIAL EXCEPTIONS AND VARIATIONS RELATED TO TYPICAL SECTION:

VARIATION FOR RR 50' CLEARANCE REQUIREMENT.

TYPICAL SECTION No. 9-S



TYPICAL SECTION 9-S

SEGMENT: S-E7
(NTS)

TRAFFIC DATA:

POSTED SPEED 15 MPH

NOTES:

1. R/W DEPICTED AT THE WIDEST LOCATIONS. ADDITIONAL R/W MAY BE REQUIRED TO IMPLEMENT TYPICAL SECTION.
2. R/W LINES WERE OBTAINED FROM MANATEE COUNTY'S PROPERTY APPRAISER.
3. COORDINATION WITH CSX MAY BE REQUIRED.

FINANCIAL PROJECT ID	SHEET NO.
444857-1-22-01	14

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PROJECT CONTROLS

CONTEXT CLASSIFICATION

( )	C1 : NATURAL	( )	C3C : SUBURBAN COMM.
( )	C2 : RURAL	(X)	C4 : URBAN GENERAL
( )	C2T : RURAL TOWN	( )	C5 : URBAN CENTER
( )	C3R : SUBURBAN RES.	( )	C6 : URBAN CORE
( )	N/A : L.A. FACILITY		

FUNCTIONAL CLASSIFICATION

( )	INTERSTATE	( )	MAJOR COLLECTOR
( )	FREEWAY/EXPWY.	( )	MINOR COLLECTOR
( )	PRINCIPAL ARTERIAL	(X)	LOCAL
( )	MINOR ARTERIAL		

HIGHWAY SYSTEM

( )	NATIONAL HIGHWAY SYSTEM
( )	STRATEGIC INTERMODAL SYSTEM
( )	STATE HIGHWAY SYSTEM
(X)	OFF-STATE HIGHWAY SYSTEM

ACCESS CLASSIFICATION

( )	1 - FREEWAY
( )	2 - RESTRICTIVE w/Service Roads
( )	3 - RESTRICTIVE w/660 ft. Connection Spacing
( )	4 - NON-RESTRICTIVE w/2640 ft. Signal Spacing
( )	5 - RESTRICTIVE w/440 ft. Connection Spacing
( )	6 - NON-RESTRICTIVE w/1320 ft. Signal Spacing
(X)	7 - BOTH MEDIAN TYPES

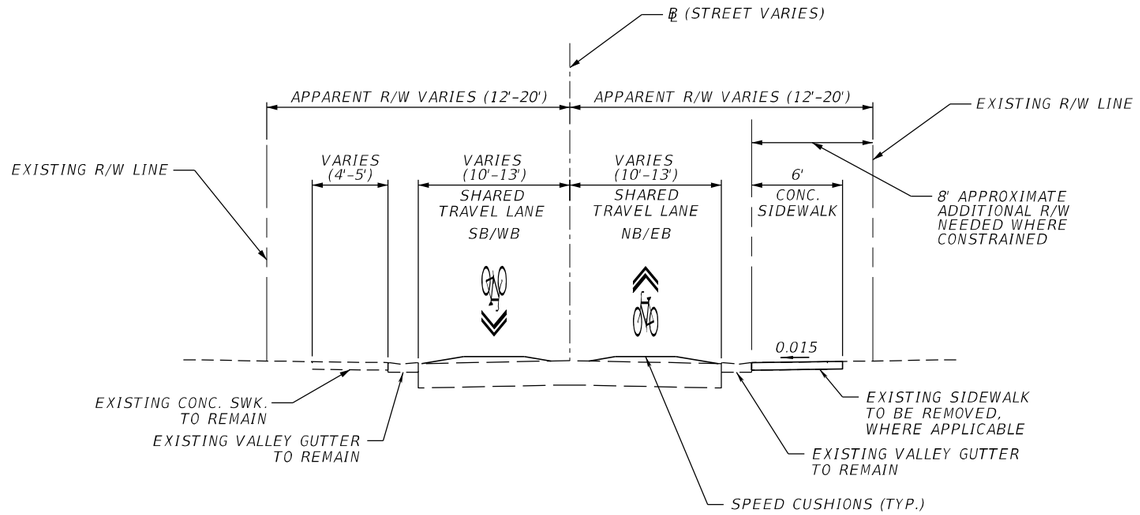
CRITERIA

(X)	NEW CONSTRUCTION / RECONSTRUCTION
( )	RESURFACING (LA FACILITIES)
( )	RRR (ARTERIALS & COLLECTORS)

POTENTIAL EXCEPTIONS AND VARIATIONS RELATED TO TYPICAL SECTION:

NONE

TYPICAL SECTION No. 10-S



TYPICAL SECTION 10-S

SEGMENT: S-D3, S-D4, S-E2, S-E3, S-E4, S-G1, S-G2, AND S-G3
(NTS)

TRAFFIC DATA:

POSTED SPEED	15 MPH S-E4
	25 MPH S-D3, S-D4, S-G2, S-G3
	30 MPH S-E2
	35 MPH S-E3

NOTES:

1. R/W DEPICTED AT THE WIDEST LOCATIONS. ADDITIONAL R/W MAY BE REQUIRED TO IMPLEMENT TYPICAL SECTION.
2. R/W LINES WERE OBTAINED FROM MANATEE COUNTY'S PROPERTY APPRAISER.
3. SEGMENTS S-D3, S-D4, S-E2, S-E3, AND S-G3 MAY BE ABLE TO ACCOMMODATE SIDEWALK IMPROVEMENTS WITHIN THE EXISTING BUFFERS.

FINANCIAL PROJECT ID	SHEET NO.
444857-1-22-01	15

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PROJECT CONTROLS

CONTEXT CLASSIFICATION

( ) C1 : NATURAL
( ) C2 : RURAL
( ) C2T : RURAL TOWN
( ) C3R : SUBURBAN RES.
( ) C3C : SUBURBAN COMM.
(X) C4 : URBAN GENERAL
( ) C5 : URBAN CENTER
( ) C6 : URBAN CORE
( ) N/A : L.A. FACILITY

FUNCTIONAL CLASSIFICATION

( ) INTERSTATE
( ) FREEWAY/EXPWY.
( ) PRINCIPAL ARTERIAL
( ) MINOR ARTERIAL
( ) MAJOR COLLECTOR
( ) MINOR COLLECTOR
(X) LOCAL

HIGHWAY SYSTEM

( ) NATIONAL HIGHWAY SYSTEM
( ) STRATEGIC INTERMODAL SYSTEM
( ) STATE HIGHWAY SYSTEM
(X) OFF-STATE HIGHWAY SYSTEM

ACCESS CLASSIFICATION

( ) 1 - FREEWAY
( ) 2 - RESTRICTIVE w/Service Roads
( ) 3 - RESTRICTIVE w/660 ft. Connection Spacing
( ) 4 - NON-RESTRICTIVE w/2640 ft. Signal Spacing
( ) 5 - RESTRICTIVE w/440 ft. Connection Spacing
( ) 6 - NON-RESTRICTIVE w/1320 ft. Signal Spacing
(X) 7 - BOTH MEDIAN TYPES

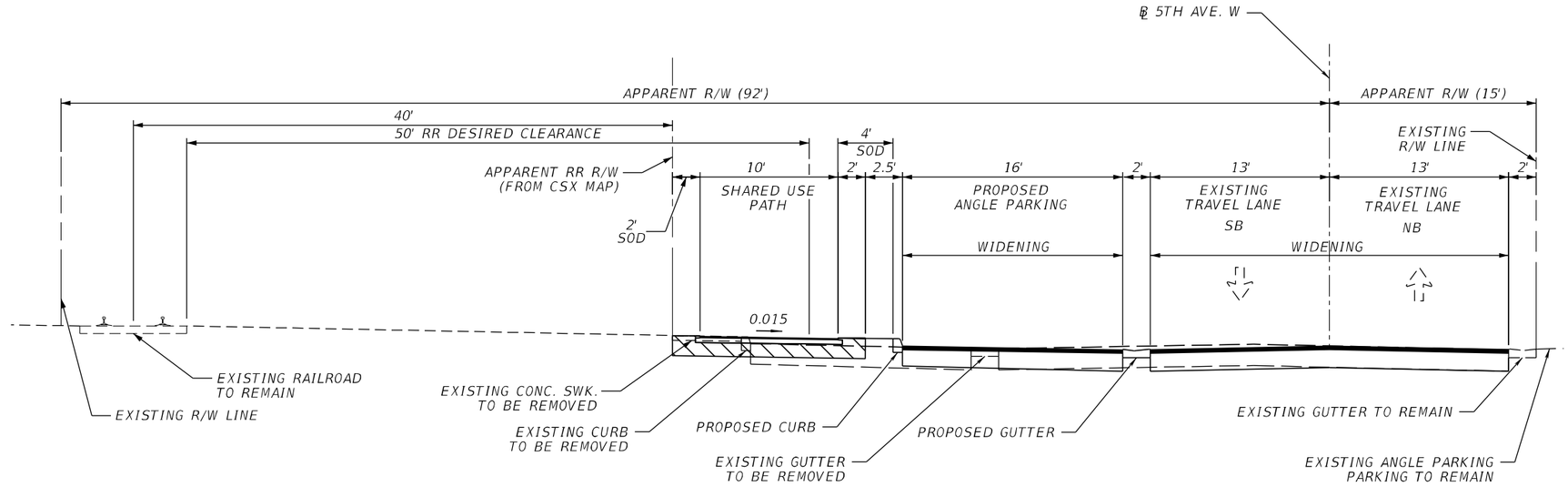
CRITERIA

(X) NEW CONSTRUCTION / RECONSTRUCTION
( ) RESURFACING (LA FACILITIES)
( ) RRR (ARTERIALS & COLLECTORS)

POTENTIAL EXCEPTIONS AND VARIATIONS RELATED TO TYPICAL SECTION:

VARIATION NEEDED FOR RR 50' CLEARANCE REQUIREMENT.
(SIDEWALK CURRENTLY WITHIN CLEARANCE)

TYPICAL SECTION No. 11-S



TYPICAL SECTION 11-S
SEGMENT: S-E6
(NTS)

TRAFFIC DATA:

POSTED SPEED 30 MPH

NOTES:

1. R/W LINES WERE OBTAINED FROM MANATEE COUNTY'S PROPERTY APPRAISER.
2. APPARENT RR R/W (FROM CSX MAP) OBTAINED FROM DOCUMENT RECIEVED FROM CSX.

FINANCIAL PROJECT ID	SHEET NO.
444857-1-22-01	16

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PROJECT CONTROLS

CONTEXT CLASSIFICATION

( ) C1 : NATURAL
( ) C2 : RURAL
( ) C2T : RURAL TOWN
( ) C3R : SUBURBAN RES.
( ) C3C : SUBURBAN COMM.
(X) C4 : URBAN GENERAL
( ) C5 : URBAN CENTER
( ) C6 : URBAN CORE
( ) N/A : L.A. FACILITY

FUNCTIONAL CLASSIFICATION

( ) INTERSTATE
( ) FREEWAY/EXPWY.
( ) PRINCIPAL ARTERIAL
( ) MINOR ARTERIAL
( ) MAJOR COLLECTOR
( ) MINOR COLLECTOR
(X) LOCAL

HIGHWAY SYSTEM

( ) NATIONAL HIGHWAY SYSTEM
( ) STRATEGIC INTERMODAL SYSTEM
( ) STATE HIGHWAY SYSTEM
(X) OFF-STATE HIGHWAY SYSTEM

ACCESS CLASSIFICATION

( ) 1 - FREEWAY
( ) 2 - RESTRICTIVE w/Service Roads
( ) 3 - RESTRICTIVE w/660 ft. Connection Spacing
( ) 4 - NON-RESTRICTIVE w/2640 ft. Signal Spacing
( ) 5 - RESTRICTIVE w/440 ft. Connection Spacing
( ) 6 - NON-RESTRICTIVE w/1320 ft. Signal Spacing
(X) 7 - BOTH MEDIAN TYPES

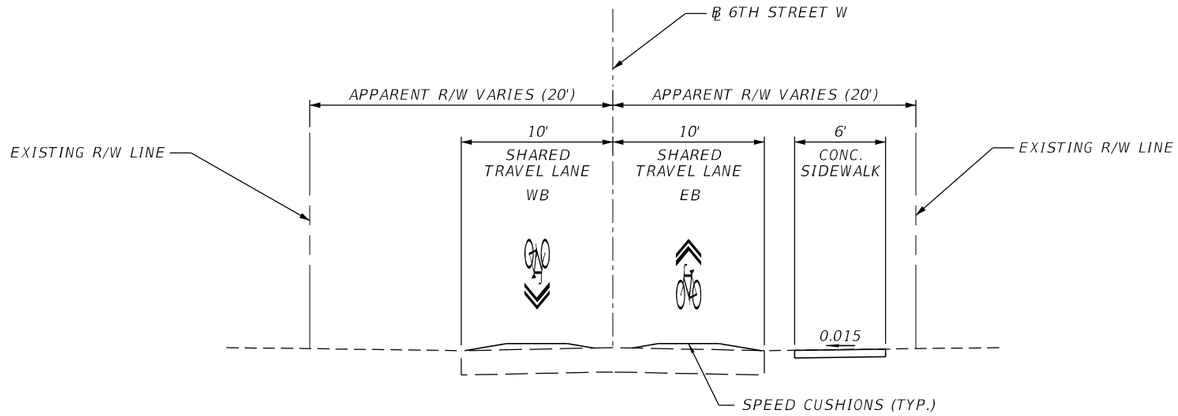
CRITERIA

(X) NEW CONSTRUCTION / RECONSTRUCTION
( ) RESURFACING (LA FACILITIES)
( ) RRR (ARTERIALS & COLLECTORS)

POTENTIAL EXCEPTIONS AND VARIATIONS RELATED TO TYPICAL SECTION:

NONE

TYPICAL SECTION No. 12-S



TYPICAL SECTION 12-S
SEGMENT: S-D5
(NTS)

TRAFFIC DATA:

POSTED SPEED 30 MPH

NOTES:

1. R/W DEPICTED AT THE WIDEST LOCATIONS. ADDITIONAL R/W MAY BE REQUIRED TO IMPLEMENT TYPICAL SECTION.
2. R/W LINES WERE OBTAINED FROM MANATEE COUNTY'S PROPERTY APPRAISER.

FINANCIAL PROJECT ID	SHEET NO.
444857-1-22-01	17

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PROJECT CONTROLS

CONTEXT CLASSIFICATION

( ) C1 : NATURAL
( ) C2 : RURAL
( ) C2T : RURAL TOWN
( ) C3R : SUBURBAN RES.
( ) C3C : SUBURBAN COMM.
(X) C4 : URBAN GENERAL
( ) C5 : URBAN CENTER
( ) C6 : URBAN CORE
( ) N/A : L.A. FACILITY

FUNCTIONAL CLASSIFICATION

( ) INTERSTATE
( ) FREEWAY/EXPWY.
( ) PRINCIPAL ARTERIAL
( ) MINOR ARTERIAL
( ) MAJOR COLLECTOR
( ) MINOR COLLECTOR
(X) LOCAL

HIGHWAY SYSTEM

( ) NATIONAL HIGHWAY SYSTEM
( ) STRATEGIC INTERMODAL SYSTEM
( ) STATE HIGHWAY SYSTEM
(X) OFF-STATE HIGHWAY SYSTEM

ACCESS CLASSIFICATION

( ) 1 - FREEWAY
( ) 2 - RESTRICTIVE w/Service Roads
( ) 3 - RESTRICTIVE w/660 ft. Connection Spacing
( ) 4 - NON-RESTRICTIVE w/2640 ft. Signal Spacing
( ) 5 - RESTRICTIVE w/440 ft. Connection Spacing
( ) 6 - NON-RESTRICTIVE w/1320 ft. Signal Spacing
(X) 7 - BOTH MEDIAN TYPES

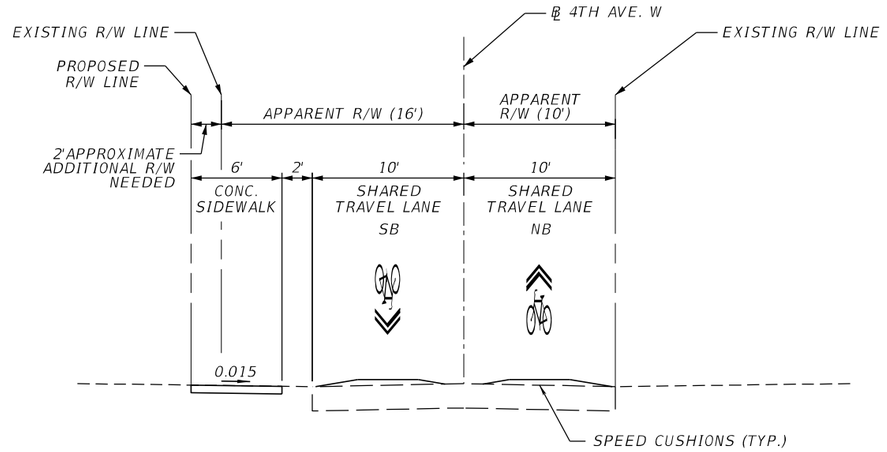
CRITERIA

(X) NEW CONSTRUCTION / RECONSTRUCTION
( ) RESURFACING (LA FACILITIES)
( ) RRR (ARTERIALS & COLLECTORS)

POTENTIAL EXCEPTIONS AND VARIATIONS RELATED TO TYPICAL SECTION:

NONE

TYPICAL SECTION No. 13-S



TYPICAL SECTION 13-S
SEGMENT: S-D6
(NTS)

TRAFFIC DATA:

POSTED SPEED 30 MPH

NOTES:

1. R/W DEPICTED AT THE WIDEST LOCATIONS. ADDITIONAL R/W WILL BE REQUIRED TO IMPLEMENT TYPICAL SECTION.
2. R/W LINES WERE OBTAINED FROM MANATEE COUNTY'S PROPERTY APPRAISER.

FINANCIAL PROJECT ID	SHEET NO.
444857-1-22-01	18

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PROJECT CONTROLS

CONTEXT CLASSIFICATION

( ) C1 : NATURAL
( ) C2 : RURAL
( ) C2T : RURAL TOWN
( ) C3R : SUBURBAN RES.
( ) C3C : SUBURBAN COMM.
(X) C4 : URBAN GENERAL
( ) C5 : URBAN CENTER
( ) C6 : URBAN CORE
( ) N/A : L.A. FACILITY

FUNCTIONAL CLASSIFICATION

( ) INTERSTATE
( ) FREEWAY/EXPWY.
( ) PRINCIPAL ARTERIAL
( ) MINOR ARTERIAL
( ) MAJOR COLLECTOR
( ) MINOR COLLECTOR
(X) LOCAL

HIGHWAY SYSTEM

( ) NATIONAL HIGHWAY SYSTEM
( ) STRATEGIC INTERMODAL SYSTEM
( ) STATE HIGHWAY SYSTEM
(X) OFF-STATE HIGHWAY SYSTEM

ACCESS CLASSIFICATION

( ) 1 - FREEWAY
( ) 2 - RESTRICTIVE w/Service Roads
( ) 3 - RESTRICTIVE w/660 ft. Connection Spacing
( ) 4 - NON-RESTRICTIVE w/2640 ft. Signal Spacing
( ) 5 - RESTRICTIVE w/440 ft. Connection Spacing
( ) 6 - NON-RESTRICTIVE w/1320 ft. Signal Spacing
(X) 7 - BOTH MEDIAN TYPES

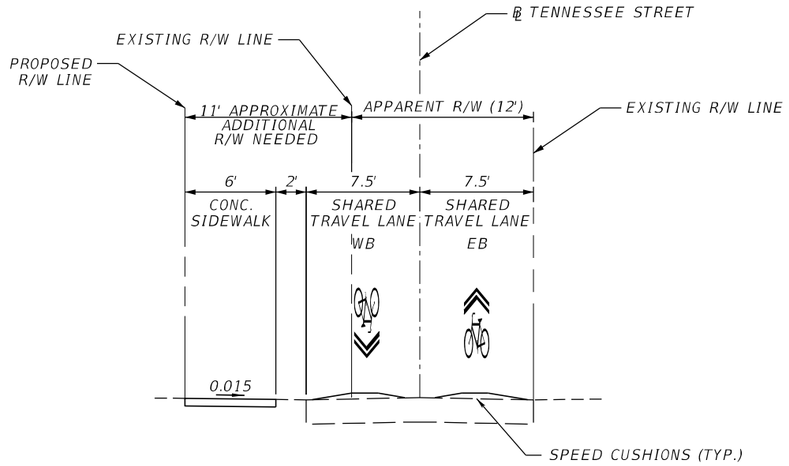
CRITERIA

(X) NEW CONSTRUCTION / RECONSTRUCTION
( ) RESURFACING (LA FACILITIES)
( ) RRR (ARTERIALS & COLLECTORS)

POTENTIAL EXCEPTIONS AND VARIATIONS RELATED TO TYPICAL SECTION:

NONE

TYPICAL SECTION No. 14-S



TYPICAL SECTION 14-S

SEGMENT: S-D7
(NTS)

TRAFFIC DATA:

POSTED SPEED 30 MPH

NOTES:

1. R/W DEPICTED AT THE WIDEST LOCATIONS. ADDITIONAL R/W MAY BE REQUIRED TO IMPLEMENT TYPICAL SECTION.
2. R/W LINES WERE OBTAINED FROM MANATEE COUNTY'S PROPERTY APPRAISER.

FINANCIAL PROJECT ID	SHEET NO.
444857-1-22-01	19

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PROJECT CONTROLS

CONTEXT CLASSIFICATION

( ) C1 : NATURAL
( ) C2 : RURAL
( ) C2T : RURAL TOWN
(X) C3R : SUBURBAN RES.
( ) C3C : SUBURBAN COMM.
( ) C4 : URBAN GENERAL
( ) C5 : URBAN CENTER
( ) C6 : URBAN CORE
( ) N/A : L.A. FACILITY

FUNCTIONAL CLASSIFICATION

( ) INTERSTATE
( ) FREEWAY/EXPWY.
( ) PRINCIPAL ARTERIAL
( ) MINOR ARTERIAL
( ) MAJOR COLLECTOR
( ) MINOR COLLECTOR
(X) LOCAL

HIGHWAY SYSTEM

( ) NATIONAL HIGHWAY SYSTEM
( ) STRATEGIC INTERMODAL SYSTEM
( ) STATE HIGHWAY SYSTEM
(X) OFF-STATE HIGHWAY SYSTEM

ACCESS CLASSIFICATION

( ) 1 - FREEWAY
( ) 2 - RESTRICTIVE w/Service Roads
( ) 3 - RESTRICTIVE w/660 ft. Connection Spacing
( ) 4 - NON-RESTRICTIVE w/2640 ft. Signal Spacing
( ) 5 - RESTRICTIVE w/440 ft. Connection Spacing
( ) 6 - NON-RESTRICTIVE w/1320 ft. Signal Spacing
(X) 7 - BOTH MEDIAN TYPES

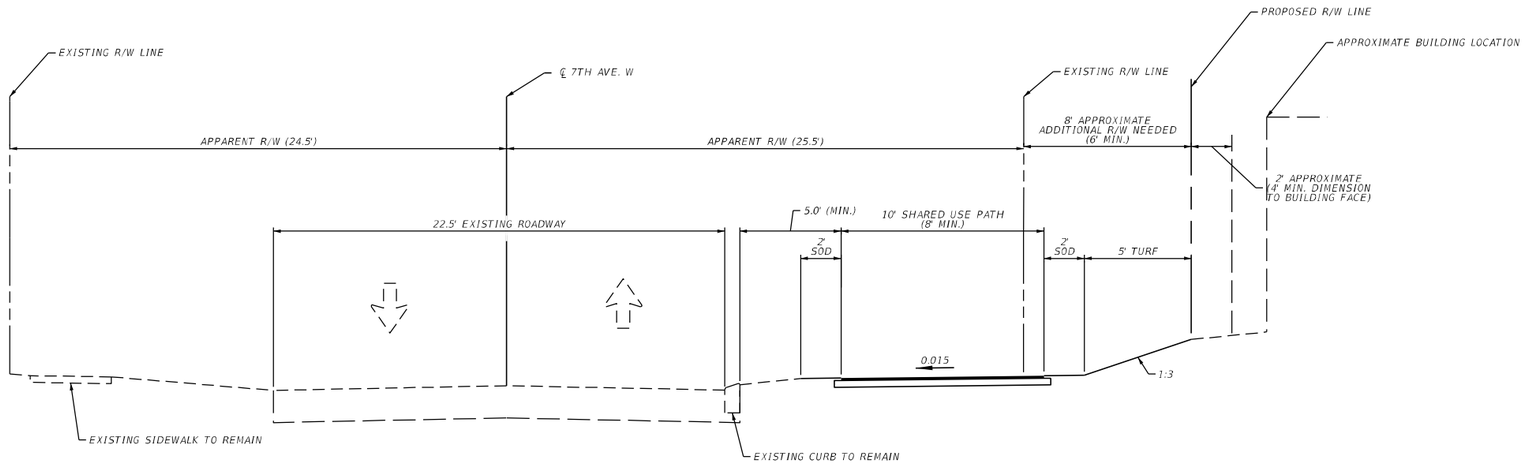
CRITERIA

(X) NEW CONSTRUCTION / RECONSTRUCTION
( ) RESURFACING (LA FACILITIES)
( ) RRR (ARTERIALS & COLLECTORS)

POTENTIAL EXCEPTIONS AND VARIATIONS RELATED TO TYPICAL SECTION:

NONE

TYPICAL SECTION No. 1A



TYPICAL SECTION 1A
SEGMENT: A
(NTS)

SHARED USE PATH DESIGN SPEED: 18 MPH

FINANCIAL PROJECT ID	SHEET NO.
444857-1-22-01	20

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KatelynnDunkerson 8/17/2026 5:56:06 PM

PROJECT CONTROLS

CONTEXT CLASSIFICATION

( ) C1 : NATURAL
( ) C2 : RURAL
( ) C2T : RURAL TOWN
(X) C3R : SUBURBAN RES.
( ) C3C : SUBURBAN COMM.
( ) C4 : URBAN GENERAL
( ) C5 : URBAN CENTER
( ) C6 : URBAN CORE
( ) N/A : L.A. FACILITY

FUNCTIONAL CLASSIFICATION

( ) INTERSTATE
( ) FREEWAY/EXPWY.
( ) PRINCIPAL ARTERIAL
( ) MINOR ARTERIAL
( ) MAJOR COLLECTOR
( ) MINOR COLLECTOR
(X) LOCAL

HIGHWAY SYSTEM

( ) NATIONAL HIGHWAY SYSTEM
( ) STRATEGIC INTERMODAL SYSTEM
( ) STATE HIGHWAY SYSTEM
(X) OFF-STATE HIGHWAY SYSTEM

ACCESS CLASSIFICATION

( ) 1 - FREEWAY
( ) 2 - RESTRICTIVE w/Service Roads
( ) 3 - RESTRICTIVE w/660 ft. Connection Spacing
( ) 4 - NON-RESTRICTIVE w/2640 ft. Signal Spacing
( ) 5 - RESTRICTIVE w/440 ft. Connection Spacing
( ) 6 - NON-RESTRICTIVE w/1320 ft. Signal Spacing
(X) 7 - BOTH MEDIAN TYPES

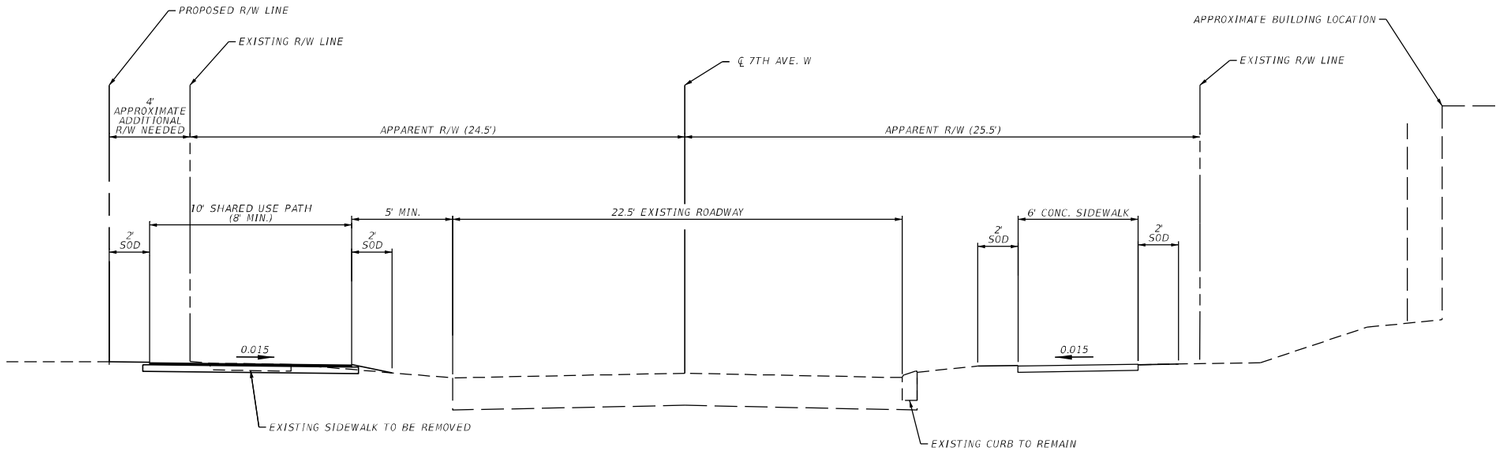
CRITERIA

(X) NEW CONSTRUCTION / RECONSTRUCTION
( ) RESURFACING (LA FACILITIES)
( ) RRR (ARTERIALS & COLLECTORS)

POTENTIAL EXCEPTIONS AND VARIATIONS RELATED TO TYPICAL SECTION:

NONE

TYPICAL SECTION No. 1B



TYPICAL SECTION 1B
SEGMENT: A1
(NTS)

SHARED USE PATH DESIGN SPEED: 18 MPH

FINANCIAL PROJECT ID	SHEET NO.
444857-1-22-01	21

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PROJECT CONTROLS

CONTEXT CLASSIFICATION

( ) C1 : NATURAL
( ) C2 : RURAL
( ) C2T : RURAL TOWN
(X) C3R : SUBURBAN RES.
( ) C3C : SUBURBAN COMM.
( ) C4 : URBAN GENERAL
( ) C5 : URBAN CENTER
( ) C6 : URBAN CORE
( ) N/A : L.A. FACILITY

FUNCTIONAL CLASSIFICATION

( ) INTERSTATE
( ) FREEWAY/EXPWY.
( ) PRINCIPAL ARTERIAL
( ) MINOR ARTERIAL
( ) MAJOR COLLECTOR
( ) MINOR COLLECTOR
(X) LOCAL

HIGHWAY SYSTEM

( ) NATIONAL HIGHWAY SYSTEM
( ) STRATEGIC INTERMODAL SYSTEM
( ) STATE HIGHWAY SYSTEM
(X) OFF-STATE HIGHWAY SYSTEM

ACCESS CLASSIFICATION

( ) 1 - FREEWAY
( ) 2 - RESTRICTIVE w/Service Roads
( ) 3 - RESTRICTIVE w/660 ft. Connection Spacing
( ) 4 - NON-RESTRICTIVE w/2640 ft. Signal Spacing
( ) 5 - RESTRICTIVE w/440 ft. Connection Spacing
( ) 6 - NON-RESTRICTIVE w/1320 ft. Signal Spacing
(X) 7 - BOTH MEDIAN TYPES

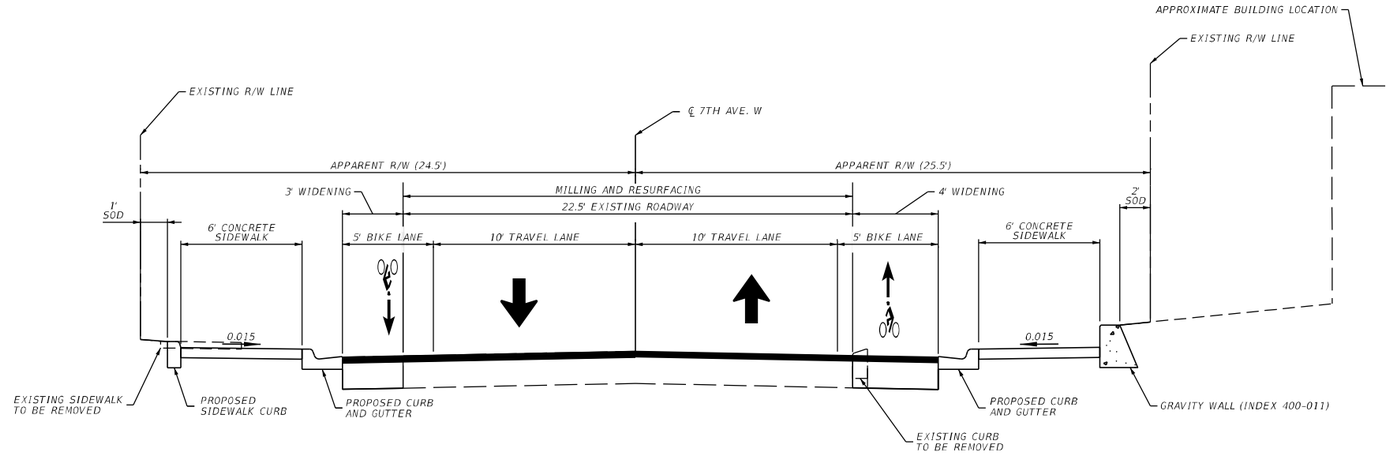
CRITERIA

(X) NEW CONSTRUCTION / RECONSTRUCTION
( ) RESURFACING (LA FACILITIES)
( ) RRR (ARTERIALS & COLLECTORS)

POTENTIAL EXCEPTIONS AND VARIATIONS RELATED TO TYPICAL SECTION:

NONE

TYPICAL SECTION No. 1C



TYPICAL SECTION 1C

SEGMENT: A1
(NTS)

TRAFFIC DATA:

POSTED SPEED 30 MPH

FINANCIAL PROJECT ID	SHEET NO.
444857-1-22-01	22

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PROJECT CONTROLS

CONTEXT CLASSIFICATION

( ) C1 : NATURAL
( ) C2 : RURAL
( ) C2T : RURAL TOWN
(X) C3R : SUBURBAN RES.
( ) N/A : L.A. FACILITY
( ) C3C : SUBURBAN COMM.
( ) C4 : URBAN GENERAL
( ) C5 : URBAN CENTER
( ) C6 : URBAN CORE

FUNCTIONAL CLASSIFICATION

( ) INTERSTATE
( ) FREEWAY/EXPWY.
( ) PRINCIPAL ARTERIAL
( ) MINOR ARTERIAL
( ) MAJOR COLLECTOR
( ) MINOR COLLECTOR
(X) LOCAL

HIGHWAY SYSTEM

( ) NATIONAL HIGHWAY SYSTEM
( ) STRATEGIC INTERMODAL SYSTEM
( ) STATE HIGHWAY SYSTEM
(X) OFF-STATE HIGHWAY SYSTEM

ACCESS CLASSIFICATION

( ) 1 - FREEWAY
( ) 2 - RESTRICTIVE w/Service Roads
( ) 3 - RESTRICTIVE w/660 ft. Connection Spacing
( ) 4 - NON-RESTRICTIVE w/2640 ft. Signal Spacing
( ) 5 - RESTRICTIVE w/440 ft. Connection Spacing
( ) 6 - NON-RESTRICTIVE w/1320 ft. Signal Spacing
(X) 7 - BOTH MEDIAN TYPES

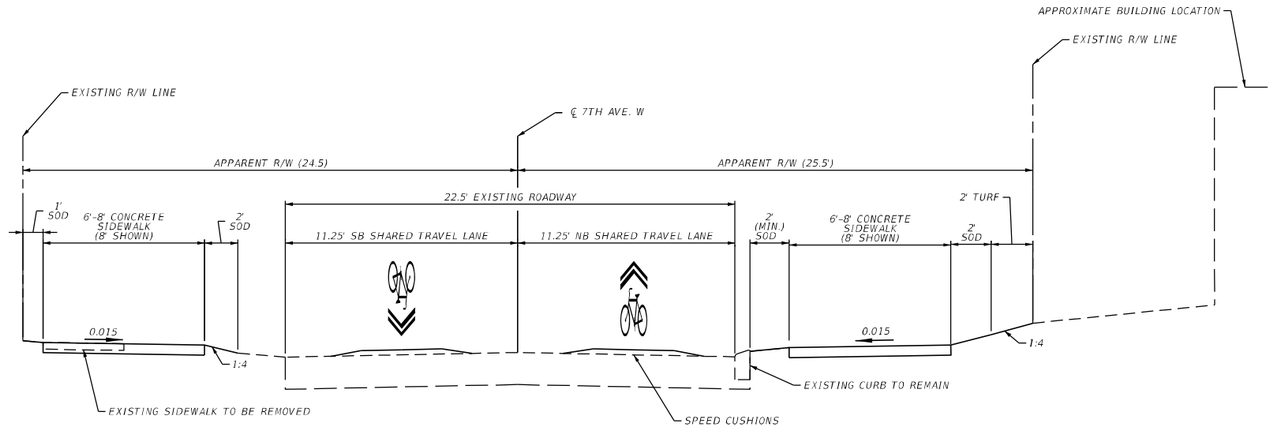
CRITERIA

(X) NEW CONSTRUCTION / RECONSTRUCTION
( ) RESURFACING (LA FACILITIES)
( ) RRR (ARTERIALS & COLLECTORS)

POTENTIAL EXCEPTIONS AND VARIATIONS RELATED TO TYPICAL SECTION:

NONE

TYPICAL SECTION No. 1D



TYPICAL SECTION 1D
SEGMENT: A1
(NTS)

TRAFFIC DATA:

POSTED SPEED 30 MPH

FINANCIAL PROJECT ID	SHEET NO.
444857-1-22-01	23

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PROJECT CONTROLS

CONTEXT CLASSIFICATION

( ) C1 : NATURAL
( ) C2 : RURAL
( ) C2T : RURAL TOWN
(X) C3R : SUBURBAN RES.
( ) C3C : SUBURBAN COMM.
( ) C4 : URBAN GENERAL
( ) C5 : URBAN CENTER
( ) C6 : URBAN CORE
( ) N/A : L.A. FACILITY

FUNCTIONAL CLASSIFICATION

( ) INTERSTATE
( ) FREEWAY/EXPWY.
( ) PRINCIPAL ARTERIAL
( ) MINOR ARTERIAL
(X) MAJOR COLLECTOR
( ) MINOR COLLECTOR
( ) LOCAL

HIGHWAY SYSTEM

( ) NATIONAL HIGHWAY SYSTEM
( ) STRATEGIC INTERMODAL SYSTEM
( ) STATE HIGHWAY SYSTEM
(X) OFF-STATE HIGHWAY SYSTEM

ACCESS CLASSIFICATION

( ) 1 - FREEWAY
( ) 2 - RESTRICTIVE w/Service Roads
( ) 3 - RESTRICTIVE w/660 ft. Connection Spacing
( ) 4 - NON-RESTRICTIVE w/2640 ft. Signal Spacing
( ) 5 - RESTRICTIVE w/440 ft. Connection Spacing
( ) 6 - NON-RESTRICTIVE w/1320 ft. Signal Spacing
(X) 7 - BOTH MEDIAN TYPES

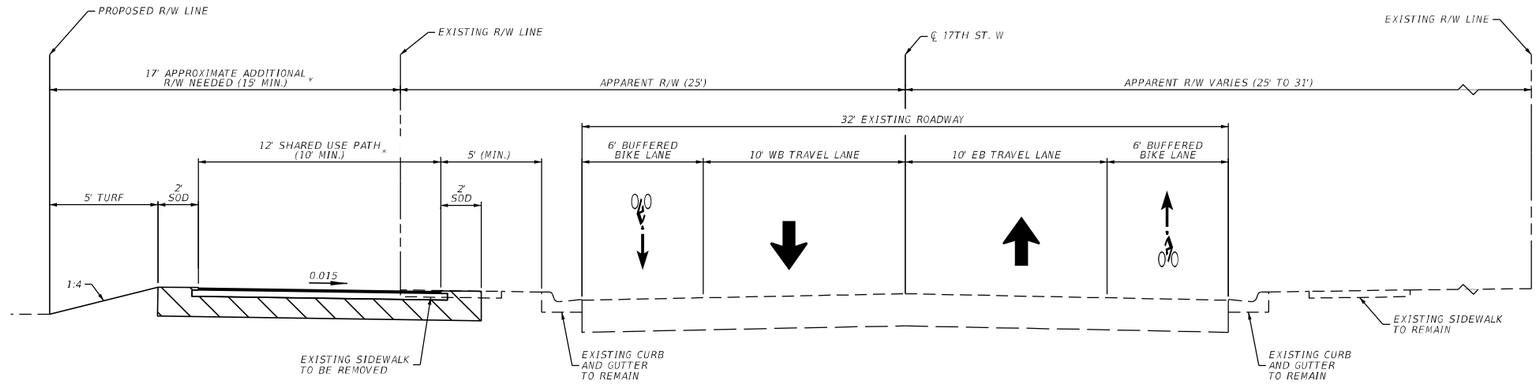
CRITERIA

(X) NEW CONSTRUCTION / RECONSTRUCTION
( ) RESURFACING (LA FACILITIES)
( ) RRR (ARTERIALS & COLLECTORS)

POTENTIAL EXCEPTIONS AND VARIATIONS RELATED TO TYPICAL SECTION:

Narrow at RR Crossing to 6 feet
Narrow to avoid car park at western end of segment

TYPICAL SECTION No. 2



*ADDITIONAL R/W REQUIRED FOR APPROXIMATELY 550' (~50% OF TOTAL SEGMENT)

TYPICAL SECTION 2

SEGMENT: A2
(NTS)

TRAFFIC DATA:

POSTED SPEED 30 MPH

FINANCIAL PROJECT ID	SHEET NO.
444857-1-22-01	24

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PROJECT CONTROLS

CONTEXT CLASSIFICATION

( ) C1 : NATURAL
( ) C2 : RURAL
( ) C2T : RURAL TOWN
(X) C3R : SUBURBAN RES.
( ) N/A : L.A. FACILITY
( ) C3C : SUBURBAN COMM.
( ) C4 : URBAN GENERAL
( ) C5 : URBAN CENTER
( ) C6 : URBAN CORE

FUNCTIONAL CLASSIFICATION

( ) INTERSTATE
( ) FREEWAY/EXPWY.
( ) PRINCIPAL ARTERIAL
( ) MINOR ARTERIAL
( ) MAJOR COLLECTOR
( ) MINOR COLLECTOR
(X) LOCAL

HIGHWAY SYSTEM

( ) NATIONAL HIGHWAY SYSTEM
( ) STRATEGIC INTERMODAL SYSTEM
( ) STATE HIGHWAY SYSTEM
(X) OFF-STATE HIGHWAY SYSTEM

ACCESS CLASSIFICATION

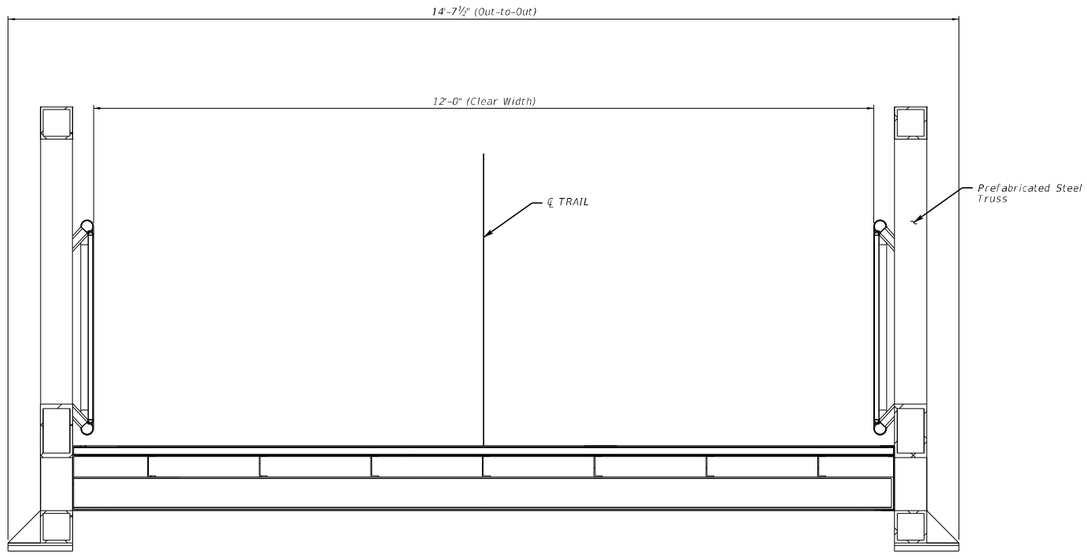
( ) 1 - FREEWAY
( ) 2 - RESTRICTIVE w/Service Roads
( ) 3 - RESTRICTIVE w/660 ft. Connection Spacing
( ) 4 - NON-RESTRICTIVE w/2640 ft. Signal Spacing
( ) 5 - RESTRICTIVE w/440 ft. Connection Spacing
( ) 6 - NON-RESTRICTIVE w/1320 ft. Signal Spacing
(X) 7 - BOTH MEDIAN TYPES

CRITERIA

(X) NEW CONSTRUCTION / RECONSTRUCTION
( ) RESURFACING (LA FACILITIES)
( ) RRR (ARTERIALS & COLLECTORS)

POTENTIAL EXCEPTIONS AND VARIATIONS RELATED TO TYPICAL SECTION:

TYPICAL SECTION No. 3



TYPICAL SECTION 3
SEGMENT: B1, B6
(NTS)

SHARED USE PATH DESIGN SPEED: 18 MPH

NOTES:

1. IF A BOX CULVERT IS USED INSTEAD OF A TRUSS BRIDGE, TYPICAL SECTION No. 4 WOULD APPLY.

FINANCIAL PROJECT ID	SHEET NO.
444857-1-22-01	25

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PROJECT CONTROLS

CONTEXT CLASSIFICATION

( ) C1 : NATURAL
( ) C2 : RURAL
( ) C2T : RURAL TOWN
(X) C3R : SUBURBAN RES.
( ) C3C : SUBURBAN COMM.
( ) C4 : URBAN GENERAL
( ) C5 : URBAN CENTER
( ) C6 : URBAN CORE
( ) N/A : L.A. FACILITY

FUNCTIONAL CLASSIFICATION

( ) INTERSTATE
( ) FREEWAY/EXPWY.
( ) PRINCIPAL ARTERIAL
( ) MINOR ARTERIAL
( ) MAJOR COLLECTOR
( ) MINOR COLLECTOR
(X) LOCAL

HIGHWAY SYSTEM

( ) NATIONAL HIGHWAY SYSTEM
( ) STRATEGIC INTERMODAL SYSTEM
( ) STATE HIGHWAY SYSTEM
(X) OFF-STATE HIGHWAY SYSTEM

ACCESS CLASSIFICATION

( ) 1 - FREEWAY
( ) 2 - RESTRICTIVE w/Service Roads
( ) 3 - RESTRICTIVE w/660 ft. Connection Spacing
( ) 4 - NON-RESTRICTIVE w/2640 ft. Signal Spacing
( ) 5 - RESTRICTIVE w/440 ft. Connection Spacing
( ) 6 - NON-RESTRICTIVE w/1320 ft. Signal Spacing
(X) 7 - BOTH MEDIAN TYPES

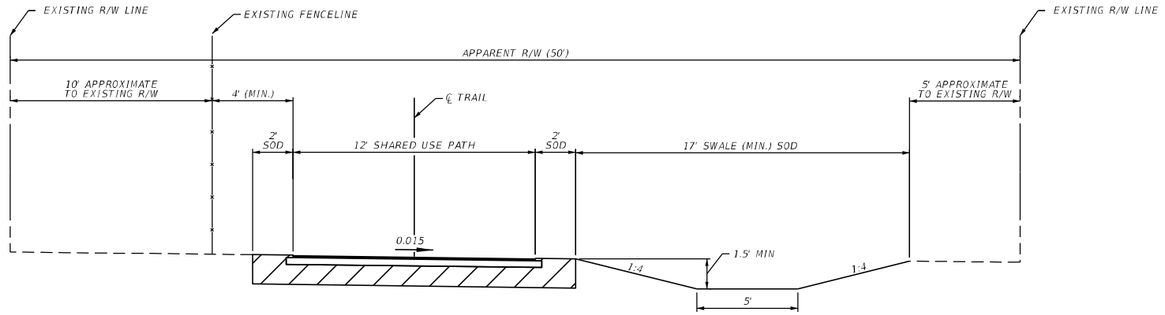
CRITERIA

(X) NEW CONSTRUCTION / RECONSTRUCTION
( ) RESURFACING (LA FACILITIES)
( ) RRR (ARTERIALS & COLLECTORS)

POTENTIAL EXCEPTIONS AND VARIATIONS RELATED TO TYPICAL SECTION:

NOTE: A JUNCTION BOX WILL BE NEEDED AT THE EASTERN END OF THIS SEGMENT TO FACILITATE A DRAINAGE CROSSING

TYPICAL SECTION No. 4



TYPICAL SECTION 4
SEGMENT: B2
(NTS)

SHARED USE PATH DESIGN SPEED: 18 MPH

NOTES:

1. SEGMENTS B1 & B6 ALSO APPLY IF A BOX CULVERT IS USED INSTEAD OF A TRUSS BRIDGE.

FINANCIAL PROJECT ID	SHEET NO.
444857-1-22-01	26

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PROJECT CONTROLS

CONTEXT CLASSIFICATION

( ) C1 : NATURAL
( ) C2 : RURAL
( ) C2T : RURAL TOWN
(X) C3R : SUBURBAN RES.
( ) N/A : L.A. FACILITY
( ) C3C : SUBURBAN COMM.
( ) C4 : URBAN GENERAL
( ) C5 : URBAN CENTER
( ) C6 : URBAN CORE

FUNCTIONAL CLASSIFICATION

( ) INTERSTATE
( ) FREEWAY/EXPWY.
(X) PRINCIPAL ARTERIAL
( ) MINOR ARTERIAL
( ) MAJOR COLLECTOR
( ) MINOR COLLECTOR
( ) LOCAL

HIGHWAY SYSTEM

(X) NATIONAL HIGHWAY SYSTEM
( ) STRATEGIC INTERMODAL SYSTEM
(X) STATE HIGHWAY SYSTEM
( ) OFF-STATE HIGHWAY SYSTEM

ACCESS CLASSIFICATION

( ) 1 - FREEWAY
( ) 2 - RESTRICTIVE w/Service Roads
(X) 3 - RESTRICTIVE w/660 ft. Connection Spacing
( ) 4 - NON-RESTRICTIVE w/2640 ft. Signal Spacing
( ) 5 - RESTRICTIVE w/440 ft. Connection Spacing
( ) 6 - NON-RESTRICTIVE w/1320 ft. Signal Spacing
( ) 7 - BOTH MEDIAN TYPES

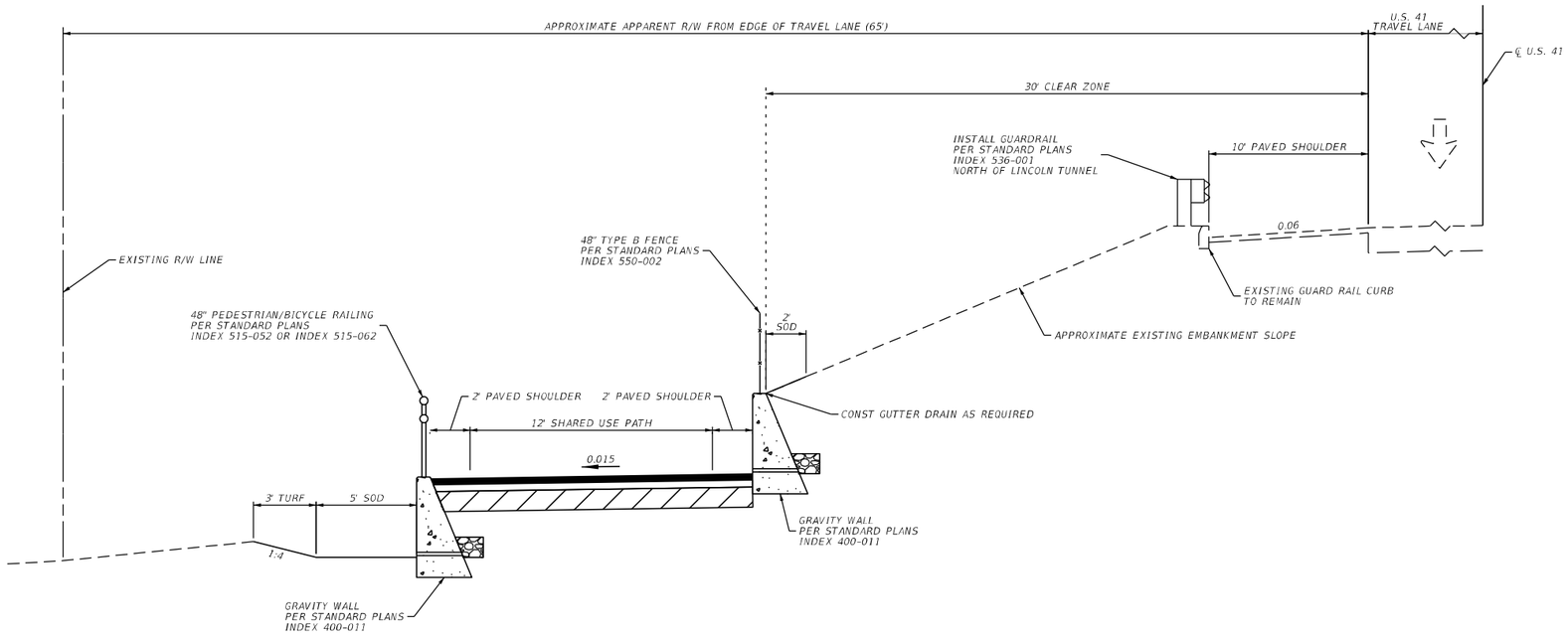
CRITERIA

(X) NEW CONSTRUCTION / RECONSTRUCTION
( ) RESURFACING (LA FACILITIES)
( ) RRR (ARTERIALS & COLLECTORS)

POTENTIAL EXCEPTIONS AND VARIATIONS RELATED TO TYPICAL SECTION:

NONE

TYPICAL SECTION No. 5



TYPICAL SECTION 5

SEGMENT: B3
(NTS)

SHARED USE PATH DESIGN SPEED: 18 MPH

FINANCIAL PROJECT ID	SHEET NO.
444857-1-22-01	27

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PROJECT CONTROLS

CONTEXT CLASSIFICATION

( ) C1 : NATURAL
( ) C2 : RURAL
( ) C2T : RURAL TOWN
(X) C3R : SUBURBAN RES.
( ) C3C : SUBURBAN COMM.
( ) C4 : URBAN GENERAL
( ) C5 : URBAN CENTER
( ) C6 : URBAN CORE
( ) N/A : L.A. FACILITY

FUNCTIONAL CLASSIFICATION

( ) INTERSTATE
( ) FREEWAY/EXPWY.
(X) PRINCIPAL ARTERIAL
( ) MINOR ARTERIAL
( ) MAJOR COLLECTOR
( ) MINOR COLLECTOR
( ) LOCAL

HIGHWAY SYSTEM

(X) NATIONAL HIGHWAY SYSTEM
( ) STRATEGIC INTERMODAL SYSTEM
(X) STATE HIGHWAY SYSTEM
( ) OFF-STATE HIGHWAY SYSTEM

ACCESS CLASSIFICATION

( ) 1 - FREEWAY
( ) 2 - RESTRICTIVE w/Service Roads
(X) 3 - RESTRICTIVE w/660 ft. Connection Spacing
( ) 4 - NON-RESTRICTIVE w/2640 ft. Signal Spacing
( ) 5 - RESTRICTIVE w/440 ft. Connection Spacing
( ) 6 - NON-RESTRICTIVE w/1320 ft. Signal Spacing
( ) 7 - BOTH MEDIAN TYPES

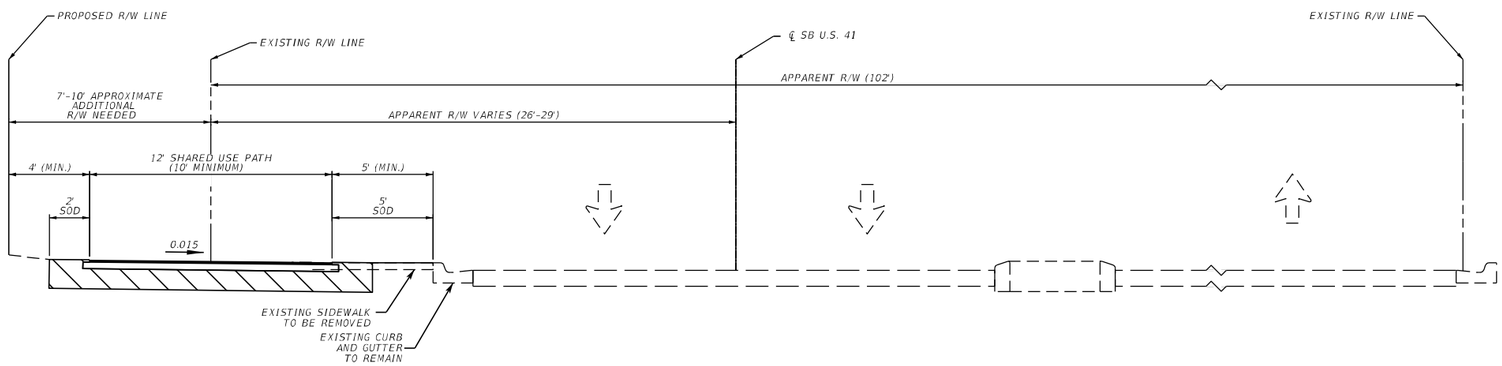
CRITERIA

(X) NEW CONSTRUCTION / RECONSTRUCTION
( ) RESURFACING (LA FACILITIES)
( ) RRR (ARTERIALS & COLLECTORS)

POTENTIAL EXCEPTIONS AND VARIATIONS RELATED TO TYPICAL SECTION:

NONE

TYPICAL SECTION No. 6



TYPICAL SECTION 6
SEGMENT: B4
(NTS)

SHARED USE PATH DESIGN SPEED: 18 MPH

FINANCIAL PROJECT ID	SHEET NO.
444857-1-22-01	28

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PROJECT CONTROLS

CONTEXT CLASSIFICATION

( ) C1 : NATURAL
( ) C2 : RURAL
( ) C2T : RURAL TOWN
(X) C3R : SUBURBAN RES.
( ) C3C : SUBURBAN COMM.
( ) C4 : URBAN GENERAL
( ) C5 : URBAN CENTER
( ) C6 : URBAN CORE
( ) N/A : L.A. FACILITY

FUNCTIONAL CLASSIFICATION

( ) INTERSTATE
( ) FREEWAY/EXPWY.
( ) PRINCIPAL ARTERIAL
( ) MINOR ARTERIAL
( ) MAJOR COLLECTOR
( ) MINOR COLLECTOR
(X) LOCAL

HIGHWAY SYSTEM

( ) NATIONAL HIGHWAY SYSTEM
( ) STRATEGIC INTERMODAL SYSTEM
(X) STATE HIGHWAY SYSTEM
( ) OFF-STATE HIGHWAY SYSTEM

ACCESS CLASSIFICATION

( ) 1 - FREEWAY
( ) 2 - RESTRICTIVE w/Service Roads
( ) 3 - RESTRICTIVE w/660 ft. Connection Spacing
( ) 4 - NON-RESTRICTIVE w/2640 ft. Signal Spacing
( ) 5 - RESTRICTIVE w/440 ft. Connection Spacing
( ) 6 - NON-RESTRICTIVE w/1320 ft. Signal Spacing
(X) 7 - BOTH MEDIAN TYPES

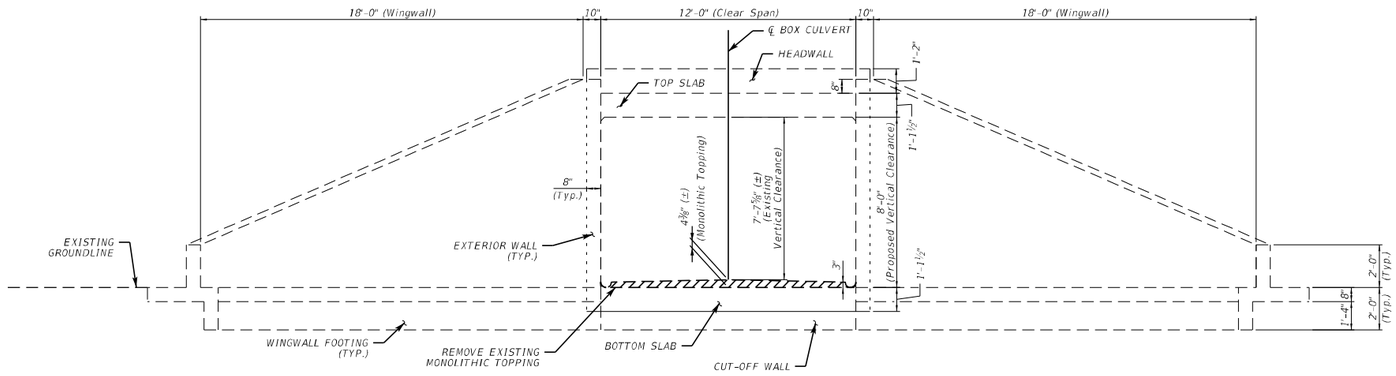
CRITERIA

(X) NEW CONSTRUCTION / RECONSTRUCTION
( ) RESURFACING (LA FACILITIES)
( ) RRR (ARTERIALS & COLLECTORS)

POTENTIAL EXCEPTIONS AND VARIATIONS RELATED TO TYPICAL SECTION:

NONE

TYPICAL SECTION No. 7



TYPICAL SECTION 7
SEGMENT: B5
(NTS)

SHARED USE PATH DESIGN SPEED: 18 MPH

FINANCIAL PROJECT ID	SHEET NO.
444857-1-22-01	29

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PROJECT CONTROLS

CONTEXT CLASSIFICATION

( ) C1 : NATURAL
( ) C2 : RURAL
( ) C2T : RURAL TOWN
(X) C3R : SUBURBAN RES.
( ) C3C : SUBURBAN COMM.
( ) C4 : URBAN GENERAL
( ) C5 : URBAN CENTER
( ) C6 : URBAN CORE
( ) N/A : L.A. FACILITY

FUNCTIONAL CLASSIFICATION

( ) INTERSTATE
( ) FREEWAY/EXPWY.
( ) PRINCIPAL ARTERIAL
( ) MINOR ARTERIAL
( ) MAJOR COLLECTOR
( ) MINOR COLLECTOR
(X) LOCAL

HIGHWAY SYSTEM

( ) NATIONAL HIGHWAY SYSTEM
( ) STRATEGIC INTERMODAL SYSTEM
( ) STATE HIGHWAY SYSTEM
(X) OFF-STATE HIGHWAY SYSTEM

ACCESS CLASSIFICATION

( ) 1 - FREEWAY
( ) 2 - RESTRICTIVE w/Service Roads
( ) 3 - RESTRICTIVE w/660 ft. Connection Spacing
( ) 4 - NON-RESTRICTIVE w/2640 ft. Signal Spacing
( ) 5 - RESTRICTIVE w/440 ft. Connection Spacing
( ) 6 - NON-RESTRICTIVE w/1320 ft. Signal Spacing
(X) 7 - BOTH MEDIAN TYPES

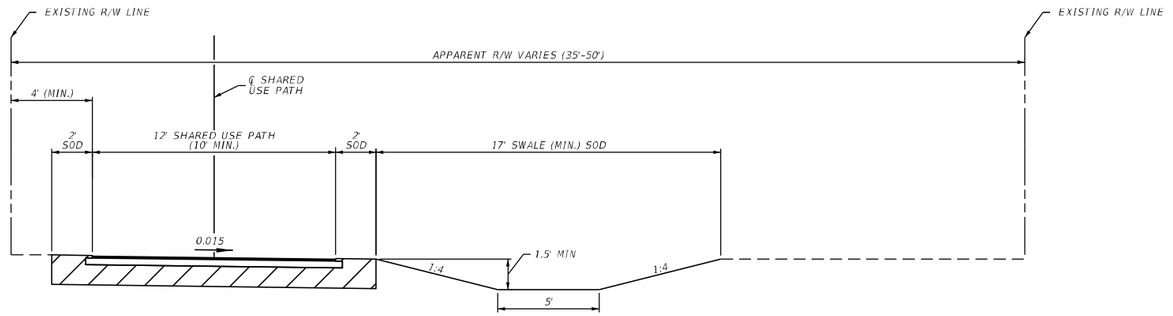
CRITERIA

(X) NEW CONSTRUCTION / RECONSTRUCTION
( ) RESURFACING (LA FACILITIES)
( ) RRR (ARTERIALS & COLLECTORS)

POTENTIAL EXCEPTIONS AND VARIATIONS RELATED TO TYPICAL SECTION:

NOTE: C8 WILL REQUIRE A BRIDGE STRUCTURE OR BOX CULVERT TO CROSS THE EXISTING CANAL AND ROW ACQUISITION AT THE CONNECTION TO SEGMENT C6

TYPICAL SECTION No. 8



TYPICAL SECTION 8

SEGMENT: C1, C2, C6, C8, F6, F7
(NTS)

SHARED USE PATH DESIGN SPEED: 18 MPH

FINANCIAL PROJECT ID	SHEET NO.
444857-1-22-01	30

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PROJECT CONTROLS

CONTEXT CLASSIFICATION

( ) C1 : NATURAL
( ) C2 : RURAL
( ) C2T : RURAL TOWN
(X) C3R : SUBURBAN RES.
( ) C3C : SUBURBAN COMM.
( ) C4 : URBAN GENERAL
( ) C5 : URBAN CENTER
( ) C6 : URBAN CORE
( ) N/A : L.A. FACILITY

FUNCTIONAL CLASSIFICATION

( ) INTERSTATE
( ) FREEWAY/EXPWY.
( ) PRINCIPAL ARTERIAL
( ) MINOR ARTERIAL
( ) MAJOR COLLECTOR
( ) MINOR COLLECTOR
(X) LOCAL

HIGHWAY SYSTEM

( ) NATIONAL HIGHWAY SYSTEM
( ) STRATEGIC INTERMODAL SYSTEM
( ) STATE HIGHWAY SYSTEM
(X) OFF-STATE HIGHWAY SYSTEM

ACCESS CLASSIFICATION

( ) 1 - FREEWAY
( ) 2 - RESTRICTIVE w/Service Roads
( ) 3 - RESTRICTIVE w/660 ft. Connection Spacing
( ) 4 - NON-RESTRICTIVE w/2640 ft. Signal Spacing
( ) 5 - RESTRICTIVE w/440 ft. Connection Spacing
( ) 6 - NON-RESTRICTIVE w/1320 ft. Signal Spacing
(X) 7 - BOTH MEDIAN TYPES

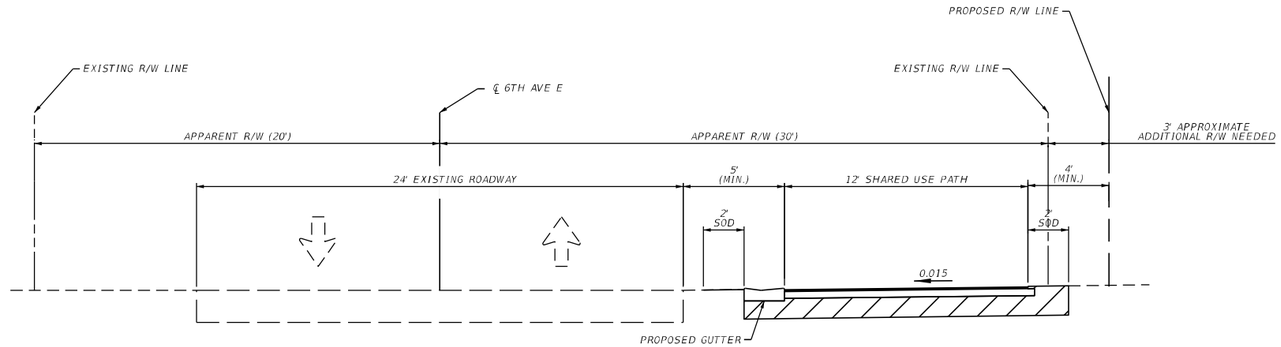
CRITERIA

(X) NEW CONSTRUCTION / RECONSTRUCTION
( ) RESURFACING (LA FACILITIES)
( ) RRR (ARTERIALS & COLLECTORS)

POTENTIAL EXCEPTIONS AND VARIATIONS RELATED TO TYPICAL SECTION:

NONE

TYPICAL SECTION No. 9



TYPICAL SECTION 9
SEGMENT: C4
(NTS)

SHARED USE PATH DESIGN SPEED: 18 MPH

FINANCIAL PROJECT ID	SHEET NO.
444857-1-22-01	31

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PROJECT CONTROLS

CONTEXT CLASSIFICATION

( ) C1 : NATURAL
( ) C2 : RURAL
( ) C2T : RURAL TOWN
(X) C3R : SUBURBAN RES.
( ) C3C : SUBURBAN COMM.
( ) C4 : URBAN GENERAL
( ) C5 : URBAN CENTER
( ) C6 : URBAN CORE
( ) N/A : L.A. FACILITY

FUNCTIONAL CLASSIFICATION

( ) INTERSTATE
( ) FREEWAY/EXPWY.
( ) PRINCIPAL ARTERIAL
( ) MINOR ARTERIAL
( ) MAJOR COLLECTOR
( ) MINOR COLLECTOR
(X) LOCAL

HIGHWAY SYSTEM

( ) NATIONAL HIGHWAY SYSTEM
( ) STRATEGIC INTERMODAL SYSTEM
( ) STATE HIGHWAY SYSTEM
(X) OFF-STATE HIGHWAY SYSTEM

ACCESS CLASSIFICATION

( ) 1 - FREEWAY
( ) 2 - RESTRICTIVE w/Service Roads
( ) 3 - RESTRICTIVE w/660 ft. Connection Spacing
( ) 4 - NON-RESTRICTIVE w/2640 ft. Signal Spacing
( ) 5 - RESTRICTIVE w/440 ft. Connection Spacing
( ) 6 - NON-RESTRICTIVE w/1320 ft. Signal Spacing
(X) 7 - BOTH MEDIAN TYPES

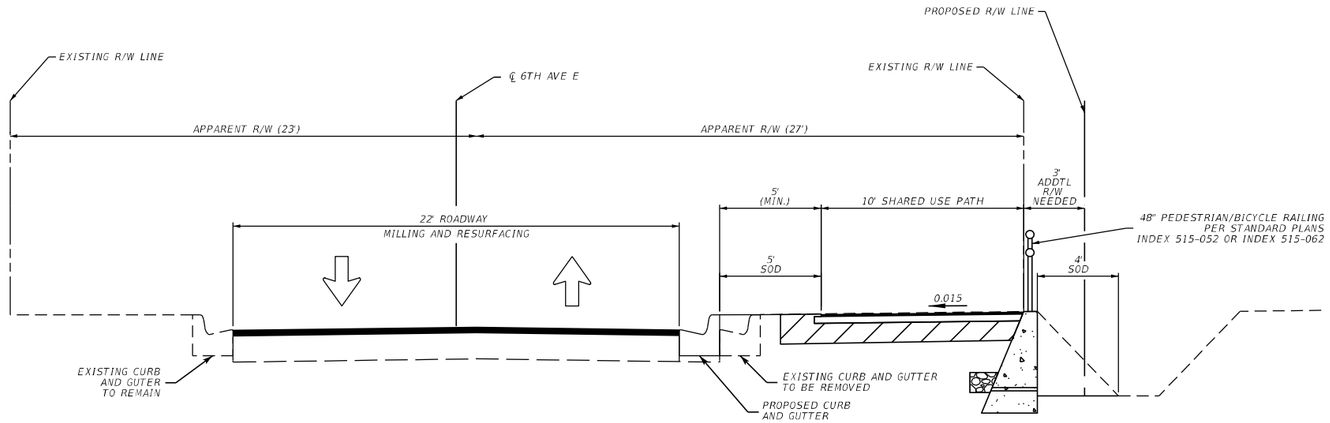
CRITERIA

(X) NEW CONSTRUCTION / RECONSTRUCTION
( ) RESURFACING (LA FACILITIES)
( ) RRR (ARTERIALS & COLLECTORS)

POTENTIAL EXCEPTIONS AND VARIATIONS RELATED TO TYPICAL SECTION:

NONE

TYPICAL SECTION No. 10A



TYPICAL SECTION 10A
SEGMENT: C5
(NTS)

SHARED USE PATH DESIGN SPEED: 18 MPH

FINANCIAL PROJECT ID	SHEET NO.
444857-1-22-01	32

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PROJECT CONTROLS

CONTEXT CLASSIFICATION

( ) C1 : NATURAL
( ) C2 : RURAL
( ) C2T : RURAL TOWN
(X) C3R : SUBURBAN RES.
( ) N/A : L.A. FACILITY
( ) C3C : SUBURBAN COMM.
( ) C4 : URBAN GENERAL
( ) C5 : URBAN CENTER
( ) C6 : URBAN CORE

FUNCTIONAL CLASSIFICATION

( ) INTERSTATE
( ) FREEWAY/EXPWY.
( ) PRINCIPAL ARTERIAL
( ) MINOR ARTERIAL
( ) MAJOR COLLECTOR
( ) MINOR COLLECTOR
(X) LOCAL

HIGHWAY SYSTEM

( ) NATIONAL HIGHWAY SYSTEM
( ) STRATEGIC INTERMODAL SYSTEM
( ) STATE HIGHWAY SYSTEM
(X) OFF-STATE HIGHWAY SYSTEM

ACCESS CLASSIFICATION

( ) 1 - FREEWAY
( ) 2 - RESTRICTIVE w/Service Roads
( ) 3 - RESTRICTIVE w/660 ft. Connection Spacing
( ) 4 - NON-RESTRICTIVE w/2640 ft. Signal Spacing
( ) 5 - RESTRICTIVE w/440 ft. Connection Spacing
( ) 6 - NON-RESTRICTIVE w/1320 ft. Signal Spacing
(X) 7 - BOTH MEDIAN TYPES

CRITERIA

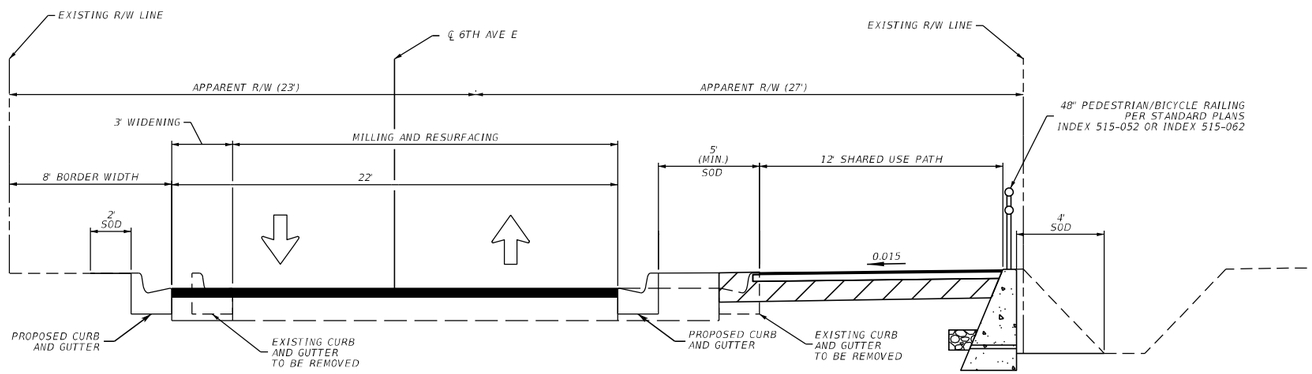
(X) NEW CONSTRUCTION / RECONSTRUCTION
( ) RESURFACING (LA FACILITIES)
( ) RRR (ARTERIALS & COLLECTORS)

POTENTIAL EXCEPTIONS AND VARIATIONS RELATED TO TYPICAL SECTION:

8-foot border width allowable per FDM Table 210.7.1 Note 2

Note: Potential impact to treatment swale east of proposed R/W line

TYPICAL SECTION No. 10B



TYPICAL SECTION 10B
SEGMENT: C5
(NTS)

SHARED USE PATH DESIGN SPEED: 18 MPH

FINANCIAL PROJECT ID	SHEET NO.
444857-1-22-01	33

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PROJECT CONTROLS

CONTEXT CLASSIFICATION

( ) C1 : NATURAL
( ) C2 : RURAL
( ) C2T : RURAL TOWN
(X) C3R : SUBURBAN RES.
( ) C3C : SUBURBAN COMM.
( ) C4 : URBAN GENERAL
( ) C5 : URBAN CENTER
( ) C6 : URBAN CORE
( ) N/A : L.A. FACILITY

FUNCTIONAL CLASSIFICATION

( ) INTERSTATE
( ) FREEWAY/EXPWY.
( ) PRINCIPAL ARTERIAL
( ) MINOR ARTERIAL
( ) MAJOR COLLECTOR
( ) MINOR COLLECTOR
(X) LOCAL

HIGHWAY SYSTEM

( ) NATIONAL HIGHWAY SYSTEM
( ) STRATEGIC INTERMODAL SYSTEM
( ) STATE HIGHWAY SYSTEM
(X) OFF-STATE HIGHWAY SYSTEM

ACCESS CLASSIFICATION

( ) 1 - FREEWAY
( ) 2 - RESTRICTIVE w/Service Roads
( ) 3 - RESTRICTIVE w/660 ft. Connection Spacing
( ) 4 - NON-RESTRICTIVE w/2640 ft. Signal Spacing
( ) 5 - RESTRICTIVE w/440 ft. Connection Spacing
( ) 6 - NON-RESTRICTIVE w/1320 ft. Signal Spacing
(X) 7 - BOTH MEDIAN TYPES

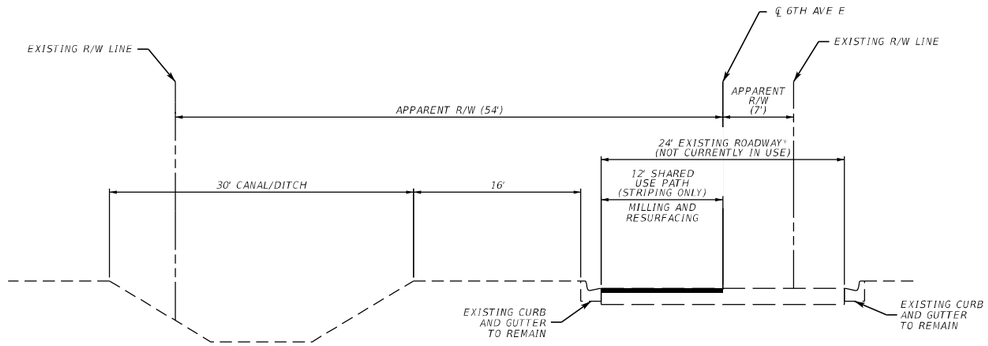
CRITERIA

(X) NEW CONSTRUCTION / RECONSTRUCTION
( ) RESURFACING (LA FACILITIES)
( ) RRR (ARTERIALS & COLLECTORS)

POTENTIAL EXCEPTIONS AND VARIATIONS RELATED TO TYPICAL SECTION:

NONE

TYPICAL SECTION No. 11



*PAVED ROADWAY NOT PRESENT FOR 215' NORTH OF 18TH ST CT E

TYPICAL SECTION 11
SEGMENT: C7
(NTS)

SHARED USE PATH DESIGN SPEED: 18 MPH

FINANCIAL PROJECT ID	SHEET NO.
444857-1-22-01	34

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KatelynnDunkerson 8/17/2026 5:56:17 PM

PROJECT CONTROLS

CONTEXT CLASSIFICATION

( ) C1 : NATURAL
( ) C2 : RURAL
( ) C2T : RURAL TOWN
(X) C3R : SUBURBAN RES.
( ) C3C : SUBURBAN COMM.
( ) C4 : URBAN GENERAL
( ) C5 : URBAN CENTER
( ) C6 : URBAN CORE
( ) N/A : L.A. FACILITY

FUNCTIONAL CLASSIFICATION

( ) INTERSTATE
( ) FREEWAY/EXPWY.
( ) PRINCIPAL ARTERIAL
( ) MINOR ARTERIAL
( ) MAJOR COLLECTOR
( ) MINOR COLLECTOR
(X) LOCAL

HIGHWAY SYSTEM

( ) NATIONAL HIGHWAY SYSTEM
( ) STRATEGIC INTERMODAL SYSTEM
( ) STATE HIGHWAY SYSTEM
(X) OFF-STATE HIGHWAY SYSTEM

ACCESS CLASSIFICATION

( ) 1 - FREEWAY
( ) 2 - RESTRICTIVE w/Service Roads
( ) 3 - RESTRICTIVE w/660 ft. Connection Spacing
( ) 4 - NON-RESTRICTIVE w/2640 ft. Signal Spacing
( ) 5 - RESTRICTIVE w/440 ft. Connection Spacing
( ) 6 - NON-RESTRICTIVE w/1320 ft. Signal Spacing
(X) 7 - BOTH MEDIAN TYPES

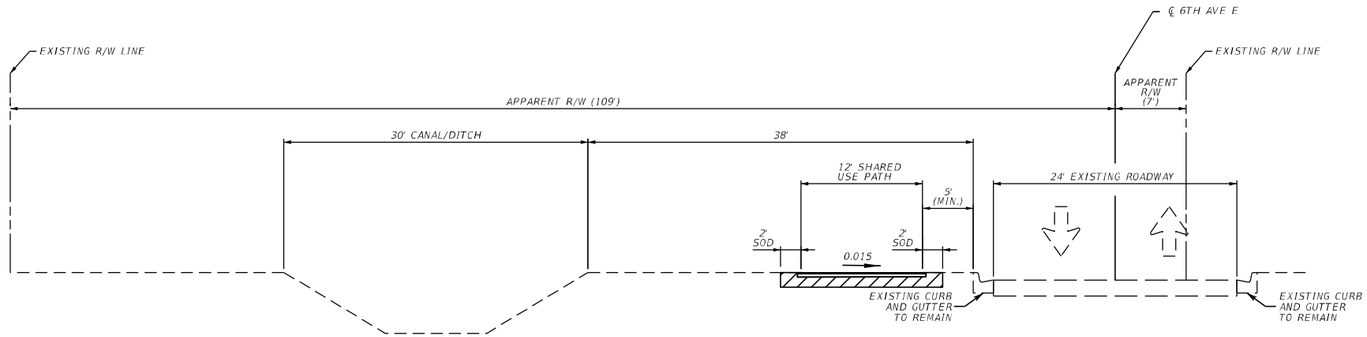
CRITERIA

(X) NEW CONSTRUCTION / RECONSTRUCTION
( ) RESURFACING (LA FACILITIES)
( ) RRR (ARTERIALS & COLLECTORS)

POTENTIAL EXCEPTIONS AND VARIATIONS RELATED TO TYPICAL SECTION:

NONE

TYPICAL SECTION No. 12



TYPICAL SECTION 12
SEGMENT: D1
(NTS)

SHARED USE PATH DESIGN SPEED: 18 MPH

FINANCIAL PROJECT ID	SHEET NO.
444857-1-22-01	35

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KatelynnDunkerson 8/17/2026 5:56:18 PM

PROJECT CONTROLS

CONTEXT CLASSIFICATION

( ) C1 : NATURAL
( ) C2 : RURAL
( ) C2T : RURAL TOWN
(X) C3R : SUBURBAN RES.
( ) C3C : SUBURBAN COMM.
( ) C4 : URBAN GENERAL
( ) C5 : URBAN CENTER
( ) C6 : URBAN CORE
( ) N/A : L.A. FACILITY

FUNCTIONAL CLASSIFICATION

( ) INTERSTATE
( ) FREEWAY/EXPWY.
( ) PRINCIPAL ARTERIAL
( ) MINOR ARTERIAL
( ) MAJOR COLLECTOR
( ) MINOR COLLECTOR
(X) LOCAL

HIGHWAY SYSTEM

( ) NATIONAL HIGHWAY SYSTEM
( ) STRATEGIC INTERMODAL SYSTEM
( ) STATE HIGHWAY SYSTEM
(X) OFF-STATE HIGHWAY SYSTEM

ACCESS CLASSIFICATION

( ) 1 - FREEWAY
( ) 2 - RESTRICTIVE w/Service Roads
( ) 3 - RESTRICTIVE w/660 ft. Connection Spacing
( ) 4 - NON-RESTRICTIVE w/2640 ft. Signal Spacing
( ) 5 - RESTRICTIVE w/440 ft. Connection Spacing
( ) 6 - NON-RESTRICTIVE w/1320 ft. Signal Spacing
(X) 7 - BOTH MEDIAN TYPES

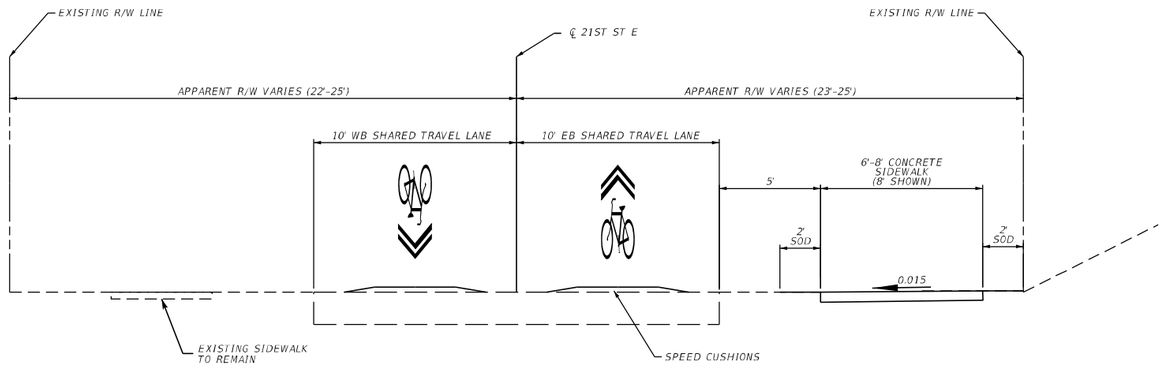
CRITERIA

(X) NEW CONSTRUCTION / RECONSTRUCTION
( ) RESURFACING (LA FACILITIES)
( ) RRR (ARTERIALS & COLLECTORS)

POTENTIAL EXCEPTIONS AND VARIATIONS RELATED TO TYPICAL SECTION:

NONE

TYPICAL SECTION No. 13



TYPICAL SECTION 13
SEGMENT: E4
(NTS)

TRAFFIC DATA:

POSTED SPEED 30 MPH

FINANCIAL PROJECT ID	SHEET NO.
444857-1-22-01	36

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PROJECT CONTROLS

CONTEXT CLASSIFICATION

( ) C1 : NATURAL
( ) C2 : RURAL
( ) C2T : RURAL TOWN
(X) C3R : SUBURBAN RES.
( ) C3C : SUBURBAN COMM.
( ) C4 : URBAN GENERAL
( ) C5 : URBAN CENTER
( ) C6 : URBAN CORE
( ) N/A : L.A. FACILITY

FUNCTIONAL CLASSIFICATION

( ) INTERSTATE
( ) FREEWAY/EXPWY.
( ) PRINCIPAL ARTERIAL
( ) MINOR ARTERIAL
( ) MAJOR COLLECTOR
( ) MINOR COLLECTOR
(X) LOCAL

HIGHWAY SYSTEM

( ) NATIONAL HIGHWAY SYSTEM
( ) STRATEGIC INTERMODAL SYSTEM
( ) STATE HIGHWAY SYSTEM
(X) OFF-STATE HIGHWAY SYSTEM

ACCESS CLASSIFICATION

( ) 1 - FREEWAY
( ) 2 - RESTRICTIVE w/Service Roads
( ) 3 - RESTRICTIVE w/660 ft. Connection Spacing
( ) 4 - NON-RESTRICTIVE w/2640 ft. Signal Spacing
( ) 5 - RESTRICTIVE w/440 ft. Connection Spacing
( ) 6 - NON-RESTRICTIVE w/1320 ft. Signal Spacing
(X) 7 - BOTH MEDIAN TYPES

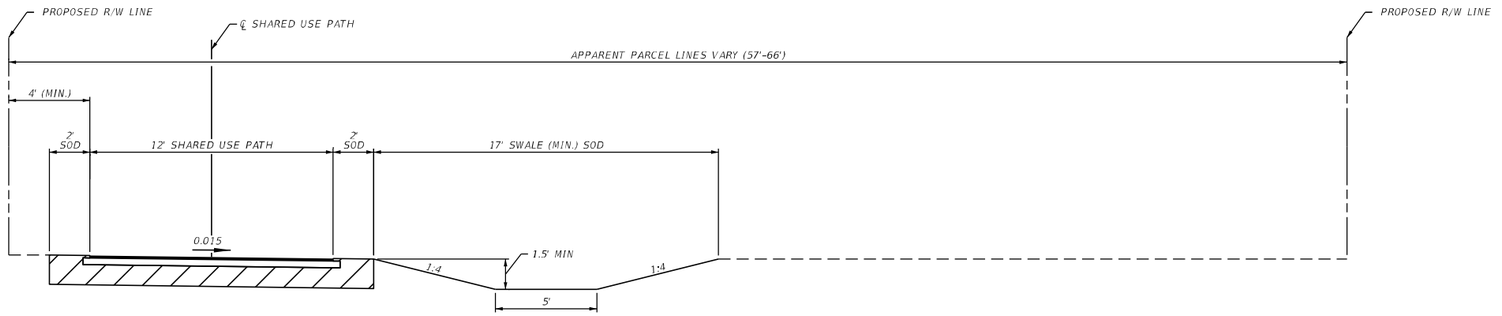
CRITERIA

(X) NEW CONSTRUCTION / RECONSTRUCTION
( ) RESURFACING (LA FACILITIES)
( ) RRR (ARTERIALS & COLLECTORS)

POTENTIAL EXCEPTIONS AND VARIATIONS RELATED TO TYPICAL SECTION:

NONE

TYPICAL SECTION No. 14



TYPICAL SECTION 14
SEGMENT: E5, E7
(NTS)

SHARED USE PATH DESIGN SPEED: 18 MPH

FINANCIAL PROJECT ID	SHEET NO.
444857-1-22-01	37

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PROJECT CONTROLS

CONTEXT CLASSIFICATION

( ) C1 : NATURAL
( ) C2 : RURAL
( ) C2T : RURAL TOWN
(X) C3R : SUBURBAN RES.
( ) C3C : SUBURBAN COMM.
( ) C4 : URBAN GENERAL
( ) C5 : URBAN CENTER
( ) C6 : URBAN CORE
( ) N/A : L.A. FACILITY

FUNCTIONAL CLASSIFICATION

( ) INTERSTATE
( ) FREEWAY/EXPWY.
( ) PRINCIPAL ARTERIAL
( ) MINOR ARTERIAL
( ) MAJOR COLLECTOR
( ) MINOR COLLECTOR
(X) LOCAL

HIGHWAY SYSTEM

( ) NATIONAL HIGHWAY SYSTEM
( ) STRATEGIC INTERMODAL SYSTEM
( ) STATE HIGHWAY SYSTEM
(X) OFF-STATE HIGHWAY SYSTEM

ACCESS CLASSIFICATION

( ) 1 - FREEWAY
( ) 2 - RESTRICTIVE w/Service Roads
( ) 3 - RESTRICTIVE w/660 ft. Connection Spacing
( ) 4 - NON-RESTRICTIVE w/2640 ft. Signal Spacing
( ) 5 - RESTRICTIVE w/440 ft. Connection Spacing
( ) 6 - NON-RESTRICTIVE w/1320 ft. Signal Spacing
(X) 7 - BOTH MEDIAN TYPES

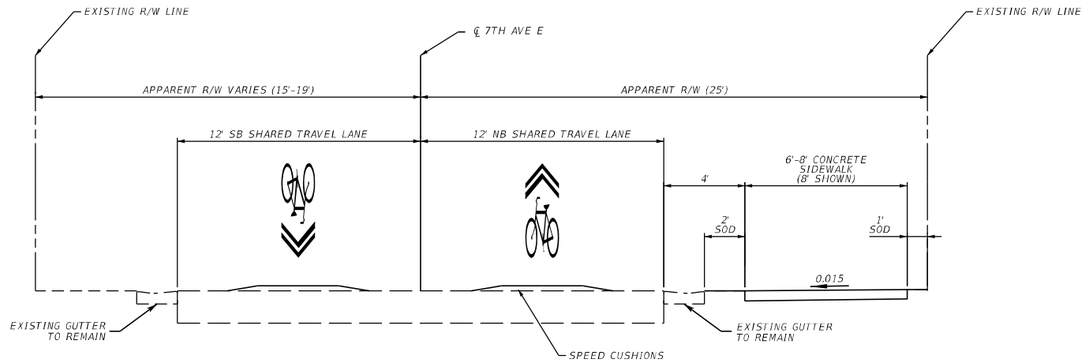
CRITERIA

(X) NEW CONSTRUCTION / RECONSTRUCTION
( ) RESURFACING (LA FACILITIES)
( ) RRR (ARTERIALS & COLLECTORS)

POTENTIAL EXCEPTIONS AND VARIATIONS RELATED TO TYPICAL SECTION:

NONE

TYPICAL SECTION No. 15



TYPICAL SECTION 15
SEGMENT: E6
(NTS)

TRAFFIC DATA:

POSTED SPEED 30 MPH

FINANCIAL PROJECT ID	SHEET NO.
444857-1-22-01	38

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PROJECT CONTROLS

CONTEXT CLASSIFICATION

( ) C1 : NATURAL
( ) C2 : RURAL
( ) C2T : RURAL TOWN
(X) C3R : SUBURBAN RES.
( ) C3C : SUBURBAN COMM.
( ) C4 : URBAN GENERAL
( ) C5 : URBAN CENTER
( ) C6 : URBAN CORE
( ) N/A : L.A. FACILITY

FUNCTIONAL CLASSIFICATION

( ) INTERSTATE
( ) FREEWAY/EXPWY.
( ) PRINCIPAL ARTERIAL
( ) MINOR ARTERIAL
( ) MAJOR COLLECTOR
( ) MINOR COLLECTOR
(X) LOCAL

HIGHWAY SYSTEM

( ) NATIONAL HIGHWAY SYSTEM
( ) STRATEGIC INTERMODAL SYSTEM
( ) STATE HIGHWAY SYSTEM
(X) OFF-STATE HIGHWAY SYSTEM

ACCESS CLASSIFICATION

( ) 1 - FREEWAY
( ) 2 - RESTRICTIVE w/Service Roads
( ) 3 - RESTRICTIVE w/660 ft. Connection Spacing
( ) 4 - NON-RESTRICTIVE w/2640 ft. Signal Spacing
( ) 5 - RESTRICTIVE w/440 ft. Connection Spacing
( ) 6 - NON-RESTRICTIVE w/1320 ft. Signal Spacing
(X) 7 - BOTH MEDIAN TYPES

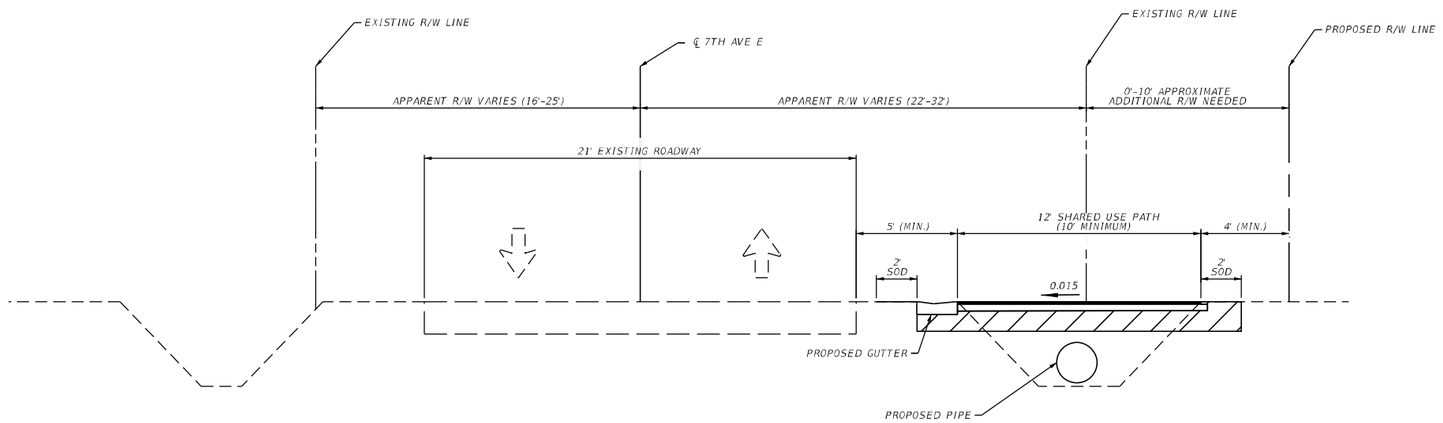
CRITERIA

(X) NEW CONSTRUCTION / RECONSTRUCTION
( ) RESURFACING (LA FACILITIES)
( ) RRR (ARTERIALS & COLLECTORS)

POTENTIAL EXCEPTIONS AND VARIATIONS RELATED TO TYPICAL SECTION:

Note: Impact to existing shed on westernmost parcel of segment

TYPICAL SECTION No. 16



TYPICAL SECTION 16
SEGMENT: F4
(NTS)

SHARED USE PATH DESIGN SPEED: 18 MPH

FINANCIAL PROJECT ID	SHEET NO.
444857-1-22-01	39

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PROJECT CONTROLS

CONTEXT CLASSIFICATION

( ) C1 : NATURAL
( ) C2 : RURAL
( ) C2T : RURAL TOWN
(X) C3R : SUBURBAN RES.
( ) C3C : SUBURBAN COMM.
( ) C4 : URBAN GENERAL
( ) C5 : URBAN CENTER
( ) C6 : URBAN CORE
( ) N/A : L.A. FACILITY

FUNCTIONAL CLASSIFICATION

( ) INTERSTATE
( ) FREEWAY/EXPWY.
( ) PRINCIPAL ARTERIAL
( ) MINOR ARTERIAL
( ) MAJOR COLLECTOR
( ) MINOR COLLECTOR
(X) LOCAL

HIGHWAY SYSTEM

( ) NATIONAL HIGHWAY SYSTEM
( ) STRATEGIC INTERMODAL SYSTEM
( ) STATE HIGHWAY SYSTEM
(X) OFF-STATE HIGHWAY SYSTEM

ACCESS CLASSIFICATION

( ) 1 - FREEWAY
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( ) 3 - RESTRICTIVE w/660 ft. Connection Spacing
( ) 4 - NON-RESTRICTIVE w/2640 ft. Signal Spacing
( ) 5 - RESTRICTIVE w/440 ft. Connection Spacing
( ) 6 - NON-RESTRICTIVE w/1320 ft. Signal Spacing
(X) 7 - BOTH MEDIAN TYPES

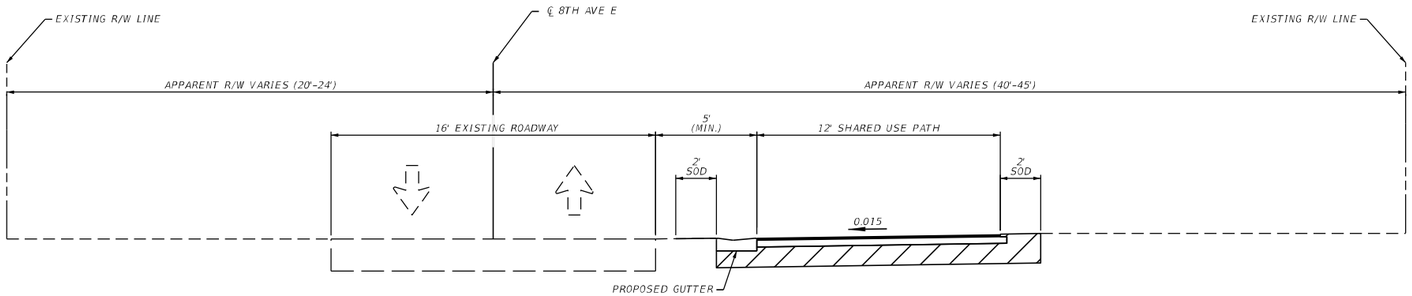
CRITERIA

(X) NEW CONSTRUCTION / RECONSTRUCTION
( ) RESURFACING (LA FACILITIES)
( ) RRR (ARTERIALS & COLLECTORS)

POTENTIAL EXCEPTIONS AND VARIATIONS RELATED TO TYPICAL SECTION:

NONE

TYPICAL SECTION No. 17



TYPICAL SECTION 17
SEGMENT: F5
(NTS)

SHARED USE PATH DESIGN SPEED: 18 MPH

FINANCIAL PROJECT ID	SHEET NO.
444857-1-22-01	40

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PROJECT CONTROLS

CONTEXT CLASSIFICATION

( ) C1 : NATURAL
( ) C2 : RURAL
( ) C2T : RURAL TOWN
(X) C3R : SUBURBAN RES.
( ) C3C : SUBURBAN COMM.
( ) C4 : URBAN GENERAL
( ) C5 : URBAN CENTER
( ) C6 : URBAN CORE
( ) N/A : L.A. FACILITY

FUNCTIONAL CLASSIFICATION

( ) INTERSTATE
( ) FREEWAY/EXPWY.
( ) PRINCIPAL ARTERIAL
( ) MINOR ARTERIAL
( ) MAJOR COLLECTOR
( ) MINOR COLLECTOR
(X) LOCAL

HIGHWAY SYSTEM

( ) NATIONAL HIGHWAY SYSTEM
( ) STRATEGIC INTERMODAL SYSTEM
( ) STATE HIGHWAY SYSTEM
(X) OFF-STATE HIGHWAY SYSTEM

ACCESS CLASSIFICATION

( ) 1 - FREEWAY
( ) 2 - RESTRICTIVE w/Service Roads
( ) 3 - RESTRICTIVE w/660 ft. Connection Spacing
( ) 4 - NON-RESTRICTIVE w/2640 ft. Signal Spacing
( ) 5 - RESTRICTIVE w/440 ft. Connection Spacing
( ) 6 - NON-RESTRICTIVE w/1320 ft. Signal Spacing
(X) 7 - BOTH MEDIAN TYPES

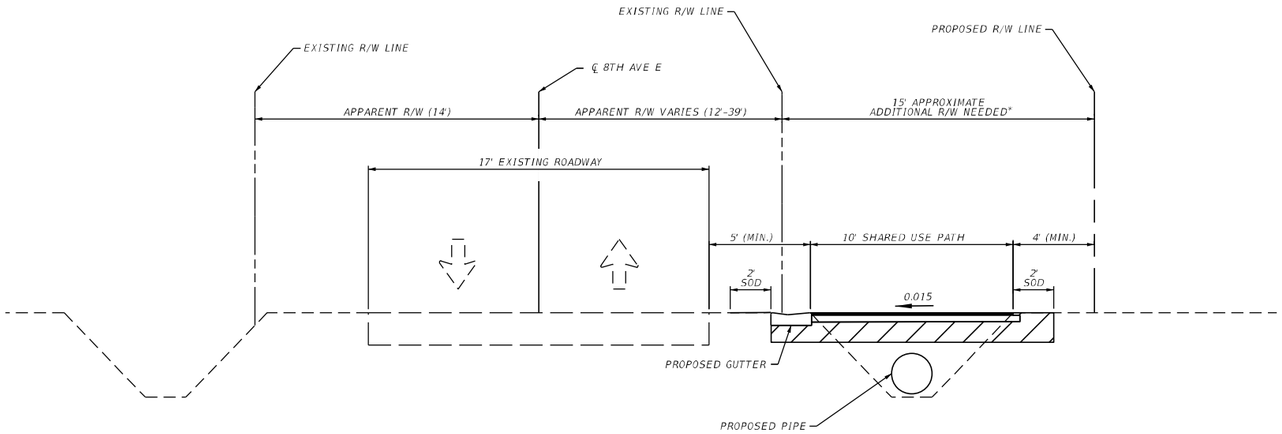
CRITERIA

(X) NEW CONSTRUCTION / RECONSTRUCTION
( ) RESURFACING (LA FACILITIES)
( ) RRR (ARTERIALS & COLLECTORS)

POTENTIAL EXCEPTIONS AND VARIATIONS RELATED TO TYPICAL SECTION:

NONE

TYPICAL SECTION No. 18



*ADDITIONAL R/W REQUIRED
FOR APPROXIMATELY 85'
(~35% OF TOTAL SEGMENT)

TYPICAL SECTION 18
SEGMENT: G1
(NTS)

SHARED USE PATH DESIGN SPEED: 18 MPH

FINANCIAL PROJECT ID	SHEET NO.
444857-1-22-01	41

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PROJECT CONTROLS

CONTEXT CLASSIFICATION

( ) C1 : NATURAL
( ) C2 : RURAL
( ) C2T : RURAL TOWN
(X) C3R : SUBURBAN RES.
( ) C3C : SUBURBAN COMM.
( ) C4 : URBAN GENERAL
( ) C5 : URBAN CENTER
( ) C6 : URBAN CORE
( ) N/A : L.A. FACILITY

FUNCTIONAL CLASSIFICATION

( ) INTERSTATE
( ) FREEWAY/EXPWY.
( ) PRINCIPAL ARTERIAL
( ) MINOR ARTERIAL
( ) MAJOR COLLECTOR
( ) MINOR COLLECTOR
(X) LOCAL

HIGHWAY SYSTEM

( ) NATIONAL HIGHWAY SYSTEM
( ) STRATEGIC INTERMODAL SYSTEM
( ) STATE HIGHWAY SYSTEM
(X) OFF-STATE HIGHWAY SYSTEM

ACCESS CLASSIFICATION

( ) 1 - FREEWAY
( ) 2 - RESTRICTIVE w/Service Roads
( ) 3 - RESTRICTIVE w/660 ft. Connection Spacing
( ) 4 - NON-RESTRICTIVE w/2640 ft. Signal Spacing
( ) 5 - RESTRICTIVE w/440 ft. Connection Spacing
( ) 6 - NON-RESTRICTIVE w/1320 ft. Signal Spacing
(X) 7 - BOTH MEDIAN TYPES

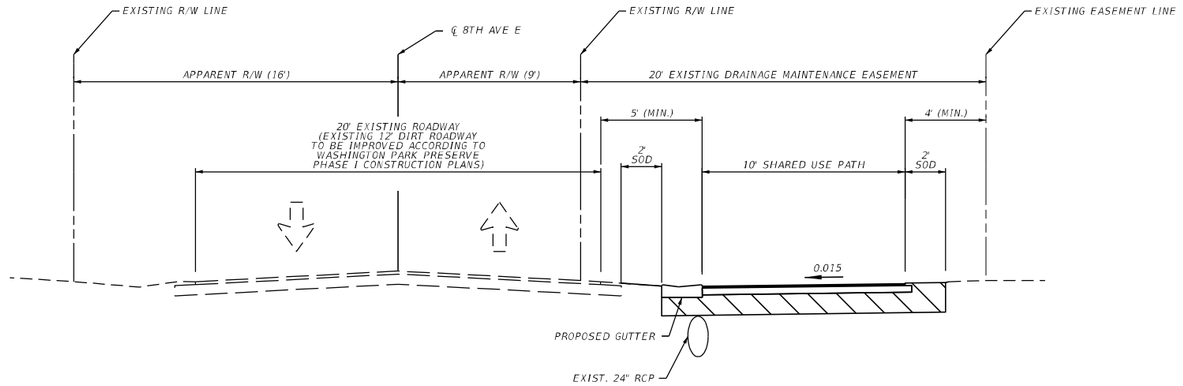
CRITERIA

(X) NEW CONSTRUCTION / RECONSTRUCTION
( ) RESURFACING (LA FACILITIES)
( ) RRR (ARTERIALS & COLLECTORS)

POTENTIAL EXCEPTIONS AND VARIATIONS RELATED TO TYPICAL SECTION:

NONE

TYPICAL SECTION No. 19



TYPICAL SECTION 19
SEGMENT: G2
(NTS)

SHARED USE PATH DESIGN SPEED: 18 MPH

FINANCIAL PROJECT ID	SHEET NO.
444857-1-22-01	42

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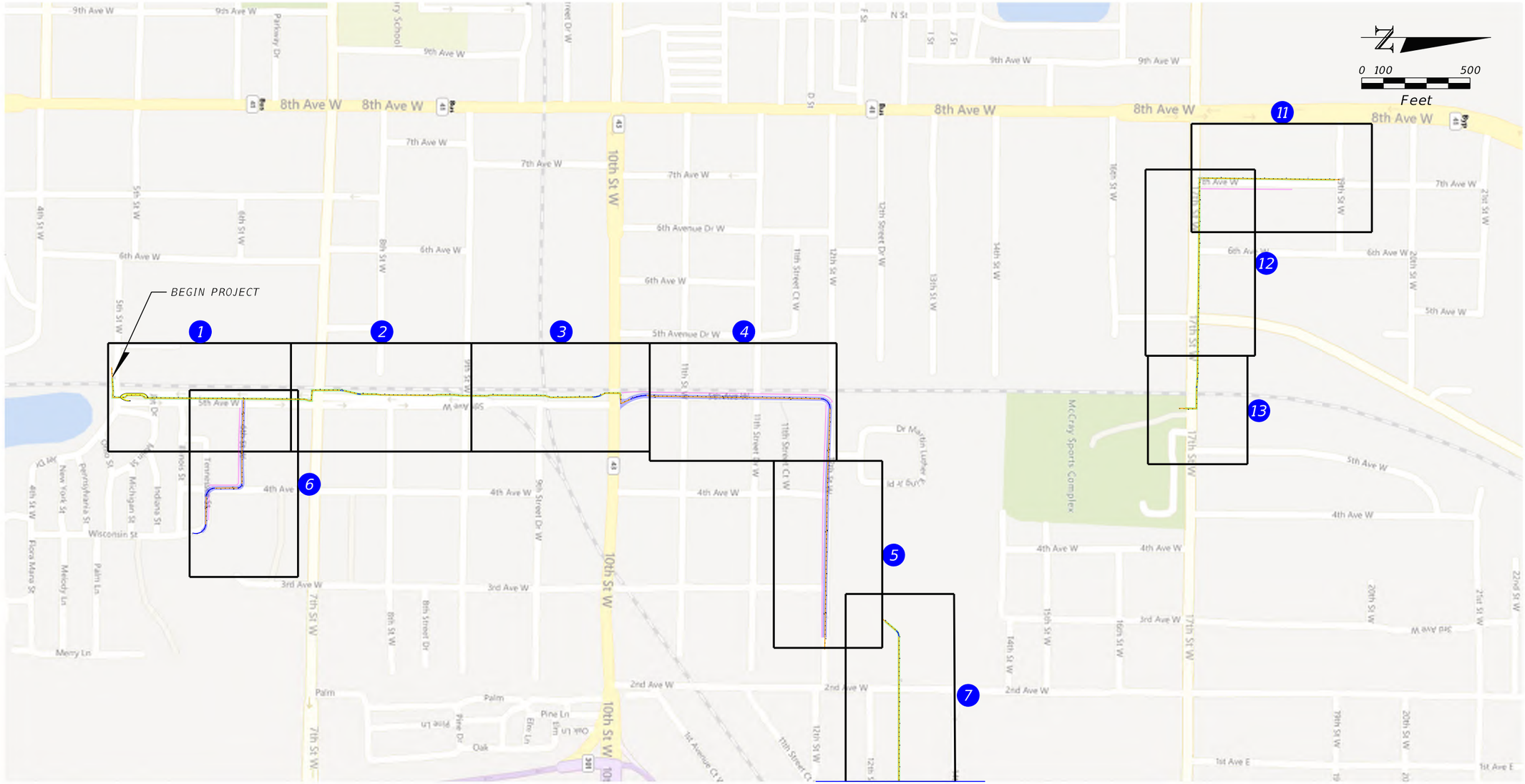
APPENDIX D - CONCEPT PLANS



REVISIONS				N/A	STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION			CONCEPT PLAN LAYOUT	SHEET NO.
DATE	DESCRIPTION	DATE	DESCRIPTION		ROAD NO.	COUNTY	FINANCIAL PROJECT ID		
					N/A	MANATEE	444857-1-22-01		EX-1

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KatelynnDunkerson 10/12/2026 8:53:06 AM

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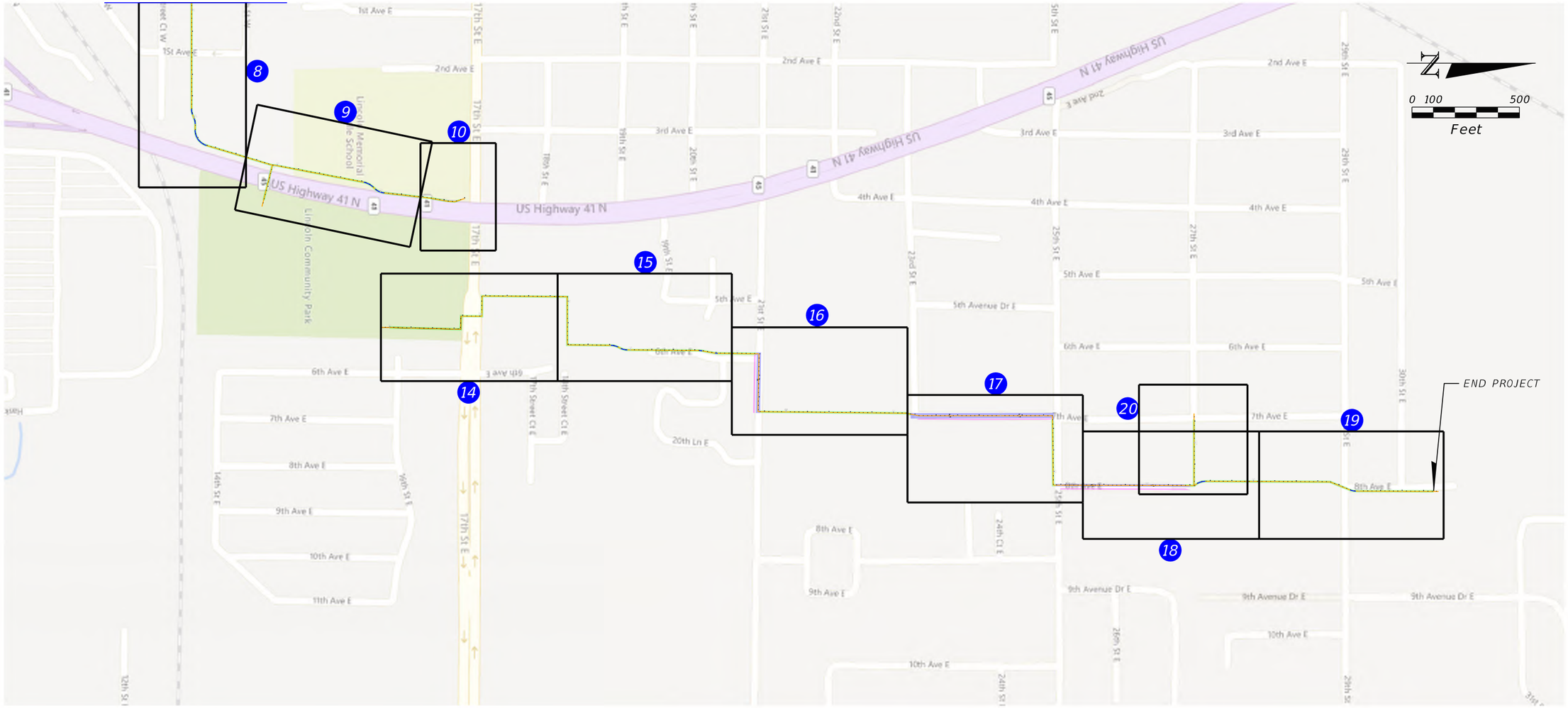
MATCH LINE
(SEE PREVIOUS SHEET)



REVISIONS				N/A	STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION			CONCEPT PLAN LAYOUT	SHEET NO.
DATE	DESCRIPTION	DATE	DESCRIPTION		ROAD NO.	COUNTY	FINANCIAL PROJECT ID		
					N/A	MANATEE	444857-1-22-01		EX-2

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KatelynnDunkerson 10/12/2026 9:30:28 AM

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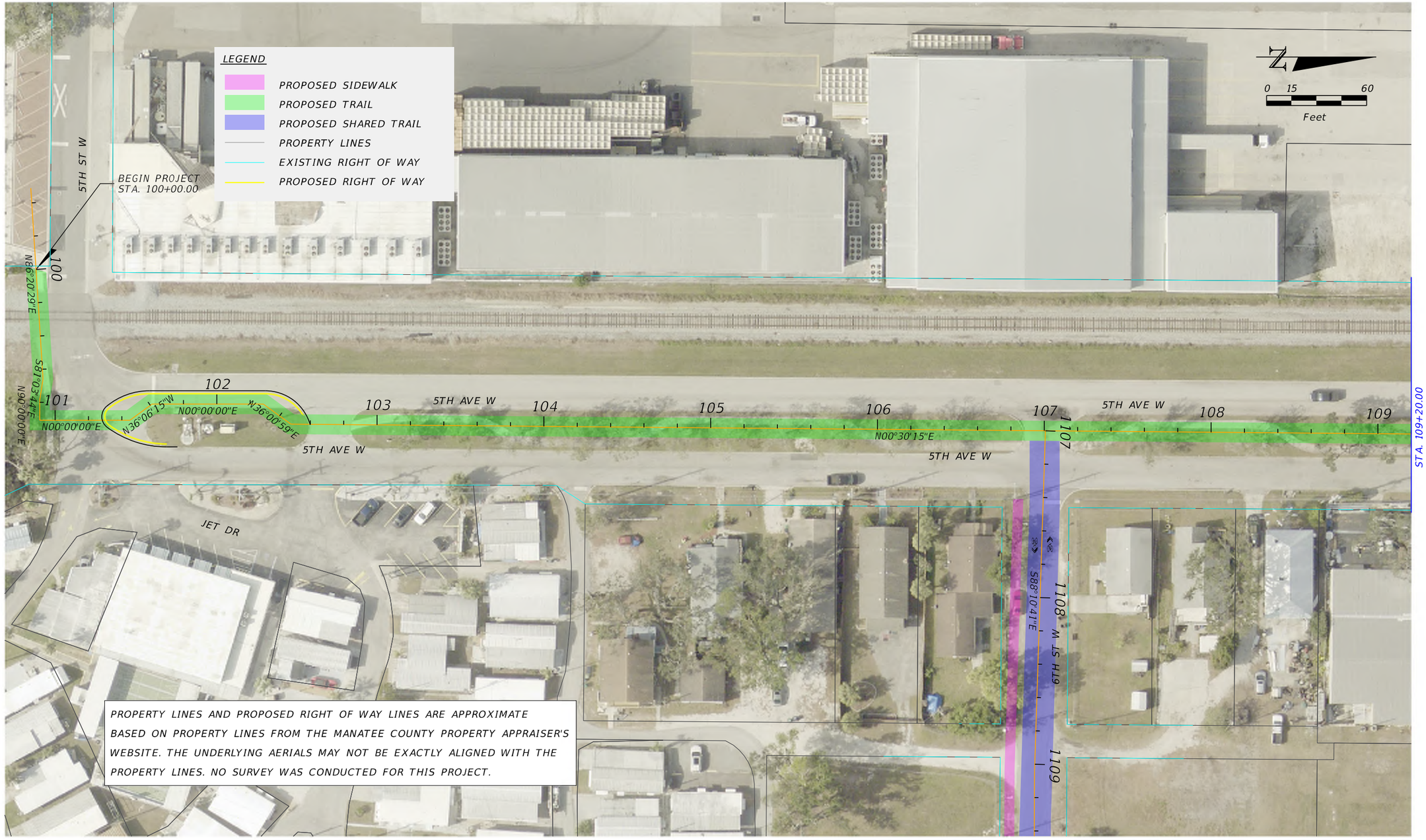
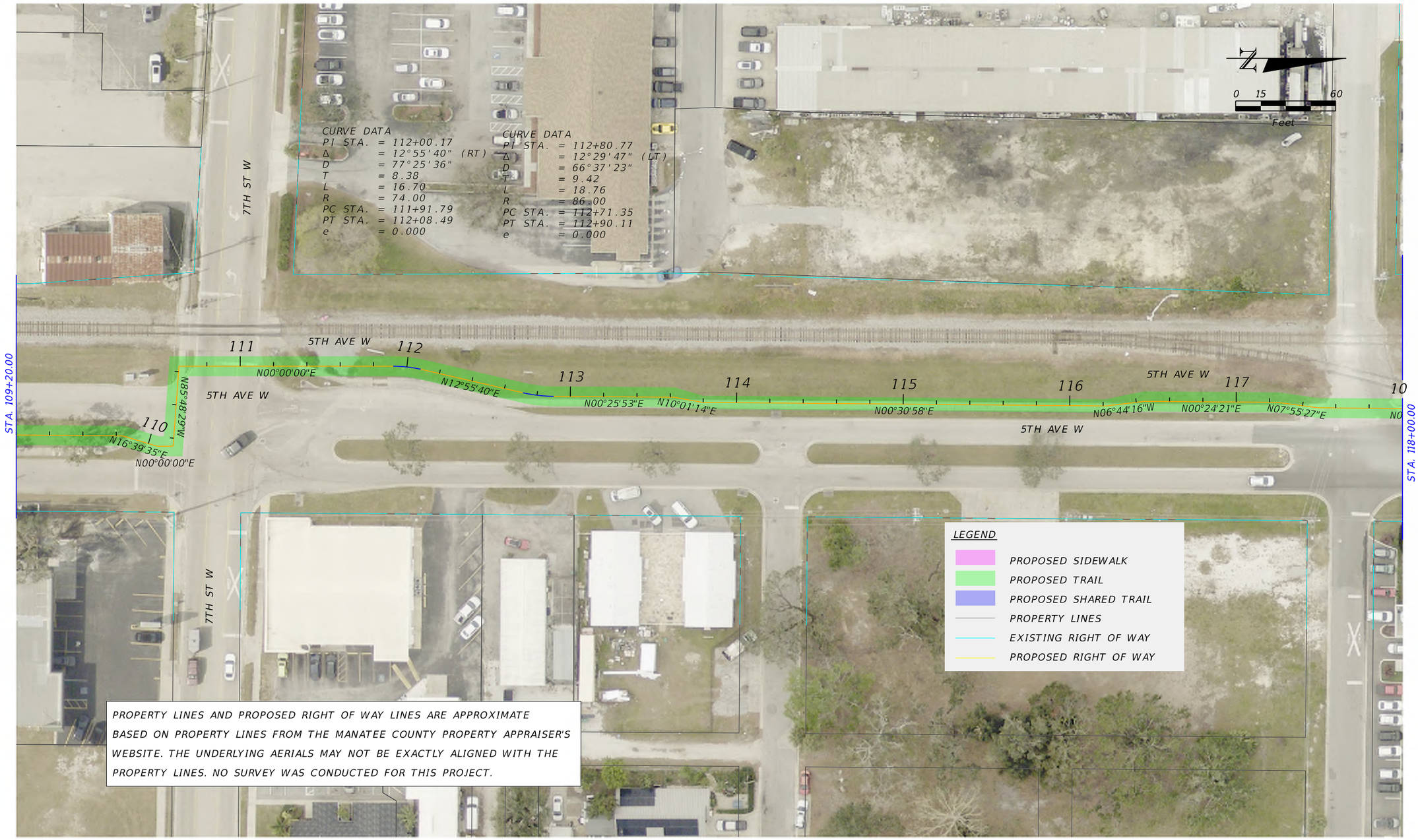
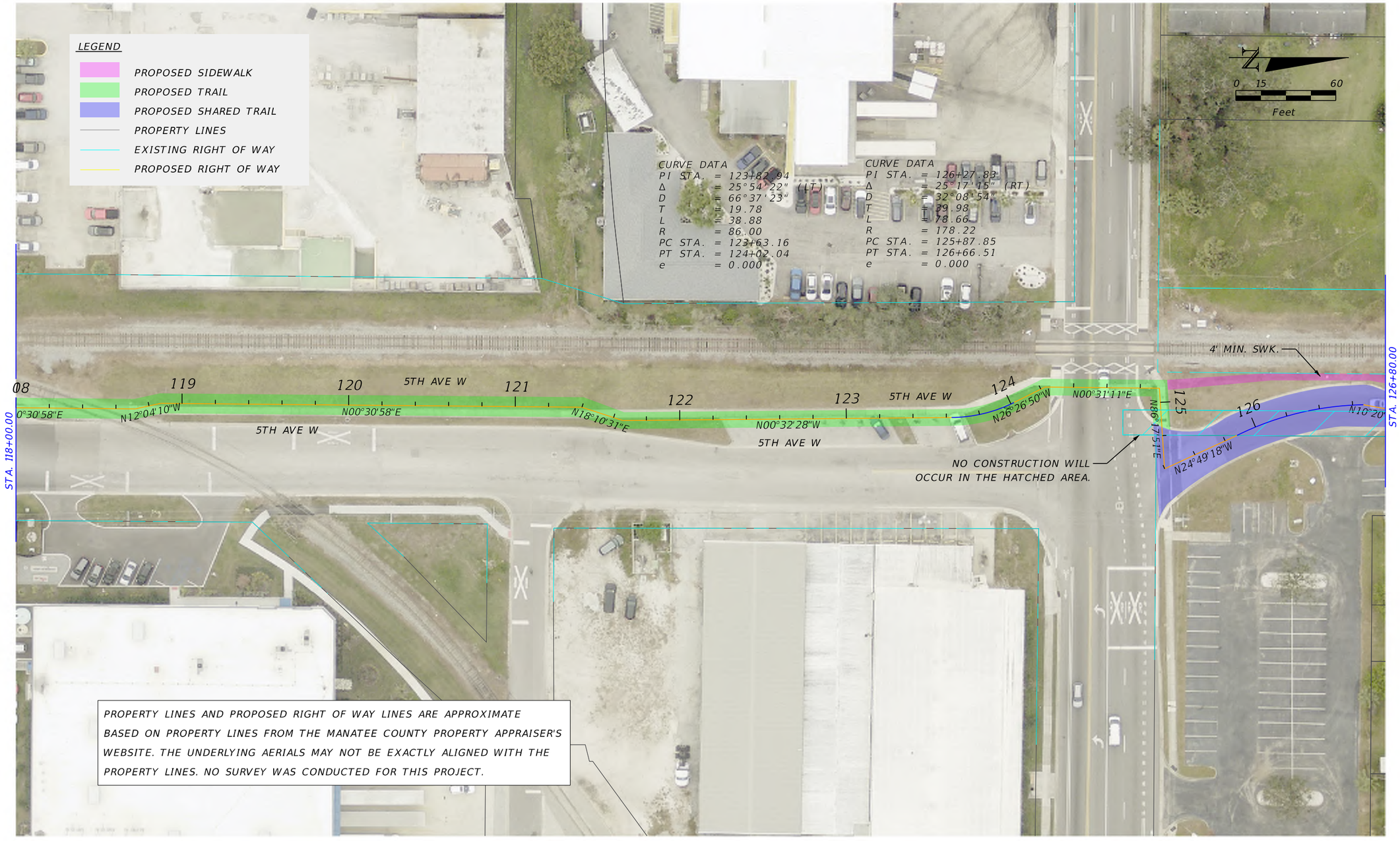


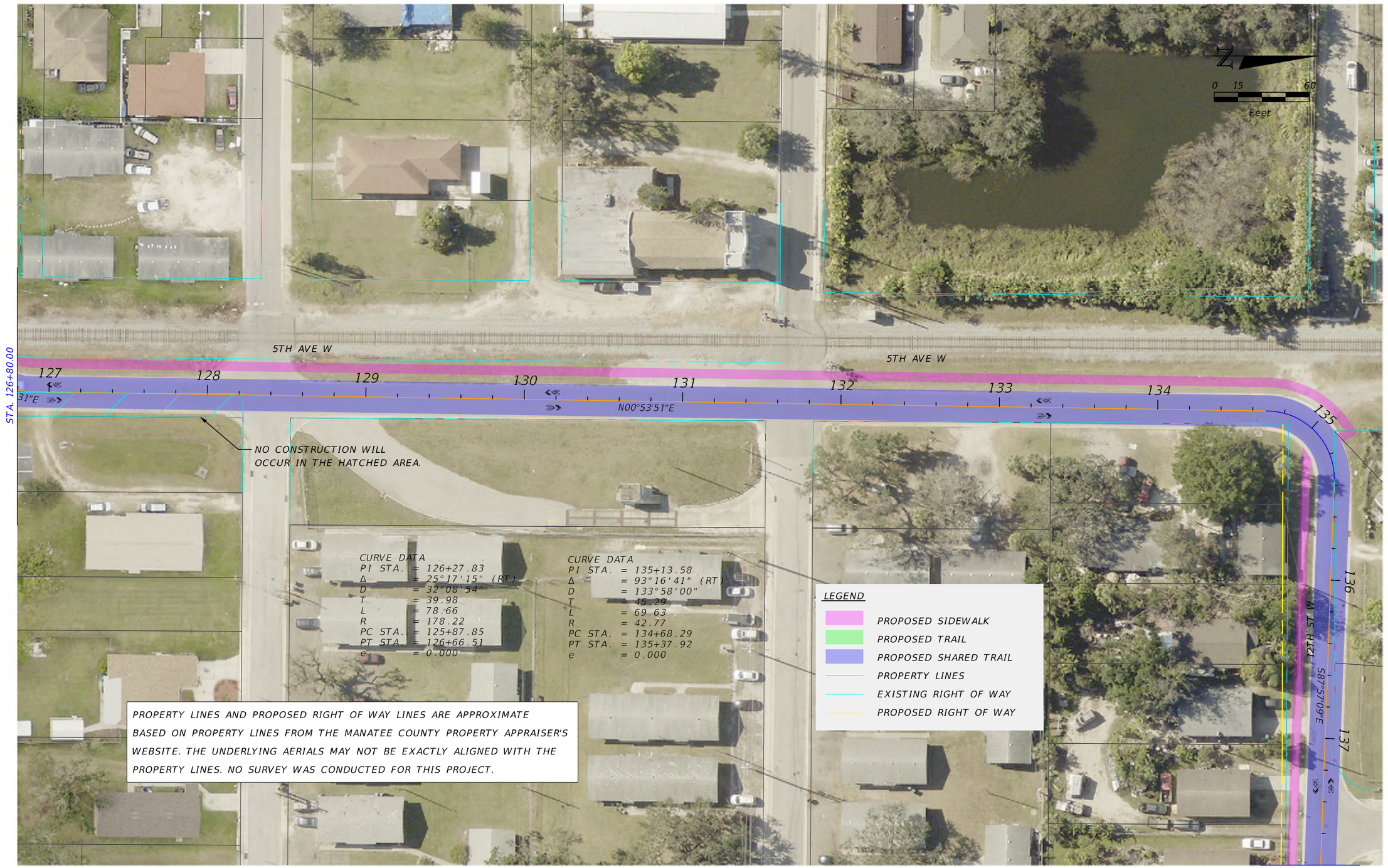
REVISIONS				N/A	STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION			CONCEPT PLAN	SHEET NO.
DATE	DESCRIPTION	DATE	DESCRIPTION		ROAD NO.	COUNTY	FINANCIAL PROJECT ID		
					N/A	MANATEE	444857-1-22-01		1



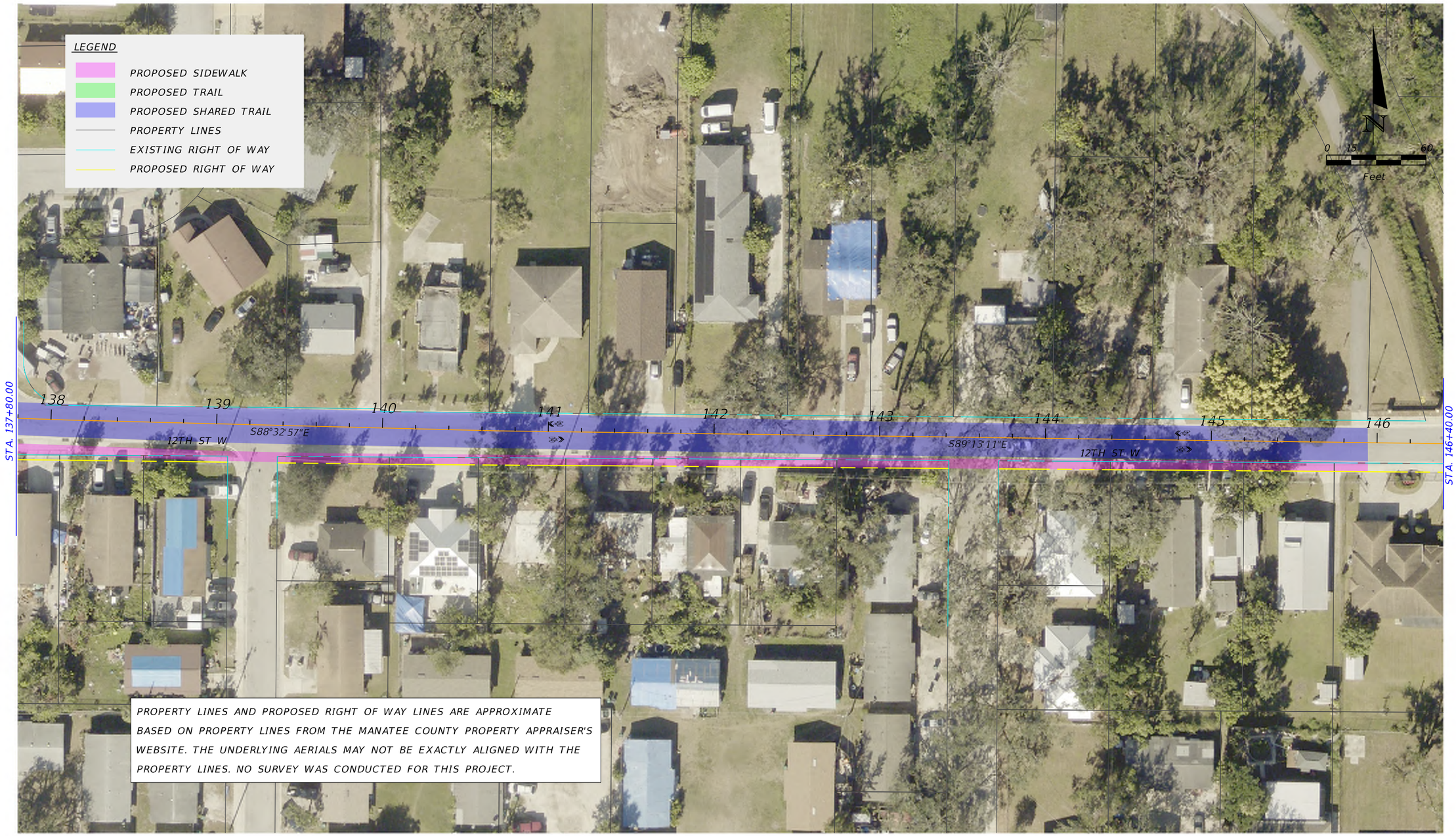
REVISIONS				N/A	STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION			CONCEPT PLAN	SHEET NO.
DATE	DESCRIPTION	DATE	DESCRIPTION		ROAD NO.	COUNTY	FINANCIAL PROJECT ID		
					N/A	MANATEE	444857-1-22-01		2



REVISIONS				N/A	STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION			CONCEPT PLAN	SHEET NO.
DATE	DESCRIPTION	DATE	DESCRIPTION		ROAD NO.	COUNTY	FINANCIAL PROJECT ID		
					N/A	MANATEE	444857-1-22-01		3



REVISIONS				N/A	STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION			CONCEPT PLAN	SHEET NO.
DATE	DESCRIPTION	DATE	DESCRIPTION		ROAD NO.	COUNTY	FINANCIAL PROJECT ID		
					N/A	MANATEE	444857-1-22-01		4



REVISIONS				N/A	STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION			CONCEPT PLAN	SHEET NO.
DATE	DESCRIPTION	DATE	DESCRIPTION		ROAD NO.	COUNTY	FINANCIAL PROJECT ID		
					N/A	MANATEE	444857-1-22-01		5

PROPERTY LINES AND PROPOSED RIGHT OF WAY LINES ARE APPROXIMATE BASED ON PROPERTY LINES FROM THE MANATEE COUNTY PROPERTY APPRAISER'S WEBSITE. THE UNDERLYING AERIALS MAY NOT BE EXACTLY ALIGNED WITH THE PROPERTY LINES. NO SURVEY WAS CONDUCTED FOR THIS PROJECT.

N

0 15 60

Feet

CURVE DATA
PI STA. = 1111+11.77
Δ = 89°39'03" (RT)
D = 286°28'44"
T = 19.88
L = 31.29
R = 20.00
PC STA. = 1110+91.90
PT STA. = 1111+23.19
e = 0.000

CURVE DATA
PI STA. = 1112+66.94
Δ = 88°56'00" (LT)
D = 143°14'22"
T = 39.26
L = 62.09
R = 40.00
PC STA. = 1112+27.68
PT STA. = 1112+89.76
e = 0.000

CURVE DATA
PI STA. = 1114+77.05
Δ = 104°17'25" (RT)
D = 124°36'02"
T = 59.16
L = 83.70
R = 45.98
PC STA. = 1114+17.89
PT STA. = 1115+01.58
e = 0.000

5TH AVE W
4TH AVE W
6TH ST W
TENNESSEE ST
WISCONSIN ST
105
106
107
108
109
1107
1108
1109
1110
1111
1112
1113
1114
1115
N00°30'15"E
S88°10'41"E
S89°44'54"E
S00°05'51"E
S89°01'51"E
S89°01'51"E

LEGEND
- PROPOSED SIDEWALK
- PROPOSED TRAIL
- PROPOSED SHARED TRAIL
- PROPERTY LINES
- EXISTING RIGHT OF WAY
- PROPOSED RIGHT OF WAY

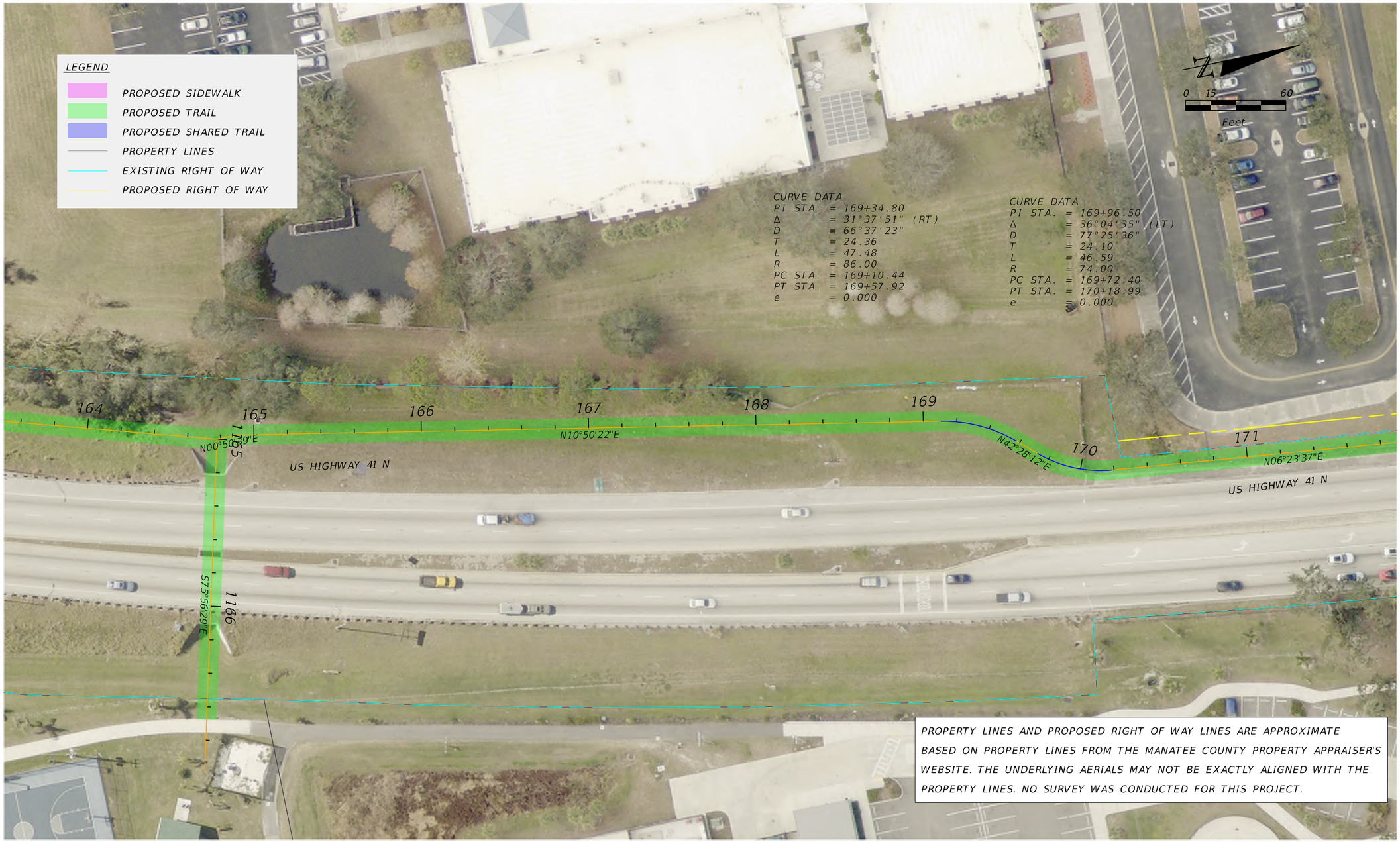
REVISIONS				N/A	STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION			CONCEPT PLAN	SHEET NO.
DATE	DESCRIPTION	DATE	DESCRIPTION		ROAD NO.	COUNTY	FINANCIAL PROJECT ID		
					N/A	MANATEE	444857-1-22-01		6



REVISIONS				N/A	STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION			CONCEPT PLAN	SHEET NO.
DATE	DESCRIPTION	DATE	DESCRIPTION		ROAD NO.	COUNTY	FINANCIAL PROJECT ID		
					N/A	MANATEE	444857-1-22-01		7



REVISIONS				N/A	STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION			CONCEPT PLAN	SHEET NO.
DATE	DESCRIPTION	DATE	DESCRIPTION		ROAD NO.	COUNTY	FINANCIAL PROJECT ID		
					N/A	MANATEE	444857-1-22-01		8



REVISIONS				N/A	STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION			CONCEPT PLAN	SHEET NO.
DATE	DESCRIPTION	DATE	DESCRIPTION		ROAD NO.	COUNTY	FINANCIAL PROJECT ID		
					N/A	MANATEE	444857-1-22-01		9

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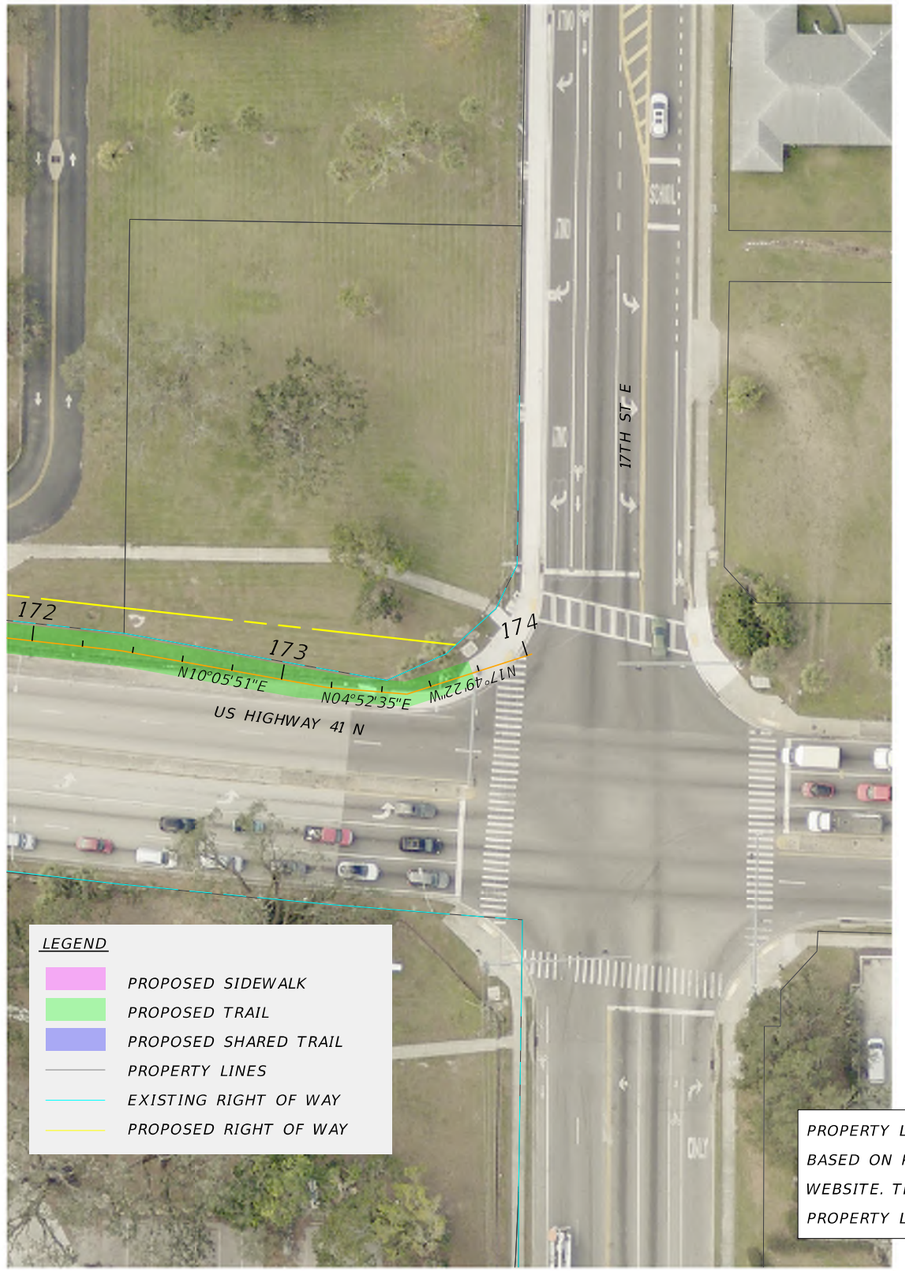
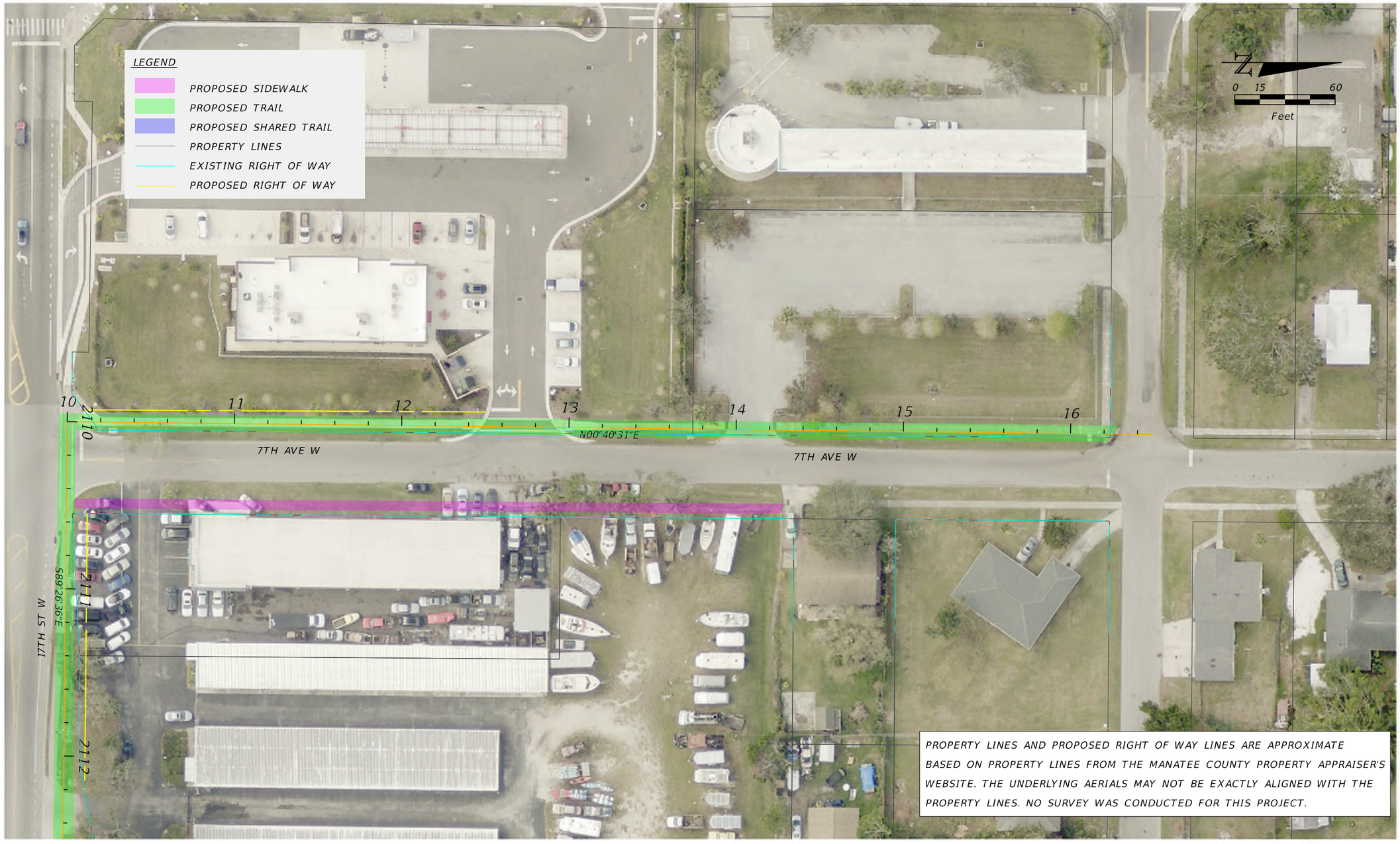


0 15 60

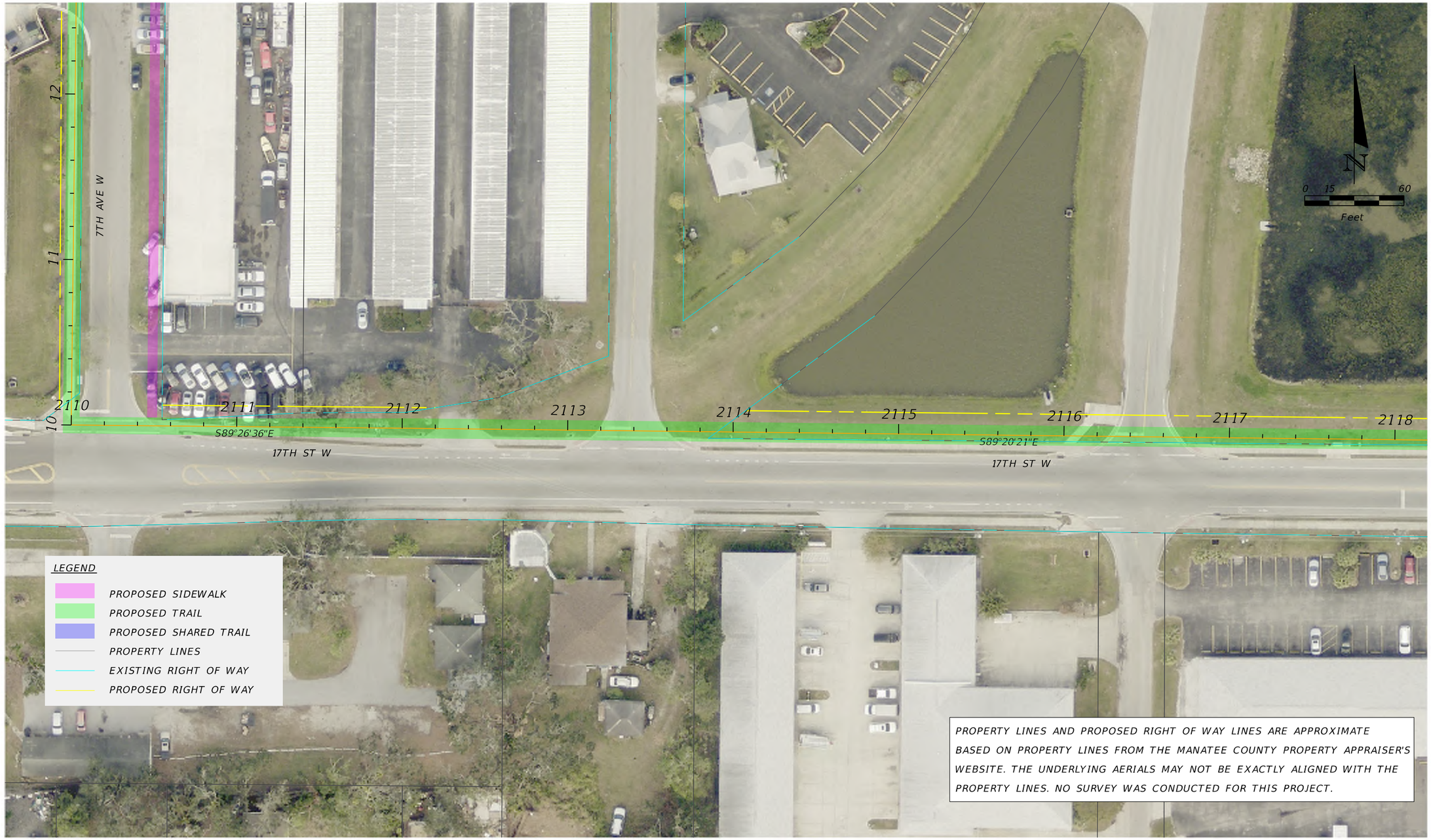
Feet

PROPERTY LINES AND PROPOSED RIGHT OF WAY LINES ARE APPROXIMATE BASED ON PROPERTY LINES FROM THE MANATEE COUNTY PROPERTY APPRAISER'S WEBSITE. THE UNDERLYING AERIALS MAY NOT BE EXACTLY ALIGNED WITH THE PROPERTY LINES. NO SURVEY WAS CONDUCTED FOR THIS PROJECT.

REVISIONS				N/A	STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION			CONCEPT PLAN	SHEET NO.
DATE	DESCRIPTION	DATE	DESCRIPTION		ROAD NO.	COUNTY	FINANCIAL PROJECT ID		
					N/A	MANATEE	444857-1-22-01		10



REVISIONS				N/A	STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION			CONCEPT PLAN	SHEET NO.
DATE	DESCRIPTION	DATE	DESCRIPTION		ROAD NO.	COUNTY	FINANCIAL PROJECT ID		11
					N/A	MANATEE	444857-1-22-01		



REVISIONS				N/A	STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION			CONCEPT PLAN	SHEET NO.
DATE	DESCRIPTION	DATE	DESCRIPTION		ROAD NO.	COUNTY	FINANCIAL PROJECT ID		
					N/A	MANATEE	444857-1-22-01		12

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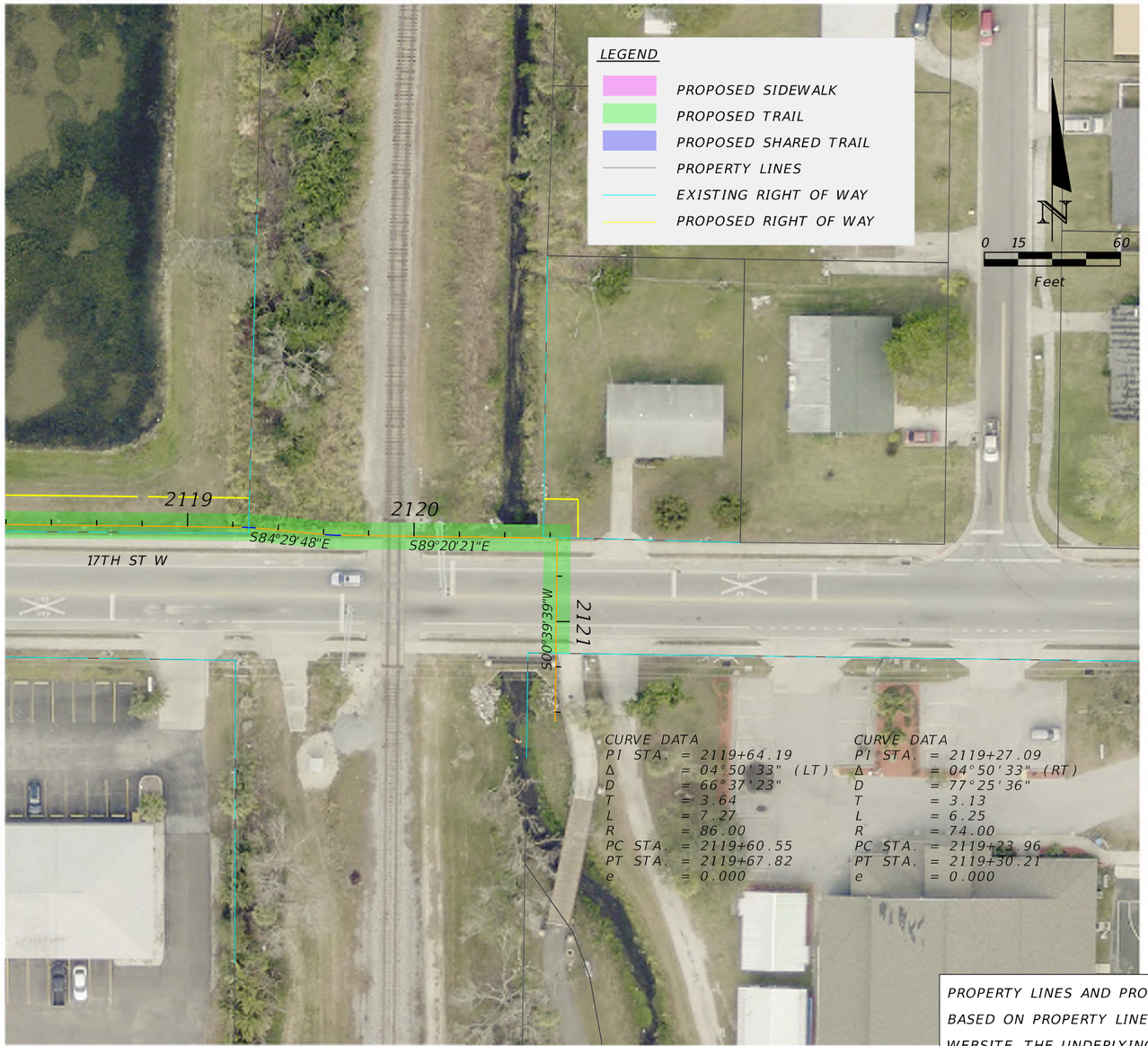
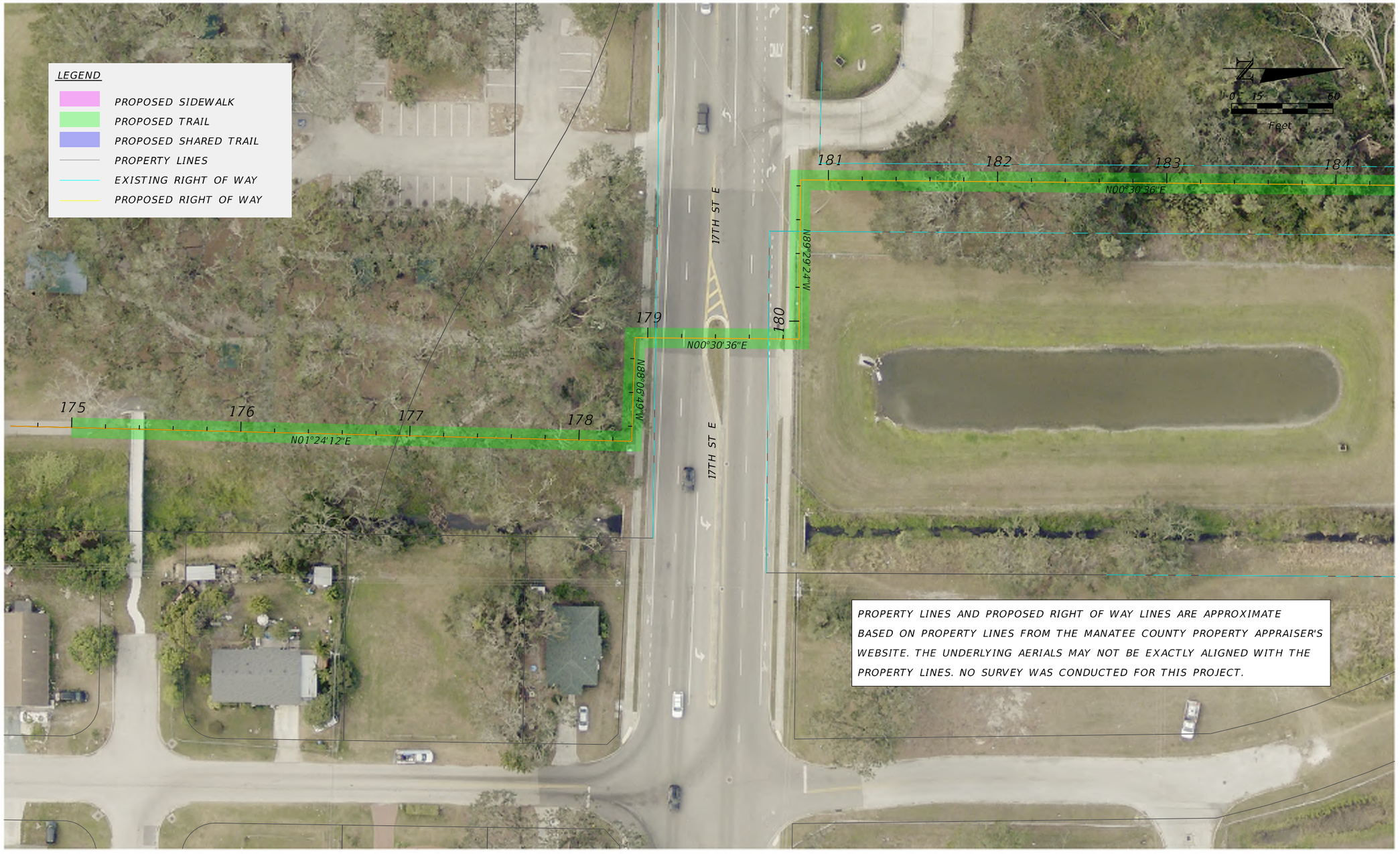


PROPERTY LINES AND PROPOSED RIGHT OF WAY LINES ARE APPROXIMATE BASED ON PROPERTY LINES FROM THE MANATEE COUNTY PROPERTY APPRAISER'S WEBSITE. THE UNDERLYING AERIALS MAY NOT BE EXACTLY ALIGNED WITH THE PROPERTY LINES. NO SURVEY WAS CONDUCTED FOR THIS PROJECT.

REVISIONS				N/A	STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION			CONCEPT PLAN	SHEET NO.
DATE	DESCRIPTION	DATE	DESCRIPTION		ROAD NO.	COUNTY	FINANCIAL PROJECT ID		13
					N/A	MANATEE	444857-1-22-01		



REVISIONS				N/A	STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION			CONCEPT PLAN	SHEET NO.
DATE	DESCRIPTION	DATE	DESCRIPTION		ROAD NO.	COUNTY	FINANCIAL PROJECT ID		
					N/A	MANATEE	444857-1-22-01		14

PROPERTY LINES AND PROPOSED RIGHT OF WAY LINES ARE APPROXIMATE BASED ON PROPERTY LINES FROM THE MANATEE COUNTY PROPERTY APPRAISER'S WEBSITE. THE UNDERLYING AERIALS MAY NOT BE EXACTLY ALIGNED WITH THE PROPERTY LINES. NO SURVEY WAS CONDUCTED FOR THIS PROJECT.

N

0 15 60

Feet

LEGEND

- PROPOSED SIDEWALK
- PROPOSED TRAIL
- PROPOSED SHARED TRAIL
- PROPERTY LINES
- EXISTING RIGHT OF WAY
- PROPOSED RIGHT OF WAY

185

186

187

N89°54'09"E

188

189

N00°30'36"E

N25°38'54"E

190

191

192

193

194

6TH AVE E

N00°30'36"E

N09°55'34"E

6TH AVE E

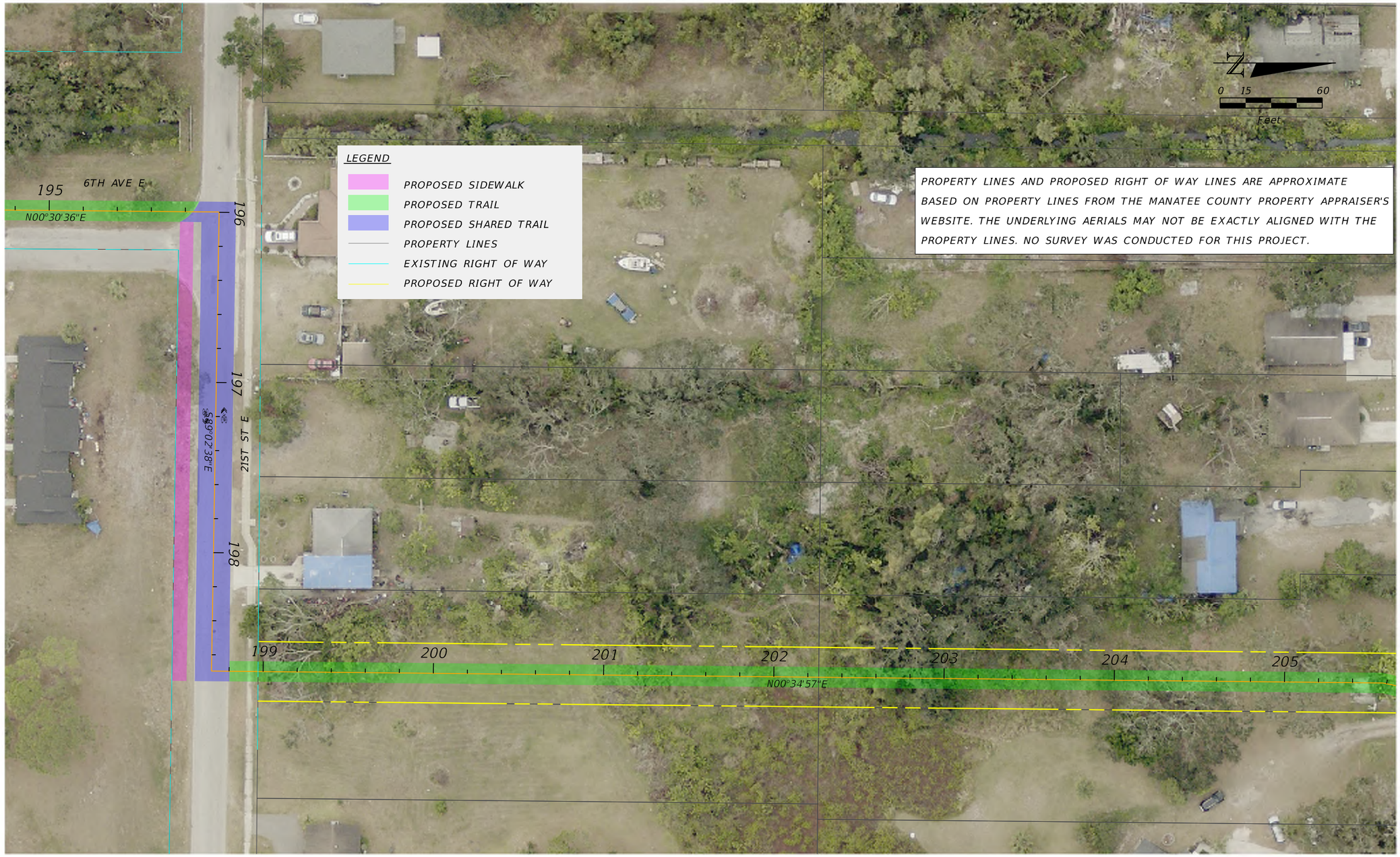
CURVE DATA
PI STA. = 189+22.59
Δ = 25°08'18" (RT)
D = 77°25'36"
T = 16.50
L = 32.47
R = 74.00
PC STA. = 189+06.09
PT STA. = 189+38.55
e = 0.000

CURVE DATA
PI STA. = 189+71.10
Δ = 25°08'18" (LT)
D = 77°25'36"
T = 16.50
L = 32.47
R = 74.00
PC STA. = 189+54.60
PT STA. = 189+87.07
e = 0.000

CURVE DATA
PI STA. = 193+28.28
Δ = 09°24'58" (RT)
D = 66°37'23"
T = 7.08
L = 14.13
R = 86.00
PC STA. = 193+21.20
PT STA. = 193+35.34
e = 0.000

CURVE DATA
PI STA. = 194+01.60
Δ = 09°24'58" (LT)
D = 77°25'36"
T = 6.09
L = 12.16
R = 74.00
PC STA. = 193+95.51
PT STA. = 194+07.67
e = 0.000

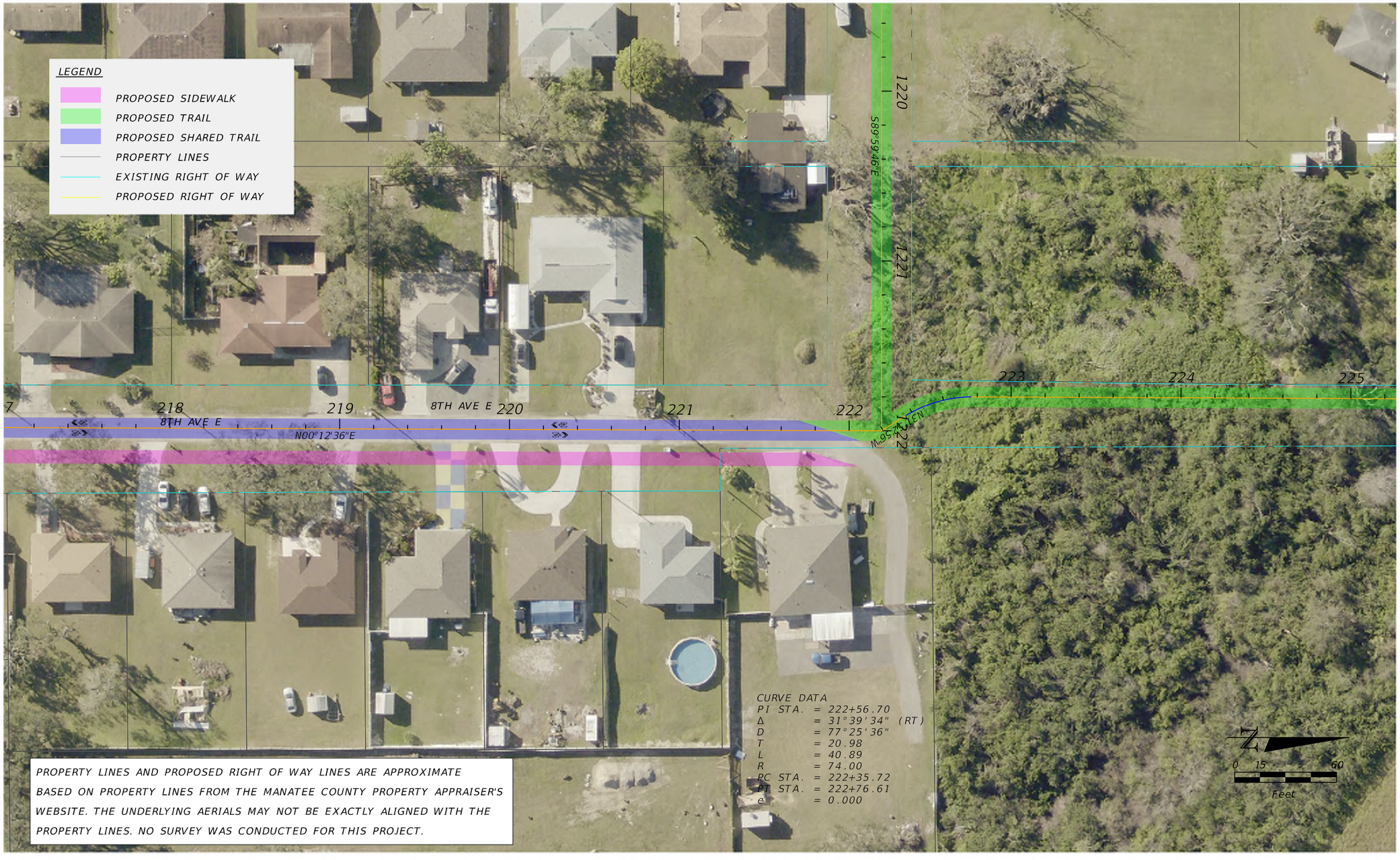
REVISIONS				N/A	STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION			CONCEPT PLAN	SHEET NO.
DATE	DESCRIPTION	DATE	DESCRIPTION		ROAD NO.	COUNTY	FINANCIAL PROJECT ID		
					N/A	MANATEE	444857-1-22-01		15



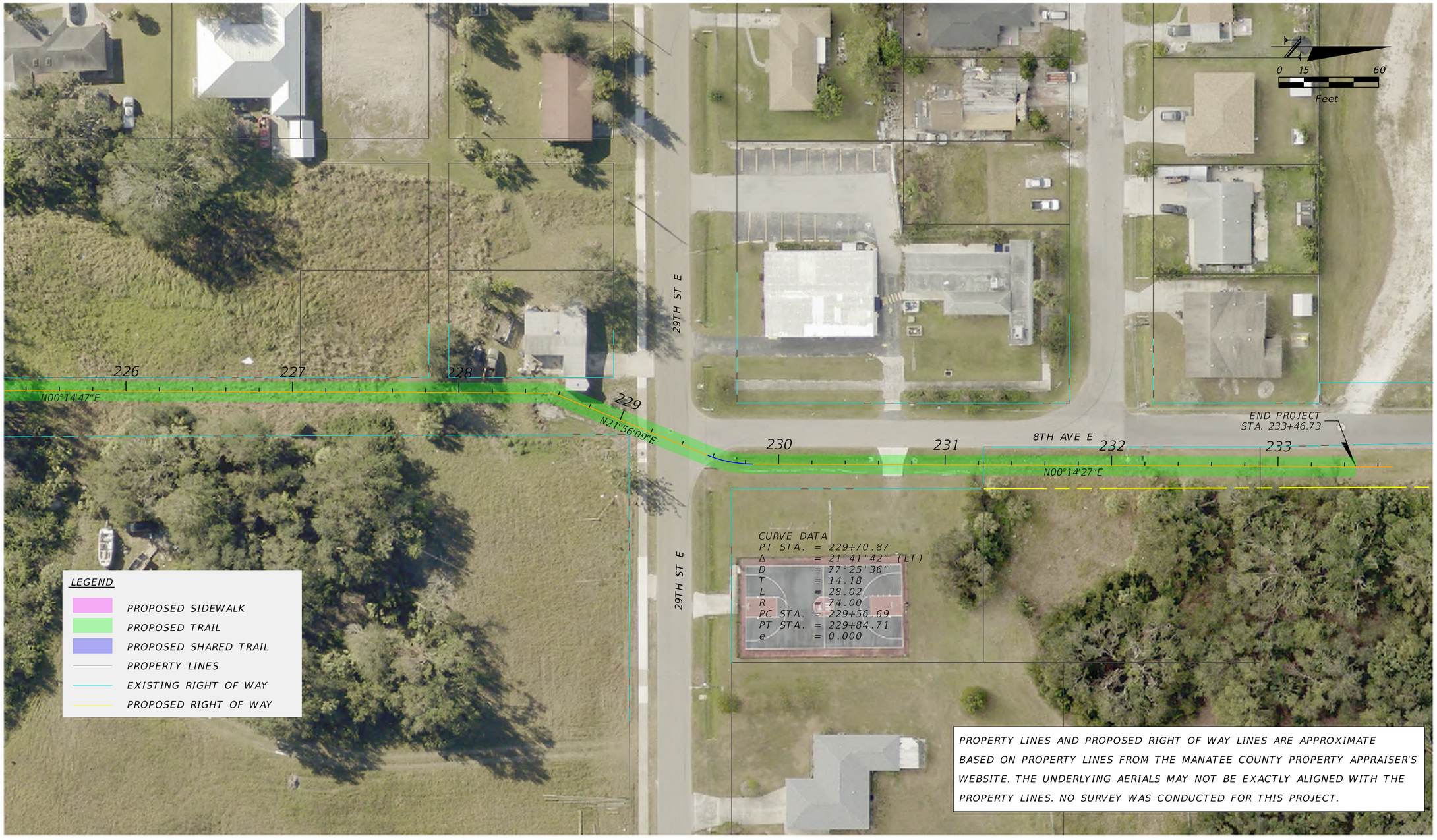
REVISIONS				N/A	STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION			CONCEPT PLAN	SHEET NO.
DATE	DESCRIPTION	DATE	DESCRIPTION		ROAD NO.	COUNTY	FINANCIAL PROJECT ID		16
					N/A	MANATEE	444857-1-22-01		



REVISIONS				N/A	STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION			CONCEPT PLAN	SHEET NO.
DATE	DESCRIPTION	DATE	DESCRIPTION		ROAD NO.	COUNTY	FINANCIAL PROJECT ID		
					N/A	MANATEE	444857-1-22-01		17

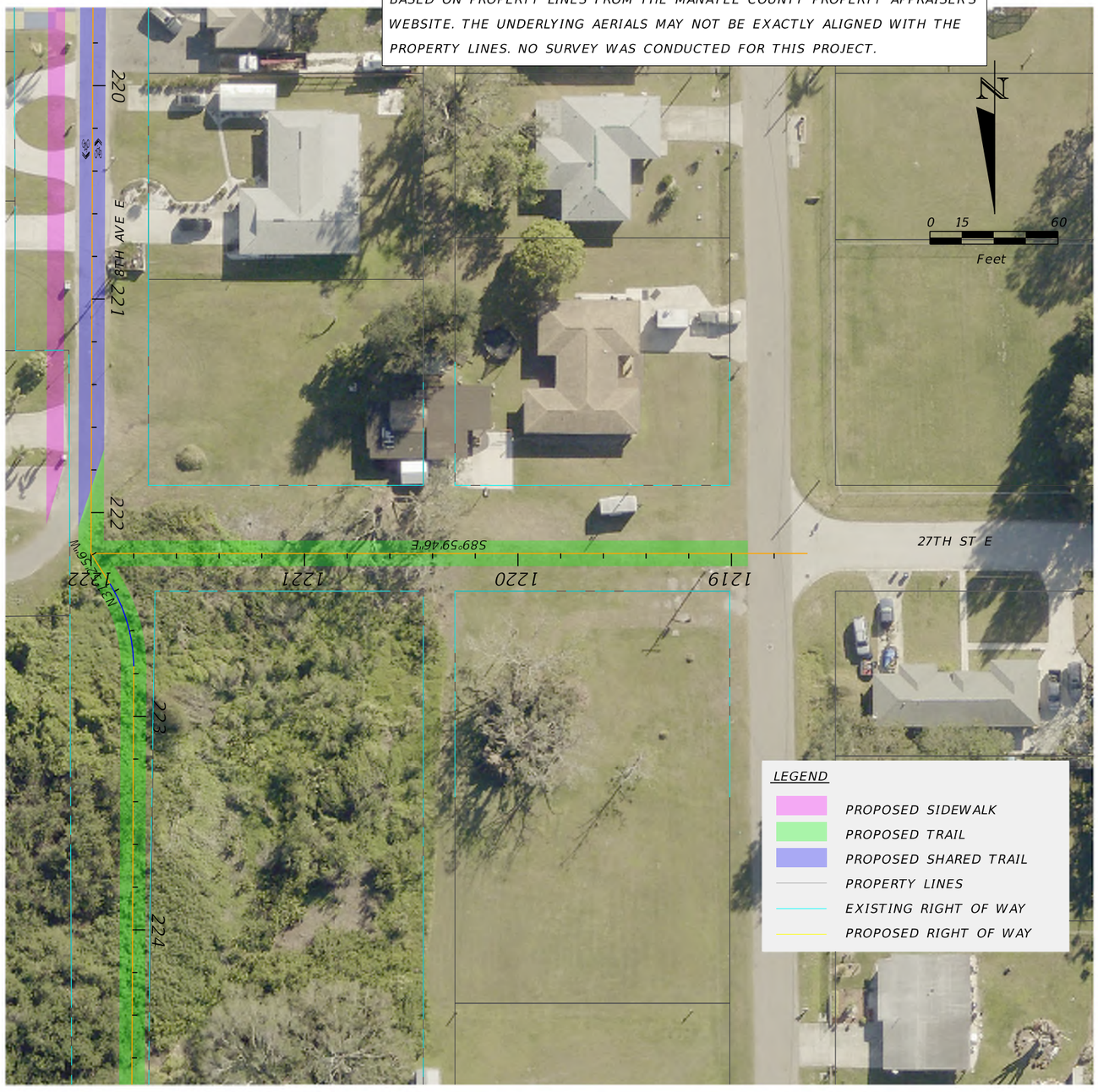


REVISIONS				N/A	STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION			CONCEPT PLAN	SHEET NO.
DATE	DESCRIPTION	DATE	DESCRIPTION		ROAD NO.	COUNTY	FINANCIAL PROJECT ID		
					N/A	MANATEE	444857-1-22-01		18



REVISIONS				N/A	STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION			CONCEPT PLAN	SHEET NO.
DATE	DESCRIPTION	DATE	DESCRIPTION		ROAD NO.	COUNTY	FINANCIAL PROJECT ID		19
					N/A	MANATEE	444857-1-22-01		

PROPERTY LINES AND PROPOSED RIGHT OF WAY LINES ARE APPROXIMATE BASED ON PROPERTY LINES FROM THE MANATEE COUNTY PROPERTY APPRAISER'S WEBSITE. THE UNDERLYING AERIALS MAY NOT BE EXACTLY ALIGNED WITH THE PROPERTY LINES. NO SURVEY WAS CONDUCTED FOR THIS PROJECT.



REVISIONS				N/A	STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION			CONCEPT PLAN	SHEET NO.
DATE	DESCRIPTION	DATE	DESCRIPTION		ROAD NO.	COUNTY	FINANCIAL PROJECT ID		20
					N/A	MANATEE	444857-1-22-01		