Department of Public Works
Engineering Division
602 S Main Street
Joplin, Missouri 64801
417-624-0820

May 16, 2024

CITY OF JOPLIN
Zora Street and Duquesne Road Intersection Improvements

Addendum No. 1

Contract Bidders:

Enclosed is Addendum No. 1 for the above referenced project. Please execute, attach, and submit this Addendum No. 1 with your bid.

City of Joplin

Rob Beachner,
Project Manager

The undersigned hereby acknowledges receipt of this addendum, which by this reference is hereby incorporated in and becomes a part of the Contract Documents for the above referenced project.

_____
Company Name

_____
Signature

_____
Printed Name, Title

May 16, 2024

ADDENDUM NO. 1

PROJECT:	Zora Street & Duquesne Road Intersection Improvements Joplin, Missouri
BID OPENING:	10:00 a.m., May 23, 2024 602 S Main St. 4th Floor Joplin, Missouri

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This addendum forms a part of the Bid Documents for the project described above. The original Bid Documents and any prior addenda remain in full force and effect except as modified by the following, which shall take precedence over any contrary provision in the prior documents. The following clarifications are made:

Clarifications

1. **Geotechnical Report:** The Geotech report is included as part of this addendum.
2. **AutoCAD Files:** CAD Files will not be provided prior to bid.
3. **Construction Staking:** Contractor will be required to provide construction staking.
4. **Imported Fill:** It is anticipated that material found on-site will be usable, however in the event that material is unsuitable, pay item for Imported Fill was previously included.
5. **Storm Sewer:** Rock backfill for storm sewer shall be full depth of trench.
6. **Central Island:** Central island of Roundabout shall be mounded. Typical slope shall be ~11.5%. Contractor shall work with Engineer during construction to verify final height.
7. **Concrete Curb & Gutter:**
    a. Type B C&G is hereby replaced with Type A C&G. The Type A C&G shall be 6" in height and constructed per MoDOT Standard details found on Sheet 38.
    b. Type A C&G shall be integral to the pavement and pour monolithic with pavement section. However, contractor may construct curb independent of the pavement and provide keyway with a curb width of 1' min 2' preferred. Contractor shall discuss installation method with City and City Inspection prior to installation and setup.
    c. Type F C&G: Type F detail has been revised and included with this addendum to provide clarity.
8. **Jointing Plan:**
    a. Jointing details have been updated to reflect sealing all joints per Joplin Spec 3100.3.19.
    b. Jointing details have been updated to reflect dowel bars in transverse contraction joints.
        1. Dowels and Baskets shall be used as necessary to construct concrete pavement.
9. **Traffic Control:** The following updates have been made to the traffic control sheets.
    a. Phase 1: of the traffic control plan has been updated to add a note that clarifies the concrete pinned on medians may be constructed during this phase once pavement has been accepted.
    b. Phase 3 has been split into two parts. 3A & 3B.
        1. These additional phases shall close the respective legs of the roundabout for construction of tie-out to existing roadway.
10. **Inspection & Testing:** The City of Joplin will provide inspection and testing for the project
11. **Demolition:**
    a. JSP 1100-02 has been update to reflect that it shall be the contractors responsibly to test building for asbestos and lead paint. Contractor shall properly dispose of material and shall obtain necessary permits as required by Missouri State Law.

b. Removal of Flashing Light shall be returned to the city. Contractor shall coordinate with inspector on delivery of material.
c. Removal of Improvements have been updated for clarity.

12. **Sheet 7** has been added as it was inadvertently missing from the initial plan set.
13. **Permits:** Contractor will be responsible to obtain all applicable permits associated with project including but limited to building demolition, utility disconnect, etc.
14. **Sign-in Sheet:** The sign-in sheet is included with this addendum.

Plan Sheets

The following plan sheets have been updated and included with this addendum.

1. Sheet 7 – Summary of Quantities
2. Sheet 9 – Summary of Quantities
3. Sheet 19 – Roadway Plan and Profile
4. Sheet 21 – Roadway Plan and Profile (East Leg)
5. Sheet 23 – Roadway Plan and Profile (North Leg)
6. Sheet 31 – Concrete Jointing Details
7. Sheet 30 – Concrete Joint Plan
8. Sheet 37 – Standard Details
9. Sheet 65 – Temporary Traffic Control
10. Sheet 66 – Temporary Traffic Control – Phase 1
11. Sheet 69A – Temporary Traffic Control – Phase 3A
12. Sheet 69B – Temporary Traffic Control – Phase 3B

Job Special Provisions

The following job special provisions have been updated and included with this addendum.

1. JSP 0400-02
2. JSP 1100-02

In order to have a valid bid proposal, this addendum must be acknowledged and returned with your bid proposal.

If you have any questions concerning this addendum, please feel free to contact Jonathan Peitz at (417) 885-1763.



Jonathan Peitz, P.E.
Project Engineer
Olsson

MEETING ATTENDANCE RECORD

Project Name:	Zora Street & Duquesne Road Intersection Improvements
Client:	City of Joplin
Project Manager:	Jonathan Peitz
Project #:	D17-0642
Date:	May 9, 2024

Name of Attendee (Please print)	Company / Role	Phone #	Cell #	Email
JK Sconcrete inc	concrete	414-214-7188		
Josh Flager	Goins / utilities	(417) 483-6074		josh.flager@goinsent.com
Tommy Scotten	ATS Contractors	417-684-7446		tscotten@atsjoplin.com
DAN YATES	ATS CONTRACTORS	417-437-0206		DYATES@ATSJoplin.com
Kyle Roy	Emery Sapp & Sons	417-209-1641		Kyle.roy@emerysapp.com
Jack Rowden	Emery Sapp & Sons	417-840-8903		Jack.rowden@emerysapp.com
Mark Snowbarger	D3E	417-725-5300		deplbg01@yahoo.com
Amy Henegar	Elements Const. Concepts/ Admin	417-214-4360		elementsconstructionconcepts@gmail.com
Jacob Patterson	Emery Sapp & Sons	417-623-1520		jacob.patterson@emerysapp.com
Jinah Lee	Own-Survey	417-782-7399		jlee@weareown.com
Dwight Sprouls	SCI	417-849-1928		dwight@SCI96.com
Steve Kendall	Olsson	620-670-5104		SKendall@olsson.com

MEETING ATTENDANCE RECORD

Project Name:	Zora Street & Duquesne Road Intersection Improvements
Client:	City of Joplin
Project Manager:	Jonathan Peitz
Project #:	D17-0642
Date:	May 9, 2024

Name of Attendee (Please print)	Company / Role	Phone #	Cell #	Email
TONY BECKER	DIRKS HEAVY	660-464-2520		TONY@dirksheavy.com
Eric McPeak	Dirks Heavy	660-464-1320		eric@dirksheavy.com
Ryan Zenger	JIE	417-529-1574		ryan@joplinelectric.com
C Winans	Sprouls	417 682-9577		dawg@sc196.com
John Davis	Summit/Blue Jays	417-540-0663		jdavis03128@gmail.com
Steve Bright	JKS Concrete	620-238-1204		jks const. inc@outlook.com
Tim Johnson	COJ			
Rob Beachner	COJ	417-624-0820 Ext. 1543		rbeachner@joplinmo.org
Kurt Yoder	Dirks Heavy	785-448-8644		kurt@dirksheavy.com
Jonathan Peitz	Olsson	417-880-8802		JPeitz@olsson.com

RECAPITULATION OF QUANTITIES - BASE BID

ITEM NO.	DESCRIPTION	UNIT	ESTIMATED QUANTITY	GOVERNING TECHNICAL SPECIFICATION
1	Mobilization	LS	1	JSP-0400-03
2	Contractor Furnished Construction Staking and Surveying	LS	1	JSP-0400-04
3	Clearing & Grubbing / Tree & Brush Removal	LS	1	JSP-1100-01
4	Demolition & Removal	LS	1	JSP-1100-02
5	Building Demolition	LS	1	JSP-1100-002
6	Seeding, Fertilizing and Mulch	SY	5047	City 5100
7	Silt Fence	LF	971	MoDOT 806
8	Curb / Inlet Protection	EA	9	MoDOT 806
9	Alternate Ditch Check	LF	126	MoDOT 806
10	Unclassified Excavation	CY	2600	City 1200
11	Embankment	CY	1250	JSP-1200-01
12	Imported Fill	CY	100	JSP-1200-01
13	Removal of Unsuitable Material	CY	100	City 1200
14	Backfill of Unsuitable Material	CY	100	City 1200
15	8" MoDOT Type 5 Aggregate Base	SY	6921	JSP-1400-01
16	18" MoDOT Type 5 Aggregate Base	SY	879	JSP-1400-01
17	Asphaltic Concrete Surface (2") (MoDOT BP-1)	TONS	132	City 2200
18	Asphaltic Concrete Base (8") (MoDOT Bituminous Base)	TONS	530	City 2200
19	Asphalt Tack	GAL	188	City 2200
20	Asphalt Primer	GAL	1177	City 2200
21	10" Concrete Pavement (Roadway)	SY	4368	City 3100
22	10" Concrete Pavement (Truck Apron) (Red Tint)	SY	497	JSP-3100-01
23	6" Concrete Splitter Island (Red Tint) (Pinned On)	SY	348	JSP-3100-02
24	6" Concrete Center Island	SY	531	City 3100
25	Standard Curb & Gutter	LF	561	City 3200
26	1' MoDOT Type A Integral Barrier Curb	LF	2386	JSP-3200-01
27	1' Truck Apron Curb	LF	352	JSP-3200-01
28	1' Upright Curb (MoDOT Modified Type F) (Roundabout Center)	LF	251	JSP-3200-01
29	Commercial Driveway Construction (8" Concrete) (Incl. 4" MoDOT Type 5 Agg. Base)	SY	931	City 3400
30	Residential Driveway Construction (6" Concrete) (Incl. 4" MoDOT Type 5 Agg. Base)	SY	77	City 3400
31	6" MoDOT Type 1 Aggregate Surface	SY	237	JSP-3400-01
32	Type C Inlet 5'x3' I.D.	EA	3	City 4400
33	Type C Inlet 5'x4' I.D.	EA	2	City 4400
34	Type C Inlet 5'x5' I.D.	EA	1	City 4400
35	Area Inlet 3'x3' I.D.	EA	1	City 4400
36	Area Inlet 4'x4' I.D.	EA	2	City 4400
37	15" Class III RCP (including trenching, bedding, backfill, gaskets, and concrete collars)	LF	167	City 4200
38	18" Class III RCP (including trenching, bedding, backfill, gaskets, and concrete collars)	LF	79	City 4200
39	24" Class III RCP (including trenching, bedding, backfill, gaskets, and concrete collars)	LF	166	City 4200
40	30" Class III RCP (including trenching, bedding, backfill, gaskets, and concrete collars)	LF	532	City 4200
41	15" RCP FES (including trenching, bedding, backfill, gaskets, and concrete collars)	EA	2	City 4200
42	30" RCP FES (including trenching, bedding, backfill, gaskets, and concrete collars)	EA	1	City 4200
43	Concrete Ditch Liner	SY	38	JSP-4200-01
44	Rock Blanket	SY	12	City 2303
45	Removal & Resetting Existing Signs	LS	1	JSP-2300-03
46	Permanent Signage W2-6	SF	36	JSP-2300-03
47	Permanent Signage W13-1P	SF	9	JSP-2300-03
48	Permanent Signage OM1-3	SF	9	JSP-2300-03
49	Permanent Signage R1-2	SF	64	JSP-2300-03
50	Permanent Signage R6-4A	SF	32	JSP-2300-03
51	Permanent Signage D3-1	SF	15	JSP-2300-03
52	Permanent Signage Post	EA	20	JSP-2300-03
53	Changeable Message Sign (Contractor Furnished)	EA	5	JSP-6700-01
54	Traffic Control Signage W20-1	SF	18	JSP-6700-01
55	Traffic Control Signage W20-3	SF	36	JSP-6700-01
56	Traffic Control Signage R11-2	SF	50	JSP-6700-01
57	Traffic Control Signage R11-4	SF	40	JSP-6700-01
58	Traffic Control Signage G20-2	SF	18	JSP-6700-01
59	Traffic Control Type III Barricade	EA	8	JSP-6700-01
60	Traffic Control Temporary Sign Post	EA	12	JSP-6700-01
61	Pavement Marking Removal	LF	540	City 2306
62	4" SolidYellow Lane Line	LF	4093	City 2306
63	4" Broken Yellow Lane Line	LF	100	City 2306
64	4" Solid White Edge Line	LF	871	City 2306
65	12" Solid White Pavement Marking	LF	90	City 2306
66	12" Yellow Pavement Marking (Includes Splitter island face and top striping)	LF	754	City 2306
67	12" Broken White Pavement Marking	LF	115	City 2306
68	24" Yellow Pavment Marking ((Diagonal Lines)	LF	115	City 2306
69	18"x12" Solid White Yield Marking	EA	25	MoDOT 620
70	Truncated Domes	SF	84	City 3300.3.7
71	27.5' Aluminum Pole, 30' Mounting Height	EA	9	City 9401.0
72	Street Light Foundation	EA	9	City 9100.8
73	Cobra Head Luminaire (240V), 140 Watt Led, Type III	EA	9	City 9400.1
74	Bracked Arm, 8' Length W/ 2'6" Rise, Single Arm	EA	9	City 9401.0
75	Power Pedistal-Pad Mounted, 4-Circuit	EA	1	City 9401.2
76	Pedestal-Pad Foundation	EA	1	City 9401.2
77	Type II Junction Box	EA	6	City 9401.2
78	2" Schedule 40 PVC Conduit (Lighting)	LF	1010	City 9100.6
79	3" Schedule 40 PVC Conduit (Controller to Transformer)	LF	150	City 9100.6
80	3-1c #1/0 RHH/RHW/USE CU (Power)	LF	200	City 9100.7
81	3-1c #4 USE CU w/1-1c#6 Bare CU (Distribution)	LF	1070	City 9100.7
82	1-2c #14 THHN (Pole & Bracket)	LF	378	City 9100.7
83	Fused Connector Kit w/8 Amp Fuse	EA	18	City 9100.7
84	Unfused Connector	EA	9	City 9100.7
85	Multitap Connector	EA	27	City 9100.7
86	Ground Rod (1/2"X10')	EA	10	City 9100.9
87	Breakaway Pole Device	EA	9	City 9401.0

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Missouri Certificate of Authority #001592
702 S. Main Street
Joplin, MO 64801
TEL 417.781.0643
www.olsson.com

STATE OF MISSOURI
JONATHAN W. PEITZ
NUMBER PE-2017019023
PROFESSIONAL ENGINEER

JONATHAN W. PEITZ-CIVIL ENGINEER
MO# PE-2017019023

REV. NO.	DATE	REVISIONS DESCRIPTION	BY
1	5/15/2024	ADDENDUM #1 - SHEET ADDED	SMK

REVISIONS

SUMMARY OF QUANTITIES

ZORA STREET IMPROVEMENTS - PHASE 1
CITY OF JOPLIN

JOPLIN, MISSOURI

2024

drawn by: ZLL/SMK/CTK
checked by: CAD
approved by: JWP
QA/QC by: ENG
project no.: 017-0642.D
drawing no.: C_QTY01_D170642
date: 4/26/2024

SHEET
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DWG: F:\2017\0501-1000\017-0642-D\40-Design\AutoCAD\Final Plans\Sheets\GNCV\C_QTY01_D170642.dwg USER: skendall
DATE: May 15, 2024 5:15pm XREFS: C_PTBLK_D170642

STORM SEWER STRUCTURES & PIPE																
STATION	STATION	LOCATION	SIDE	STRUCTURE NO.	INLET (AREA) (3x3') (Each)	INLET (AREA) (4'x4') (Each)	INLET (CURB) (5'x3') TYPE C (Each)	INLET (CURB) (5'x4') TYPE C (Each)	INLET (CURB) (5'x5') TYPE C (Each)	RCP 15" (Ft.)	RCP 18" (Ft.)	RCP 24" (Ft.)	RCP 30" (Ft.)	END SECTION 15" RC (Each)	END SECTION 30" RC (Each)	NOTES
	103+00	ZORA STREET	RT	FES-1 & FES-2						32				2		STORM DRAIN: SD-1
103+62.75	107+53.13	ZORA STREET	LT	CI-6, CI-1, FES-3				1	1				444		1	STORM DRAIN: SD-2
107+53.13	108+26.80	ZORA STREET	LT	CI-2			1				79					STORM DRAIN: SD-3
108+26.80	108+26.39	ZORA STREET	LT TO RT	CI-3			1			80						STORM DRAIN: SD-4
208+29.87	209+15.16	DUQUESNE ROAD	RT	CI-5				1					88			STORM DRAIN: SD-5
209+15.16	210+21.20	DUQUESNE ROAD	RT	AI-2		1						99				STORM DRAIN: SD-6
210+21.20	210+92.50	DUQUESNE ROAD	RT	AI-3		1						67				STORM DRAIN: SD-7
209+15.09	209+15.31	DUQUESNE ROAD	LT TO RT	CI-4			1			39						STORM DRAIN: SD-8
209+15.13	209+15.31	DUQUESNE ROAD	RT	AI-1	1					16						STORM DRAIN: SD-9
				TOTAL	1	2	3	2	1	167	79	166	532	2	1	

INLET PROTECTION				
STATION	LOCATION	SIDE	EA	NOTES
103+82	ZORA STREET	LT	1	CURB INLET CI-6
108+25	ZORA STREET	RT	1	CURB INLET CI-3
108+25	ZORA STREET	LT	1	CURB INLET CI-2
208+25	DUQUESNE ROAD	RT	1	CURB INLET CI-1
209+15	DUQUESNE ROAD	LT	1	CURB INLET CI-4
209+15	DUQUESNE ROAD	RT	1	CURB INLET CI-5
209+15	DUQUESNE ROAD	RT	1	AREA INLET AI-1
210+21	ZORA STREET	RT	1	AREA INLET AI-2
210+92	ZORA STREET	RT	1	AREA INLET AI-3
		TOTAL	9	

ALTERNATE DITCH CHECK				
STATION	LOCATION	SIDE	LF	NOTES
103+28	ZORA STREET	RT	14	
103+59	ZORA STREET	RT	14	
103+94	ZORA STREET	RT	14	
104+23	ZORA STREET	RT	14	
104+50	ZORA STREET	RT	14	
104+81	ZORA STREET	RT	14	
102+97	ZORA STREET	LT	14	
103+21	ZORA STREET	LT	14	
103+46	ZORA STREET	LT	14	
		TOTAL	126	

REMOVAL OF EXISTING STRUCTURES (For Information Only)							
STATION	STATION	LOCATION	SIDE	ITEM	QUANTITY	UNITS	NOTES
207+10.54	208+79.30	DUQUESNE ROAD	NE CORNER	PARKING LOT ASPHALT	10138	SF	
207+55.06	207+99.98	DUQUESNE ROAD	RT	BUILDING	1	EA	
103+14.23	110+82.17	ZORA STREET		ASPHALT PAVEMENT	18080	SF	
205+50	206+71.04	DUQUESNE ROAD		ASPHALT PAVEMENT NORTH	11803	SF	
206+98	211+33.61	DUQUESNE ROAD		ASPHALT PAVEMENT SOUTH	5325	SF	
210+36.79	210+38.20	DUQUESNE ROAD		CULVERT PIPE	40	LF	
109+22.30	109+45.45	ZORA STREET	RT	DRIVE 3	250	SF	
110+37.96	110+67.72	ZORA STREET	RT	DRIVE 4	431	SF	
210+41.34	210+77.39	DUQUESNE ROAD	RT	DRVE 6	560	SF	
103+14.23	110+82.18	ZORA STREET	LT	RELOCATE BURRIED TELEPHONE	1	LS	BY OTHERS ⚠
103+14.23	110+82.18	ZORA STREET	LT	RELOCATE BURRIED FIBER-OPTIC	1	LS	BY OTHERS ⚠
104+83.87		ZORA STREET	LT	POWER POLE	1	EA	
105+92.96		ZORA STREET	RT	SPEED LIMIT SIGN	1	EA	
106+13.17		ZORA STREET	RT	WATER METER	1	EA	
106+60.16		ZORA STREET	LT	STOP SIGN	1	EA	
106+66.37		ZORA STREET	RT	POWER POLE	1	EA	
106+79.89		ZORA STREET	RT	POWER POLE	1	EA	
107+04.39		ZORA STREET	RT	POWER POLE	1	EA	
107+76.76		ZORA STREET	RT	RETAIL SIGN	1	EA	
108+03.92		ZORA STREET	RT	STOP SIGN	1	EA	
108+56.58		ZORA STREET	LT	TELEPHONE BOX	1	EA	
108+69.37		ZORA STREET	LT	TRUCK ROUTE SIGN	1	EA	
108+83.57		ZORA STREET	RT	POWER POLE	1	EA	
206+00.10		DUQUESNE ROAD	LT	SPEED LIMIT SIGN	1	EA	
206+16.60		DUQUESNE ROAD	RT	STOP SIGN	1	EA	
206+33.86		DUQUESNE ROAD	LT	STREET SIGN	1	EA	
206+43.49		DUQUESNE ROAD	RT	FIRE HYDRANT	1	EA	
207+62.91		DUQUESNE ROAD	RT	FIRE HYDRANT	1	EA	
207+66.26		DUQUESNE ROAD	RT	BUCKLE UP SIGN	1	EA	
208+42.69		DUQUESNE ROAD	RT	SPEED LIMIT SIGN	1	EA	
208+79.95		DUQUESNE ROAD	RT	RADER ENFORSED SIGN	1	EA	
205+50.00	211+33.35	DUQUESNE ROAD	RT	RELOCATE BURRIED WATER LINE	1	LS	BY OTHERS ⚠

SILT FENCE					
STATION	STATION	LOCATION	SIDE	L.F.	NOTES
103+10	105+79	ZORA WEST	RT	297	
105+91	205+50	SW QUADRANT	RT	173	ZORA TO DUQ STA
205+48	205+45	DUQUESNE SOUTH	RT	23	
206+15	109+28	SE QUADRANT	RT	186	
109+35	110+51	ZORA EAST	RT	121	
110+62	112+25	ZORA EAST	RT	171	
			TOTAL	971	

SEEDING, FERTILIZING & MULCH					
STATION	STATION	LOCATION	SIDE	SQ. YD.	NOTES
102+84.98	104+01.62	ZORA WEST	LT	191.8	
104+85.34	105+71.02	ZORA WEST	LT	216.4	
207+73.35	209+28.57	NW QUADRANT	LT	400.7	DUQUESNE ROAD STA
103+14.23	105+41.99	ZORA WEST	RT	829.2	
207+00.60	205+50	SW QUADRANT	LT	822.0	DUQUESNE ROAD STA
209+43.59	112+16.03	NE QUADRANT	LT	1552.6	DUQ TO ZORA STA
205+50	109+29.66	SE QUADRANT	RT	348.2	DUQ TO ZORA STA
109+45.45	110+47.64	ZORA EAST	RT	171.0	
110+63.23	112+16.03	ZORA EAST	RT	116.3	
209+66.04	210+23.78	DUQUESNE NORTH	LT	97.2	
211+23.86	211+33.67	DUQUESNE NORTH	LT	15.4	
209+77.36	210+53.05	DUQUESNE NORTH	RT	172.0	
210+71.05	211+33.61	DUQUESNE NORTH	RT	114.2	
			TOTAL	5047	

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Missouri Certificate of Authority #001592
702 S. Main Street
Joplin, MO 64801
TEL 417.781.0643
www.olsson.com

STATE OF MISSOURI
JONATHAN W. PEITZ
NUMBER PE-2017019023
PROFESSIONAL ENGINEER
JONATHAN W. PEITZ–CIVIL ENGINEER
MO# PE–2017019023

REV. NO.	DATE	REVISIONS DESCRIPTION	BY
⚠	5/15/2024	ADDENDUM #1 – CLARIFY UTILITY RELOCATION RESPONSIBILITY	SMK

REVISIONS

SUMMARY OF QUANTITIES

ZORA STREET IMPROVEMENTS - PHASE 1
CITY OF JOPLIN

JOPLIN, MISSOURI

2024

drawn by: ZLL/SMK/CTK
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date: 4/26/2024

SHEET
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DWG: F:\2017\0501–1000\017–0642–D\40–Design\AutoCAD\Final Plans\Sheets\GNCV\C_QTY01_D170642.dwg USER: skendall
DATE: May 15, 2024 5:15pm XREFS: C_PTBLK_D170642

C_PBASE_PH3_D170642
C_PPATT_D170642
C_PBASE_D170642
C_XUTIL_D170642
21.05.16_Lighting Plan
C_RRTED_D170642
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C_PRWAY_D170642
C_RPP01_D170642.dwg
C_XTOPO_D170642
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May 15, 2024 5:16pm
DWG:
DATE:

LEGEND

- ASPHALT PAVEMENT
- CONCRETE PAVEMENT
- CONCRETE ISLAND/TRUCK APRON
- CONCRETE DRIVEWAY
- AGGREGATE SURFACE
- ROCK BLANKET

NOTE:
ASPHALT WILL NOT GET SURFACE COURSE. THIS COURSE WILL BE COMPLETED WHEN PHASE III IS PAVED.

FES-3
STA. 103+43.99, 23.40' LT.
CONST. 30" FES

CI-6
STA. 103+82.20, 20.59' LT.
CONST. 5' X 4' CURB INLET

CI-1
STA. 107+53.13, 89.54' LT.
CONST. 5' X 5' CURB INLET

CI-3
STA. 108+26.39, 45.34' RT.
CONST. 5' X 3' CURB INLET

PARCEL 1
CROSSLAND HOLDING COMPANY

PARCEL 2
HOLLDAN, INC.

PARCEL 3
JOE HUGHES

PARCEL 4
JOSEPH & COLEEN FOSTER

PARCEL 5
MARZELLE GOETZ

PARCEL 6
WILLIAM P. & PATRICIA EPPRIGHT

BEGIN CONSTRUCTION
ZORA STREET
STA 102+84.27

INSTALL 12.4 SY OF JOPLIN ROCK BLANKET (7'x16'x1') SEE CITY SPEC. 2303.5 FOR DETAILS

INSTALL 38 SY OF CONCRETE DITCH LINER

EXISTING RIGHT-OF-WAY

PROPOSED RIGHT-OF-WAY

PROPOSED TEMPORARY CONSTRUCTION EASEMENT

STANDARD JOPLIN CURB & GUTTER

6" MoDOT TYPE A INTEGRAL BARRIER CURB

LIMITS OF DISTURBANCE

AGGREGATE DRIVE

℄ DRIVE 1
℄ DRIVE 2
℄ DRIVE 7
℄ DRIVE 8
℄ ZORA STREET
℄ DUQUESNE ROAD

E. ZORA STREET

N. DUQUESNE ROAD

R900.46'
R1047.19'

+14.23 19.00' LT
+14.23 16.19' LT
+14.23 15.19' RT
+97.80 19.00' RT
+92.18 6.00'
+71.65 41.00' LT
+07.32 20.50' RT
+60.70 20.50' LT
+50 20.50' LT
+60.70 20.50' RT
+50 20.50' RT
+44.58 34.23' RT

PC: 103+14.25
PT: 106+52.20
PRC: 106+13.95
PC: 107+50
PI: 207+50
PRC: 206+20.01
PC: 205+60.70
PT: 206+52.20

MATCHLINE SEE SHEET

STA 208+75.00
23

PRC: 208+69.81
PC: 208+47.80

STA 108+40.00
21

6" CONCRETE (RED TINT) PINNED ON SPLITTER ISLAND

CONCRETE (RED TINT) TRUCK APRON

AREA LIGHT

MoDOT MODIFIED TYPE F CURB

TRUCK APRON CURB

BURIED SOUTHERN STAR GAS LINE MARKER POST

BLDG

FES-1
FES-2
FES-3
CI-1
CI-3
CI-6

103+00
104+00
105+00
106+00
107+00
108+00
205+00
206+00
207+00
208+00

13.69'
12.69'
12'

0' 10' 20' 40'
SCALE IN FEET

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TEL 417.781.0643
www.olsson.com

STATE OF MISSOURI
JONATHAN W. PEITZ
NUMBER PE-2017019023
PROFESSIONAL ENGINEER
JONATHAN W. PEITZ-CIVIL ENGINEER
MO# PE-2017019023

REV. NO.	DATE	REVISIONS DESCRIPTION	BY
1	5/15/2024	ADDENDUM #1 - CHANGED CURB TO MODOT TYPE A INTEGRAL	SMK

REVISIONS

ROADWAY PLAN & PROFILES
WEST SIDE - ZORA ST

ZORA STREET IMPROVEMENTS - PHASE 1
CITY OF JOPLIN

JOPLIN, MISSOURI

2024

drawn by: ZLL/SMK/CTK
checked by: CAD
approved by: JWP
QA/QC by: ENG
project no.: 017-0642-D
drawing no.: C_RPP01_D170642
date: 4/26/2024

SHEET
19 of 88

MATCHLINE SEE SHEET

STA 208+75.00
23

CI–2
STA. 108+26.80, 38.27' LT.
CONST. 5' X 3' CURB INLET

PARCEL 7
LAWVER INVESTMENTS, LLC

6" CONCRETE (RED TINT) PINNED ON SPLITTER ISLAND

PROPOSED TEMPORARY CONSTRUCTION EASEMENT

PROPOSED RIGHT–OF–WAY

PROPOSED AT&T UTILITY EASEMENT

EXISTING RIGHT–OF–WAY

RELOCATE FENCE

6" MoDOT TYPE A INTEGRAL BARRIER CURB

END CONSTRUCTION
ZORA STREET
STA 112+16.03

LIMITS OF DISTURBANCE

PT: 111+92.35

AREA LIGHT

STA 108+40.00
19

+82.85
17.01' LT

+62.44
0.00'

E. ZORA STREET

℄ ZORA STREET

℄ DRIVE 3

℄ DRIVE 4

PRC: 111+10.92

+81.52
17.96' RT

34.23' RT

LIMITS OF DISTURBANCE

MATCHLINE SEE SHEET

EXISTING RIGHT–OF–WAY

6" MoDOT TYPE A INTEGRAL BARRIER CURB

PROPOSED TEMPORARY CONSTRUCTION EASEMENT

PARCEL 9
SWMO DEVELOPMENT, INC.

PARCEL 10
CNJ DEVELOPERS, INC.

PARCEL 11
SHAWN E. & MARK L. HARRIS

109+00 110+00 111+00 112+00 113+00

ASPHALT GRAVEL BLDG

LEGEND

- ASPHALT PAVEMENT
- CONCRETE PAVEMENT
- CONCRETE ISLAND/TRUCK APRON
- CONCRETE DRIVEWAY
- AGGREGATE SURFACE
- ROCK BLANKET

N

0' 10' 20' 40'
SCALE IN FEET

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REV. NO.	DATE	REVISIONS DESCRIPTION	BY
1	5/15/2024	ADDENDUM #1 – CHANGED CURB TO MODOT TYPE A INTEGRAL	SMK

REVISIONS

ROADWAY PLAN & PROFILE
EAST SIDE - E ZORA STREET

ZORA STREET IMPROVEMENTS - PHASE 1
CITY OF JOPLIN

JOPLIN, MISSOURI

2024

drawn by: ZLL/SMK/CTK
checked by: CAD
approved by: JWP
QA/QC by: ENG
project no.: 017-0642-D
drawing no.: C_RPP01_D170642
date: 4/26/2024

SHEET
21 of 88

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USER: skendall
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DWG: F:\2017\0501-1000\017-0642-D\40-Design\AutoCAD\Final Plans\Sheets\GNCV\C_RPP01_D170642.dwg
DATE: May 15, 2024 5:16pm XREFS: C_PTBLK_D170642 C_XTOPO_D170642 C_PRWAY_D170642
USER: skendall V_BW-BNDY_CONVERTED_D170642 21.05.16_Lighting Plan C_XUTIL_D170642 C_PBASE_D170642 C_PPATT_D170642 C_PBASE_PH3_

PARCEL 1
CROSSLAND HOLDING COMPANY
EXISTING = 73.79 ACRES
R/W ACQUISITION = 185 SQ. FT.
TEMP. CONST. ESMT. = 543 SQ. FT.
REMAINING = 73.79 ACRES

PARCEL 2
HOLLDAN, INC.

PARCEL 14
COUNTRY ACRES MHP

PARCEL 7
LAWVER INVESTMENTS, LLC

AI–3
STA. 210+92.50, 24.73' RT.
CONST. 4' x 4' AREA INLET

AI–2
STA. 210+21.20, 27.32' RT.
CONST. 4' x 4' AREA INLET

AI–1
STA. 209+15.31, 40.53' RT.
CONST. 3' x 3' AREA INLET

CI–5
STA. 209+15.13, 21.88' RT.
CONST. 5' X 4' CURB INLET

CI–4
STA. 209+15.09, 19.77' LT.
CONST. 5' X 3' CURB INLET

END CONSTRUCTION
S. HALL STREET
STA 211+33.35

212+00
211+00
210+00
209+00

S. HALL STREET

+33.61
12.00' LT

+33.61
12.00' RT

LIMITS OF DISTURBANCE

℄ DRIVE 10

℄ DRIVE 6

℄ DUQUESNE ROAD

EXISTING RIGHT–OF–WAY

+93.61
15.50' LT

+93.61
15.50' RT

PROPOSED TEMPORARY CONSTRUCTION EASEMENT

PROPOSED RIGHT–OF–WAY

℄ DRIVE 5

PT: 209+68.61

℄ DRIVE 9

6" MoDOT TYPE A INTEGRAL BARRIER CURB

6" CONCRETE (RED TINT) PINNED ON SPLITTER ISLAND

+03.73
0.00

AREA LIGHT

PROPOSED PERMANENT DRAINAGE EASEMENT

6" MoDOT TYPE A INTEGRAL BARRIER CURB

OH

MATCHLINE
SEE SHEET

STA 208+75.00
21

LEGEND
- ASPHALT PAVEMENT
- CONCRETE PAVEMENT
- CONCRETE ISLAND/TRUCK APRON
- CONCRETE DRIVEWAY
- AGGREGATE SURFACE
- ROCK BLANKET

N

0' 10' 20' 40'
SCALE IN FEET

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MO# PE–2017019023

REV. NO.	DATE	REVISIONS DESCRIPTION	BY
1	5/15/2024	ADDENDUM #1 - CHANGED CURB TO MODOT TYPE A INTEGRAL	SMK

REVISIONS

ROADWAY PLAN & PROFILE
NORTH SIDE - S. HALL STREET

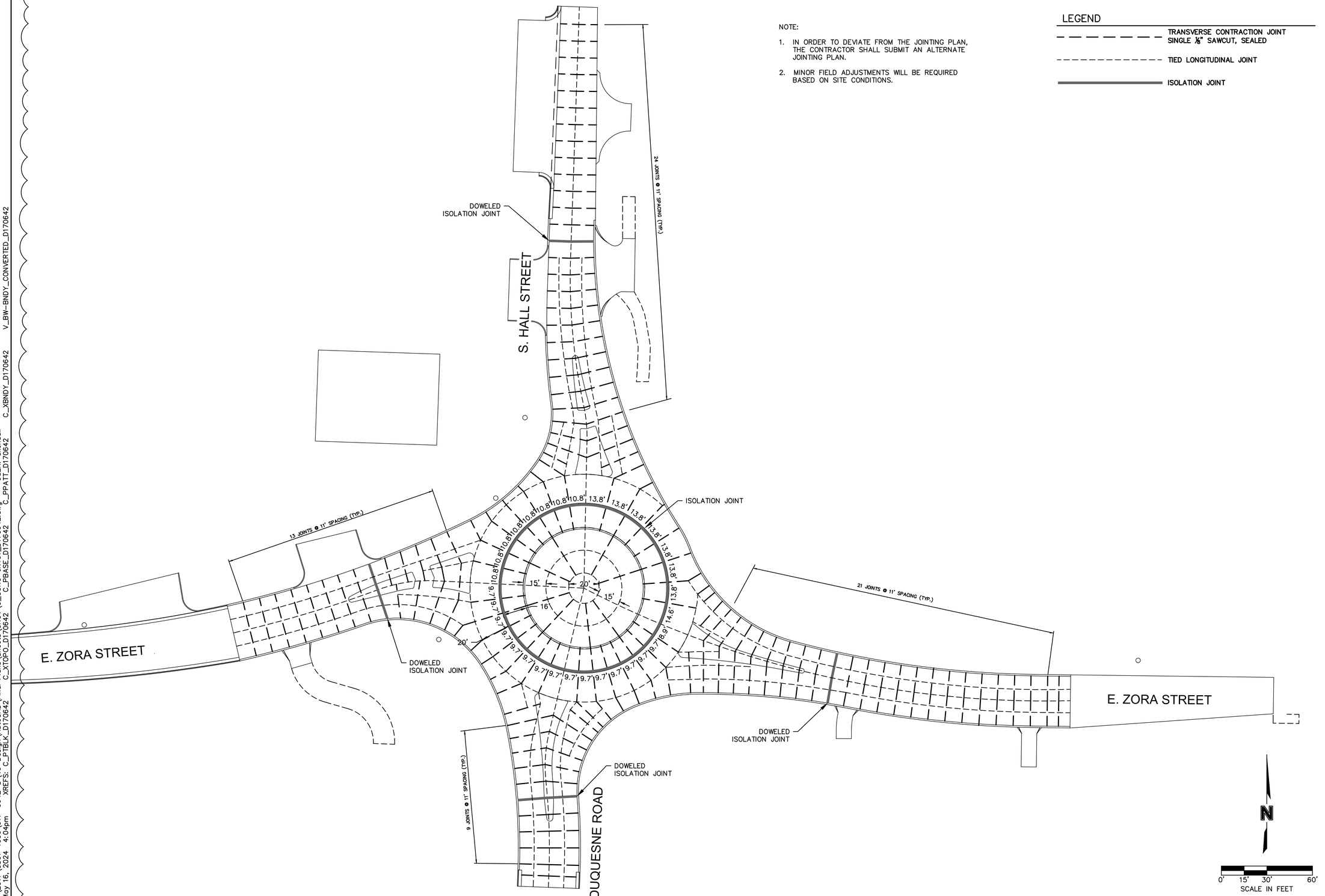
ZORA STREET IMPROVEMENTS - PHASE 1
CITY OF JOPLIN

JOPLIN, MISSOURI

2024

drawn by: ZLL/SMK/CTK
checked by: CAD
approved by: JWP
QA/QC by: ENG
project no.: 017-0642-D
drawing no.: C_RPP01_D170642
date: 4/26/2024

SHEET
23 of 88



NOTE:

1. IN ORDER TO DEVIATE FROM THE JOINTING PLAN, THE CONTRACTOR SHALL SUBMIT AN ALTERNATE JOINTING PLAN.
2. MINOR FIELD ADJUSTMENTS WILL BE REQUIRED BASED ON SITE CONDITIONS.

LEGEND

- TRANSVERSE CONTRACTION JOINT SINGLE ⅛" SAWCUT, SEALED
- TIED LONGITUDINAL JOINT
- ISOLATION JOINT

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MO# PE-2017019023

REV. NO.	DATE	REVISIONS DESCRIPTION	BY
1	5/15/2024	ADDENDUM #1 - REVISED ISOLATION JOINT LOC & CALLOUTS	SMK

REVISIONS

CONCRETE JOINT PLAN

ZORA STREET IMPROVEMENTS - PHASE 1
CITY OF JOPLIN

JOPLIN, MISSOURI

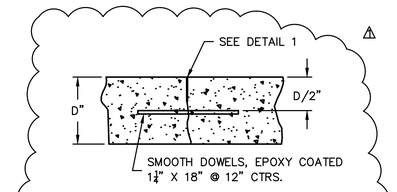
2024

drawn by: ZLL/SMK/CTK
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project no.: 017-0642-D
drawing no.: CONC-JNT01_D170642
date: 4/26/2024

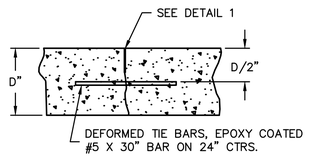
SHEET
30 of 88

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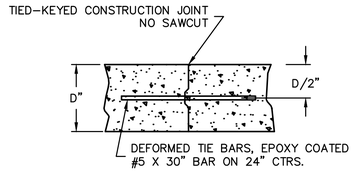
NOTE:
ALL CONTRACTION JOINTS SHALL BE SEALED.
SEE CITY OF JOPLIN SPEC 3100.3.19 AND 3100.3.20



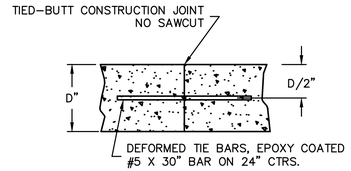
DOWELED TRANSVERSE CONTRACTION JOINT
SINGLE 1/8" SAWCUT, SEALED
NO SCALE



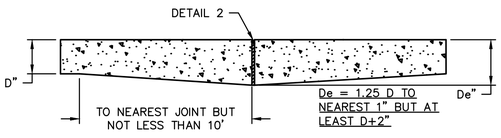
TIED LONGITUDINAL CONTRACTION JOINT
SINGLE 1/8" SAWCUT, SEALED
NO SCALE



TIED-KEYED CONSTRUCTION JOINT
NO SCALE

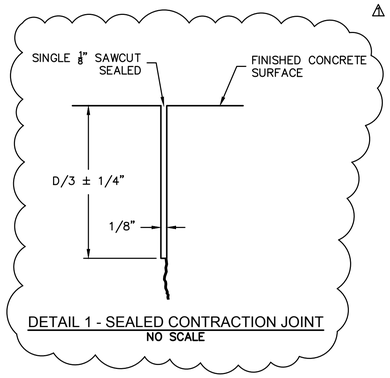


TIED-BUTT CONSTRUCTION JOINT
NO SCALE

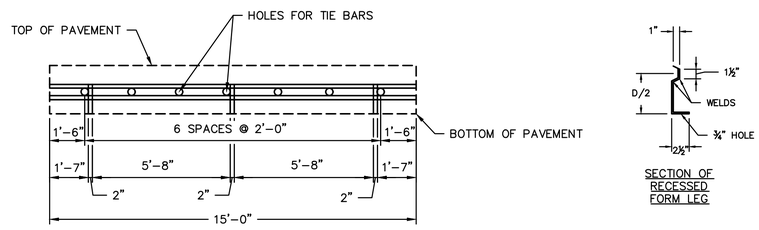


ISOLATION JOINT - TYPE 'A' THICKENED EDGE
NO SCALE

NOTE: FOR LONGITUDINAL CONSTRUCTION JOINTS, THE CONTRACTOR
HAS THE OPTION OF USING EITHER THE KEYED OR THE BUTT TYPE



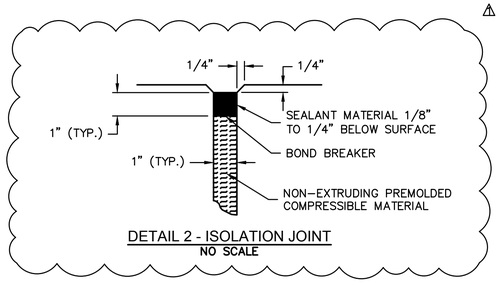
DETAIL 1 - SEALED CONTRACTION JOINT
NO SCALE



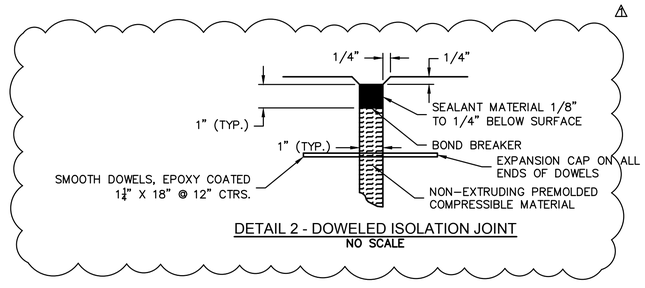
SECTION OF
RECESSED
FORM LEG

NOTE: TO BE USED ONLY AGAINST FORMS, DO
NOT EXTEND THROUGH CONTRACTION JOINTS

METAL STRIPS FOR LONGITUDINAL CONSTRUCTION JOINT
NO SCALE



DETAIL 2 - ISOLATION JOINT
NO SCALE



DETAIL 2 - DOWELED ISOLATION JOINT
NO SCALE

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MO# PE-2017019023

REV. NO.	DATE	REVISIONS DESCRIPTION	BY
1	5/15/2024	ADDENDUM #1 - REVISE JOINT DETAIL	SMK

REVISIONS

CONCRETE JOINT DETAILS

ZORA STREET IMPROVEMENTS - PHASE 1
CITY OF JOPLIN

2024

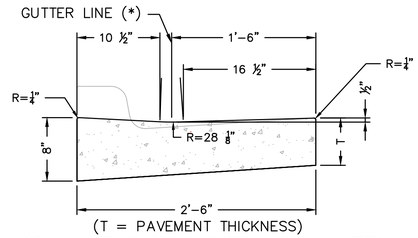
JOPLIN, MISSOURI

drawn by: ZLL/SMK/CTK
checked by: CAD
approved by: JWP
QA/QC by: ENG
project no.: 017-0642-D
drawing no.: CONC-JNT01_D170642
date: 4/26/2024

SHEET
31 of 88

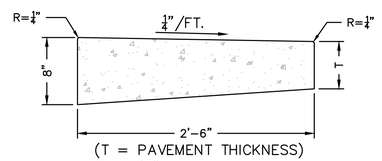
DWG: F:\2017\0501-1000\017-0642-D\40-Design\AutoCAD\Final Plans\Sheets\GNCV\C_CONC-JNT01_D170642.dwg USER: skendall
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* – 0.5% MINIMUM POSITIVE SLOPE IN GUTTER LINE SHALL BE MAINTAINED THROUGH TRANSITION FROM STANDARD CURB TO RAMP CURB



(T = PAVEMENT THICKNESS)

USE WITH STANDARD CONCRETE CURB & GUTTER



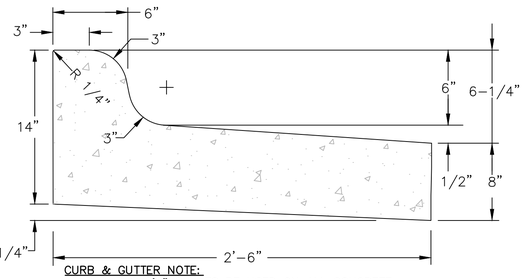
(T = PAVEMENT THICKNESS)

USE WITH 1/4" SPILL CURB & GUTTER

NOTE:
SEE STANDARD CURB DETAIL FOR ADDITIONAL REQUIREMENTS

STREET CURB DETAIL AT RAMP

NTS

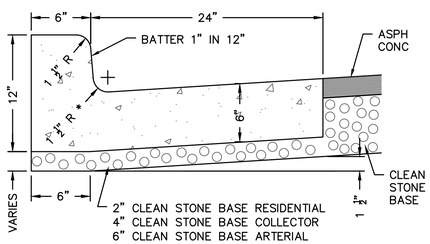


CURB & GUTTER NOTE:
#5 REBAR @ 2'6" O.C. TO BE USED ON ALL CONCRETE PAVEMENT. ASPHALT PAVEMENT – DOWEL SHALL BE OMITTED.

1/4" SPILL CURB & GUTTER DETAIL

NTS

* = OPTIONAL WITH APPROVAL BY CITY ENGINEER.



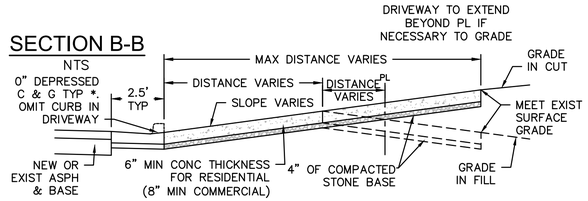
NOTES:
1. JOINT MATERIAL TO EXTEND THRU C & G, FRONT TO BACK, & NEATLY TRIMMED TO MATCH CONC SURFACE.
2. FLOAT GROUT TO SURFACE ON EXPOSED SURFACES.
3. ALL POURED CONCRETE SHALL BE CLASS 'B'.

STANDARD UPRIGHT CURB & GUTTER

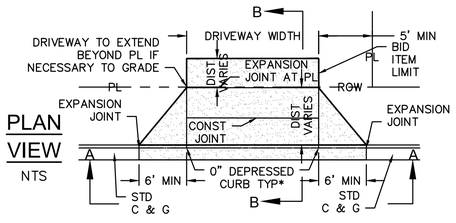
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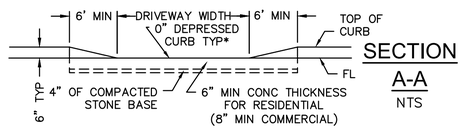
SECTION B-B

NTS



NOTES:
1. ALL POURED CONCRETE SHALL BE CLASS 'B1'.
2. STEEL REINFORCEMENT IS NOT ALLOWED.
3. ALL GUTTER CONST IN FRONT OF DRIVEWAY & ALL C & G IN DRIVEWAY TRANSITIONS SHALL BE INCLUDED IN THE BID PRICE OF THE CURB & GUTTER.
4. BID PRICE FOR ALL DRIVEWAYS SHALL INCLUDE ALL EXCAVATION, LABOR, & MATERIALS REQUIRED TO CONSTRUCT DRIVEWAY.
5. * = 1.5" DEPRESSED CURB ALLOWED WHEN NEEDED FOR DRAINAGE OR SIDEWALK GRADE.
6. 5' INCREMENTS FOR GRADE CHANGES IN DRIVEWAY ARE ALLOWED TO MEET EXIST GRADE.
7. ALGEBRAIC DIFFERENCE AT GRADE CHANGES ARE NOT TO EXCEED 13%.
8. EXPANSION JOINTS SHALL BE CONSTRUCTED NEAR PROPERTY LINE & THROUGH C & G ADJACENT TO DRIVEWAY.
9. OPTIONAL CONSTRUCTION JOINTS MAY BE USED AT GRADE CHANGES IN DRIVEWAY.





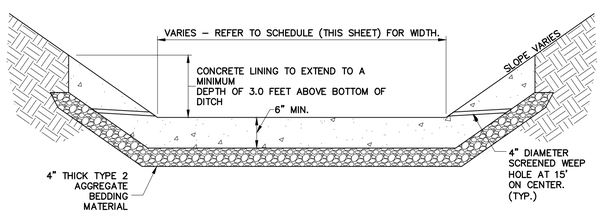
DRIVEWAY WITH NO SIDEWALK

NTS

BEDDING MATERIAL FOR DITCH LINING SHALL BE TYPE 2 AGGREGATE AS PER SECTION 1007 OF THE MISSOURI DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS.

CONCRETE LINING SHALL EXTEND TO A MINIMUM DEPTH OF 3.0 FEET ABOVE BOTTOM OF DITCH.

CONCRETE LINING SHALL BE SAW CUT AT A MAXIMUM OF 15 FOOT INTERVALS TO A MINIMUM DEPTH OF 1 1/2" WITHIN 48 HOURS OF POUR.

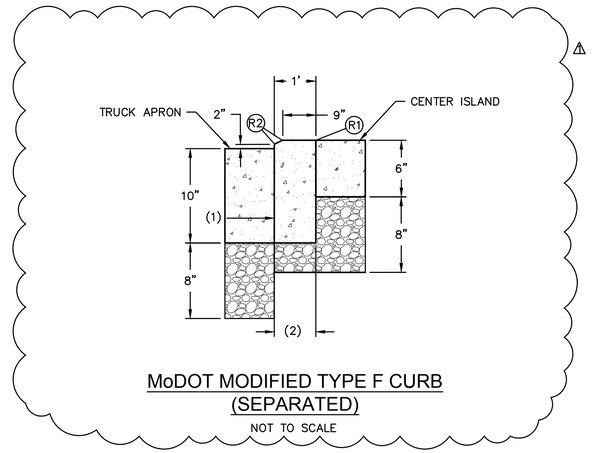


CONCRETE DITCH LINER

NTS

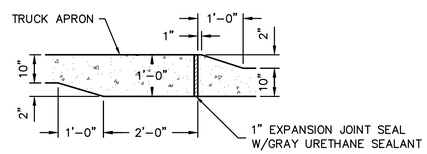
LEGEND

- (B) TIE BARS – 30" X #5 Ø AT 30" CTRS.
- (C) PERMISSIBLE CONSTRUCTION JOINT. IF CONSTRUCTED IN THIS MANNER TIE BARS MUST BE USED.
- (D) #4 Ø TIE BAR AT 24" CENTERS LENGTH OF THE TIE BARS EQUALS THICKNESS OF PAVEMENT PLUS HEIGHT OF CURB, LESS 3 INCHES.
- (L2) LONGITUDINAL JOINT WITH TIE BARS.
- (P) TOP OF PAVEMENT OR CONCRETE BASE.
- (R1) ROUND TO ¼" RADIUS (EXCEPT FOR SAWED JOINTS).
- (R2) ROUND TO ¾" RADIUS.
- (R3) CONSTRUCT TO 9" RADIUS.
- (1) PAY LIMIT FOR PAVEMENT
- (2) PAY LIMIT FOR CURB, OR CURB & GUTTER.



MoDOT MODIFIED TYPE F CURB (SEPARATED)

NOT TO SCALE



TRUCK APRON CURB

NOT TO SCALE

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NUMBER PE-2017019023
PROFESSIONAL ENGINEER

JONATHAN W. PEITZ–CIVIL ENGINEER
MO# PE–2017019023

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REVISIONS

STANDARD DETAILS

ZORA STREET IMPROVEMENTS - PHASE 1
CITY OF JOPLIN

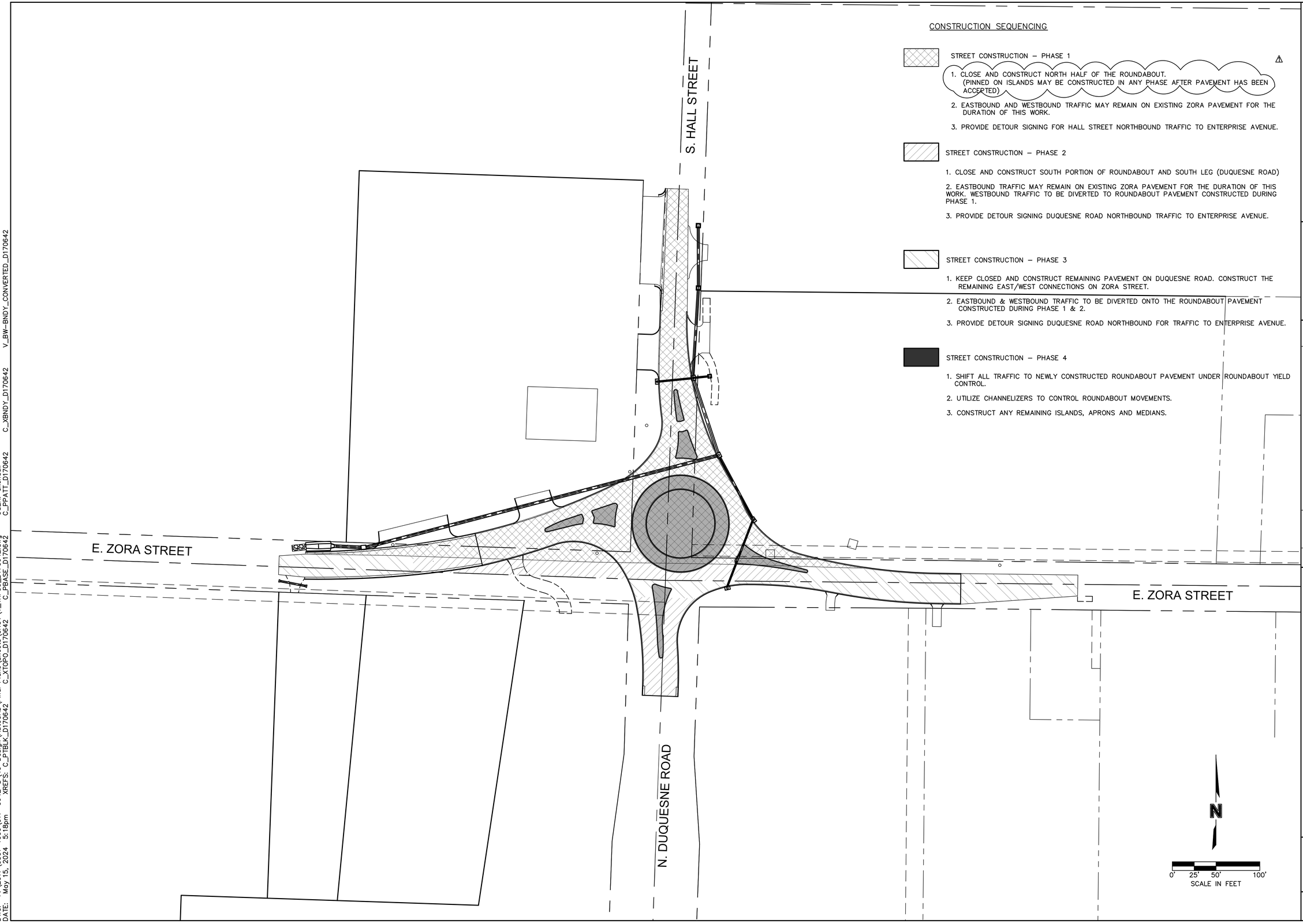
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JOPLIN, MISSOURI

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CONSTRUCTION SEQUENCING

STREET CONSTRUCTION – PHASE 1

1. CLOSE AND CONSTRUCT NORTH HALF OF THE ROUNDABOUT. (PINNED ON ISLANDS MAY BE CONSTRUCTED IN ANY PHASE AFTER PAVEMENT HAS BEEN ACCEPTED)
2. EASTBOUND AND WESTBOUND TRAFFIC MAY REMAIN ON EXISTING ZORA PAVEMENT FOR THE DURATION OF THIS WORK.
3. PROVIDE DETOUR SIGNING FOR HALL STREET NORTHBOUND TRAFFIC TO ENTERPRISE AVENUE.

STREET CONSTRUCTION – PHASE 2

1. CLOSE AND CONSTRUCT SOUTH PORTION OF ROUNDABOUT AND SOUTH LEG (DUQUESNE ROAD)
2. EASTBOUND TRAFFIC MAY REMAIN ON EXISTING ZORA PAVEMENT FOR THE DURATION OF THIS WORK. WESTBOUND TRAFFIC TO BE DIVERTED TO ROUNDABOUT PAVEMENT CONSTRUCTED DURING PHASE 1.
3. PROVIDE DETOUR SIGNING DUQUESNE ROAD NORTHBOUND TRAFFIC TO ENTERPRISE AVENUE.

STREET CONSTRUCTION – PHASE 3

1. KEEP CLOSED AND CONSTRUCT REMAINING PAVEMENT ON DUQUESNE ROAD. CONSTRUCT THE REMAINING EAST/WEST CONNECTIONS ON ZORA STREET.
2. EASTBOUND & WESTBOUND TRAFFIC TO BE DIVERTED ONTO THE ROUNDABOUT PAVEMENT CONSTRUCTED DURING PHASE 1 & 2.
3. PROVIDE DETOUR SIGNING DUQUESNE ROAD NORTHBOUND FOR TRAFFIC TO ENTERPRISE AVENUE.

STREET CONSTRUCTION – PHASE 4

1. SHIFT ALL TRAFFIC TO NEWLY CONSTRUCTED ROUNDABOUT PAVEMENT UNDER ROUNDABOUT YIELD CONTROL.
2. UTILIZE CHANNELIZERS TO CONTROL ROUNDABOUT MOVEMENTS.
3. CONSTRUCT ANY REMAINING ISLANDS, APRONS AND MEDIANS.

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TRAFFIC CONTROL
CONSTRUCTION SEQUENCE

ZORA STREET IMPROVEMENTS - PHASE 1
CITY OF JOPLIN

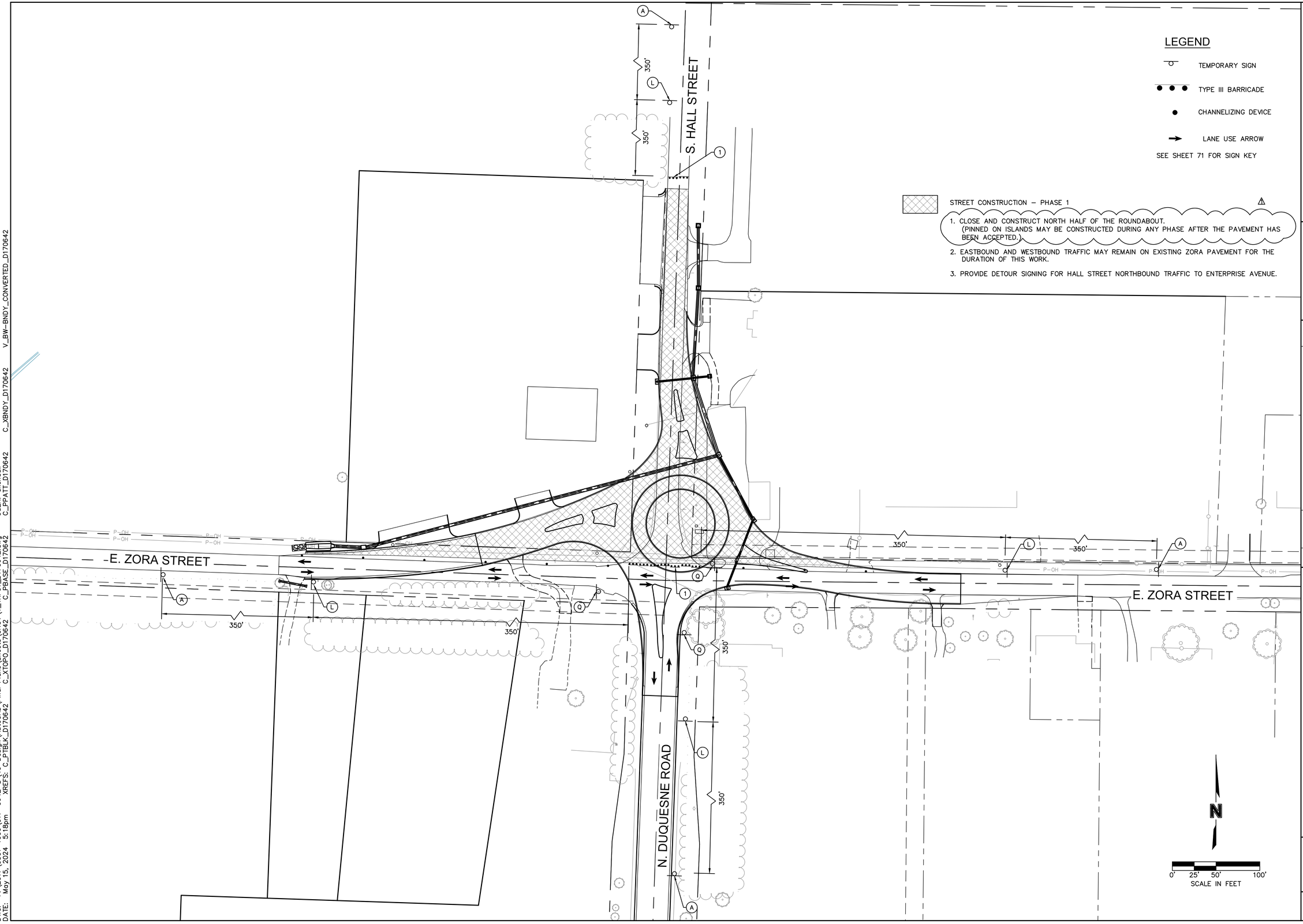
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TRAFFIC CONTROL
PHASE 1

ZORA STREET IMPROVEMENTS - PHASE 1
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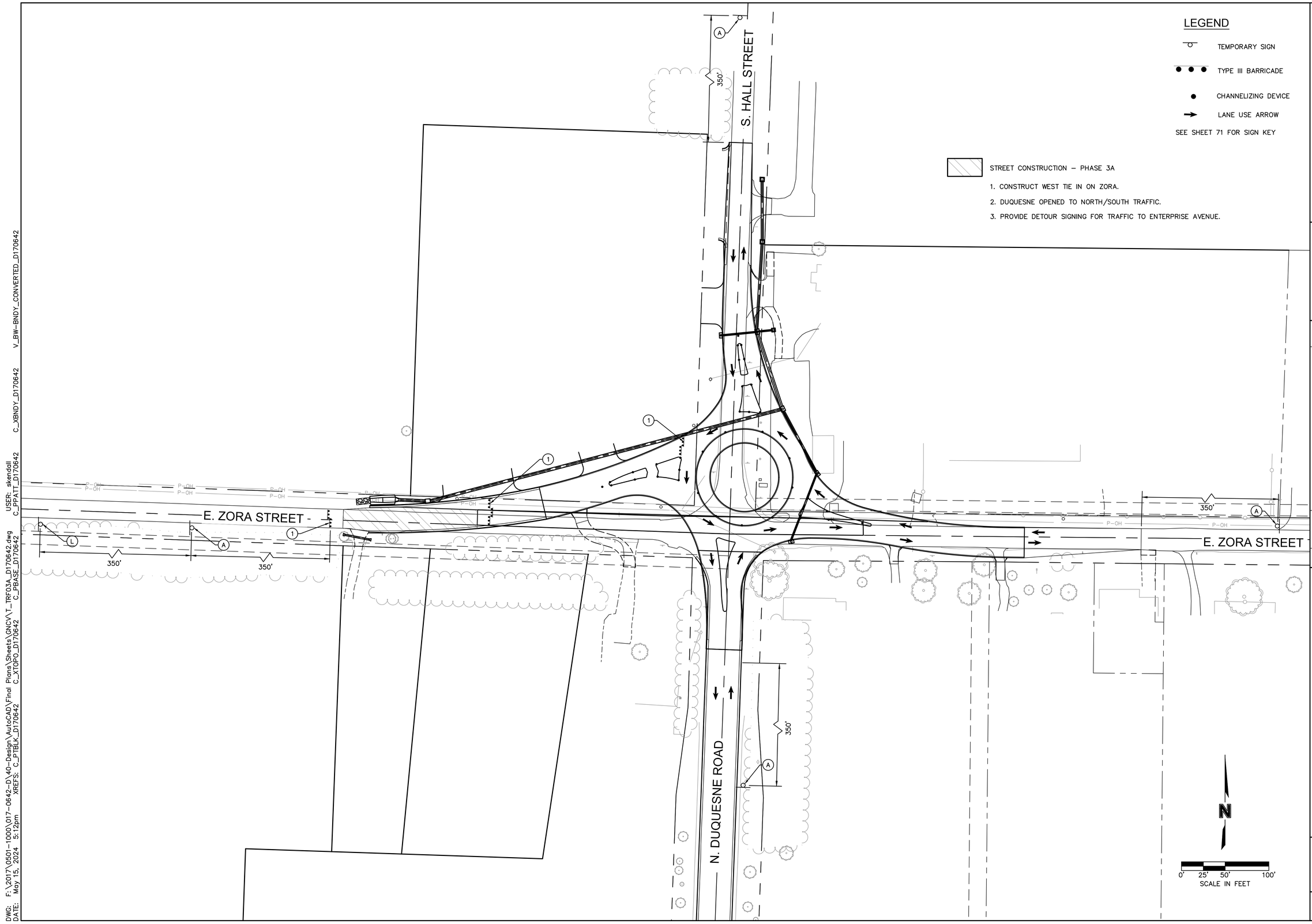
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TRAFFIC CONTROL
PHASE 3A

ZORA STREET IMPROVEMENTS - PHASE 1
CITY OF JOPLIN

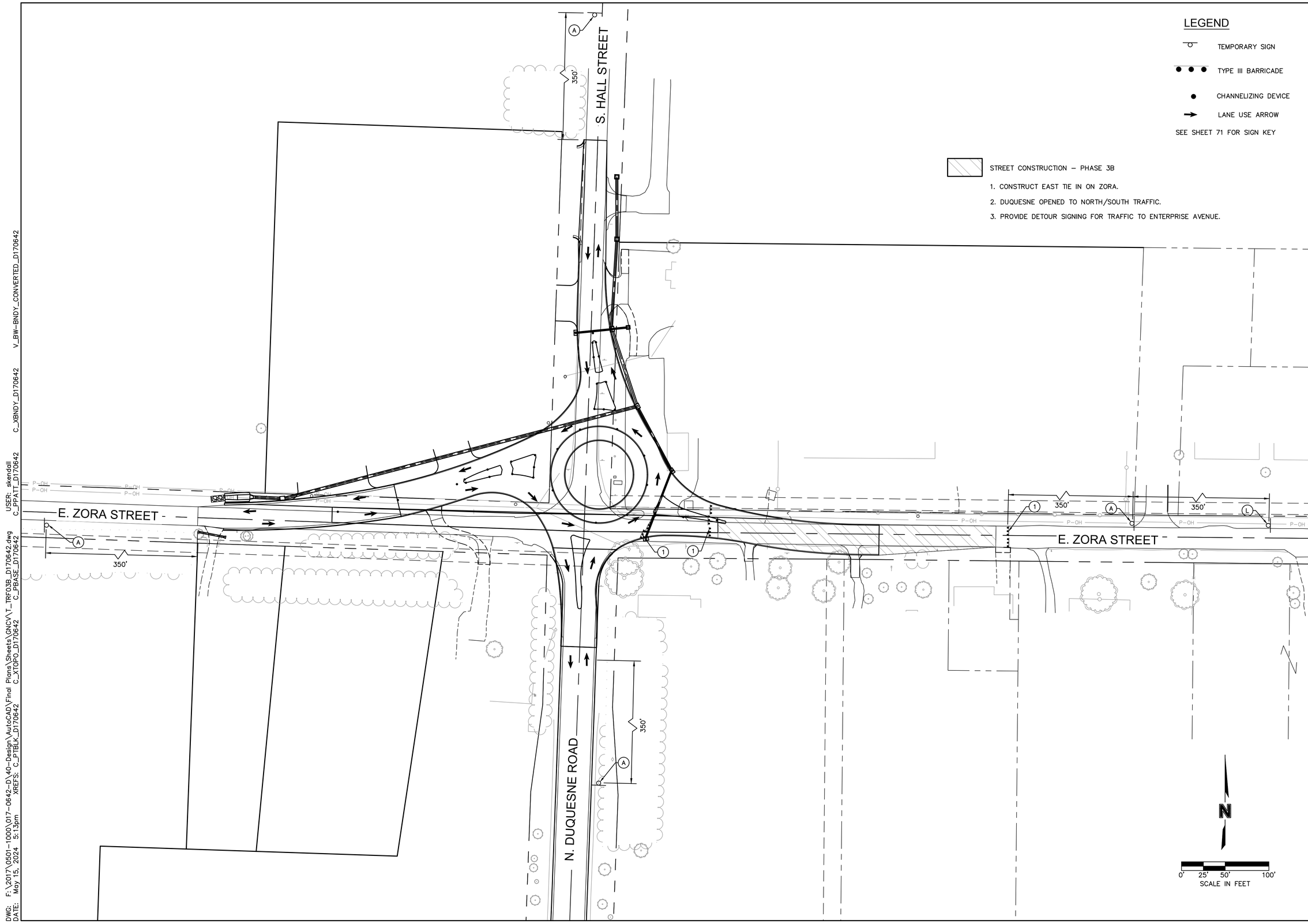
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LEGEND

- TEMPORARY SIGN
- TYPE III BARRICADE
- CHANNELIZING DEVICE
- LANE USE ARROW

SEE SHEET 71 FOR SIGN KEY

STREET CONSTRUCTION – PHASE 3B

1. CONSTRUCT EAST TIE IN ON ZORA.
2. DUQUESNE OPENED TO NORTH/SOUTH TRAFFIC.
3. PROVIDE DETOUR SIGNING FOR TRAFFIC TO ENTERPRISE AVENUE.

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PROFESSIONAL ENGINEER

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TRAFFIC CONTROL
PHASE 3B

ZORA STREET IMPROVEMENTS - PHASE 1
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JOPLIN, MISSOURI

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JOB SPECIAL PROVISION JSP-0400-02 rev1
UTILITY COORDINATION

1.0 UTILITY COORDINATION

1.1 SCOPE

It shall be the duty of the Contractor to notify the serving utility companies of pending construction operations and the schedule of same, prior to any work being done on this project. The utility companies will relocate and adjust their own facilities at no cost to the Contractor, except for sanitary and storm sewers and waterlines. The Contractor shall be responsible for the adjustment and protection of all sanitary and storm sewer facilities. Some minor grading and backfill work may be required of the Contractor at locations of utility adjustments. This work shall be considered subsidiary to other items of work.

The Contractor shall be responsible for holding periodic utility meetings with the City, the Engineer, and utility companies during the relocation of utility lines. The frequency of meetings will initially be bi-weekly (or more frequently if necessary) and then, as relocation work begins to diminish, will be held more infrequently. The Contractor shall keep minutes of the meetings and send copies to all those in attendance.

1.2 STATUS OF UTILITIES

The information below is the latest update for each utility. The utility companies will be invited to the Pre-Bid meeting to give an update on their relocations.

Gas: Southern Star no relocation anticipated.
Location: Crossing near station 110+00
Schedule: N/A

Spire no relocation anticipated.

Water: Missouri American Water Main relocation to be completed based on the following location and schedule:
Location: Near Curb Inlet 3, Water Meters
Schedule: To be coordinated by the general contractor with the overall construction schedule

Webb City water line relocation to be completed based on the following location and schedule:
Location: Along Hall Street
Schedule: to be coordinated by the general contractor with the overall contractor schedule.

Electric – Phase 1: Liberty Utilities Overhead Electric (Distribution) relocation to be completed based on the following location and schedule:
Location: Along Zora

Schedule: Northwest quadrant to be coordinated and completed during construction. This area supplies power to the flashing beacon. Coordination with Sparklight required.

Phone: AT&T relocation to be completed based on the following location and schedule:

AT&T Phase 1
Location: Northeast quadrant relocation and splicing
Schedule: Verify relocation with AT&T

AT&T Phase 2
Location: Various Locations
Schedule: Upon final clearance of Phase 2 right-of-way

Cable/Fiber: Sparklight cable relocation to be completed based on the following location and schedule:
Location: Various locations
Schedule: After Liberty Electric relocation

Fiber: Liberty Connect Fiber relocation to be completed based on the following location and schedule:
Location: Various locations
Schedule: After Liberty Electric Relocation

Fiber: AT&T Phase 1. No relocation is anticipated. The AT&T fiber is present in the intersection. Coordinate construction with AT&T.

1.3 MEASUREMENT AND PAYMENT

This work shall be considered subsidiary to other items of work. No additional payment will be allowed for delays caused by utility delays. Additional time will be considered for delays caused by utility conflicts that exceed the schedules listed in this special provision.

JOB SPECIAL PROVISION JSP-1100-02 rev1
DEMOLITION & REMOVAL

1.0 SCOPE

Demolition & Removal shall be in accordance with Section 1100 of the current approved City of Joplin, Standard Specifications, except as modified by this Job Special Provision.

2.0 MEASUREMENT

No separate measurement will be made for Demolition & Removal.

3.0 PAYMENT

Payment for “Demolition & Removal” shall be at the contract lump sum price and shall include the cost of furnishing all labor, equipment, disposal fees, tools, and materials, and the performance of all work necessary to complete demolition and pavement removal.

4.0 REMOVAL OF BUILDING

4.1 Scope of Work

This work shall consist of furnishing all labor and equipment necessary to perform all operations in connection with the removal and disposal of three existing buildings including but not limited to removal of building pads, floors, structural columns, utility service lines, cleanouts, and mailboxes, as necessary in accordance with the improvement plans. Contractor shall remove all appurtenances, building contents, debris, and utilities found within the existing building areas. Contractor shall coordinate with all respective utility companies affected by demolition to ensure correct removal and shutoff per respective utility company requirements. Contractor shall obtain all necessary permits for completion of this work.

Contractor shall be responsible for testing and removal of asbestos containing materials (ACM) and lead based paint (LBP). Contractor shall perform survey of building and insure that suspected materials have been abated in accordance with Missouri State Law.

This work includes any necessary measure to properly preform this work. Any item that must be removed to construct the improvements but is not shown on the plan to be removed, or not covered under separate bid item, shall be considered incidental to this project and no additional payment will be made for these items. Any items not covered within this job special provision but necessary for the completion of these bid items shall conform to City of Joplin Standard Specifications. Removal of building foundations shall be incidental to removal of building.

4.3 Method of Measurement

Final measurement will not be made except for written authorized changes, accepted by the Owner or Owner's Representative during construction.

4.4 Basis of Payment

The accepted quantities of removal of buildings and foundations will each be paid for by the contract unit price per lump sum. Testing, abetment, disposal, haul off, dumping fees, etc. shall be considered incidental to this pay item.

GEOTECHNICAL ENGINEERING REPORT

ZORA STREET WIDENING

RANGE LINE ROAD TO MO ROUTE 249

JOPLIN, MISSOURI

Prepared for:

BARTLETT & WEST
1719 Southridge Drive
Jefferson City, Missouri

Prepared by:



Springfield, MO
4168 W. Kearney Springfield, MO 65803
Call 417.864.6000 Fax 417.864.6004
www.ppimo.com

PPI PROJECT NUMBER: 229492

September 6, 2016

PALMERTON & PARRISH, INC.

GEOTECHNICAL & MATERIALS ENGINEERS
MATERIALS TESTING LABORATORIES
ENVIRONMENTAL SERVICES

4168 W. Kearney Street.
Springfield, MO 65803
Ph: (417) 864-6000
www.ppimo.com

September 6, 2016

Bartlett & West
1719 Southridge Drive
Jefferson City, MO 65109

Attn: Mr. Herb Bailey, P.E.
Herb.bailey@bartwest.com

RE: Geotechnical Engineering Report
Zora Street Widening – Range Line Road to MO Route 249
City Project #TC0608
Joplin, Missouri
PPI Project Number: 229492

Dear Mr. Bailey:

Attached, please find the report summarizing the results of the geotechnical investigation conducted for the above referenced project. We appreciate this opportunity to be of service. If you have any questions, please don't hesitate to contact this office.

PALMERTON & PARRISH, INC.
By:

Brandon R. Parrish P.E.
Vice-President

PALMERTON & PARRISH, INC.
By:

Brad R. Parrish, P.E.
President

STATE OF MISSOURI
BRANDON ROSS PARRISH
NUMBER PE-2010000852
9/6/16
PROFESSIONAL ENGINEER

Submitted: One (1) Electronic .pdf Copy

BRP/BRP/cmc

PALMERTON & PARRISH, INC.

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FIGURES

FIGURES 1 THRU 5 – BORING LOCATION PLAN

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APPENDIX VI – IMPORTANT INFORMATION REGARDING YOUR GEOTECHNICAL REPORT

EXECUTIVE SUMMARY

A Geotechnical Investigation was performed within the existing roadway along Zora Street from Range Line Road to Missouri Route 249 in Joplin, Missouri. Zora Street is currently a two-lane roadway along the proposed reconstruction alignment. It is understood that the alignment between Range Line Road and Duquesne Road will primarily consist of a two-lane roadway with a bike lane in either direction with a center turn lane. Curb and gutter with a sidewalk is anticipated along this section. From Duquesne Road to Missouri Route 249, the new roadway section will consist of a two-lane roadway with a center turn lane and 4 ft. shoulders. This section of roadway will be ditched versus construction of curb and gutter. Existing pavements that will be utilized are anticipated to receive a 2-inch overlay while new full depth asphalt construction will occur in the widening areas and in areas of full depth replacement of the existing roadway. The new roadway will be constructed along the same approximate alignment as the existing Zora Street with a new roundabout constructed at the intersection of Duquesne Road. Cut and fill depths of less than 2 ft. are anticipated along the entire roadway alignment.

A total of seventeen (17) pavement cores and shallow borings were drilled within the pavement along the proposed new reconstruction alignment. The borings extended to depths ranging from 5.6 to 10 ft. below the existing pavement surface. Based upon the information obtained from the borings and subsequent laboratory testing, recommendations for roadway reconstruction/repair were developed. Important geotechnical considerations for the project are summarized below. However, users of the information contained in the report must review the entire report for specific details pertinent to geotechnical design considerations.

- A conceptual phase Geotechnical Investigation consisting of a site reconnaissance and research was prepared and submitted July 1, 2016 by PPI for this project. During this conceptual phase investigation, several mining and possible karst features were documented within the proposed Zora Street widening alignment. Several roadway borings were strategically located within the areas of these features during this investigation, but a full scale study for

each of these features was not performed and was outside the scope of this investigation. These features are further discussed in Section 10.0 of this report;

- The existing pavement along the proposed roadway alignment consists of asphalt ranging in thickness from 5 to 11 inches overlying aggregate baserock ranging in thickness from 2 to 12 inches;
- The soil subgrade underlying pavements typically consisted of a clayey gravel or a lean/fat clay with appreciable rock fragments extending to boring completion depth. Many borings contained existing fill material below the pavement section which transitions to natural overburden soil at a relatively shallow depth. However, existing fill was encountered to boring completion depth within Boring 49+25 WB following auger refusal encountered at 5.6 ft. below the existing pavement surface. This boring is in a previously patched area where pavement subsidence has been reported by the City of Joplin to have occurred;
- Average minimum California Bearing Ratio (CBR) values correlated from Dynamic Cone Penetrometer (DCP) test data for all borings ranged from 2 to greater than 10 (primarily 6 to greater than 10);
- In general, stiff soil subgrade materials were encountered below the existing pavement section with the exception of borings located at stations 80+00 and 123+00 (above 2 ft.). Additional subgrade preparation and/or subgrade stabilization procedures should be anticipated in these areas exhibiting a low CBR value; and
- Palmerton & Parrish, Inc. should be retained for construction observation and construction materials testing. Close monitoring of subgrade preparation work is considered critical to achieve adequate subgrade performance.

GEOTECHNICAL ENGINEERING REPORT

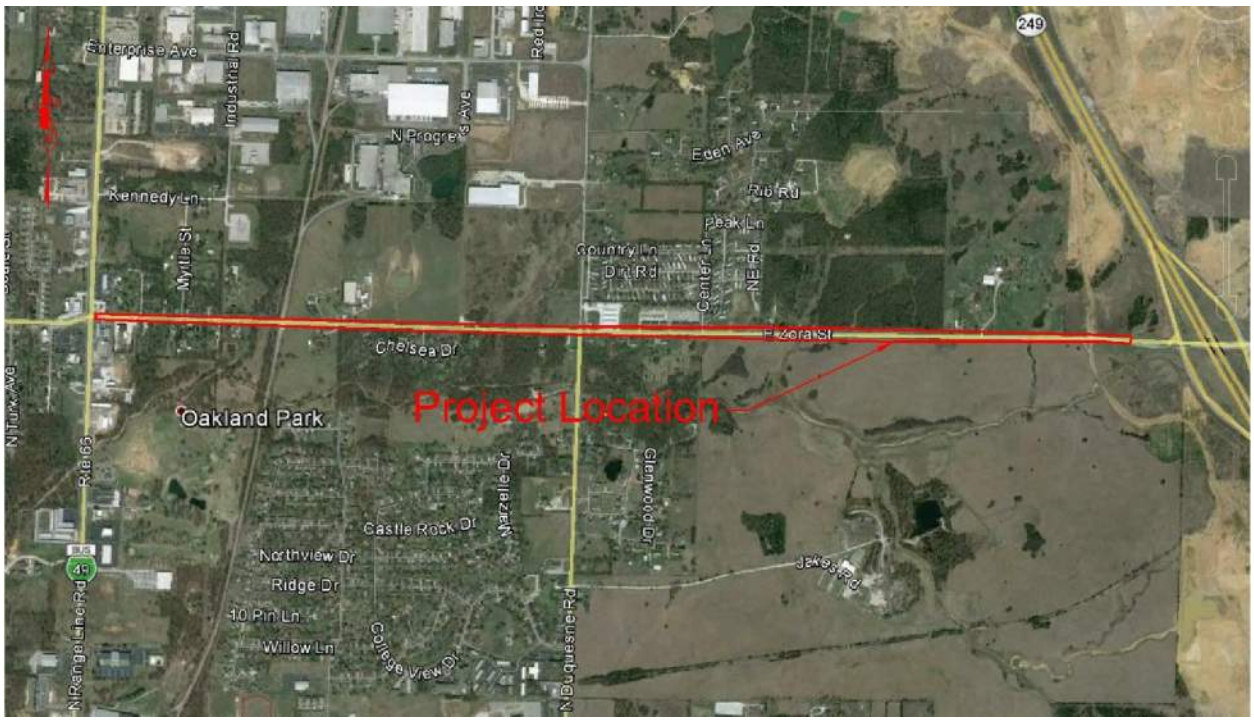
ZORA STREET WIDEINING

RANGE LINE ROAD TO MO ROUTE 249

JOPLIN, MISSOURI

1.0 INTRODUCTION

This is the report of the Geotechnical Investigation performed for the planned pavement improvement project along Zora Street between Range Line Road and Missouri Route 249 in Joplin, Missouri. This investigation was authorized by a letter proposal dated March 1st, 2016, performed under a Master Agreement for Professional Services between Bartlett & West and Palmerton & Parrish, Inc. (PPI). The approximate roadway improvement alignment is shown below.



The purpose of the Geotechnical Investigation was to provide information for design and construction planning, and to aid in site development. PPI's scope of services included field and laboratory investigation of the subsurface conditions in the vicinity of the proposed project site, engineering analysis of the collected data, development of recommendations for design and construction planning, and preparation of this engineering report.

2.0 PROJECT DESCRIPTION

Item	Description
Site Layout	See Figures 1 through 5: Boring Location Plan.
Grading	Cut and/or fill depths along the planned improvement alignment are anticipated to range from 1 to 2 ft. to achieve top of pavement elevation.
Planned Improvements	**Between Range Line Road and Duquesne Road:** Roadway Widening on both the north and south sides of the existing roadway to allow for construction of a two-lane runway with a center turn lane and 3 ft. bike lanes on both sides of the road with a 6 ft. sidewalk located on the south side of the roadway. Where full depth replacement is not performed, the existing pavement will be overlaid. **Between Duquesne Road and Missouri Route 249:** Widening to the south of the existing roadway, with the exception of a short segment of roadway that will be widened to the north just east of Duquesne, to allow for construction of a two-lane roadway with a center turn lane and 4 ft. shoulders in each direction. This section of roadway will include ditches on each side of the road. Where full depth replacement is not performed, the existing pavement will be overlaid.
Public Utilities	Both buried and aerial public utilities are present along this alignment of roadway, not only within the right-of-way, but also crossing Zora Street.

3.0 SITE DESCRIPTION

Item	Description
Physical Location	Zora Street between Range Line Road and Missouri Route 249 in Joplin, Missouri.
Current Ground Cover	Asphalt within the existing roadway and grass/brush/tree cover within widening areas.
Existing Topography	Gently rolling terrain.
Drainage Characteristics	Poor to Fair.

4.0 SUBSURFACE INVESTIGATION

Subsurface conditions were investigated through completion of pavement coring and subsurface borings, as well as subsequent laboratory testing.

4.1 Subsurface Borings

Subsurface conditions at this site were investigated by drilling and sampling a total of seventeen (17) pavement cores/sample borings located within the existing roadway along the planned improvement alignment. Boring locations were selected and staked in the field by PPI. Borings were identified as the station number in which they were located and were drilled at the approximate boring locations shown on Figures 1 through 5: Boring Location Plan.

Logs of the borings showing descriptions of soil and rock units encountered, as well as results of field and laboratory tests and a “Key to Symbols” are presented in Appendix I. A two-man flagging crew was mobilized during field drilling operations since the roadway alignment is currently two-lane only. Traffic control measures were in accordance with the Manual on Uniform Traffic Control Devices (MUTCD). The traffic control plan was approved by the City of Joplin prior to mobilization. The Missouri One-Call System was also notified prior to the investigation to assist in locating buried public utilities.

The existing pavement section was removed at the boring locations using a 6-inch diameter diamond impregnated core barrel powered by a CME 75 truck-mounted drill rig. The pavement cores were obtained and sampling/coring procedures were implemented. After pavement removal, the aggregate baserock thickness was measured and then a subgrade sample was obtained using a split spoon sampler while performing the Standard Penetration Test (SPT) in general accordance with ASTM D1586. Drilling and sampling procedures extended to depths ranging from 5.6 to 10 ft. below the existing pavement surface. Please refer to Appendix II for general notes regarding boring logs and additional soil sampling information. In addition, please refer to Appendix III for pavement core photographs.

4.2 Dynamic Cone Penetrometer

Dynamic Cone Penetrometer (DCP) testing was performed within all boring locations, except Sta. 49+25 EB, at the ground surface after core removal, prior to drilling. The dual mass DCP is used to assess the in-situ strength of undisturbed soil and/or compacted materials. The operator drives the DCP tip into soil and/or compacted materials by lifting the sliding hammer to the handle then releasing it. The total penetration for a given number of blows is measured and recorded, which is then used to estimate the in-situ California Bearing Ratio (CBR) or shear strength from an appropriate correlation chart using equations recommended by the U.S. Army Corps of Engineers. Graphical results from DCP testing are presented in Appendix IV.

4.3 Laboratory Testing

Collected samples were sealed and transported to the laboratory for further evaluation and visual examination. Laboratory soil testing included the following:

- Moisture Content (ASTM D2216);
- Grain Size Analysis (ASTM D6913); and
- Atterberg Limits (ASTM D4318).

5.0 SITE GEOLOGY

The general site area is underlain at depth with Mississippian Age Limestone. The upper surface of this limestone is often irregular due to the effects of differential vertical weathering and solution activities. Limestone is often overlain by discontinuous beds of Pennsylvanian Shale. Overburden soils at the site are typically residual having developed through chemical and physical weathering of the underlying parent bedrock. The boundary between overburden soils and comparatively unweathered limestone is usually abrupt, while the boundary between overburden soils and shale is generally a more gradual transition.

5.1 Mining Activity

The project alignment is located with an area of previous intense lead and zinc mining activities, which occurred within the Joplin area, part of the Tri-State Lead Belt, from the mid-1800's to the 1950's. As previously stated, PPI performed a Conceptual Phase Geotechnical Investigation published July 1, 2016, which presents the published mining activity that may affect this project.

6.0 GENERAL SITE & SUBSURFACE CONDITIONS

Based upon subsurface conditions encountered within the borings drilled at the project site, generalized subsurface conditions are summarized in the table below. Soil stratification lines on the boring logs indicate approximate boundary lines between different types of soil and rock units based upon observations made during drilling. In-situ transitions between soil and some rock types are typically gradual.

Description	Borings	Approx. Depth to Bottom of Stratum	Material Encountered	Moisture	Consistency/ Density
Stratum 1A	All	5 to 11 inches	Asphalt	-	-
Stratum 1B	All	2 to 12 inches	Aggregate Baserock	Slightly Moist	Medium Dense
Stratum 2	15+00, 31+50, 46+00, 49+25 WB*, 58+00, 68+25, 80+00, 97+00 & 123+00	2 to 8 ft.	Fill – Chert Sand & Gravel, Lean or Fat Clay, Clayey Gravel or Mine Tailings	Slightly Moist to Moist	Medium Dense to Dense or Medium Stiff to Stiff
Stratum 3	46+00, 80+00, 88+00, 115+00 & 124+62	3.8 to 8 ft.	Lean Clay or Silty Lean Clay	Moist	Stiff to Hard
Stratum 4	All, Except 49+25 WB	Boring Completion or Top of Shale (Sta. 105+00)	Fat Clay with Gravel or Clayey Gravel	Moist	Stiff or Dense to Very Dense
Stratum 5	102+00	Boring Completion (9.5 ft.)	Limestone	-	Medium Hard
Stratum 6	105+00	Boring Completion (9.5 ft.)	Shale	-	Soft
*Sta. 49+25 was discontinued in fill following spoon refusal at a depth of 5.6 ft.					

6.1 Groundwater

Shallow groundwater was not observed within the borings on the date drilled. Groundwater levels should be expected to fluctuate with changes in site grading, precipitation, and regional groundwater levels. Groundwater may be encountered at shallower depths during wetter periods.

7.0 SUBGRADE PREPARATION & EARTHWORK

Minimal cut and fill depths ranging from 1 to 2 ft. are anticipated along the project alignment. The existing subgrade soils encountered below 5 to 11 inches of asphalt and 2 to 12 inches of aggregate baserock were primarily logged as medium stiff to stiff and medium dense to dense with primarily moderate to high average minimum CBR values correlated from field DCP testing. However, two (2) soft subgrade areas were identified at Sta. 88+00 and 123+00. These areas are understood to receive new pavement in the widening areas and overlay of the existing asphalt. If these subgrades

are exposed, stabilization will most likely be required to achieve a stable subgrade. Based upon preliminary plans, top of pavement elevations will be approximately 1 ft. higher than existing pavements within these areas. Subgrade preparation prior to pavement construction is considered essential to long term pavement performance. Please refer to the sections below for subgrade preparation alternates.

7.1 Subgrade Preparation – Widening Areas or Complete Reconstruction

In future widening areas where no pavements exist currently, or in areas where the existing pavement will be completely removed and reconstructed, the initial phase of subgrade preparation should include clearing/grubbing of all vegetative matter and topsoil stripping or removal of the existing pavement section. Although borings could not be drilled within the widening areas, topsoil stripping on the order of 6 to 8-inches should be anticipated. The second phase of subgrade preparation should include proof-rolling of the pavement subgrade, as well as other areas to receive controlled fill, if any, prior to fill placement and/or pavement construction in order to assure a stable subgrade. Proof rolling consists essentially of rolling the ground surface with a loaded tandem axle dump truck or similar heavy rubber tired construction equipment and noting any areas which rut or deflect during rolling. Proof rolling, undercutting and replacement should be monitored by a qualified representative of PPI. **The stability of the exposed subgrade will be greatly influenced by the time of year and related soil moisture conditions, as well as provisions for drainage provided during construction. Any unstable subgrades should be stabilized using the methods outlined below in Section 7.3.**

7.2 Subgrade Preparation – Filling on Existing Asphalt

In areas where the existing pavement is to be left in place and filled upon, but not overlaid, pavements may be broken up with a large diameter vibratory compactor, pneumatic breaker, or any other means necessary to allow for downward migration of water and provide a suitable base for baserock/fill placement. Prior to fill placement, all areas should be proof-rolled and approved, as described above.

7.3 Structural Fill & Subgrade Stabilization

Widespread subgrade improvement is not anticipated at the project site. However, subgrade improvements may be desired prior to pavement construction within isolated areas of lower CBR values that do not pass a proof-rolling. Options for subgrade stabilization or improvement are presented in the sections below.

7.3.1 Removal & Replacement w/ Select Earth Fill

Although it is not anticipated, areas where deeper fill is required to achieve finish subgrade elevations, or after undercut of soft subgrade conditions, earth fill should be placed in no greater than 8-inch loose lifts and compacted to at least 95% of maximum density at a moisture content within 2% of optimum moisture content for CL soil types with a liquid limit less than 45 and between 0 and 4% above optimum for CH and CL-CH soil types with a liquid limit greater than or equal to 45, if utilized, as determined by Standard Proctor Procedures (ASTM D-698). This method of stabilization is typically the more expedient and economical method in the general site area. Adequate field density and moisture content tests should be performed to insure compliance with project specifications. A testing frequency of at least one field density test for each 5000 sq. ft. of fill lift, but no less than 3 tests per lift is recommended within pavement areas unless project specifications require a more frequent interval.

7.3.2 Rock Fill

In areas of soft subgrade identified during proof-rolling, if any, removal of soft soils and replacement with select earth fill or rock fill is recommended. Rock fill is the recommended filling medium, if deeper soft soil conditions are present. Rock fill can be utilized to stabilize the subgrade so that proper compaction of overlying soil fill can be achieved. Rock fill used to stabilize undercut bottoms should consist of 4 to 6 inch top size stone. Rock material should be placed in horizontal layers having a maximum thickness of 12-inches and compacted with a minimum of three (3) passes with a heavy self-propelled vibratory roller. Rock fill should not be dumped into place, but should be distributed in horizontal lifts by blading and dozing in such a manner as to ensure proper placement into final

position. Finer material including rock fines and limited soil fines should be worked into the rock voids during this blading operation. Excessive soil and rock fine particles preventing aggregate interlock should be prohibited. The testing of rock fill quality should include the requirements that a representative of the Geotechnical Engineer be present daily, but not necessarily continuously during the placement of the fill to observe the placement of rock fill in order to determine fill quality and to observe that the contractor's work sequence is in compliance with this specification. Progress reports indicative of the quality of the fill should be made at regular intervals to the Owner. If improper placement procedures are observed during the placement of the fill, the Contractor should be informed, and no additional fill should be permitted on the affected area until the condition causing the low densities has been corrected and the fill has been reworked to obtain sufficient density.

7.3.3 Chemical Stabilization

If additional subgrade improvements are required even after scarifying and recompacting, another option for additional subgrade improvement in deeper, soft areas is chemical stabilization using fly ash, Portland cement, cement kiln dust, or lime. Additional recommendations regarding chemical stabilization can be provided, if desired.

7.3.4 Geogrid

In lieu of or in addition to the subgrade improvement methods discussed above, geogrid reinforcement may be used in areas with deeper soft subgrade to reduce the required baserock thickness. A geogrid reinforcement product typically specified on similar roadway projects is Tensar Triax TX-5, or equivalent. Geogrids are typically placed at the base of the baserock course, above the soil subgrade in pavement areas or at the bottom of undercuts is soft areas that have been removed. Additional computation is required to identify the cost savings associated with reduced baserock thickness using geogrid. However, once baserock thicknesses are computed in softer subgrade areas, PPI can help evaluate whether the use of geogrid on this project would be beneficial.

7.4 Subgrade Support Parameters

At the time of this investigation, the aggregate baserock and soil subgrade primarily exhibited moderate to high CBR values. Please refer to the table below for the average minimum CBR value at each boring location. Existing pavement thicknesses have also been presented within this table.

Boring Location	Asphalt (in.)	Aggregate Baserock (in.)	Average Minimum CBR Value
15+00	8	12	10
23+00	7	4	7
31+50	5	4	10
39+50	9	7	10
46+00	9	8	8
49+25EB	9	9	-
49+25WB	8.75	6	10 (Above 2.3 ft.) & 4 (Below 2.3 ft.)
58+00	8.5	5.5	>10
68+25	10.5	8	>10
80+00	11	2	7
88+00	8.25	9	2
97+00	10.5	2	>10
102+00	8.5	5.5	5
105+00	10	7	6
115+00	10	4	10
123+00	5	5	2 (Above 2 ft.) & 10 (Below 2 ft.)
124+62	6.25	5	10

For on-site gravelly soils scarified and adjusted to within the specified soil moisture range and recompacted to at least 95% of Maximum Standard Proctor density (ASTM D 698), a minimum CBR value of 5.0 should be appropriate. Based upon previous knowledge of the soils in the general site area, the design CBR value may be increased to 8.0 using chemical stabilization and 12.0 for at least 24 inches of rock fill below pavement sections. Benefits of chemical stabilization and rock fill are an increase in the design CBR value, as well as providing a working platform for pavement construction. Research has shown that chemically stabilized soils sometimes suffer strength loss

over time due to leaching. Alternate subgrade improvement methods are discussed below, with associated Design CBR values for all subgrade stabilization methods presented in the table below.

Subgrade Improvement Methods & Associated CBR Values	
Subgrade Improvement Method	**Design CBR Value**
Scarify & Recompact Existing Stiff Gravelly Clay Subgrade & Evaluate By Proof-Rolling	5.0
Remove & Replace (Select Earth Fill, i.e. containing at least 35% rock fragments retained on the No. 4 sieve)	6.0
Chemical Stabilization of Soil Subgrade using cement, flyash or hydrated lime	8.0
Remove & Replace (Rock Fill)	12.0

8.0 PAVEMENT MILLING & OVERLAY

Due to the medium stiff/dense to stiff/dense subgrade soils encountered below existing pavements and generally thick existing asphalt, milling and overlay is considered an option regarding pavement rehabilitation. This option is not considered equivalent to complete removal and replacement due to utilizing existing asphalt pavement with a reduced pavement life. In addition, the soil subgrade cannot be observed and repaired where needed when the existing asphalt is not completely removed. However, complete removal and replacement of existing pavement may not be economically feasible, and milling/overlay is a lower cost repair option with a lesser design life as compared to complete reconstruction in these areas. Based upon preliminary plans, a 2-inch overlay has been proposed for all existing pavements that will not be completely reconstructed. A pavement analysis was performed to evaluate whether or not a 2-inch overlay would be adequate for all the different pavement sections encountered. Results of this pavement analysis are summarized in in Section 9.2 below.

Based upon the information obtained during this study, as well as the understanding that the existing roadway was constructed many years ago, it is anticipated that isolated areas of deteriorated asphalt may be exposed. All highly deteriorated areas should be removed to stable subgrade soils and backfilled with asphalt pavement in accordance with the project asphalt specifications. A second alternative is to overlay all deteriorated areas with a petro-mat or equivalent, to resist reflective pavement cracking. It is

recommended that the pavement fabric extend a minimum of 5 feet beyond the highly deteriorated areas in all directions. In addition to deteriorated area, petro-mat or equivalent is recommended to be placed along the longitudinal interface between existing pavements and new pavements to reduce the potential for reflective cracking.

9.0 PAVEMENT

Refer to Section 7.0 regarding subgrade preparation for pavements. It is anticipated that any new pavements associated with this project will be constructed of an asphaltic concrete wearing surface placed over a base over a granular base course.

9.1 Asphalt Pavement

If asphaltic paving is selected, the aggregate base may be a granular compacted crushed limestone with a gradation and quality conforming to the requirements of the Missouri Department of Transportation, Standard Specification 1007 for either Type 1 or Type 5 aggregates. The maximum lift thickness for the granular base is 4 inches. Granular base thicknesses in excess of 4 inches should be placed in multiple lifts with each lift being of approximate equal thickness. The granular base should be compacted to at least 100% of Standard Proctor Compaction (ASTM D-698). The base may also be a bituminous base.

Asphaltic concrete, both base and surface, should conform to the applicable volumetric and gradational requirements of MoDOT Standard Specification 401 except that sampling for testing compliance during laydown should be from hot mix samples taken behind the paver. Asphaltic concrete should be compacted to 92 to 96% of Maximum Theoretical Specific Gravity (ASTM D-2041). 95% of 50-Blow Marshall compaction is also accepted as a minimum compaction if the void content (Va) is within the specification value range. Substitution of an appropriate Superpave Mix Design (MoDOT Section 403) is permitted. SP 190C or SP 250C can be used in place of the bituminous base. SP 190C or SP 125C may be used for the surface. All bituminous mix designs should have been prepared or verified within six (6) months of the date of placement on this project and should recognize the tendency of the mineral aggregate to “fine up” in the mixer.

9.2 Asphalt Thickness – New Construction

A site specific pavement analysis was performed for the above project site for the new pavements constructed in widening and reconstruction areas. The pavement analysis was performed using WINPAS, a pavement design software following AASHTO Guide for Pavement Structures, as well as traffic data provided by the City of Joplin. Assumptions used during this analysis included;

- 5,370 vehicles per day with 5% trucks (2015 values);
- 7,979 vehicles per day with 5% trucks (2035 values);
- Soil subgrade with a CBR of 5 corresponding to existing stiff gravelly clay subgrades passing proof-rolling;
- Design life of 20 years;
- Initial serviceability = 4.2;
- Terminal serviceability = 2.5 (minor arterial);
- Reliability = 90%; and
- Overall deviation = 0.45.

Please refer to Appendix V for a summary of the actual number and type of trucks assumed.

Based upon the above traffic loading and assumed subgrade conditions, a required structural number of approximately 4.69 was computed. Based upon this structural number, a pavement section consisting of 2-inches of asphalt concrete wearing surface, over 8-inches of asphaltic base, over 8-inches of aggregate baserock is required. This pavement section is equal to the City of Joplin minimum standard pavement section for roadways classifying as an arterial. As a result, the standard City of Joplin pavement section is applicable for use in all complete reconstruction and widening areas.

9.3 Asphalt Thickness – Overlays

An additional pavement analysis was performed for the sections of existing roadway where the asphalt will be overlaid. As presented in Section 7.3 above, existing pavement thicknesses vary considerably along the proposed project alignment. At the stations investigated, the required overlay thickness was computed using the pavement analysis assumptions presented above. It should be noted that the layer coefficient of the existing pavement was reduced, as compared to new asphalt, to account for the age and deterioration of the existing asphalt. Refer to the following table for the computed overlay thickness at each station investigated where future overlay is anticipated. The values shown are the required overlay thicknesses to bring the existing pavement section equivalent to a new standard pavement section. It should be noted that these values utilize the CBR obtained at each individual station.

Boring Location	Existing Asphalt (in.)	Existing Aggregate Baserock (in.)	Anticipated Construction	Computed Required Asphalt Overlay (inches)
15+00	8	12	Overlay	0.5
23+00	7	4	Full Depth Replacement	-
31+50	5	4	Overlay	5
39+50	9	7	Overlay	1
46+00	9	8	Full Depth Replacement	-
49+25EB	9	9	Overlay	0.5
49+25WB	8.75	6	Overlay	1.5
58+00	8.5	5.5	Overlay	2
68+25	10.5	8	Full Depth Replacement	-
80+00	11	2	Full Depth Replacement	-
88+00	8.25	9	Overlay	5.5
97+00	10.5	2	Overlay	1.5
102+00	8.5	5.5	Full Depth Replacement	-
105+00	10	7	Overlay	2
115+00	10	4	Full Depth Replacement	-
123+00	5	5	Overlay	4.5
124+62	6.25	5	Overlay	3.5

As shown in the table above, a 2-inch overlay, as is shown on the preliminary plans, is considered sufficient for some of the areas investigated, but not for others. Where a 2-inch overlay is not considered sufficient, the existing pavement section is relatively thin, a low subgrade CBR was obtained, or both. Although a 2-inch overlay will improve the life of the existing pavement, it will not be equivalent to the new pavement, constructed using the standard City of Joplin arterial pavement section. It is assumed that project budget will dictate overlay thickness in the deficient areas computed.

10.0 EXCAVATIONS

Based upon the subsurface conditions encountered during this investigation, the on-site soils typically classify as Type B in accordance with OSHA regulations. Temporary excavations in soils classifying as Type B with a total height of less than 20 ft. should be cut no steeper than 1H:1V in accordance with OSHA guidelines. Confirmation of soil classification during construction, as well as construction safety, including shoring, if required, is the responsibility of the contractor.

11.0 CUT & FILL SLOPES

Based upon the soil samples obtained during field drilling procedures, as well as previous knowledge of the general area overburden soil conditions, general cut and fill slopes may be designed with a grade of 2.5H:1V, or flatter. A steeper slope inclination of 2H:1V may be used if the residual soil contains at least 40-percent admixed chert or rock fragments retained on the No. 10 sieve, as recommended by MoDOT. However, it should be noted that this recommendation is for slopes 20 ft. in height, or less. A more detailed analysis should be performed by PPI for slopes greater than 20 ft. in height. Earth cut or fill slopes designed as a 2.5H:1V, shall be constructed with properly compacted earth fill or natural existing soils classifying as a GC, CL, CL-CH and/or CH. Slopes constructed completely out of rock fill (not just the slope surface) may be designed using a grade of 2H:1V. Rock fill should consist primarily of particles with a diameter of 4-inches, or greater.

Although design of 2H:1V earth slopes are permissible depending on material gradation, these steeper slopes typically require more maintenance and erosion protection immediately following construction, and through the life of the slope, as compared to a flatter slope. Although design and construction of 2H:1V slopes are considered permissible, and consistently used on similar transportation projects in the area, care should be taken to reduce the potential surface erosion of these slopes, which may lead to shallow surface failures if left unattended. Vegetation on slopes should be established as soon as reasonable possible, or some type of erosion control product used on the slope surface to minimize erosion potential.

11.1 Benching

Any fill material placed on top of existing slopes, should be benched into the existing hillside to reduce the potential of a failure plane forming between the two materials. Per MoDOT Section 203.4.11 "Embankment on Hillsides or Against Existing Embankment," any fill placed on existing hillsides or embankments (steeper than 6H:1V measured at a right angle to the roadway) shall be continuously benched into less than 12 inch rises over those areas receiving fill, as the embankment is constructed in lifts. Benching shall be of sufficient width to permit placing and compacting operations. Each horizontal cut shall begin at the intersection of the ground line and the vertical side of the previous bench. Existing slopes shall also be stepped to prevent any wedging action of the embankment against existing structures.

12.0 ADDITIONAL INVESTIGATION

As stated in Section 5.1 above, the project site is located within an area of previous intense mining activity. In addition, the City of Joplin has noted four (4) roadway repair areas of previous subsidence that have been patched in the past located approximately 150 ft. east of Wellington Street. Two (2) borings drilled during this investigation were located within one of the patched areas (Sta. 49+25 EB & WB). Within the boring located at Sta. 49+25 WB, existing fill was logged to spoon refusal depth at 5.6 ft., while no fill material was logged within the adjacent boring drilled within the eastbound lane. Since this boring was located within a previous patch area, with deeper fill, as compared to an adjacent boring, this patch area is believed to be a result of subsidence, most likely due to previous mining activity. From the data we currently have, this feature, as well as the other 3 features previously patched by the City of Joplin seem to be relatively small diameter, and may be previous prospect holes or pits. Asphalt overlay is currently planned for these areas. Since these areas have a history of subsidence, we recommended additional investigation for these areas to determine if they are indeed mining related and the horizontal extent and provide repair recommendations, if applicable. Additional investigation is anticipated to include drilling of additional geotechnical borings, possibly supplemented by surface seismic geophysics. PPI can

perform this additional investigations, if desired, prior to construction of the widening project.

13.0 CONSTRUCTION OBSERVATION & TESTING

The construction process is an integral design component with respect to the geotechnical aspects of a project. Since geotechnical engineering is influenced by variable depositional and weathering processes and because we sample only a small portion of the soils affecting the performance of the proposed structures, unanticipated or changed conditions can be disclosed during grading. Proper geotechnical observation and testing during construction is imperative to allow the Geotechnical Engineer the opportunity to evaluate assumptions made during the design process. Therefore, we recommend that PPI be kept apprised of design modifications and construction schedule of the proposed project to observe compliance with the design concepts and geotechnical recommendations, and to allow design changes in the event that subsurface conditions or methods of construction differ from those assumed while completing this study. We recommend that during construction all earthwork be monitored by a representative of PPI, including site preparation, placement of all engineered fill and trench backfill, and all foundation excavations as outlined below.

- An experienced Geotechnical Engineer or Engineering Technician of PPI should observe the subgrade throughout the proposed project site immediately following stripping to evaluate the native clay, identify areas requiring additional undercutting, and evaluate the suitability of the exposed surface for fill placement;
- An experienced Engineering Technician of PPI should monitor and test all fill placed within the pavement areas to determine whether the type of material, moisture content, and degree of compaction are within recommended limits; and
- The condition of the subgrade should be evaluated immediately prior to construction of the building floor slabs to determine whether the moisture content and relative density of the subgrade soils are as recommended.

14.0 REPORT LIMITATIONS

This report has been prepared in accordance with generally accepted practices of other consultants undertaking similar studies at the same time and in the same geographical area. Palmerton & Parrish, Inc. observed that degree of care and skill generally exercised by other consultants under similar circumstances and conditions. Palmerton & Parrish's findings and conclusions must be considered not as scientific certainties, but as opinions based on our professional judgment concerning the significance of the data gathered during the course of this investigation. Other than this, no warranty is implied or intended.

FIGURES

S:_MASTER PROJECT FILE\2015\B\Bartlett & West-229492-Zora St Widening No T60608-Sub\Figures\Figures.dwg



SCALE
1" = 250'

LEGEND

Boring Location

Project: Zora Street Widening - Joplin, Missouri
Client: Bartlett & West, Inc.

Boring Location Plan

DATE: August 15, 2016

Project Number: 229492

PALMERTON & PARRISH, INC.
GEOTECHNICAL AND MATERIALS ENGINEERS/
MATERIALS TESTING LABORATORIES / ENVIRONMENTAL SERVICES

FIGURE 1



SCALE
1" = 200'

LEGEND

Boring Location

Project: Zora Street Widening - Joplin, Missouri
Client: Bartlett & West, Inc.

Boring Location Plan

DATE: August 15, 2016

Project Number: 229492

PALMERTON & PARRISH, INC.
GEOTECHNICAL AND MATERIALS ENGINEERS/
MATERIALS TESTING LABORATORIES / ENVIRONMENTAL SERVICES

FIGURE 2

S: _MASTER PROJECT FILE\2015\B\Bartlett & West-229492-Zora St Widening No T60608-Sub\Figures\Figures.dwg



SCALE
1" = 200'

LEGEND

Boring Location

Project: Zora Street Widening - Joplin, Missouri
Client: Bartlett & West, Inc.

Boring Location Plan

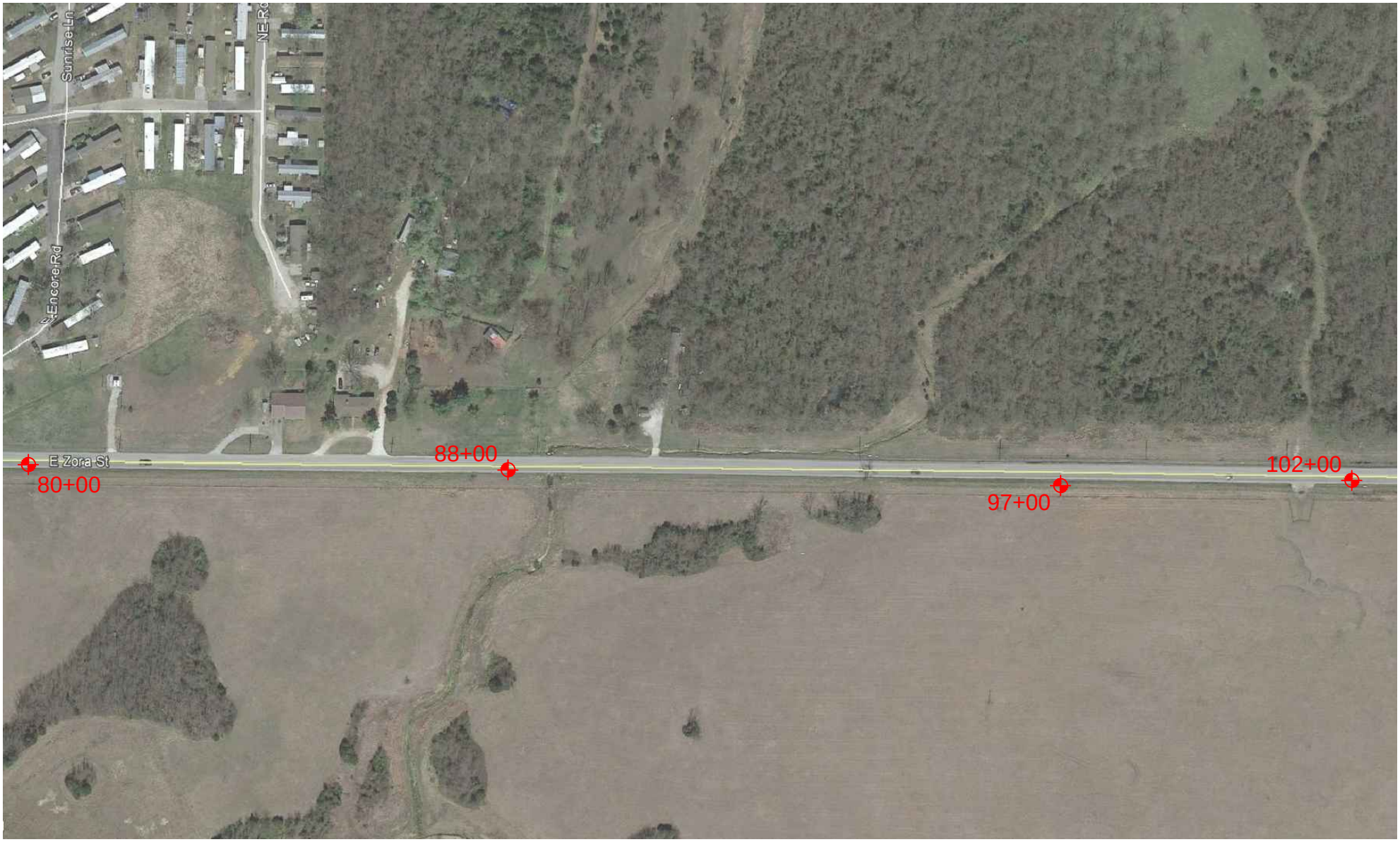
DATE: August 15, 2016

Project Number: 229492

PALMERTON & PARRISH, INC.
GEOTECHNICAL AND MATERIALS ENGINEERS/
MATERIALS TESTING LABORATORIES / ENVIRONMENTAL SERVICES

FIGURE 3

S:_MASTER PROJECT FILE\2015\B\Bartlett & West-229492-Zora St Widening No T60608-Sub\Figures\Figures.dwg



SCALE
1" = 225'

LEGEND

Boring Location

Project: Zora Street Widening - Joplin, Missouri
Client: Bartlett & West, Inc.

Boring Location Plan

DATE: August 15, 2016

Project Number: 229492

PALMERTON & PARRISH, INC.
GEOTECHNICAL AND MATERIALS ENGINEERS/
MATERIALS TESTING LABORATORIES / ENVIRONMENTAL SERVICES

FIGURE 4

S:_MASTER PROJECT FILE\2015\B\Bartlett & West-229492-Zora St Widening No T60608-Sub\Figures\Figures.dwg

S:_MASTER PROJECT FILE\2015\B\Bartlett & West-229492-Zora St Widening No T60608-Sub\Figures\Figures.dwg



SCALE
1" = 200'

LEGEND

Boring Location

Project: Zora Street Widening - Joplin, Missouri
Client: Bartlett & West, Inc.

Boring Location Plan

DATE: August 15, 2016

Project Number: 229492

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MATERIALS TESTING LABORATORIES / ENVIRONMENTAL SERVICES

FIGURE 5

APPENDIX I

BORING LOGS & KEY TO SYMBOLS

4168 W. Kearney St.
Springfield, MO 65803
Telephone: (417) 864-6000
Fax: (417) 864-6004

GEOTECHNICAL BORING LOG

BORING NUMBER 15+00

CLIENT Bartlett & West
PROJECT NAME Zora Street Widening - Range Line to MO Rte 249
PROJECT NO. 229492
PROJECT LOCATION Joplin, MO
DATE STARTED 8/11/16 **COMPLETED** 8/11/16
SURFACE ELEVATION _____ **BENCHMARK EL.** _____
DRILLER EP **DRILL RIG** CME 75
GROUND WATER LEVELS
HAMMER TYPE Auto
AT TIME OF DRILLING None
LOGGED BY CW **CHECKED BY** AM
AT END OF DRILLING _____
NOTES _____

DEPTH (ft)	DRILLING METHOD	STRATA SYMBOL	MATERIAL DESCRIPTION (Unified Soil Classification System)	SAMPLE TYPE NUMBER	RECOVERY % (RQD %)	CORRECTED BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT (pcf) 20 40 60 80 100 / N VALUE 20 40 60 80 / PL MC LL 20 40 60 80 / SHEAR STRENGTH (ksf) 1 2 3 4	ELEVATION (ft)
0.0	CFA - 4.5" O.D.		ASPHALT (8")						
			0.7 ft						
			AGGREGATE BASEROCK (12")						
			1.7 ft						
			FILL - Chert Sand & Gravel, w/ Fat Clay, Medium Dense, Moist (SC)	SPT 1		10-7-13 (20)			
2.5			3.0 ft						
			FAT CLAY, w/ Chert Gravel, Red, Moist, Stiff (CH)	SPT 2		7-9-9 (18)	2		
5.0			- Red to Red Brown below 5.5'	SPT 3		15-7-10 (17)	1		
7.5			- Dark Red and Very Stiff below 8'	SPT 4		10-13-13 (26)	3		
			9.5 ft						

Bottom of borehole at 9.5 feet.

BORING LOG - PPI - PPI STD TEMPLATE.GDT - 9/1/16 15:20 - S:_MASTER PROJECT FILE\2015\B\BARTLETT & WEST-229492-ZORA ST WIDENING NO T60608-SUB\BORING LOGS\BORING LOGS.GPJ

4168 W. Kearney St.
Springfield, MO 65803
Telephone: (417) 864-6000
Fax: (417) 864-6004

GEOTECHNICAL BORING LOG

BORING NUMBER 23+00

CLIENT Bartlett & West
PROJECT NAME Zora Street Widening - Range Line to MO Rte 249
PROJECT NO. 229492
PROJECT LOCATION Joplin, MO
DATE STARTED 8/11/16 **COMPLETED** 8/11/16
SURFACE ELEVATION _____ **BENCHMARK EL.** _____
DRILLER EP **DRILL RIG** CME 75
GROUND WATER LEVELS
HAMMER TYPE Auto
AT TIME OF DRILLING None
LOGGED BY CW **CHECKED BY** AM
AT END OF DRILLING _____
NOTES _____

DEPTH (ft)	DRILLING METHOD	STRATA SYMBOL	MATERIAL DESCRIPTION Unified Soil Classification System	SAMPLE TYPE NUMBER	RECOVERY % (RQD %)	CORRECTED BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT (pcf) 20 40 60 80 100 / N VALUE 20 40 60 80 / PL MC LL 20 40 60 80 / SHEAR STRENGTH (ksf) 1 2 3 4	ELEVATION (ft)
0.0	CFA - 4.5" O.D.		ASPHALT (7") 0.6 ft						
			AGGREGATE BASEROCK (4") 0.9 ft						
			FAT CLAY, w/ Chert Gravel, Dark Red, Stiff to Very Stiff, Moist (CH)	SPT 1		9-4-9 (13)	2.5		
2.5				ST 1	83		4		
5.0				SPT 2		9-16-10 (26)	3.5		
7.5			- Trace Chert below 8'	SPT 3		6-6-7 (13)			
			9.5 ft						

Bottom of borehole at 9.5 feet.

BORING LOG - PPI - PPI STD TEMPLATE.GDT - 9/1/16 15:20 - S:_MASTER PROJECT FILE\2015\B\BARTLETT & WEST-229492-ZORA ST WIDENING NO T60608-SUB\BORING LOGS\BORING LOGS.GPJ

4168 W. Kearney St.
Springfield, MO 65803
Telephone: (417) 864-6000
Fax: (417) 864-6004

GEOTECHNICAL BORING LOG

BORING NUMBER 31+50

CLIENT Bartlett & West
PROJECT NAME Zora Street Widening - Range Line to MO Rte 249
PROJECT NO. 229492
PROJECT LOCATION Joplin, MO
DATE STARTED 8/11/16 **COMPLETED** 8/11/16
SURFACE ELEVATION _____ **BENCHMARK EL.** _____
DRILLER EP **DRILL RIG** CME 75
GROUND WATER LEVELS
HAMMER TYPE Auto
AT TIME OF DRILLING None
LOGGED BY CW **CHECKED BY** AM
AT END OF DRILLING _____
NOTES _____

DEPTH (ft)	DRILLING METHOD	STRATA SYMBOL	MATERIAL DESCRIPTION (Unified Soil Classification System)	SAMPLE TYPE NUMBER	RECOVERY % (RQD %)	CORRECTED BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	ELEVATION (ft)
0.0	CFA - 4.5" O.D.		ASPHALT (5") 0.4 ft					
			AGGREGATE BASEROCK (4") 0.8 ft					
			FILL - LEAN to FAT CLAY, w/ Chert Gravel and Cobbles, Brown, Stiff, Moist (CL-CH)	SPT 1		6-7-10 (17)		
2.5				SPT 2		7-10-12 (22)		
5.0			- Very Stiff below 5.5'	SPT 3		4-12-15 (27)		
			7.0 ft					
7.5			CLAYEY GRAVEL, Tan, Very Dense, Moist (GC)	SPT 4		25-23-29 (52)		
			9.5 ft					

Bottom of borehole at 9.5 feet.

DRY UNIT WT (pcf) 20 40 60 80 100
N VALUE 20 40 60 80
PL MC LL 20 40 60 80
SHEAR STRENGTH (ksf) 1 2 3 4

BORING LOG - PPI - PPI STD TEMPLATE.GDT - 9/1/16 15:20 - S:_MASTER PROJECT FILE\2015\B\BARTLETT & WEST-229492-ZORA ST WIDENING NO T60608-SUB\BORING LOGS\BORING LOGS.GPJ

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GEOTECHNICAL BORING LOG

BORING NUMBER 39+50

CLIENT Bartlett & West
PROJECT NAME Zora Street Widening - Range Line to MO Rte 249
PROJECT NO. 229492
PROJECT LOCATION Joplin, MO
DATE STARTED 8/10/16 **COMPLETED** 8/9/16
SURFACE ELEVATION _____ **BENCHMARK EL.** _____
DRILLER EP **DRILL RIG** CME 75
GROUND WATER LEVELS
HAMMER TYPE Auto
AT TIME OF DRILLING None
LOGGED BY CW **CHECKED BY** JE
AT END OF DRILLING _____
NOTES _____

DEPTH (ft)	DRILLING METHOD	STRATA SYMBOL	MATERIAL DESCRIPTION (Unified Soil Classification System)	SAMPLE TYPE NUMBER	RECOVERY % (RQD %)	CORRECTED BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	ELEVATION (ft)
0.0	CFA - 4.5" O.D.		ASPHALT (9")					
			0.8 ft					
			AGGREGATE BASEROCK (7")					
			1.3 ft					
			CLAYEY GRAVEL, Red to Red Brown, Dense, Moist (GC)	SPT 1		6-15-20 (35)		
2.5			- Moist and Very Dense below 3'	SPT 2		41-38-46 (84)		
5.0			- Dense Below 6'	SPT 3		13-13-13 (26)		
7.5				SPT 4		10-16-19 (35)		
			9.5 ft					

Bottom of borehole at 9.5 feet.

DRY UNIT WT (pcf) 20 40 60 80 100
N VALUE 20 40 60 80
PL MC LL 20 40 60 80
SHEAR STRENGTH (ksf) 1 2 3 4

BORING LOG - PPI - PPI STD TEMPLATE.GDT - 9/1/16 15:20 - S:_MASTER PROJECT FILE\2015\B\BARTLETT & WEST-229492-ZORA ST WIDENING NO T60608-SUB\BORING LOGS\BORING LOGS.GPJ

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GEOTECHNICAL BORING LOG

BORING NUMBER 46+00

CLIENT Bartlett & West
PROJECT NAME Zora Street Widening - Range Line to MO Rte 249
PROJECT NO. 229492
PROJECT LOCATION Joplin, MO
DATE STARTED 8/10/16 **COMPLETED** 8/9/16
SURFACE ELEVATION _____ **BENCHMARK EL.** _____
DRILLER EP **DRILL RIG** CME 75
GROUND WATER LEVELS
HAMMER TYPE Auto
AT TIME OF DRILLING None
LOGGED BY CW **CHECKED BY** JE
AT END OF DRILLING _____
NOTES _____

DEPTH (ft)	DRILLING METHOD	STRATA SYMBOL	MATERIAL DESCRIPTION (Unified Soil Classification System)	SAMPLE TYPE NUMBER	RECOVERY % (RQD %)	CORRECTED BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	ELEVATION (ft)
0.0	CFA - 4.5" O.D.		ASPHALT (9")					
			0.8 ft AGGREGATE BASEROCK (8")					
			1.4 ft FILL - CLAYEY GRAVEL, Brown and Red, Medium Dense, Moist	SPT 1		12-13-10 (23)		
2.5				SPT 2		6-7-9 (16)		
5.0			5.5 ft SILTY LEAN CLAY, w/ Chert Gravel, Brown, Stiff to Very Stiff, Moist (CL-ML)	SPT 3		4-6-10 (16)		
7.5			8.0 ft CLAYEY GRAVEL, Reddish Brown, Dense, Moist (GC)	SPT 4		6-9-16 (25)		
			9.5 ft Bottom of borehole at 9.5 feet.					

DRY UNIT WT (pcf): 20 40 60 80 100
N VALUE: 20 40 60 80
PL MC LL: 20 40 60 80
SHEAR STRENGTH (ksf): 1 2 3 4

BORING LOG - PPI - PPI STD TEMPLATE.GDT - 9/1/16 15:20 - S:_MASTER PROJECT FILE\2015\B\BARTLETT & WEST-229492-ZORA ST WIDENING NO T60608-SUB\BORING LOGS\BORING LOGS.GPJ

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GEOTECHNICAL BORING LOG

BORING NUMBER 49+25 EB

CLIENT Bartlett & West
PROJECT NAME Zora Street Widening - Range Line to MO Rte 249
PROJECT NO. 229492
PROJECT LOCATION Joplin, MO
DATE STARTED 8/11/16 **COMPLETED** 8/11/16
SURFACE ELEVATION _____ **BENCHMARK EL.** _____
DRILLER EP **DRILL RIG** CME 75
GROUND WATER LEVELS
HAMMER TYPE Auto
AT TIME OF DRILLING None
LOGGED BY CW **CHECKED BY** AM
AT END OF DRILLING _____
NOTES _____

DEPTH (ft)	DRILLING METHOD	STRATA SYMBOL	MATERIAL DESCRIPTION Unified Soil Classification System	SAMPLE TYPE NUMBER	RECOVERY % (RQD %)	CORRECTED BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT (pcf) 20 40 60 80 100 N VALUE 20 40 60 80 PL MC LL 20 40 60 80 SHEAR STRENGTH (ksf) 1 2 3 4	ELEVATION (ft)
0.0	CFA - 4.5" O.D.		ASPHALT (9")						
			0.8 ft						
			AGGREGATE BASEROCK (9")						
			1.5 ft						
			FAT CLAY, w/ Chert Gravel, Dark Red Mottled Black and Tan, Stiff, Moist (CH)	SPT 1		10-4-6 (10)	2		
2.5				ST 1	100		3		
5.0			- Scattered Chert below 5'	SPT 2		4-7-10 (17)	3.5		
7.5				SPT 3		7-9-9 (18)			
			9.5 ft						

Bottom of borehole at 9.5 feet.

BORING LOG - PPI - PPI STD TEMPLATE.GDT - 9/1/16 15:20 - S:_MASTER PROJECT FILE\2015\B\BARTLETT & WEST-229492-ZORA ST WIDENING NO T60608-SUB\BORING LOGS\BORING LOGS.GPJ

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GEOTECHNICAL BORING LOG

BORING NUMBER 49+25 WB

CLIENT Bartlett & West
PROJECT NAME Zora Street Widening - Range Line to MO Rte 249
PROJECT NO. 229492
PROJECT LOCATION Joplin, MO
DATE STARTED 8/11/16 **COMPLETED** 8/11/16
SURFACE ELEVATION _____ **BENCHMARK EL.** _____
DRILLER EP **DRILL RIG** CME 75
GROUND WATER LEVELS
HAMMER TYPE Auto
AT TIME OF DRILLING None
LOGGED BY CW **CHECKED BY** AM
AT END OF DRILLING _____
NOTES _____

DEPTH (ft)	DRILLING METHOD	STRATA SYMBOL	MATERIAL DESCRIPTION Unified Soil Classification System	SAMPLE TYPE NUMBER	RECOVERY % (RQD %)	CORRECTED BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)
0	CFA - 4.5" O.D.		ASPHALT (8.75")				
			0.7 ft				
			AGGREGATE BASEROCK (6")				
1			1.2 ft				
			FILL - FAT CLAY, w/ Chert Gravel, Stiff, Moist (CH)	SPT 1		7-7-4 (11)	1.25
2			2.5 ft				
			FILL - LEAN & FAT CLAY, Abundant Chert Sand & Gravel, Stiff, Moist (CL & CH)				
3							
4				ST 1	93		1
			4.7 ft				
			FILL - GRAVELLY FAT CLAY, w/ Chert Cobbles, Stiff, Moist (CH) --Drilling Discontinued on Probable Chert Boulder--	SPT 2		26-73/5"	
5			5.6 ft				

Bottom of borehole at 5.6 feet.

DRY UNIT WT (pcf) 20 40 60 80 100
N VALUE 20 40 60 80
PL MC LL 20 40 60 80
SHEAR STRENGTH (ksf) 1 2 3 4

ELEVATION (ft)

BORING LOG - PPI - PPI STD TEMPLATE.GDT - 9/1/16 15:20 - S:_MASTER PROJECT FILE\2015\B\BARTLETT & WEST-229492-ZORA ST WIDENING NO T60608-SUB\BORING LOGS\BORING LOGS.GPJ

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GEOTECHNICAL BORING LOG

BORING NUMBER 58+00

CLIENT Bartlett & West
PROJECT NAME Zora Street Widening - Range Line to MO Rte 249
PROJECT NO. 229492
PROJECT LOCATION Joplin, MO
DATE STARTED 8/10/16 **COMPLETED** 8/9/16
SURFACE ELEVATION _____ **BENCHMARK EL.** _____
DRILLER EP **DRILL RIG** CME 75
GROUND WATER LEVELS
HAMMER TYPE Auto
AT TIME OF DRILLING None
LOGGED BY CW **CHECKED BY** JE
AT END OF DRILLING _____
NOTES _____

DEPTH (ft)	DRILLING METHOD	STRATA SYMBOL	MATERIAL DESCRIPTION (Unified Soil Classification System)	SAMPLE TYPE NUMBER	RECOVERY % (RQD %)	CORRECTED BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	ELEVATION (ft)
0.0	CFA - 4.5" O.D.		ASPHALT (8.5")					
			0.7 ft					
			AGGREGATE BASEROCK (5.5")					
			1.2 ft					
			FILL - CLAYEY GRAVEL, Brown, Medium Dense, Moist	SPT 1		7-9-9 (18)		
2.5			- Very Dense below 3.5'	SPT 2		32-17-28 (45)		
5.0			5.5 ft					
			FAT CLAY, Scattered Chert Gravel, Gray to Green Gray, Stiff, Moist (CH)	SPT 3		4-6-9 (15)	2	
7.5			7.5 ft					
			CLAYEY GRAVEL, Tan to Brown, Very Dense, Moist (GC)	SPT 4		35-41-46 (87)		
			9.5 ft					

DRY UNIT WT (pcf) 20 40 60 80 100
N VALUE 20 40 60 80
PL MC LL 20 40 60 80
SHEAR STRENGTH (ksf) 1 2 3 4

Bottom of borehole at 9.5 feet.

BORING LOG - PPI - PPI STD TEMPLATE.GDT - 9/1/16 15:20 - S:_MASTER PROJECT FILE\2015\B\BARTLETT & WEST-229492-ZORA ST WIDENING NO T60608-SUB\BORING LOGS\BORING LOGS.GPJ

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GEOTECHNICAL BORING LOG

BORING NUMBER 68+25

CLIENT Bartlett & West
PROJECT NAME Zora Street Widening - Range Line to MO Rte 249
PROJECT NO. 229492
PROJECT LOCATION Joplin, MO
DATE STARTED 8/10/16 **COMPLETED** 8/9/16
SURFACE ELEVATION _____ **BENCHMARK EL.** _____
DRILLER EP **DRILL RIG** CME 75
GROUND WATER LEVELS
HAMMER TYPE Auto
AT TIME OF DRILLING None
LOGGED BY CW **CHECKED BY** JE
AT END OF DRILLING _____
NOTES _____

DEPTH (ft)	DRILLING METHOD	STRATA SYMBOL	MATERIAL DESCRIPTION Unified Soil Classification System	SAMPLE TYPE NUMBER	RECOVERY % (RQD %)	CORRECTED BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)
0.0	CFA - 4.5" O.D.		ASPHALT (10.5")				
			0.9 ft AGGREGATE BASEROCK (8")				
			1.5 ft FILL - LEAN & FAT CLAY MIX, with Chert Gravel and Sand, Brown and Red, Stiff, Moist (CL & CH)	SPT 1		9-6-6 (12)	
2.5			3.5 ft FILL - POORLY GRADED SAND, w/ Chert Gravel (MINE TAILINGS),Gray to Brown, Medium Dense, Moist (SP)	ST 2	60		
5.0			-Very Dense Below 5.5'	SPT 3		12-25-33 (58)	
			7.5 ft CLAYEY GRAVEL, Brown, Very Dense, Moist (GC)				
7.5			- Red Brown to Brown and Dense below 8'	SPT 4		28-20-17 (37)	
			9.5 ft				

DRY UNIT WT (pcf) 20 40 60 80 100
N VALUE 20 40 60 80
PL MC LL 20 40 60 80
SHEAR STRENGTH (ksf) 1 2 3 4

ELEVATION (ft)

Bottom of borehole at 9.5 feet.

BORING LOG - PPI - PPI STD TEMPLATE.GDT - 9/1/16 15:20 - S:_MASTER PROJECT FILE\2015\B\BARTLETT & WEST-229492-ZORA ST WIDENING NO T60608-SUB\BORING LOGS\BORING LOGS.GPJ

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GEOTECHNICAL BORING LOG

BORING NUMBER 80+00

CLIENT Bartlett & West
PROJECT NAME Zora Street Widening - Range Line to MO Rte 249
PROJECT NO. 229492
PROJECT LOCATION Joplin, MO
DATE STARTED 8/10/16 **COMPLETED** 8/9/16
SURFACE ELEVATION _____ **BENCHMARK EL.** _____
DRILLER EP **DRILL RIG** CME 75
GROUND WATER LEVELS
HAMMER TYPE Auto
AT TIME OF DRILLING None
LOGGED BY CW **CHECKED BY** JE
AT END OF DRILLING _____
NOTES _____

DEPTH (ft)	DRILLING METHOD	STRATA SYMBOL	MATERIAL DESCRIPTION (Unified Soil Classification System)	SAMPLE TYPE NUMBER	RECOVERY % (RQD %)	CORRECTED BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	ELEVATION (ft)
0.0	CFA - 4.5" O.D.		ASPHALT (11")					
			0.9 ft / 1.1 ft AGGREGATE BASEROCK (2")					
			FILL- Mine Tailing and Creek Gravel 1.4 ft					
			FILL - Lean Clay, with Chert Gravel, Brown, Stiff, Moist 2.0 ft					
2.5			SILTY LEAN CLAY, Scattered Chert and Sandstone Gravel, Dark Brown to Black, Hard, Moist (CL-ML)	SPT 1		4-26-33 (59)		
			4.0 ft					
5.0			CLAYEY GRAVEL, Tan to Brown, Medium Dense, Moist (GC)	SPT 2		26-13-7 (20)		
			5.5 ft					
7.5			FAT CLAY, w/ Chert Layers, Tan to Brown, Very Stiff to Hard, Moist (CH)	SPT 3		9-19-9 (28)	1	
			8.5 ft	SPT 4		29-73/0"		

DRY UNIT WT (pcf) ◆ 20 40 60 80 100
N VALUE ▲ 20 40 60 80
PL MC LL 20 40 60 80
SHEAR STRENGTH (ksf) □ 1 2 3 4

Bottom of borehole at 8.5 feet.

BORING LOG - PPI - PPI STD TEMPLATE.GDT - 9/1/16 15:20 - S:_MASTER PROJECT FILE\2015\B\BARTLETT & WEST-229492-ZORA ST WIDENING NO T60608-SUB\BORING LOGS\BORING LOGS.GPJ

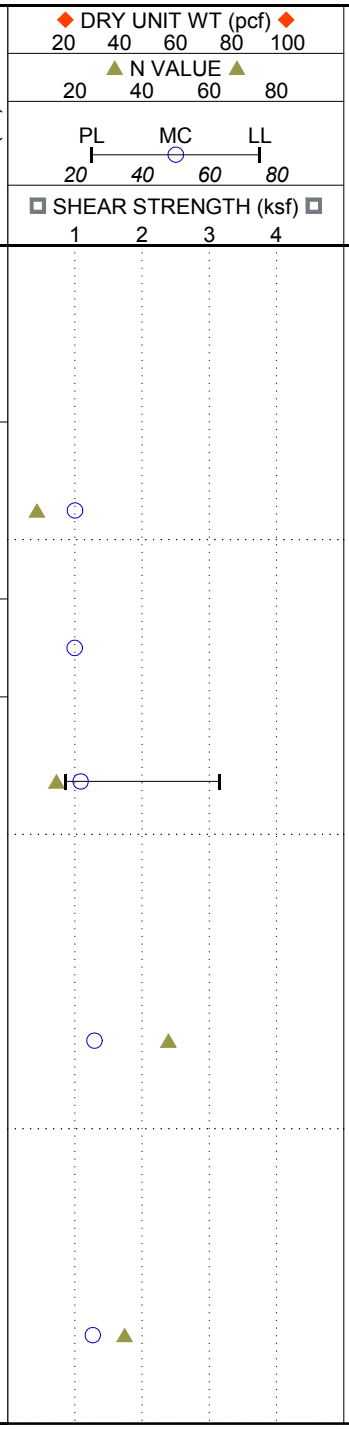
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GEOTECHNICAL BORING LOG

BORING NUMBER 88+00

CLIENT Bartlett & West
PROJECT NAME Zora Street Widening - Range Line to MO Rte 249
PROJECT NO. 229492
PROJECT LOCATION Joplin, MO
DATE STARTED 8/9/16 **COMPLETED** 8/9/16
SURFACE ELEVATION _____ **BENCHMARK EL.** _____
DRILLER EP **DRILL RIG** CME 75
GROUND WATER LEVELS
HAMMER TYPE Auto
AT TIME OF DRILLING None
LOGGED BY CW **CHECKED BY** AM
AT END OF DRILLING _____
NOTES _____

DEPTH (ft)	DRILLING METHOD	STRATA SYMBOL	MATERIAL DESCRIPTION (Unified Soil Classification System)	SAMPLE TYPE NUMBER	RECOVERY % (RQD %)	CORRECTED BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)
0.0	CFA - 4.5" O.D.		ASPHALT (8.25")				
			0.7 ft AGGREGATE BASEROCK (9")				
			1.4 ft SILTY LEAN CLAY, Scattered Chert Gravel, Brown to Gray, Medium Stiff, Moist (CL-ML)	SPT 1		6-4-4 (8)	1
2.5				ST 1	100		0
			3.8 ft FAT CLAY, w/ Chert Gravel and Sand, Gray Brown, Stiff, Moist (CH)	SPT 2		7-7-7 (14)	
5.0			6.0 ft CLAYEY GRAVEL, Tan to Gray, Dense, Moist (GC)	SPT 3		28-26-22 (48)	
7.5			- Wet and Medium Dense below 8.5'	SPT 4		23-20-15 (35)	
			10.0 ft				
10.0			Bottom of borehole at 10.0 feet.				



ELEVATION (ft)

BORING LOG - PPI - PPI STD TEMPLATE.GDT - 9/1/16 15:20 - S:_MASTER PROJECT FILE\2015\B\BARTLETT & WEST-229492-ZORA ST WIDENING NO T60608-SUB\BORING LOGS\BORING LOGS.GPJ

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GEOTECHNICAL BORING LOG

BORING NUMBER 97+00

CLIENT Bartlett & West
PROJECT NAME Zora Street Widening - Range Line to MO Rte 249
PROJECT NO. 229492
PROJECT LOCATION Joplin, MO
DATE STARTED 8/9/16 **COMPLETED** 8/9/16
SURFACE ELEVATION _____ **BENCHMARK EL.** _____
DRILLER EP **DRILL RIG** CME 75
GROUND WATER LEVELS
HAMMER TYPE Auto
AT TIME OF DRILLING None
LOGGED BY CW **CHECKED BY** JE
AT END OF DRILLING _____
NOTES _____

DEPTH (ft)	DRILLING METHOD	STRATA SYMBOL	MATERIAL DESCRIPTION Unified Soil Classification System	SAMPLE TYPE NUMBER	RECOVERY % (RQD %)	CORRECTED BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT (pcf) 20 40 60 80 100 N VALUE 20 40 60 80 PL MC LL 20 40 60 80 SHEAR STRENGTH (ksf) 1 2 3 4	ELEVATION (ft)
0.0	CFA - 4.5" O.D.		ASPHALT (10.5")						
			0.9 ft 1.0 ft AGGREGATE BASEROCK (2")						
			FILL - Chert Cobbles 1.4 ft						
			FILL - POORLY SORTED GRAVEL, w/ Sand, Reddish Brown, Dense to Very Dense, Moist (GC)	SPT 1		46-41-39 (80)			
2.5				SPT 2		17-13-16 (29)			
5.0			- Scattered Clay Layers below 5.5'	SPT 3		10-41-73 (114)			
7.5			8.0 ft FAT CLAY, w/ Chert Gravel and Layers, Orange Tan to Red Brown, Very Stiff, Moist (CH)	SPT 4		15-17-13 (30)			
			9.5 ft						

Bottom of borehole at 9.5 feet.

BORING LOG - PPI - PPI STD TEMPLATE.GDT - 9/1/16 15:20 - S:_MASTER PROJECT FILE\2015\B\BARTLETT & WEST-229492-ZORA ST WIDENING NO T60608-SUB\BORING LOGS\BORING LOGS.GPJ

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GEOTECHNICAL BORING LOG

BORING NUMBER 102+00

CLIENT Bartlett & West
PROJECT NAME Zora Street Widening - Range Line to MO Rte 249
PROJECT NO. 229492
PROJECT LOCATION Joplin, MO
DATE STARTED 8/9/16 **COMPLETED** 8/9/16
SURFACE ELEVATION _____ **BENCHMARK EL.** _____
DRILLER EP **DRILL RIG** CME 75
GROUND WATER LEVELS
HAMMER TYPE Auto
AT TIME OF DRILLING None
LOGGED BY CW **CHECKED BY** JE
AT END OF DRILLING _____
NOTES _____

DEPTH (ft)	DRILLING METHOD	STRATA SYMBOL	MATERIAL DESCRIPTION (Unified Soil Classification System)	SAMPLE TYPE NUMBER	RECOVERY % (RQD %)	CORRECTED BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	ELEVATION (ft)
0.0	CFA - 4.5" O.D.		ASPHALT (8.5")					
			0.7 ft					
			AGGREGATE BASEROCK (5.5")					
			1.2 ft					
2.5			LEAN CLAY, Scattered Chert Gravel, Brown, Medium Stiff, Moist (CL)	ST 1	54		2	
			3.2 ft					
			FAT CLAY, Scattered Chert Sand, Gray Brown Mottled Red and Black, Stiff to Very Stiff, Moist (CH)	SPT 2		4-6-6 (12)	1.5	
5.0				SPT 3		4-6-6 (12)	3	
7.5								
			8.8 ft	SPT 4		16-61-33 (94)	2.5	
			LIMESTONE, Weathered, Medium Hard					
			9.5 ft					

Bottom of borehole at 9.5 feet.

DRY UNIT WT (pcf) ◆ 20 40 60 80 100
N VALUE ▲ 20 40 60 80
PL MC LL 20 40 60 80
SHEAR STRENGTH (ksf) □ 1 2 3 4

BORING LOG - PPI - PPI STD TEMPLATE.GDT - 9/1/16 15:20 - S:_MASTER PROJECT FILE\2015\B\BARTLETT & WEST-229492-ZORA ST WIDENING NO T60608-SUB\BORING LOGS\BORING LOGS.GPJ

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GEOTECHNICAL BORING LOG

BORING NUMBER 105+00

CLIENT Bartlett & West
PROJECT NAME Zora Street Widening - Range Line to MO Rte 249
PROJECT NO. 229492
PROJECT LOCATION Joplin, MO
DATE STARTED 8/9/16 **COMPLETED** 8/9/16
SURFACE ELEVATION _____ **BENCHMARK EL.** _____
DRILLER EP **DRILL RIG** CME 75
GROUND WATER LEVELS
HAMMER TYPE Auto
AT TIME OF DRILLING None
LOGGED BY CW **CHECKED BY** JE
AT END OF DRILLING _____
NOTES _____

DEPTH (ft)	DRILLING METHOD	STRATA SYMBOL	MATERIAL DESCRIPTION (Unified Soil Classification System)	SAMPLE TYPE NUMBER	RECOVERY % (RQD %)	CORRECTED BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	ELEVATION (ft)
0.0	CFA - 4.5" O.D.		ASPHALT (10")					
			0.8 ft					
			AGGREGATE BASEROCK (7")					
			1.4 ft					
2.5			FAT CLAY, Scattered Chert Gravel, Brown, Medium Stiff, Moist (CH)	ST 1	54		4.5	
			3.3 ft					
			SHALEY FAT CLAY, Scattered Chert Gravel and Silt to Fine Sand Seams, Gray Mottled Red and Tan, Stiff, Moist (CH)	SPT 2		4-6-9 (15)	4	
			4.5 ft					
5.0			SHALE, Gray, Red Tan, Highly Weathered, Soft	SPT 3		7-13-13 (26)	2.75	
7.5				SPT 4		6-10-19 (29)	4.5	
			9.5 ft					

DRY UNIT WT (pcf) ◆ 20 40 60 80 100
▲ N VALUE ▲ 20 40 60 80
PL MC LL 20 40 60 80
□ SHEAR STRENGTH (ksf) □ 1 2 3 4

Bottom of borehole at 9.5 feet.

BORING LOG - PPI - PPI STD TEMPLATE.GDT - 9/1/16 15:20 - S:_MASTER PROJECT FILE\2015\B\BARTLETT & WEST-229492-ZORA ST WIDENING NO T60608-SUB\BORING LOGS\BORING LOGS.GPJ

4168 W. Kearney St.
Springfield, MO 65803
Telephone: (417) 864-6000
Fax: (417) 864-6004

GEOTECHNICAL BORING LOG

BORING NUMBER 115+00

CLIENT Bartlett & West
PROJECT NAME Zora Street Widening - Range Line to MO Rte 249
PROJECT NO. 229492
PROJECT LOCATION Joplin, MO
DATE STARTED 8/8/16 **COMPLETED** 8/9/16
SURFACE ELEVATION _____ **BENCHMARK EL.** _____
DRILLER EP **DRILL RIG** CME 75
GROUND WATER LEVELS
HAMMER TYPE Auto
AT TIME OF DRILLING None
LOGGED BY CW **CHECKED BY** JE
AT END OF DRILLING _____
NOTES _____

DEPTH (ft)	DRILLING METHOD	STRATA SYMBOL	MATERIAL DESCRIPTION (Unified Soil Classification System)	SAMPLE TYPE NUMBER	RECOVERY % (RQD %)	CORRECTED BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT (pcf) 20 40 60 80 100 / N VALUE 20 40 60 80 / PL MC LL 20 40 60 80 / SHEAR STRENGTH (ksf) 1 2 3 4	ELEVATION (ft)
0.0	CFA - 4.5" O.D.		ASPHALT (10")						
			0.8 ft						
			AGGREGATE BASEROCK (4")						
			1.2 ft						
			SILTY LEAN CLAY, with Chert Gravel and Sand, Dark Brown, Hard, Moist (CL-ML)	SPT 1		25-22-17 (39)			
2.5			3.0 ft						
			LEAN CLAY, w/ Chert Gravel and Sand, Brown, Medium Stiff, Moist (CL)	ST 2	67		0.75		
			5.0 ft						
5.0			CLAYEY GRAVEL, Tan to Gray, Very Dense to Dense, Moist (GC)	SPT 3		22-26-33 (59)			
7.5									
				SPT 4		13-16-20 (36)			
			9.5 ft						

Bottom of borehole at 9.5 feet.

BORING LOG - PPI - PPI STD TEMPLATE.GDT - 9/1/16 15:20 - S:_MASTER PROJECT FILE\2015\B\BARTLETT & WEST-229492-ZORA ST WIDENING NO T60608-SUB\BORING LOGS\BORING LOGS.GPJ

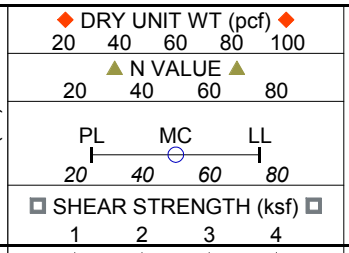
4168 W. Kearney St.
Springfield, MO 65803
Telephone: (417) 864-6000
Fax: (417) 864-6004

GEOTECHNICAL BORING LOG

BORING NUMBER 123+00

CLIENT Bartlett & West
PROJECT NAME Zora Street Widening - Range Line to MO Rte 249
PROJECT NO. 229492
PROJECT LOCATION Joplin, MO
DATE STARTED 8/10/16 **COMPLETED** 8/9/16
SURFACE ELEVATION _____ **BENCHMARK EL.** _____
DRILLER EP **DRILL RIG** CME 75
GROUND WATER LEVELS
HAMMER TYPE Auto
AT TIME OF DRILLING None
LOGGED BY CW **CHECKED BY** JE
AT END OF DRILLING _____
NOTES _____

DEPTH (ft)	DRILLING METHOD	STRATA SYMBOL	MATERIAL DESCRIPTION (Unified Soil Classification System)	SAMPLE TYPE NUMBER	RECOVERY % (RQD %)	CORRECTED BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	ELEVATION (ft)
0.0	CFA - 4.5" O.D.		ASPHALT (5") 0.4 ft					
			AGGREGATE BASEROCK (5") 0.8 ft					
			FILL - LEAN TO FAT CLAY, Scattered Chert Gravel, Brown to Red Brown to Black, Medium Stiff, Moist (CL-CH)	SPT 1		3-4-6 (10)		
2.5			2.3 ft FILL - LEAN CLAY, Scattered Chert Sand, Dark Brown, Medium Stiff, Moist (CL)	ST 2	71		3.5	
			3.7 ft FILL - CHERT GRAVEL & SAND (MINE TAILINGS), Tan Brown, Very Dense, Slightly Moist (SP)	SPT 3		16-55-73/5"		
5.0			6.0 ft CLAYEY GRAVEL, Red Brown, Very Dense, Moist (GC)	SPT 4		52-73/5"		
7.5				SPT 5		29-25-16 (41)	2.25	
			9.5 ft					



Bottom of borehole at 9.5 feet.

BORING LOG - PPI - PPI STD TEMPLATE.GDT - 9/1/16 15:20 - S:_MASTER PROJECT FILE\2015\B\BARTLETT & WEST-229492-ZORA ST WIDENING NO T60608-SUB\BORING LOGS\BORING LOGS.GPJ

4168 W. Kearney St.
Springfield, MO 65803
Telephone: (417) 864-6000
Fax: (417) 864-6004

GEOTECHNICAL BORING LOG

BORING NUMBER 124+62

CLIENT Bartlett & West
PROJECT NAME Zora Street Widening - Range Line to MO Rte 249
PROJECT NO. 229492
PROJECT LOCATION Joplin, MO
DATE STARTED 8/8/16 **COMPLETED** 8/9/16
SURFACE ELEVATION _____ **BENCHMARK EL.** _____
DRILLER EP **DRILL RIG** CME 75
GROUND WATER LEVELS
HAMMER TYPE Auto
AT TIME OF DRILLING None
LOGGED BY CW **CHECKED BY** JE
AT END OF DRILLING _____
NOTES _____

DEPTH (ft)	DRILLING METHOD	STRATA SYMBOL	MATERIAL DESCRIPTION (Unified Soil Classification System)	SAMPLE TYPE NUMBER	RECOVERY % (RQD %)	CORRECTED BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT (pcf) 20 40 60 80 100 / N VALUE 20 40 60 80 / PL MC LL 20 40 60 80 / SHEAR STRENGTH (ksf) 1 2 3 4	ELEVATION (ft)
0.0	CFA - 4.5" O.D.		ASPHALT (6.25") 0.5 ft						
			AGGREGATE BASEROCK (5") 0.9 ft						
			SILTY LEAN CLAY, Scattered Chert Gravel, Brown to Dark Brown, Stiff, Moist (CL) 2.0 ft	SPT 1		10-7-6 (13)	3		
2.5			LEAN CLAY, Trace Chert Gravel, Brown, Medium Stiff, Moist (CL) 4.7 ft	ST 2	85		2.5		
5.0			CLAYEY GRAVLE, Brown, Very Dense, Moist (GC) 7.0 ft	SPT 3		7-51-36 (87)			
7.5			FAT CLAY, Trace Chert Gravel, Yellow, Stiff, Moist (CH) 9.5 ft	SPT 4		4-6-9 (15)			

Bottom of borehole at 9.5 feet.

BORING LOG - PPI - PPI STD TEMPLATE.GDT - 9/1/16 15:20 - S:_MASTER PROJECT FILE\2015\B\BARTLETT & WEST-229492-ZORA ST WIDENING NO T60608-SUB\BORING LOGS\BORING LOGS.GPJ

4168 W. Kearney St.
Springfield, MO 65803
Telephone: (417) 864-6000
Fax: (417) 864-6004

KEY TO SYMBOLS

CLIENT Bartlett & West

PROJECT NAME Zora Street Widening - Range Line to MO Rte 249

PROJECT NO. 229492

PROJECT LOCATION Joplin, MO

LITHOLOGIC SYMBOLS
(Unified Soil Classification System)

- ASPHALT: Asphalt
- CH: USCS High Plasticity Clay
- CL: USCS Low Plasticity Clay
- CL-ML: USCS Low Plasticity Silty Clay
- FILL: Fill (made ground)
- GC: USCS Clayey Gravel
- LIMESTONE
- SHALE: Shale

SAMPLER SYMBOLS

- Standard Penetration Test
- Shelby Tube

WELL CONSTRUCTION SYMBOLS

ABBREVIATIONS

LL - LIQUID LIMIT (%)
PI - PLASTIC INDEX (%)
W - MOISTURE CONTENT (%)
DD - DRY DENSITY (PCF)
NP - NON PLASTIC
-200 - PERCENT PASSING NO. 200 SIEVE
PP - POCKET PENETROMETER (TSF)

TV - TORVANE
PID - PHOTOIONIZATION DETECTOR
UC - UNCONFINED COMPRESSION
ppm - PARTS PER MILLION

- Water Level at Time Drilling, or as Shown
- Water Level at End of Drilling, or as Shown
- Water Level After 24 Hours, or as Shown

KEY TO SYMBOLS - PPI STD TEMPLATE.GDT - 8/24/16 15:08 - S:_MASTER PROJECT FILE\2015\B\BARTLETT & WEST-229492-ZORA ST WIDENING NO T60608-SUB\BORING LOGS\BORING LOGS.GPJ

APPENDIX II

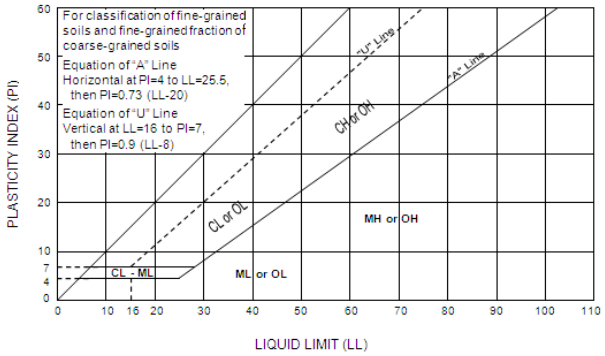
GENERAL NOTES

GENERAL NOTES

SOIL PROPERTIES & DESCRIPTIONS

COHESIVE SOILS

Consistency	Unconfined Compressive Strength (Qu)	Pocket Penetrometer Strength	N-Value
	(psf)	(tsf)	(blows/ft)
Very Soft	<500	<0.25	0-1
Soft	500-1000	0.25-0.50	2-4
Medium Stiff	1001-2000	0.50-1.00	5-8
Stiff	2001-4000	1.00-2.00	9-15
Very Stiff	4001-8000	2.00-4.00	16-30
Hard	>8000	>4.00	31-60
Very Hard			>60



Group Symbol	Group Name
CL –	Lean Clay
ML –	Silt
OL –	Organic Clay or Silt
CH –	Fat Clay
MH –	Elastic Silt
OH –	Organic Clay or Silt
PT –	Peat
CL-CH –	Lean to Fat Clay

Plasticity		Moisture	
Description	Liquid Limit (LL)	Descriptive Term	Guide
Lean	<45%	Dry	No indication of water
Lean to Fat	45-49%	Moist	Indication of water
Fat	≥50%	Wet	Visible water

Fine Grained Soil Subclassification	Percent (by weight) of Total Sample
Terms: SILT, LEAN CLAY, FAT CLAY, ELASTIC SILT	PRIMARY CONSTITUENT
Sandy,gravelly, abundant cobbles, abundant boulders	>30-50]
with sand, with gravel, with cobbles, with boulders	>15-30] – secondary coarse grained constituents
scattered sand, scattered gravel, scattered cobbles, scattered boulders	5-15]
a trace sand, a trace gravel, a few cobbles, a few boulders	<5]
The relationship of clay and silt constituents is based on plasticity and normally determined by performing index tests. Refined classifications are based on Atterberg Limits tests and the Plasticity Chart.	

NON-COHESIVE (GRANULAR) SOILS

RELATIVE DENSITY	N-VALUE
Very Loose	0-4
Loose	5-10
Medium Dense	11-24
Dense	25-50
Very Dense	≥51

MOISTURE CONDITION	
Descriptive Term	Guide
Dry	No indication of water
Moist	Damp but no visible water
Wet	Visible free water, usually soil is below water table.

**GRAIN SIZE IDENTIFICATION		
Name	Size Limits	Familiar Example
Boulder	12 in. or more	Larger than basketball
Cobbles	3 in. to 12 in.	Grapefruit
Coarse Gravel	¾-in. to 3 in.	Orange or lemon
Fine Gravel	No. 4 sieve to ¾-in.	Grape or pea
Coarse Sand	No. 10 sieve to No. 4 sieve	Rock salt
Medium Sand	No. 40 sieve to No. 10 sieve	Sugar, table salt
Fine Sand*	No. 200 sieve to No. 40 sieve	Powdered sugar
Fines	Less than No. 200 sieve	
*Particles finer than fine sand cannot be discerned with the naked eye at a distance of 8 in.		

Coarse Grained Soil Subclassification	Percent (by weight) of Total Sample
Terms: GRAVEL, SAND, COBBLES, BOULDERS	PRIMARY CONSTITUENT
Sandy,gravelly, abundant cobbles, abundant boulders	>30-50]
with gravel, with sand, with cobbles, with boulders	>15-30] – secondary coarse grained constituents
scattered gravel, scattered sand, scattered cobbles, scattered boulders	5-15]
a trace gravel, a trace sand, a few cobbles, a few boulders	<5]
Silty (MH & ML)*, clayey (CL & CH)*	<15]
(with silt, with clay)*	5-15] – secondary fine grained constituents
(trace silt, trace clay)*	<5]
*Index tests and/or plasticity tests are performed to determine whether the term "silt" or "clay" is used.	

*Modified after Ref. ASTM D2487-93 & D2488-93
**Modified after Ref. Oregon DOT 1987 & FHWA 1997
***Modified after Ref. AASHTO 1988, DM 7.1 1982, and Oregon DOT 1987

GENERAL NOTES

BEDROCK PROPERTIES & DESCRIPTIONS

ROCK QUALITY DESIGNATION (RQD)	
Description of Rock Quality	*RQD (%)
Very Poor	< 25
Poor	25-50
Fair	50-75
Good	75-90
Excellent	90-100

*RQD is defined as the total length of sound core pieces 4 in. or greater in length, expressed as a percentage of the total length cored. RQD provides an indication of the integrity of the rock mass and relative extent of seams and bedding planes.

SCALE OF RELATIVE ROCK HARDNESS		
Term	Field Identification	Approx. Unconfined Compressive Strength (tsf)
Extremely Soft	Can be indented by thumbnail	2.6-10
Very Soft	Can be peeled by pocket knife	10-50
Soft	Can be peeled with difficulty by pocket knife	50-260
Medium Hard	Can be grooved 2 mm deep by firm pressure of knife	260-520
Moderately Hard	Requires one hammer blow to fracture	520-1040
Hard	Can be scratched with knife or pick only with difficulty	1040-2610
Very Hard	Cannot be scratched by knife or sharp pick	>2610

DEGREE OF WEATHERING	
Slightly Weathered	Rock generally fresh, joints stained and discoloration extends into rock up to 25mm (1 in), open joints may contain clay, core rings under hammer impact.
Weathered	Rock mass is decomposed 50% or less, significant portions of rock show discoloration and weathering effects, cores cannot be broken by hand or scraped by knife.
Highly Weathered	Rock mass is more than 50% decomposed, complete discoloration of rock fabric, core may be extremely broken and gives clunk sound when struck by hammer, may be shaved with a knife.

GRAIN SIZE (TYPICALLY FOR SEDIMENTARY ROCKS)		
Description	Diameter (mm)	Field Identification
Very Coarse Grained	>4.76	
Coarse Grained	2.0-4.76	Individual grains can easily be distinguished by eye.
Medium Grained	0.42-2.0	Individual grains can be distinguished by eye.
Fine Grained	0.074-0.42	Individual grains can be distinguished by eye with difficulty.
Very Fine Grained	<0.074	Individual grains cannot be distinguished by unaided eye.

VOIDS	
Pit	Voids barely seen with naked eye to 6mm (¼-in)
Vug	Voids 6 to 50mm (¼ to 2 in) in diameter
Cavity	50 to 6000mm (2 to 24 in) in diameter
Cave	>600mm

BEDDING THICKNESS	
Very Thick Bedded	> 3' thick
Thick Bedded	1' to 3' thick
Medium Bedded	4" to 1' thick
Thin Bedded	1¼" to 4" thick
Very Thin Bedded	½" to 1¼" thick
Thickly Laminated	⅛" to ½" thick
Thinly Laminated	⅛" or less (paper thin)

DRILLING NOTES

Drilling and Sampling Symbols

NQ – Rock Core (2-in. diameter)
HQ – Rock Core (3 in. diameter)
HSA – Hollow Stem Auger
CFA – Continuous Flight (Solid Stem) Auger
SS – Split Spoon Sampler
ST – Shelby Tube
WB – Wash Bore or Mud Rotary
TP – Test-Pit
HA – Hand Auger

Soil Sample Types

Shelby Tube Samples: Relatively undisturbed soil samples were obtained from the borings using thin wall (Shelby) tube samplers pushed hydraulically into the soil in advance of drilling. This sampling, which is considered to be undisturbed, was performed in accordance with the requirements of ASTM D 1587. This type of sample is considered best for the testing of "in-situ" soil properties such as natural density and strength characteristics. The use of this sampling method is basically restricted to soil containing little to no chert fragments and to softer shale deposits.

Split Spoon Samples: The Standard Penetration Test is conducted in conjunction with the split-barrel sampling procedure. The "N" value corresponds to the number of blows required to drive the last 1 foot of an 18-in. long, 2-in. O.D. split-barrel sampler with a 140 lb. hammer falling a distance of 30 in. The Standard Penetration Test is carried out according to ASTM D-1586.

Water Level Measurements

Water levels indicated on the boring logs are levels measured in the borings at the times indicated. In permeable materials, the indicated levels may reflect the location of groundwater. In low permeability soils, shallow groundwater may indicate a perched condition. Caution is merited when interpreting short-term water level readings from open bore holes. Accurate water levels are best determined from piezometers.

Automatic Hammer

Palmerton and Parrish's CME's are equipped with automatic hammers. The conventional method used to obtain disturbed soil samples used a safety hammer operated by company personnel with a cat head and rope. However, use of an automatic hammer allows a greater mechanical efficiency to be achieved in the field while performing a Standard Penetration resistance test based upon automatic hammer efficiencies calibrated using dynamic testing techniques.

*Modified after Ref. ASTM D2487-93 & D2488-93
**Modified after Ref. Oregon DOT 1987 & FHWA 1997
***Modified after Ref. AASHTO 1988, DM 7.1 1982, and Oregon DOT 1987

APPENDIX III

DCP TEST RESULTS

DCP TEST DATA

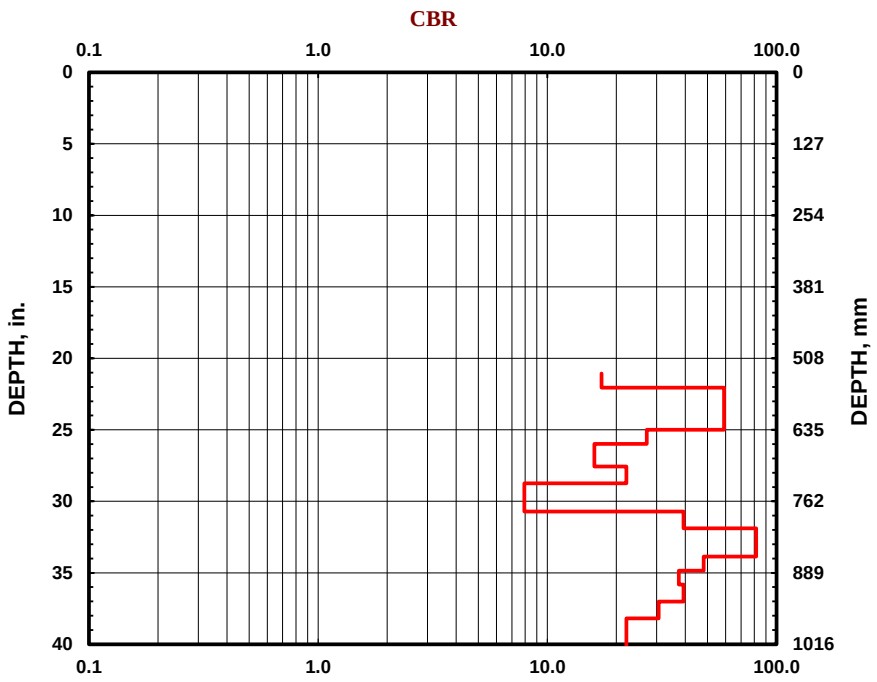
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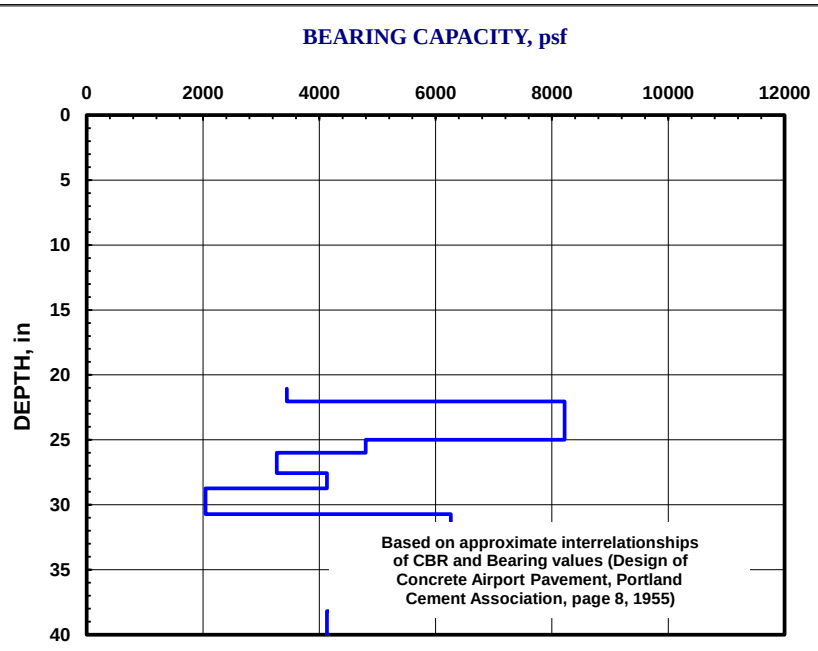
Project: *Zora St Widening*
Location: 15+00
Date: 8-Aug-16
Soil Type(s): Chert Sand & Gravel

Hammer
- ○ 10.1 lbs.
- ◉ 17.6 lbs.
- ○ Both hammers used

Soil Type
- ○ CH
- ○ CL
- ◉ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	535	1
2	560	1
6	585	1
6	610	1
6	635	1
3	660	1
3	700	1
3	730	1
2	780	1
5	810	1
8	835	1
8	860	1
5	885	1
4	910	1
5	940	1
4	970	1
3	1000	1
3	1030	1
3	1060	1
2	1095	1
2	1130	1
2	1155	1





DCP TEST DATA

File Name: 23+00

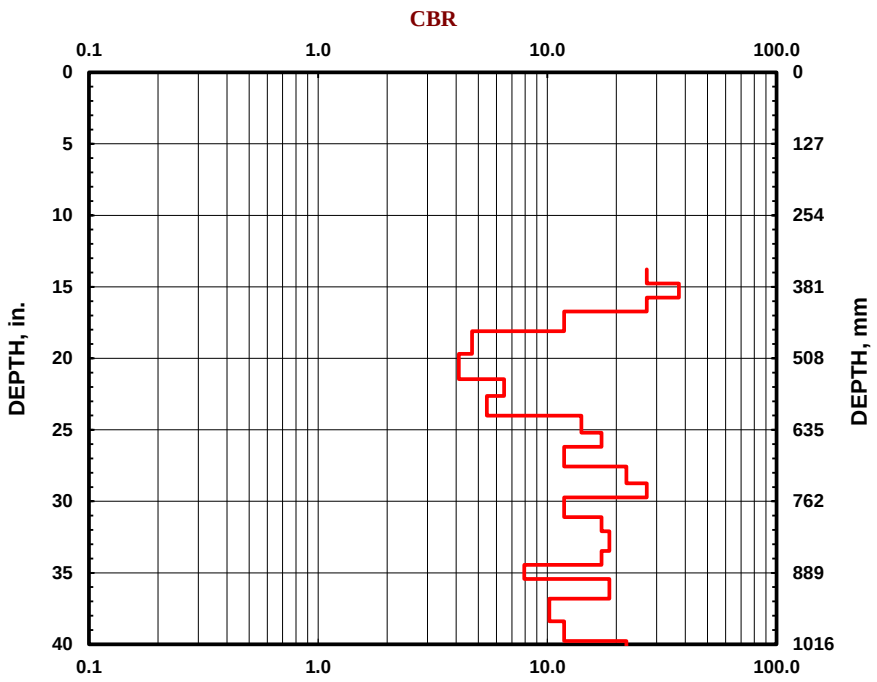
Project: *Zora St Widening* **Date:** 8-Aug-16

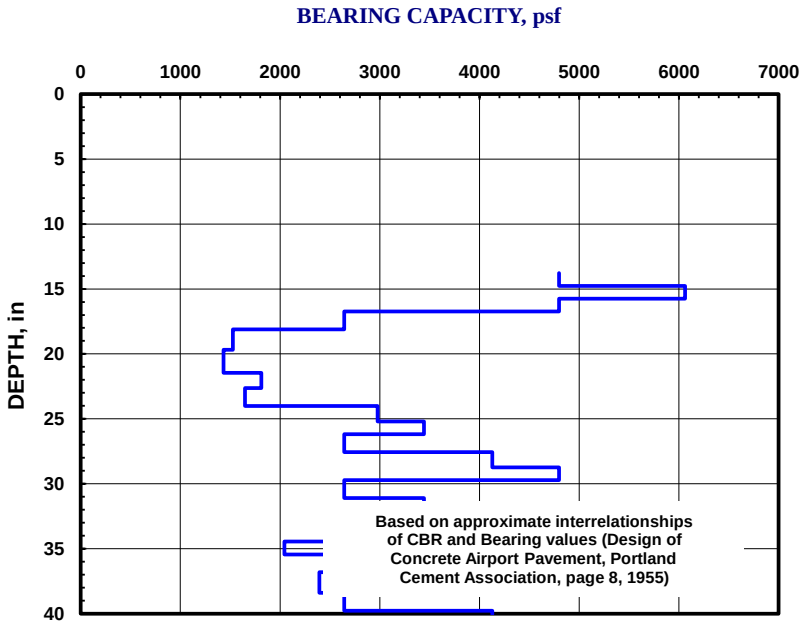
Location: 23+00 **Soil Type(s):** Fat Clay

Hammer
- ○ 10.1 lbs.
- ◉ 17.6 lbs.
- ○ Both hammers used

Soil Type
- ◉ CH
- ○ CL
- ○ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	350	1
3	375	1
4	400	1
3	425	1
2	460	1
1	500	1
1	545	1
1	575	1
1	610	1
2	640	1
2	665	1
2	700	1
3	730	1
3	755	1
2	790	1
2	815	1
3	850	1
2	875	1
1	900	1
3	935	1
2	975	1
2	1010	1
3	1040	1
3	1100	1
4	1130	1





DCP TEST DATA

File Name: 31+50

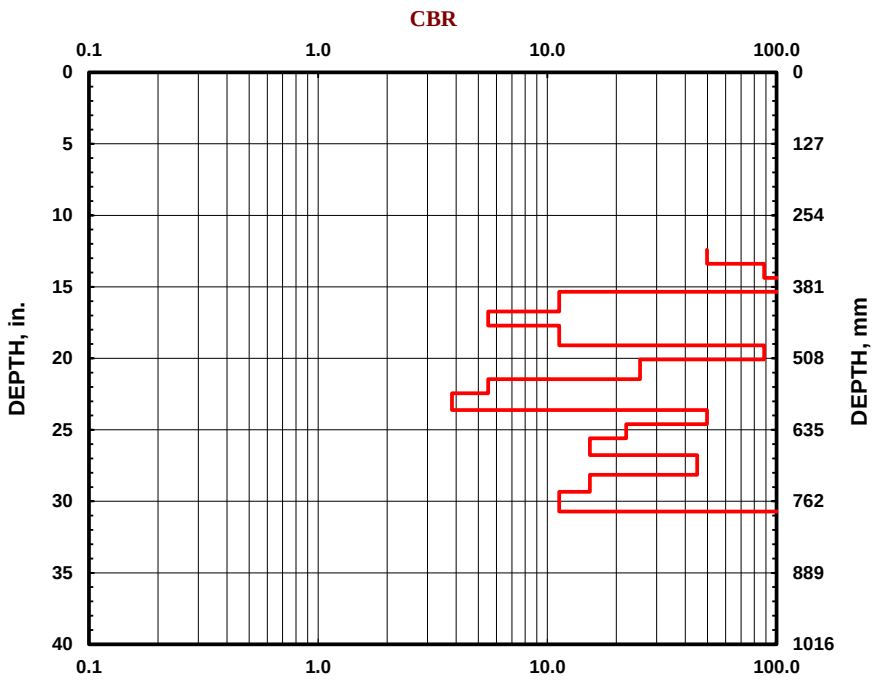
Project: *Zora St Widening* **Date:** 8-Aug-16

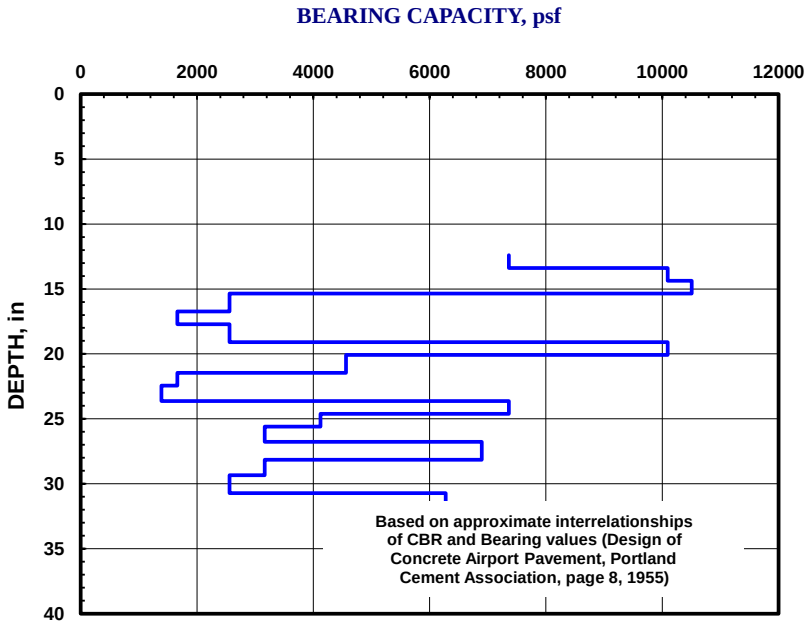
Location: 31+50 **Soil Type(s):** Lean Clay w/ Gravel

Hammer
- ○ 10.1 lbs.
- ◉ 17.6 lbs.
- ○ Both hammers used

Soil Type
- ○ CH
- ○ CL
- ◉ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	315	1
3	340	1
4	365	1
5	390	1
2	425	1
1	450	1
2	485	1
4	510	1
3	545	1
1	570	1
1	600	1
3	625	1
2	650	1
2	680	1
4	715	1
2	745	1
2	780	1
6	805	1
5	830	1
6	855	1
4	875	1





DCP TEST DATA

File Name: 39+50

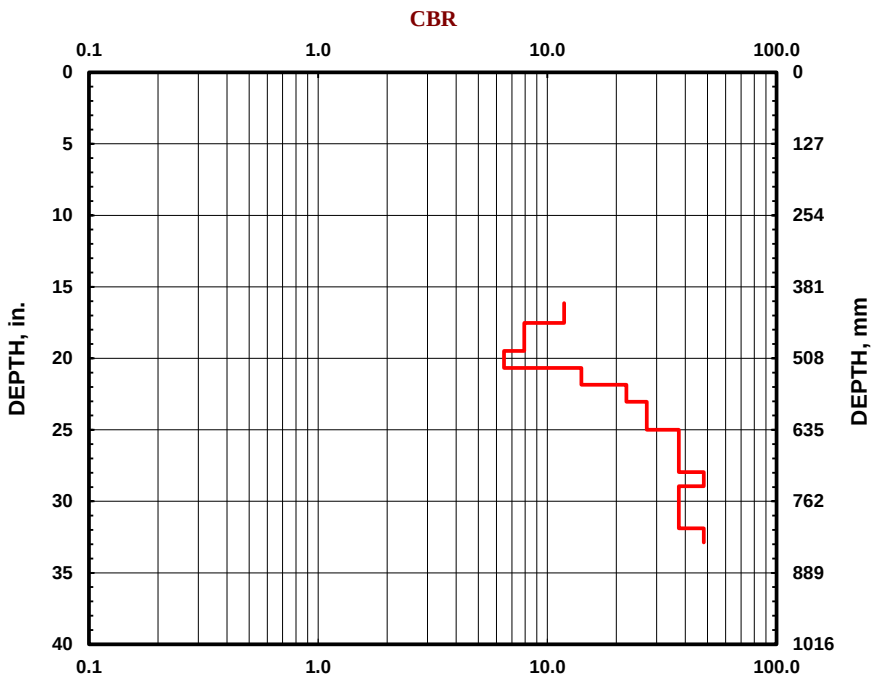
Project: *Zora St Widening* **Date:** 8-Aug-16

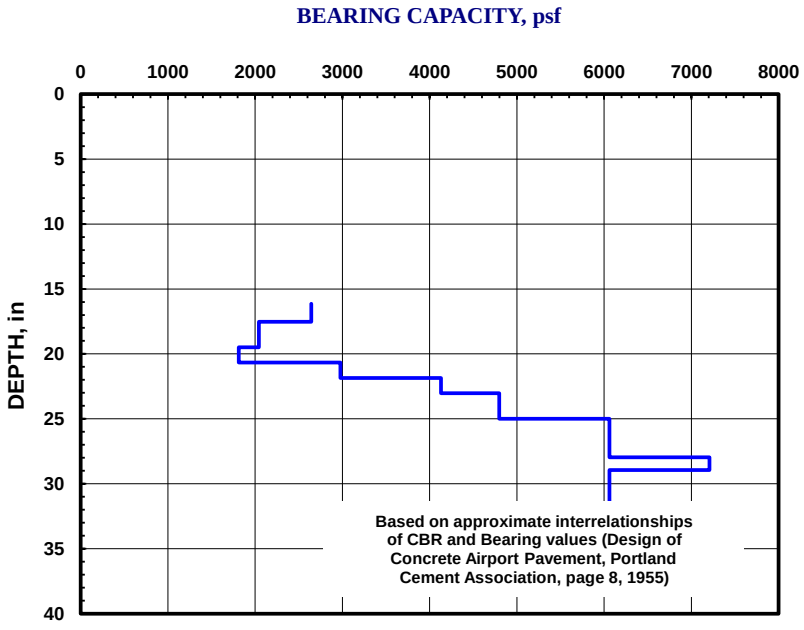
Location: 39+50 **Soil Type(s):** Clayey Gravel

Hammer
- ○ 10.1 lbs.
- ◉ 17.6 lbs.
- ○ Both hammers used

Soil Type
- ○ CH
- ○ CL
- ◉ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	410	1
2	445	1
2	495	1
1	525	1
2	555	1
3	585	1
3	610	1
3	635	1
4	660	1
4	685	1
4	710	1
5	735	1
4	760	1
4	785	1
4	810	1
5	835	1





DCP TEST DATA

File Name: 46+00

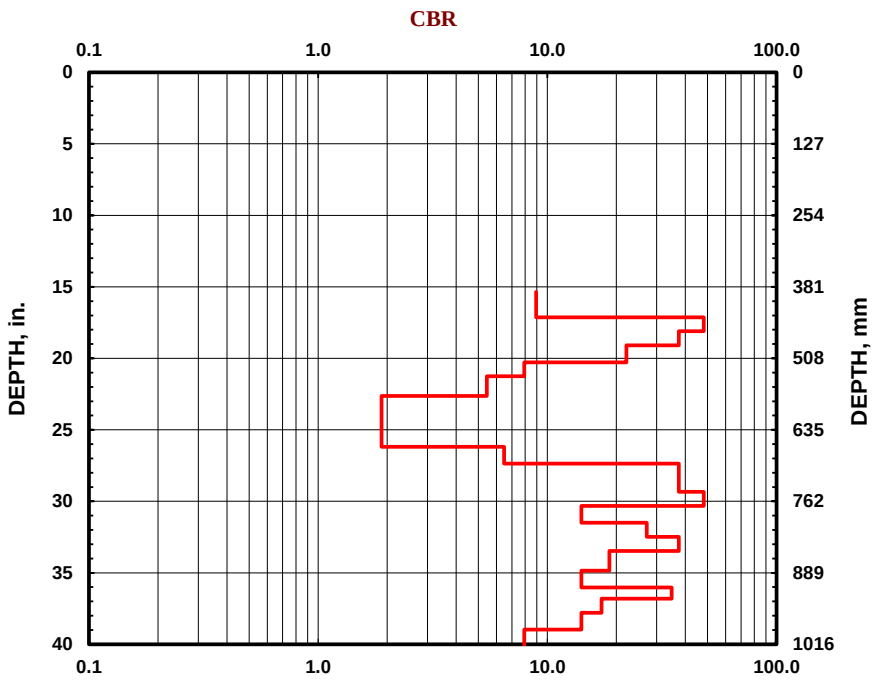
Project: *Zora St Widening* **Date:** 8-Aug-16

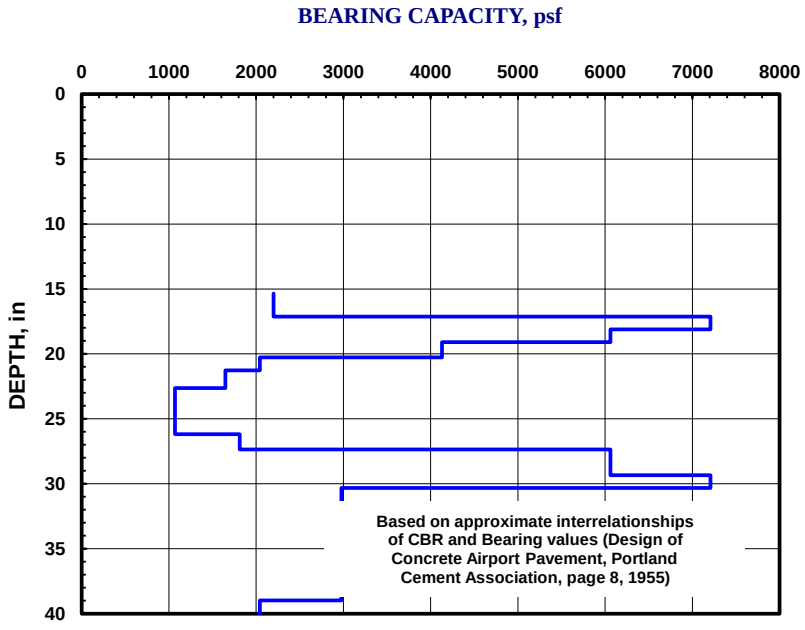
Location: 46+00 **Soil Type(s):** Clayey Gravel

Hammer
- ○ 10.1 lbs.
- ◉ 17.6 lbs.
- ○ Both hammers used

Soil Type
- ○ CH
- ○ CL
- ◉ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	390	1
2	435	1
5	460	1
4	485	1
3	515	1
1	540	1
1	575	1
1	665	1
1	695	1
4	720	1
4	745	1
5	770	1
2	800	1
3	825	1
4	850	1
3	885	1
2	915	1
3	935	1
2	960	1
2	990	1
2	1040	1
2	1065	1
4	1095	1
3	1120	1





DCP TEST DATA

File Name: 49+25 WB

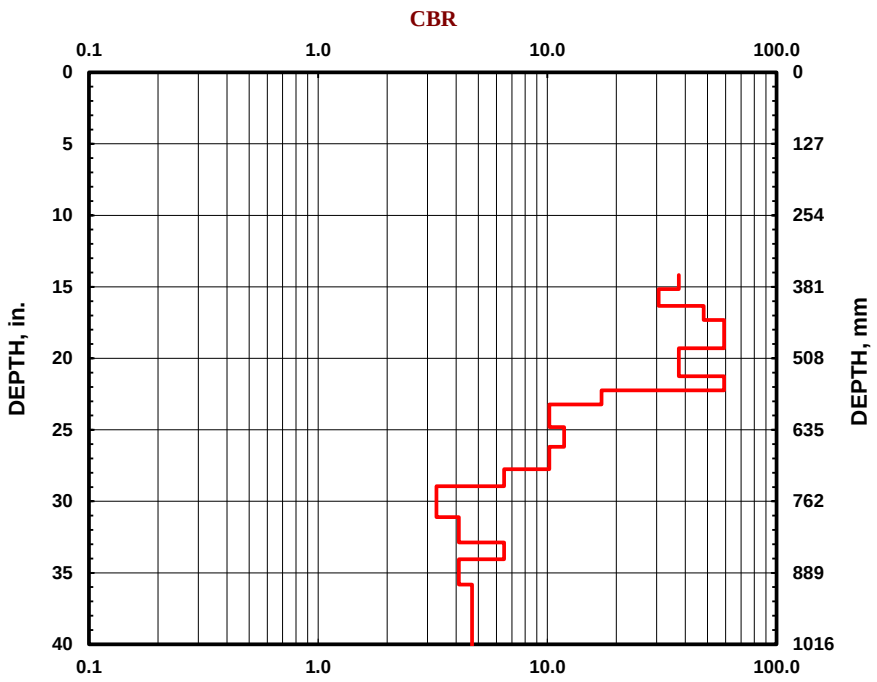
Project: *Zora St Widening* **Date:** 8-Aug-16

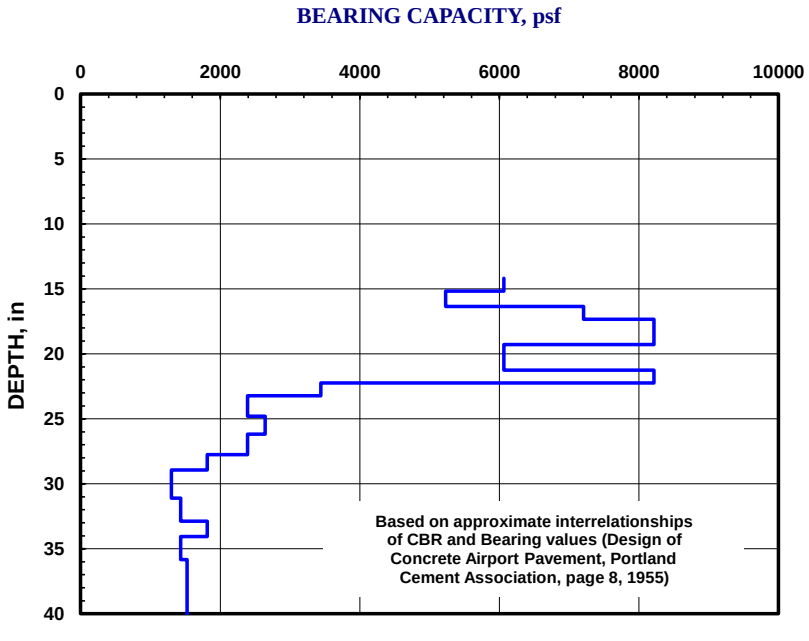
Location: 49+25 WB **Soil Type(s):** Fat Clay w/ Gravel

Hammer
- ○ 10.1 lbs.
- ◉ 17.6 lbs.
- ○ Both hammers used

Soil Type
- ◉ CH
- ○ CL
- ○ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	360	1
4	385	1
4	415	1
5	440	1
6	465	1
6	490	1
4	515	1
4	540	1
6	565	1
2	590	1
2	630	1
2	665	1
2	705	1
1	735	1
1	790	1
1	835	1
1	865	1
1	910	1
1	950	1
1	990	1
1	1030	1
1	1065	1
1	1095	1
2	1120	1





DCP TEST DATA

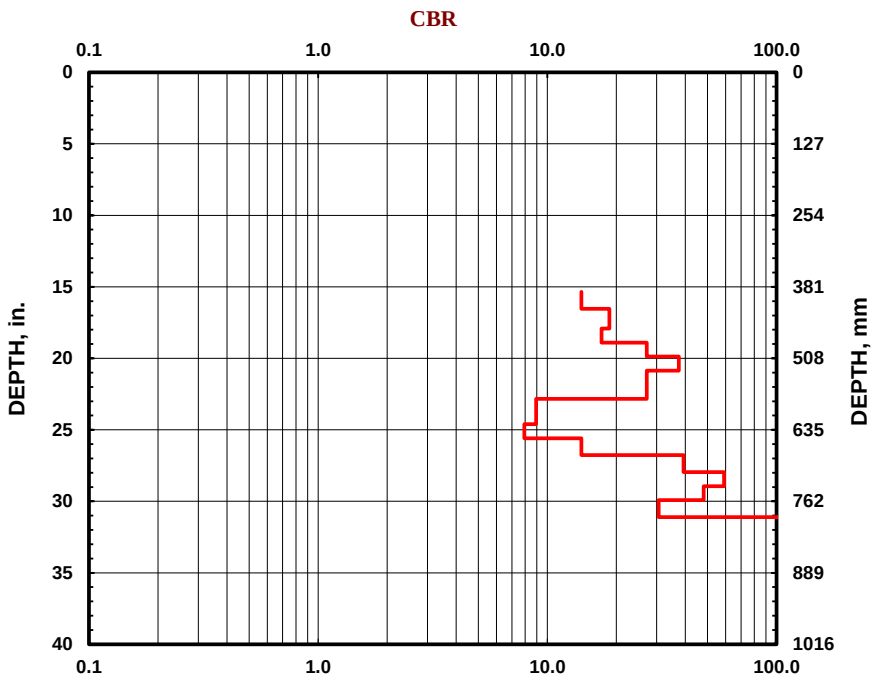
File Name: 58+00

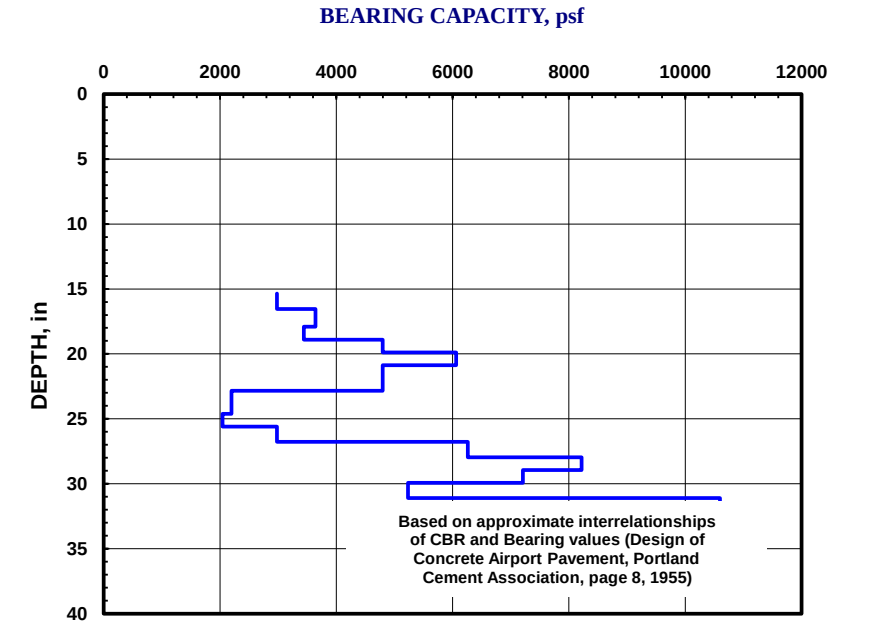
Project: *Zora St Widening*
Location: 58+00
Date: 8-Aug-16
Soil Type(s): Clayey Gravel

Hammer
- ○ 10.1 lbs.
- ◉ 17.6 lbs.
- ○ Both hammers used

Soil Type
- ○ CH
- ○ CL
- ◉ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	390	1
2	420	1
3	455	1
2	480	1
3	505	1
4	530	1
3	555	1
3	580	1
2	625	1
1	650	1
2	680	1
5	710	1
6	735	1
5	760	1
4	790	1
10	810	1





DCP TEST DATA

File Name: 68+25

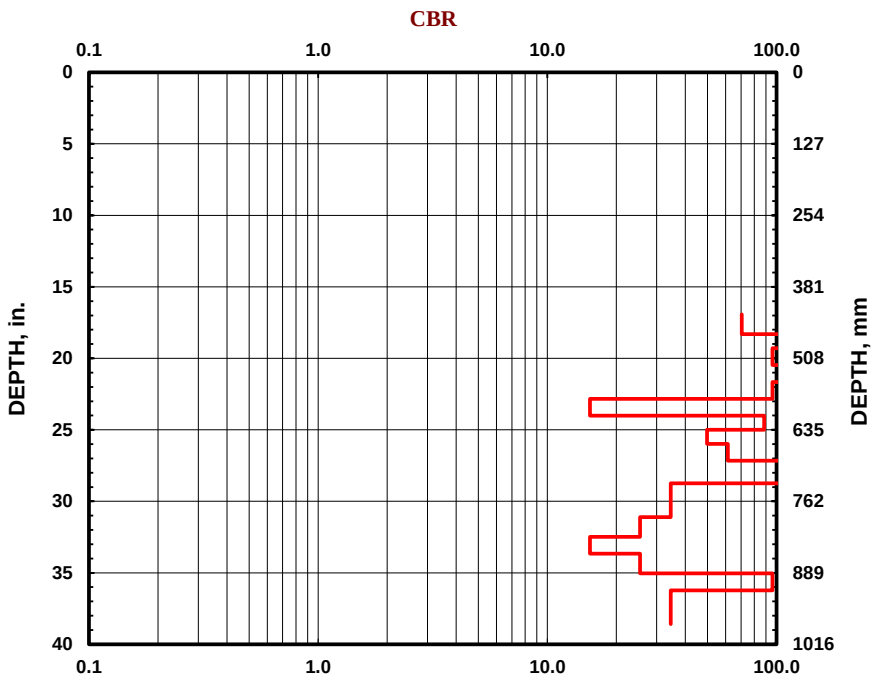
Project: *Zora St Widening* **Date:** 8-Aug-16

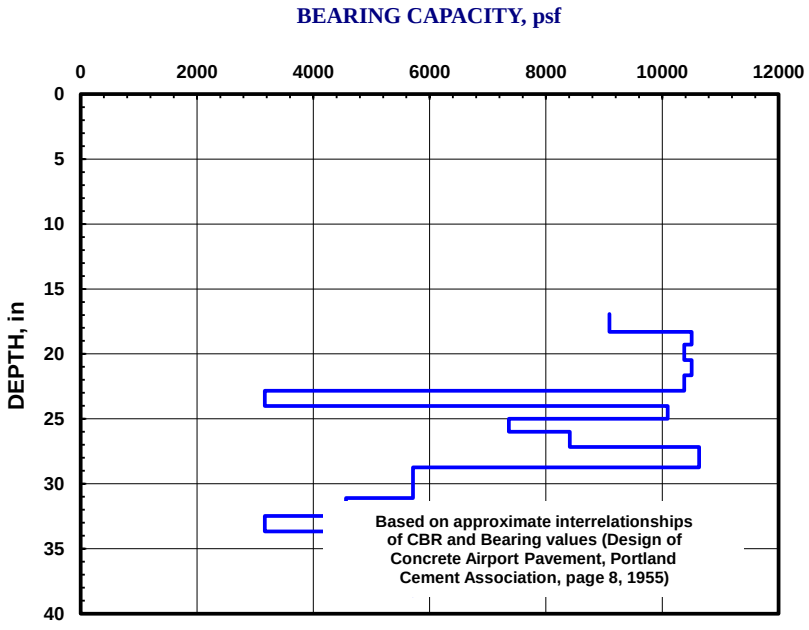
Location: 68+25 **Soil Type(s):** Lean & Fat Clay Mix

Hammer
- ○ 10.1 lbs.
- ◉ 17.6 lbs.
- ○ Both hammers used

Soil Type
- ○ CH
- ○ CL
- ◉ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	430	1
5	465	1
5	490	1
5	520	1
6	550	1
5	580	1
2	610	1
4	635	1
3	660	1
4	690	1
7	730	1
3	760	1
3	790	1
3	825	1
2	855	1
3	890	1
5	920	1
3	950	1
3	980	1





DCP TEST DATA

File Name: Zora Street Widening

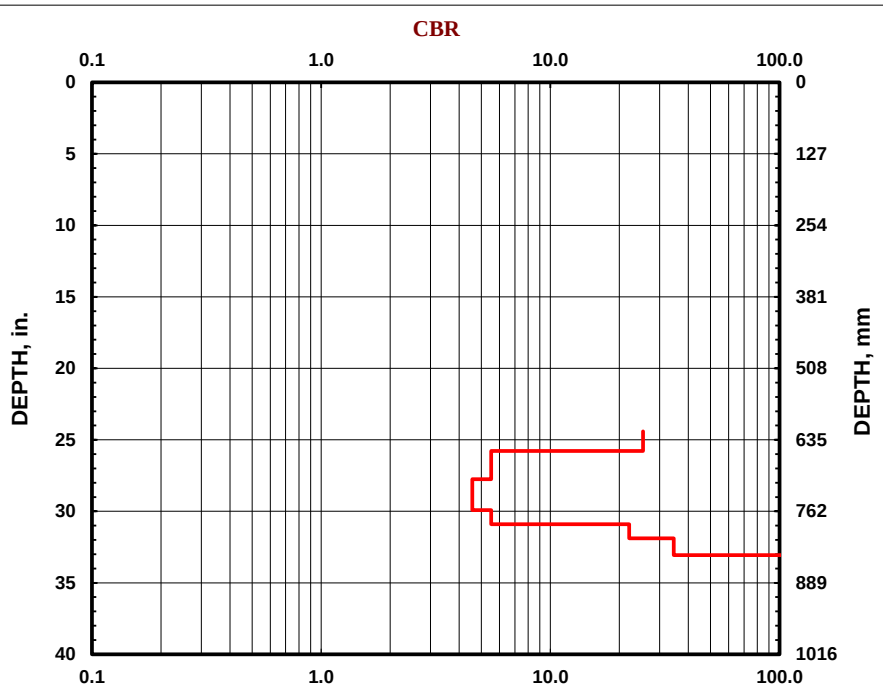
Project: *Zora St Widening* **Date:** 10-Aug-16

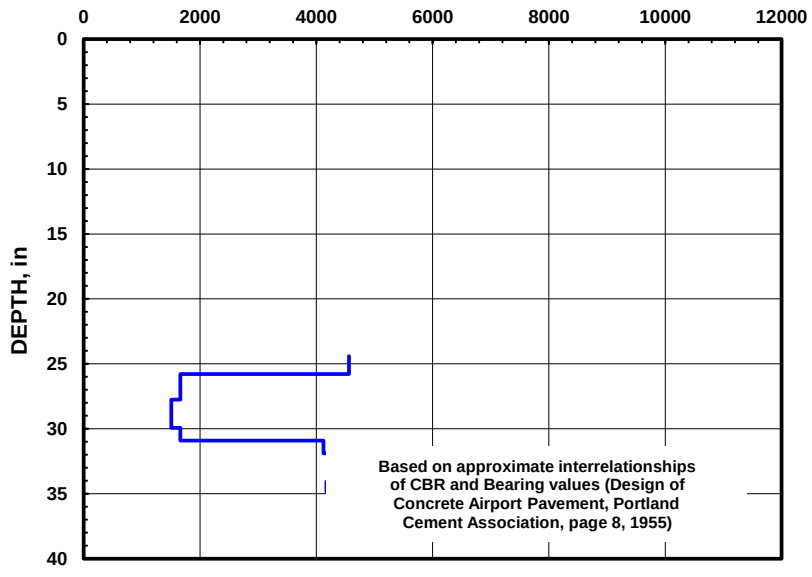
Location: 80+00 **Soil Type(s):** Lean Clay with Gravel

Hammer
- ○ 10.1 lbs.
- ◉ 17.6 lbs.
- ○ Both hammers used

Soil Type
- ○ CH
- ○ CL
- ◉ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	620	1
3	655	1
2	705	1
2	760	1
1	785	1
2	810	1
3	840	1
5	865	1
5	885	1
		1
		1
		1
		1
		1
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DCP TEST DATA

File Name: Zora Street Widening

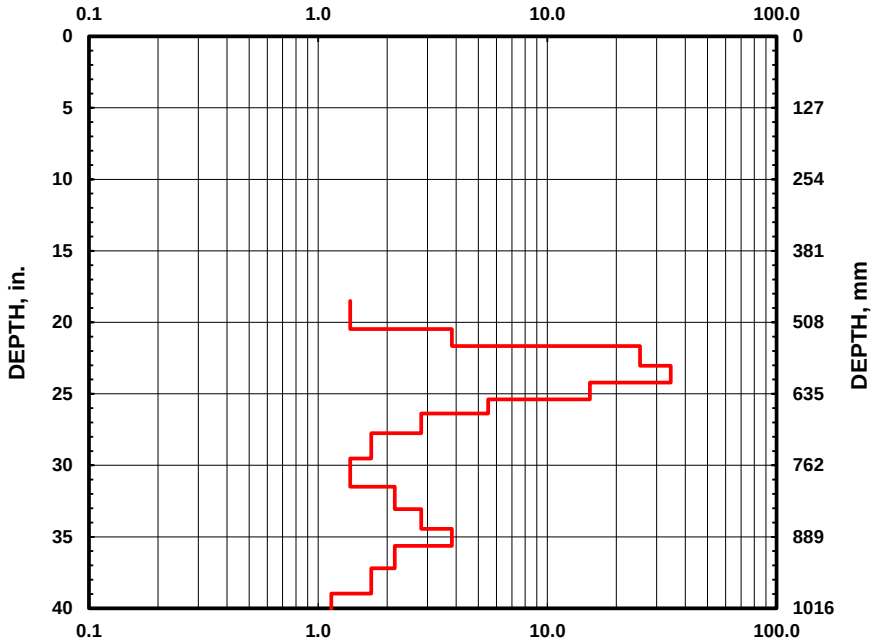
Project: *Zora St Widening* **Date:** 9-Aug-16

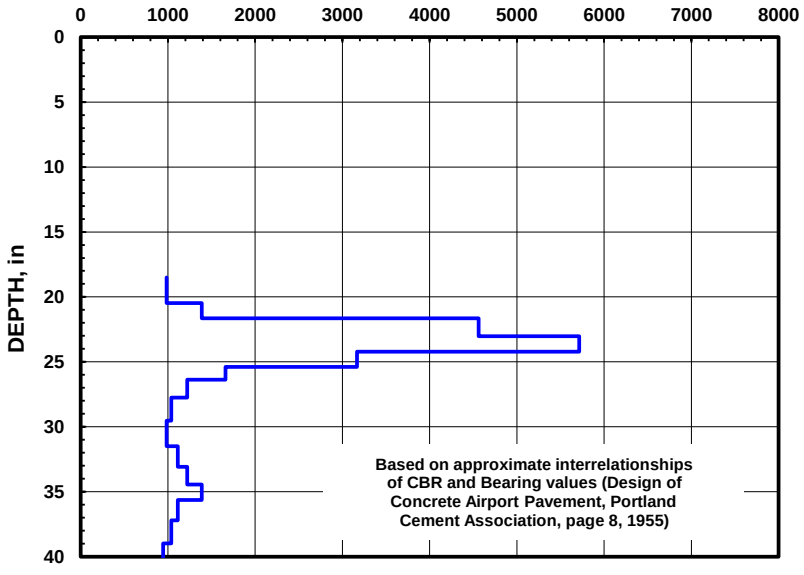
Location: 88+00 **Soil Type(s):** Lean Clay with Gravel

Hammer
- ○ 10.1 lbs.
- ◉ 17.6 lbs.
- ○ Both hammers used

Soil Type
- ○ CH
- ○ CL
- ◉ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	470	1
1	520	1
1	550	1
3	585	1
3	615	1
2	645	1
1	670	1
1	705	1
1	750	1
1	800	1
1	840	1
1	875	1
1	905	1
1	945	1
1	990	1
1	1045	1
1	1085	1
2	1110	1
3	1135	1
	1135	1
		1
		1
		1
		1
		1
		1
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		1
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DCP TEST DATA

File Name: 97+00

Project: *Zora St Widening* **Date:** 9-Aug-16

Location: 97+00 **Soil Type(s):** Poorly Sorted Sand

Hammer
- ○ 10.1 lbs.
- ◉ 17.6 lbs.
- ○ Both hammers used

Soil Type
- ○ CH
- ○ CL
- ◉ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	375	1
6	400	1
6	425	1
		1
		1

DCP TEST DATA

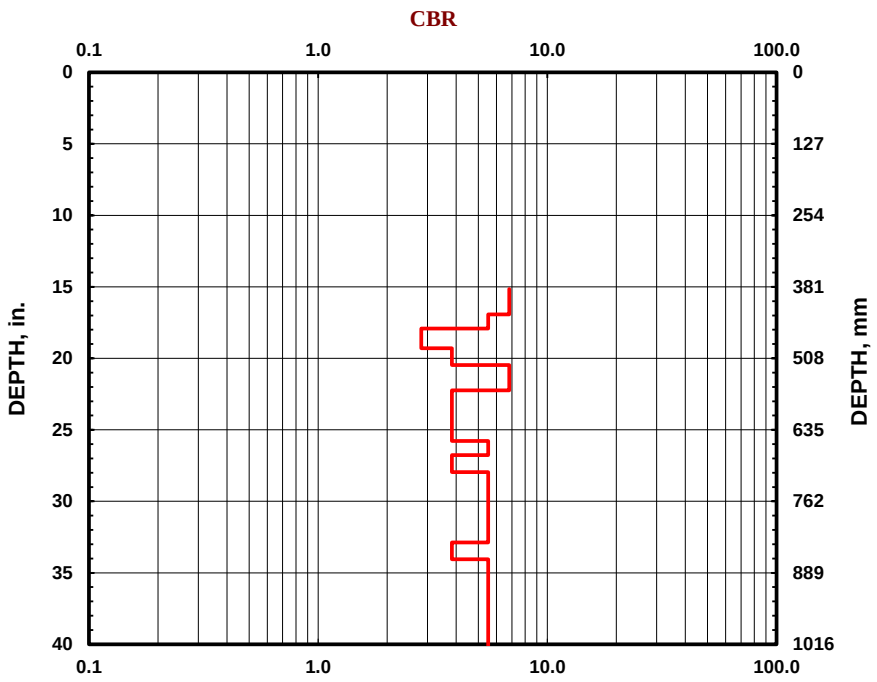
File Name: 102+00

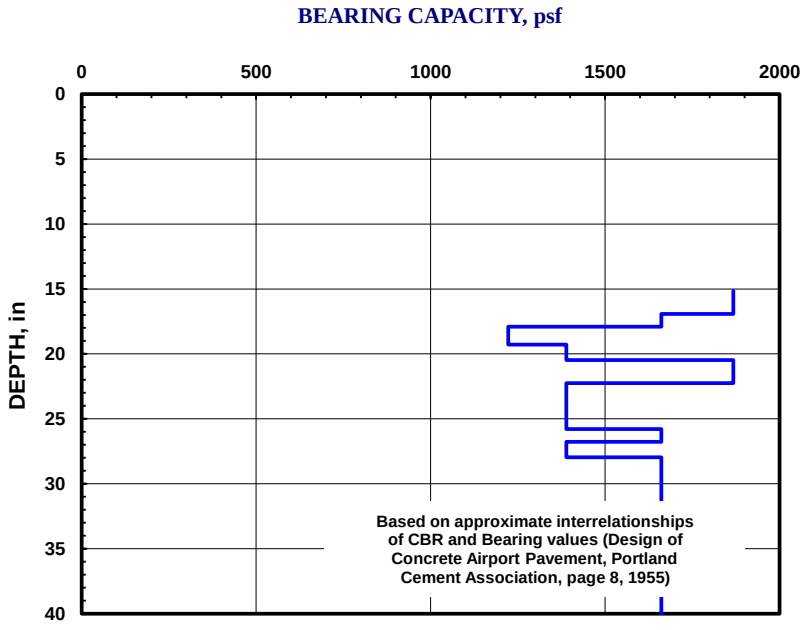
Project: *Zora St Widening*
Location: 102+00
Date: 9-Aug-16
Soil Type(s): Lean Clay with Gravel

Hammer
- ○ 10.1 lbs.
- ◉ 17.6 lbs.
- ○ Both hammers used

Soil Type
- ○ CH
- ○ CL
- ◉ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	385	1
2	430	1
1	455	1
1	490	1
1	520	1
2	565	1
1	595	1
1	625	1
1	655	1
1	680	1
1	710	1
1	735	1
1	760	1
1	785	1
1	810	1
1	835	1
1	865	1
1	890	1
2	940	1
1	965	1
1	990	1
1	1015	1
1	1040	1
1	1070	1
1	1095	1
1	1120	1
1	1145	1
		1
		1
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DCP TEST DATA

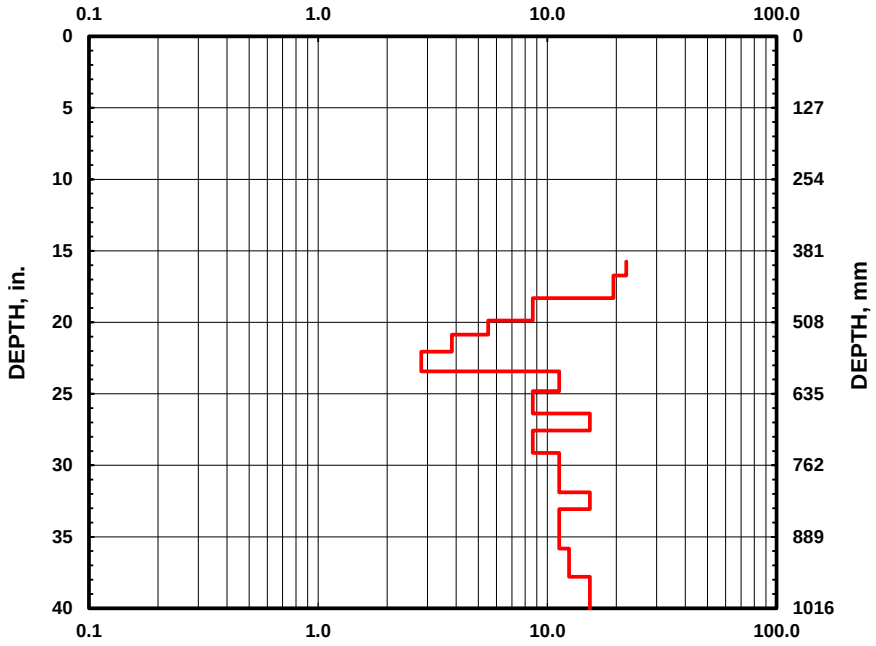
File Name: 105+00

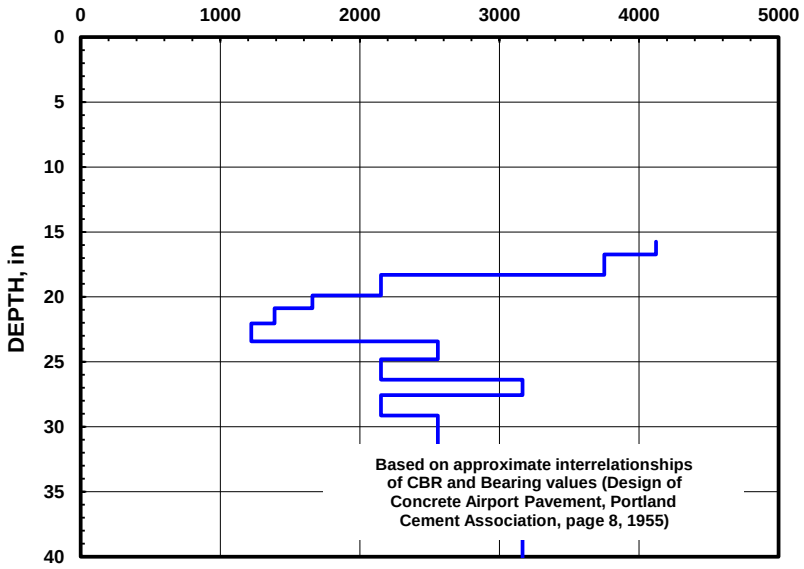
Project: *Zora St Widening*
Location: 105+00
Date: 9-Aug-16
Soil Type(s): Lean Clay with Gravel

Hammer
- ○ 10.1 lbs.
- ◉ 17.6 lbs.
- ○ Both hammers used

Soil Type
- ○ CH
- ○ CL
- ◉ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	400	1
2	425	1
3	465	1
2	505	1
1	530	1
1	560	1
1	595	1
2	630	1
2	670	1
2	700	1
2	740	1
2	775	1
2	810	1
2	840	1
2	875	1
2	910	1
3	960	1
2	990	1
2	1020	1
2	1050	1
2	1085	1
2	1115	1
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DCP TEST DATA

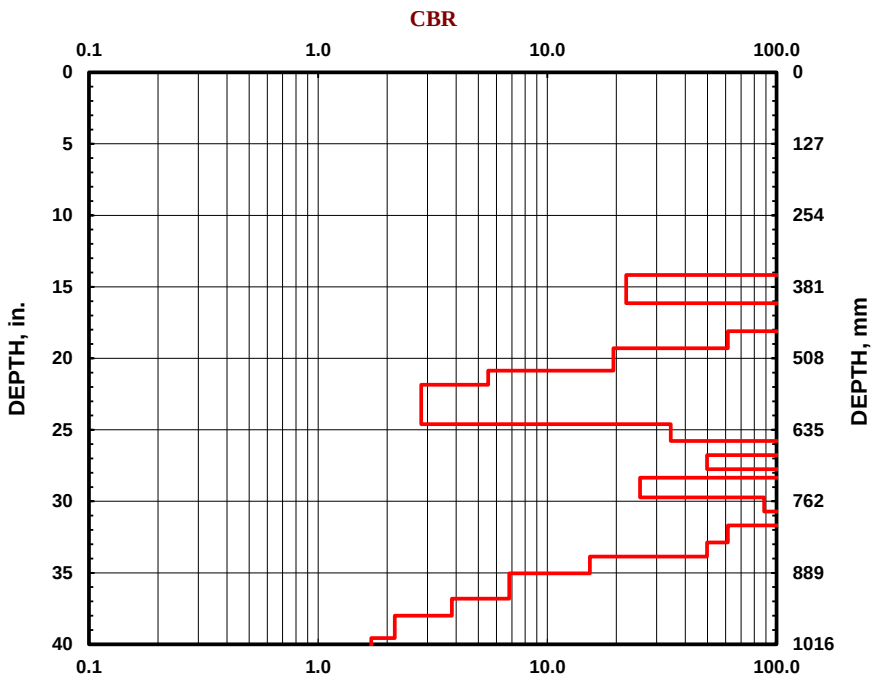
File Name: 115+00

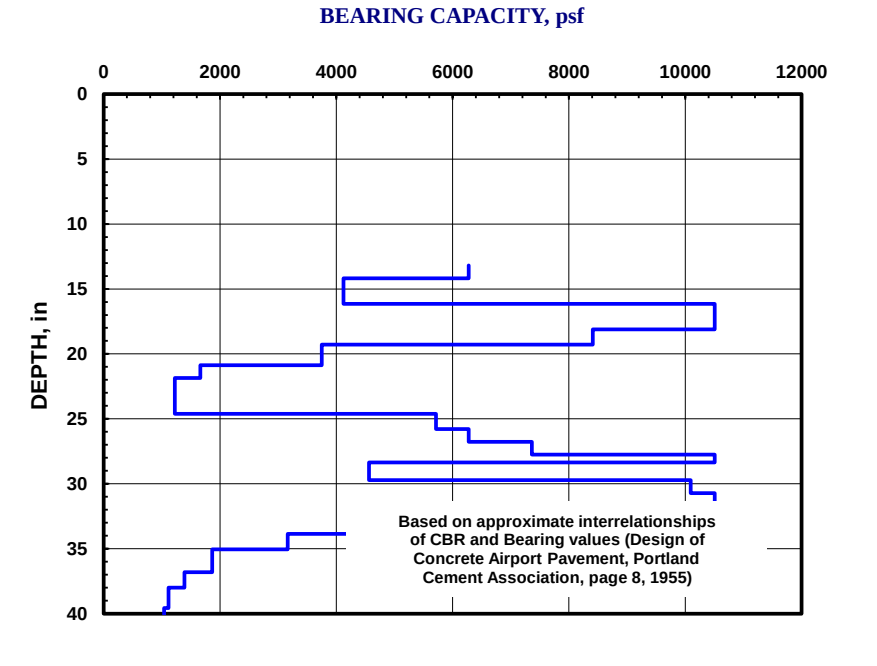
Project: *Zora St Widening*
Location: 115+00
Date: 9-Aug-16
Soil Type(s): Lean Clay with Gravel

Hammer
- ○ 10.1 lbs.
- ◉ 17.6 lbs.
- ○ Both hammers used

Soil Type
- ○ CH
- ○ CL
- ◉ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	335	1
6	360	1
2	385	1
2	410	1
5	435	1
5	460	1
4	490	1
3	530	1
1	555	1
1	590	1
1	625	1
3	655	1
6	680	1
3	705	1
3	720	1
3	755	1
4	780	1
5	805	1
4	835	1
3	860	1
2	890	1
2	935	1
1	965	1
1	1005	1
1	1050	1
1	1090	1
1	1125	1
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DCP TEST DATA

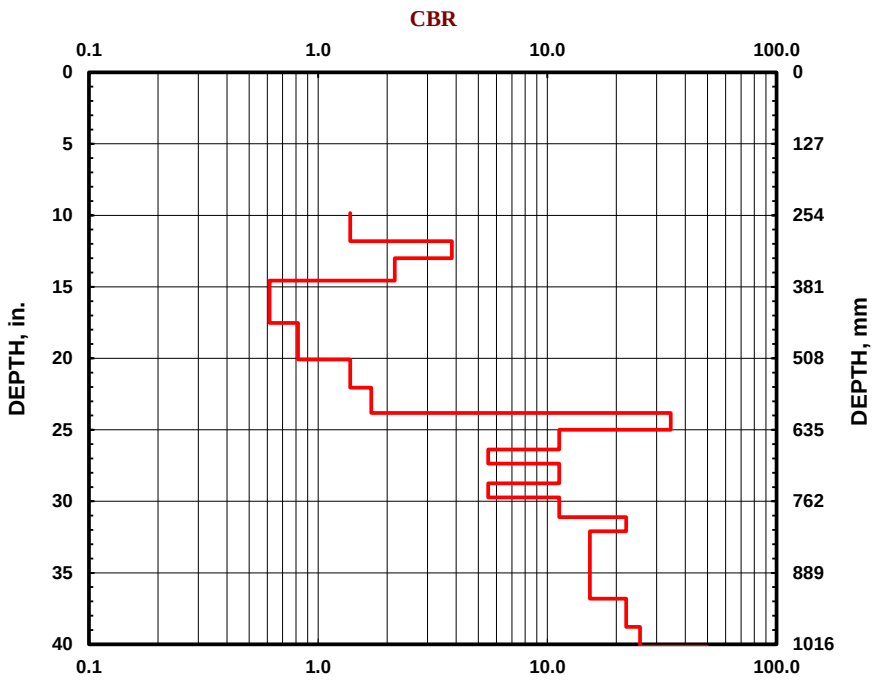
File Name: 123+00

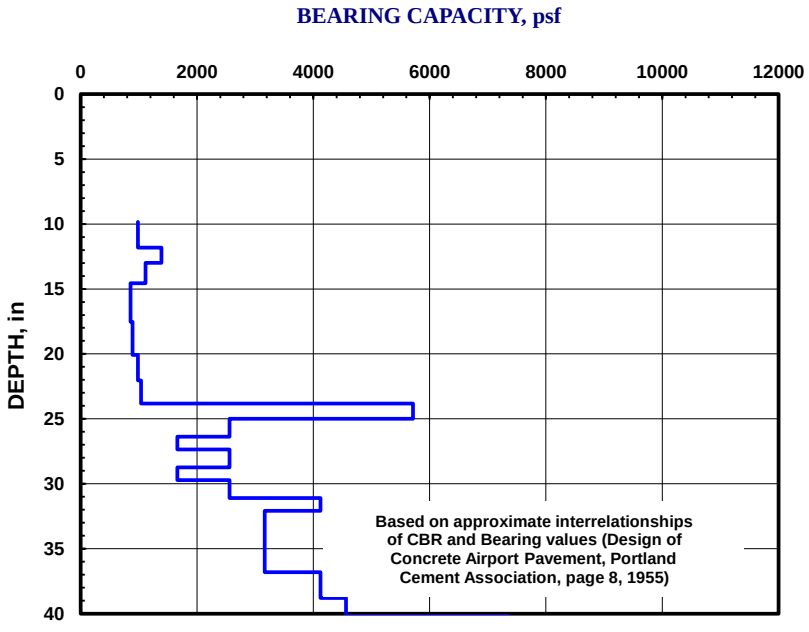
Project: *Zora St Widening*
Location: 123+00
Date: 10-Aug-16
Soil Type(s): Lean to Fat Clay

Hammer
- ○ 10.1 lbs.
- ◉ 17.6 lbs.
- ○ Both hammers used

Soil Type
- ○ CH
- ○ CL
- ◉ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	250	1
1	300	1
1	330	1
1	370	1
1	445	1
1	510	1
1	560	1
1	605	1
3	635	1
2	670	1
1	695	1
2	730	1
1	755	1
2	790	1
2	815	1
2	845	1
2	875	1
2	905	1
2	935	1
2	960	1
2	985	1
3	1020	1
3	1045	1
4	1070	1
4	1095	1





DCP TEST DATA

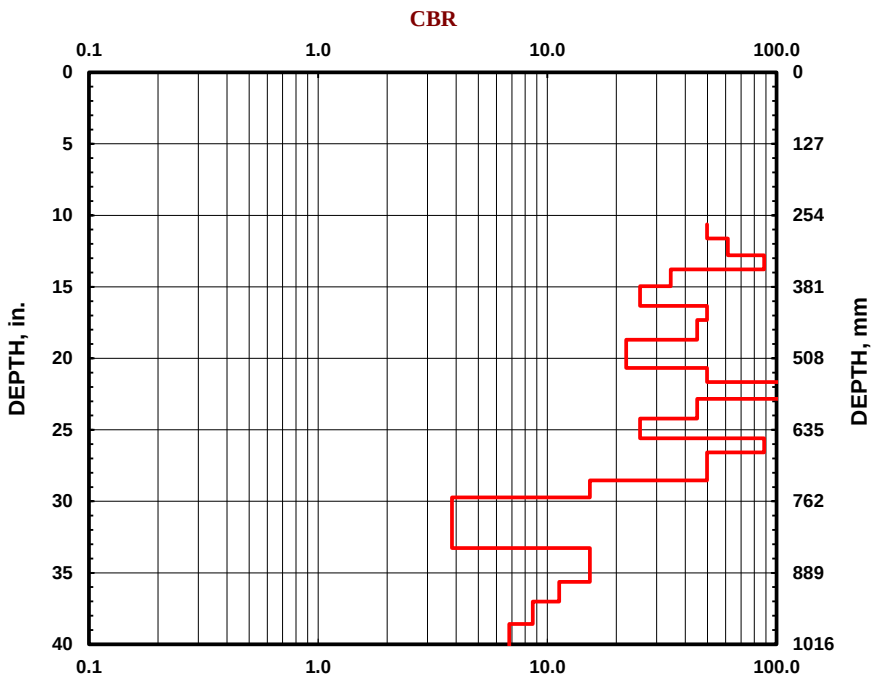
File Name: 124+62

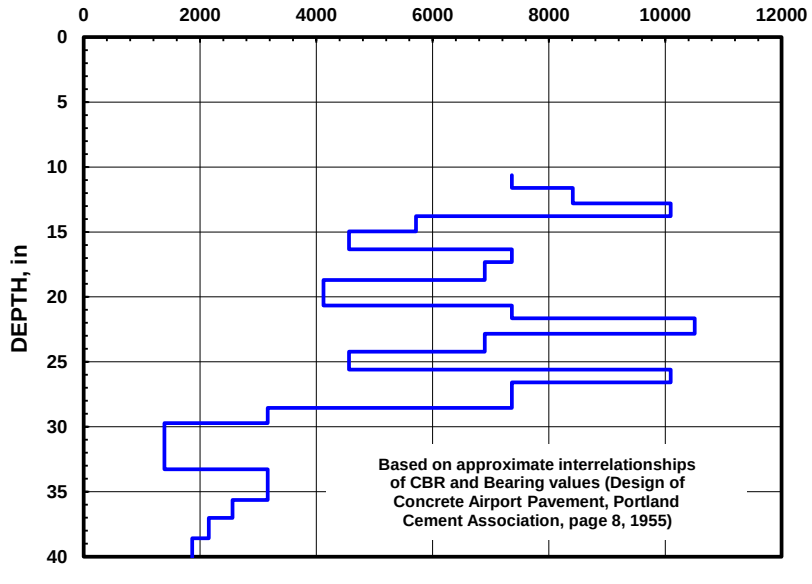
Project: *Zora St Widening*
Location: 124+62
Date: 8-Aug-16
Soil Type(s): Lean Clay w/ Gravel

Hammer
- ○ 10.1 lbs.
- ◉ 17.6 lbs.
- ○ Both hammers used

Soil Type
- ○ CH
- ○ CL
- ◉ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	270	1
3	295	1
4	325	1
4	350	1
3	380	1
3	415	1
3	440	1
4	475	1
4	525	1
3	550	1
6	580	1
4	615	1
3	650	1
4	675	1
3	700	1
3	725	1
2	755	1
1	785	1
1	815	1
1	845	1
2	875	1
2	905	1
2	940	1
2	980	1
2	1025	1
2	1060	1
2	1100	1
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APPENDIX IV

CORE PHOTOGRAPHS

Pavement Core Log

TOP



• Geotechnical Services
• Environmental Services
• Material Testing Services
PALMERTON & PARRISH, INC.
Springfield, MO
4168 W. Kearney Springfield, MO 65803
Call 417.864.6000 Fax 417.864.6004
www.ppimo.com

Core Log

Project Number:	229492
Client:	Bartlett & West
Project:	Zora St. Widening
Location:	Sta 15+00 Eastbound Lane
County:	Jasper
Date:	8/17/2016
Boring Number:	Sta 15+00

Core Layer Data (From Top to Bottom)

LAYER TYPE	**LAYER THICKNESS (in.)**
Asphalt	8
Aggregate Base	12
Total Core Thickness:	20

Pavement Core Log



• Geotechnical Services
• Environmental Services
• Material Testing Services
PALMERTON & PARRISH, INC.
Springfield, MO
4168 W. Kearney Springfield, MO 65803
Call 417.864.6000 Fax 417.864.6004
www.ppimo.com

Core Log

Project Number:	229492
Client:	Bartlett & West
Project:	Zora St. Widening
Location:	Sta 23+00 Westbound Lane
County:	Jasper
Date:	8/17/2016
Boring Number:	Sta 23+00

Core Layer Data (From Top to Bottom)

LAYER TYPE	**LAYER THICKNESS (in.)**
Asphalt	7
Aggregate Base	4
Total Core Thickness:	11

Pavement Core Log

TOP



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Call 417.864.6000 Fax 417.864.6004
www.ppimo.com

Core Log

Project Number:	229492
Client:	Bartlett & West
Project:	Zora St. Widening
Location:	Sta 31+50 Eastbound Lane
County:	Jasper
Date:	8/17/2016
Boring Number:	Sta 31+50

Core Layer Data (From Top to Bottom)

LAYER TYPE	**LAYER THICKNESS (in.)**
Asphalt	5
Aggregate Base	4
Total Core Thickness:	9”

Pavement Core Log

TOP



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4168 W. Kearney Springfield, MO 65803
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www.ppimo.com

Core Log

Project Number:	229492
Client:	Bartlett & West
Project:	Zora St. Widening
Location:	Sta 39+50 Westbound Lane
County:	Jasper
Date:	8/17/2016
Boring Number:	Sta 39+50

Core Layer Data (From Top to Bottom)

LAYER TYPE	**LAYER THICKNESS (in.)**
Asphalt	9
Aggregate Base	7
Total Core Thickness:	16

Pavement Core Log

TOP



• Geotechnical Services
• Environmental Services
• Material Testing Services
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Springfield, MO
4168 W. Kearney Springfield, MO 65803
Call 417.864.6000 Fax 417.864.6004
www.ppimo.com

Core Log

Project Number:	229492
Client:	Bartlett & West
Project:	Zora St. Widening
Location:	Sta 46+00 Eastbound Lane
County:	Jasper
Date:	8/17/2016
Boring Number:	Sta 46+00

Core Layer Data (From Top to Bottom)

LAYER TYPE	**LAYER THICKNESS (in.)**
Asphalt	9
Aggregate Base	8
Total Core Thickness:	17

Pavement Core Log

TOP



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• Material Testing Services
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Call 417.864.6000 Fax 417.864.6004
www.ppimo.com

Core Log

Project Number:	229492
Client:	Bartlett & West
Project:	Zora St. Widening
Location:	Sta 49+25 Eastbound Lane
County:	Jasper
Date:	8/17/2016
Boring Number:	Sta 49+25 EB Lane

Core Layer Data (From Top to Bottom)

LAYER TYPE	**LAYER THICKNESS (in.)**
Asphalt	9
Aggregate Base	9
Total Core Thickness:	18

Pavement Core Log

TOP



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Core Log

Project Number:	229492
Client:	Bartlett & West
Project:	Zora St. Widening
Location:	Sta 49+25 Patch Area in Westbound Lane
County:	Joplin, MO
Date:	8/17/2016
Boring Number:	Sta 49+25 WB Lane

Core Layer Data (From Top to Bottom)

LAYER TYPE	**LAYER THICKNESS (in.)**
Asphalt	8.75
Aggregate Base	6
Total Core Thickness:	14.75

Pavement Core Log

TOP



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Core Log

Project Number:	229492
Client:	Bartlett & West
Project:	Zora St. Widening
Location:	Sta 58+00 Eastbound Lane
County:	Jasper
Date:	8/17/2016
Boring Number:	Sta 49+25

Core Layer Data (From Top to Bottom)

LAYER TYPE	**LAYER THICKNESS (in.)**
Asphalt	8.5
Aggregate Base	5.5
Total Core Thickness:	14

Pavement Core Log

TOP



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Core Log

Project Number:	229492
Client:	Bartlett & West
Project:	Zora St. Widening
Location:	Sta 68+25 Westbound Lane
County:	Jasper
Date:	8/17/2016
Boring Number:	Sta 68+25

Core Layer Data (From Top to Bottom)

LAYER TYPE	**LAYER THICKNESS (in.)**
Asphalt	10.5
Aggregate Base	8

Total Core Thickness: 18.50”

Pavement Core Log

TOP



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Core Log

Project Number:	229492
Client:	Bartlett & West
Project:	Zora St. Widening
Location:	Sta 80+00 Eastbound Lane
County:	Jasper
Date:	8/17/2016
Boring Number:	Sta 80+00

Core Layer Data (From Top to Bottom)

LAYER TYPE	**LAYER THICKNESS (in.)**
Asphalt	11
Aggregate Base	2
Total Core Thickness:	13

Pavement Core Log

TOP



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Core Log

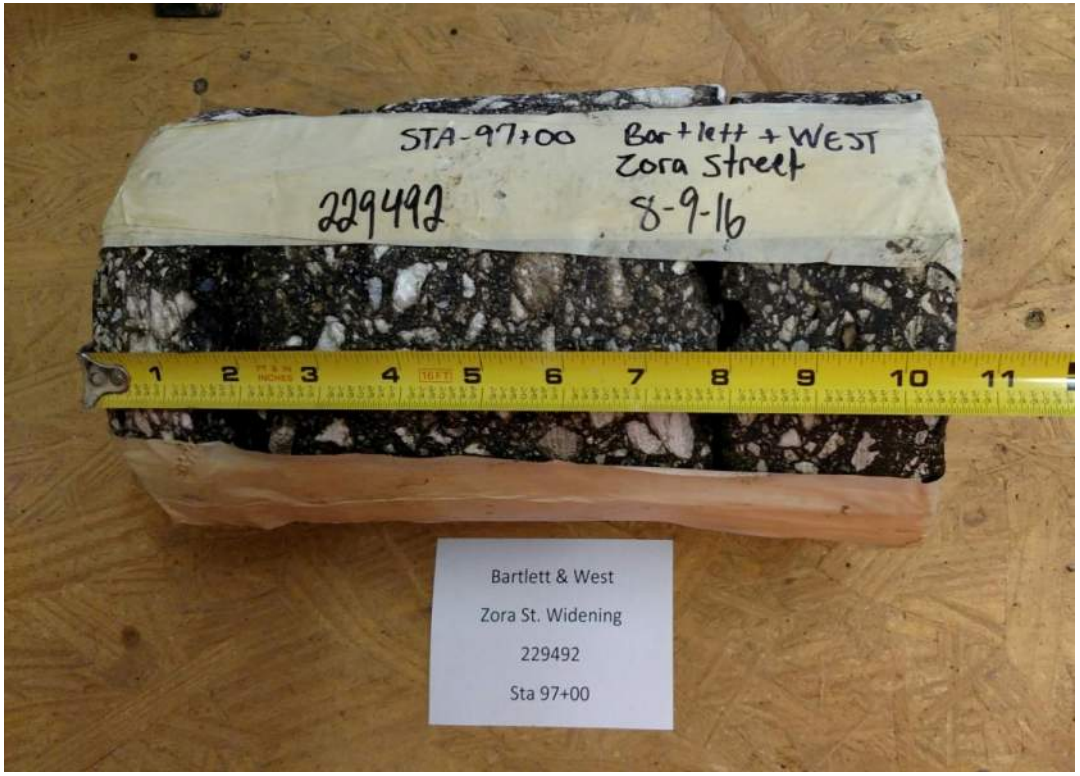
Project Number:	229492
Client:	Bartlett & West
Project:	Zora St. Widening
Location:	Sta 88+00 Eastbound Lane
County:	Jasper
Date:	8/17/2016
Boring Number:	Sta 88+00

Core Layer Data (From Top to Bottom)

LAYER TYPE	**LAYER THICKNESS (in.)**
Asphalt	8.25
Aggregate Base	9
Total Core Thickness:	17.25”

Pavement Core Log

TOP



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Core Log

Project Number:	229492
Client:	Bartlett & West
Project:	Zora St. Widening
Location:	Sta 97+00 Eastbound Lane
County:	Jasper
Date:	8/17/2016
Boring Number:	Sta 97+00

Core Layer Data (From Top to Bottom)

LAYER TYPE	**LAYER THICKNESS (in.)**
Asphalt	10.5
Aggregate Base	2
Total Core Thickness:	12.5”

Pavement Core Log

TOP



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Core Log

Project Number:	229492
Client:	Bartlett & West
Project:	Zora St. Widening
Location:	Sta 102+00 Eastbound Lane
County:	Jasper
Date:	8/17/2016
Boring Number:	Sta 102+00

Core Layer Data (From Top to Bottom)

LAYER TYPE	**LAYER THICKNESS (in.)**
Asphalt	8.5
Aggregate Base	5.5
Total Core Thickness:	14

Pavement Core Log

TOP



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Core Log

Project Number:	229492
Client:	Bartlett & West
Project:	Zora St. Widening
Location:	Sta 105+00 Eastbound Lane
County:	Jasper
Date:	8/17/2016
Boring Number:	Sta 105+00

Core Layer Data (From Top to Bottom)

LAYER TYPE	**LAYER THICKNESS (in.)**
Asphalt	10
Aggregate Base	7
Total Core Thickness:	17

Pavement Core Log

TOP



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Core Log

Project Number:	229492
Client:	Bartlett & West
Project:	Zora St. Widening
Location:	Sta 115+00 Westbound Lane
County:	Jasper
Date:	8/17/2016
Boring Number:	Sta 115+00

Core Layer Data (From Top to Bottom)

LAYER TYPE	**LAYER THICKNESS (in.)**
Asphalt	10
Aggregate Base	4
Total Core Thickness:	14

Pavement Core Log

TOP



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Core Log

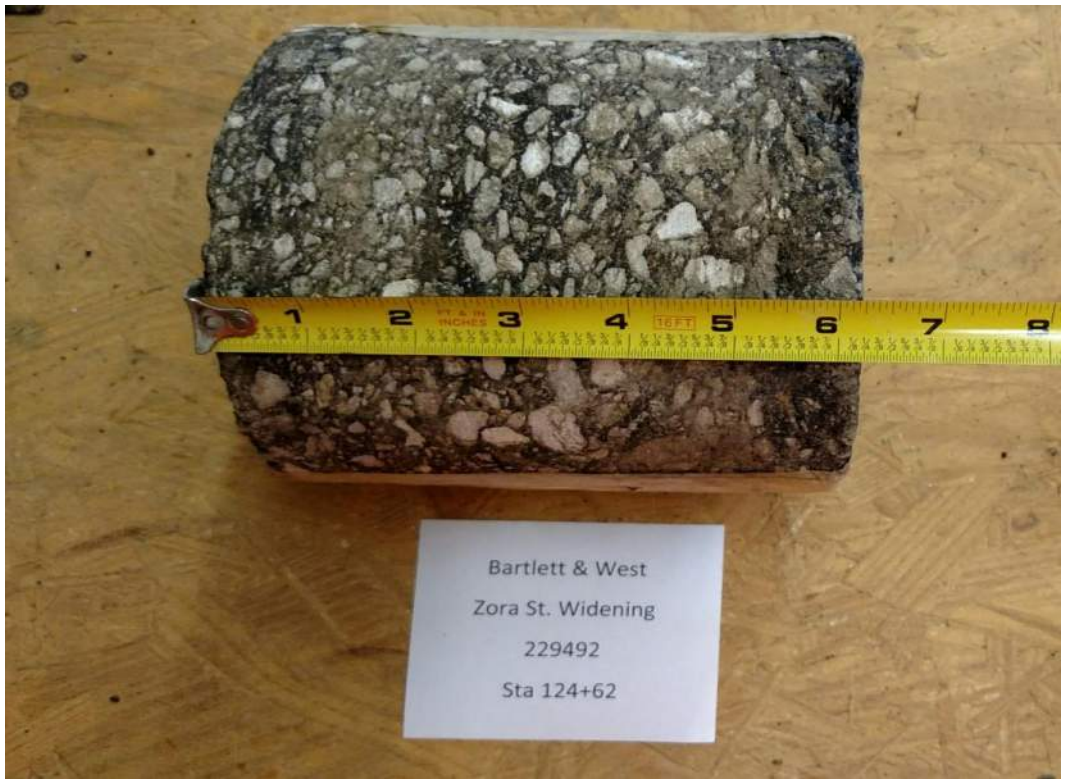
Project Number:	229492
Client:	Bartlett & West
Project:	Zora St. Widening
Location:	Sta 123+00 Eastbound Lane
County:	Jasper
Date:	8/17/2016
Boring Number:	Sta 123+00

Core Layer Data (From Top to Bottom)

LAYER TYPE	**LAYER THICKNESS (in.)**
Asphalt	5
Aggregate Base	5
Total Core Thickness:	10

Pavement Core Log

TOP



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Core Log

Project Number:	229492
Client:	Bartlett & West
Project:	Zora St. Widening
Location:	Sta 124+62 Patch Area in Eastbound Lane
County:	Jasper
Date:	8/17/2016
Boring Number:	Sta 124+62

Core Layer Data (From Top to Bottom)

LAYER TYPE	**LAYER THICKNESS (in.)**
Asphalt	6.25
Aggregate Base	5
Total Core Thickness:	11.25

APPENDIX V

PAVEMENT ANALYSIS RESULTS

WinPAS 12

Pavement Thickness Design According to

1993 AASHTO Guide for Design of Pavements Structures

American Concrete Pavement Association

ESAL Data by Vehicle Type

Project Name: Zora Street Widening - Pavement Analysis
Route: Range Line to MO Rte 249
Location: Joplin, Missouri
Owner/Agency: City of Joplin
Design Engineer: BP

Traffic Factor

Estimated Rigid Thickness	7.96	**inches**
Estimated Structural Number	4.7	
Terminal Serviceability	2.5	
Design Life	20	**years**
Annual Growth Rate	2.43	**percent**
Traffic Input by	Day	

Traffic Input by

Design Lane
Design Lane Distribution 0.00 percent
Directional Distribution 0.00 percent

Vehicle	Axle Load	Axle Type	Number
	2.00	Single	
	2.00	Single	
	0.00	Single	5,102
	10.00	Single	
	0.00	Single	
	18.00	Single	54
	10.00	Single	
	0.00	Single	
	30.00	Tandem	54

Vehicle	Axle Load	Axle Type	Number
	12.00	Single	
	16.00	Single	
	30.00	Tandem	54
	12.00	Single	
	32.00	Tandem	
	32.00	Tandem	53
	12.00	Single	
	34.00	Tandem	
	34.00	Tandem	
	0.00	Single	
	0.00	Single	53

Total Rigid ESALs **5,583,405**

Total Flexible ESALs **3,817,137**

WinPAS

Pavement Thickness Design According to

1993 AASHTO Guide for Design of Pavements Structures

American Concrete Pavement Association

Flexible Design Inputs

Project Name: Zora Street Widening - Pavement Analysis
Route: Range Line to MO Rte 249
Location: Joplin, Missouri
Owner/Agency: City of Joplin
Design Engineer: BP

Flexible Pavement Design/Evaluation

Structural Number	4.78		**Subgrade Resilient Modulus**	5,842.00	**psi**
Total Flexible ESALs	3,838,276		**Initial Serviceability**	4.20	
Reliability	90.00	**percent**	**Terminal Serviceability**	2.50	
Overall Standard Deviation	0.45				

Layer Pavement Design/Evaluation

Layer Material	Layer Coefficient	Drainage Coefficient	Layer Thickness	Layer SN
Asphalt Cement Concrete	0.43	1.00	2.00	0.86
Asphalt Treated Agg. Base	0.37	1.00	8.00	2.96
Crushed Stone Base	0.12	1.00	8.00	0.96
			Σ SN	4.78

APPENDIX VI

IMPORTANT INFORMATION REGARDING YOUR GEOTECHNICAL REPORT

Important Information about Your

Geotechnical Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical engineering study conducted for a civil engineer may not fulfill the needs of a construction contractor or even another civil engineer. Because each geotechnical engineering study is unique, each geotechnical engineering report is unique, prepared *solely* for the client. No one except you should rely on your geotechnical engineering report without first conferring with the geotechnical engineer who prepared it. *And no one — not even you* — should apply the report for any purpose or project except the one originally contemplated.

Read the Full Report

Serious problems have occurred because those relying on a geotechnical engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

A Geotechnical Engineering Report Is Based on A Unique Set of Project-Specific Factors

Geotechnical engineers consider a number of unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical engineering report that was:

- not prepared for you,
- not prepared for your project,
- not prepared for the specific site explored, or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light industrial plant to a refrigerated warehouse,
- elevation, configuration, location, orientation, or weight of the proposed structure,
- composition of the design team, or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes—even minor ones—and request an assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

Subsurface Conditions Can Change

A geotechnical engineering report is based on conditions that existed at the time the study was performed. *Do not rely on a geotechnical engineering report* whose adequacy may have been affected by: the passage of time; by man-made events, such as construction on or adjacent to the site; or by natural events, such as floods, earthquakes, or groundwater fluctuations. *Always* contact the geotechnical engineer before applying the report to determine if it is still reliable. A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ—sometimes significantly—from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A Report's Recommendations Are *Not* Final

Do not overrely on the construction recommendations included in your report. *Those recommendations are not final*, because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations only by observing actual

subsurface conditions revealed during construction. *The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's recommendations if that engineer does not perform construction observation.*

A Geotechnical Engineering Report Is Subject to Misinterpretation

Other design team members' misinterpretation of geotechnical engineering reports has resulted in costly problems. Lower that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Contractors can also misinterpret a geotechnical engineering report. Reduce that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing construction observation.

Do Not Redraw the Engineer's Logs

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

Give Contractors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make contractors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give contractors the complete geotechnical engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise contractors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure contractors have sufficient time* to perform additional study. Only then might you be in a position to give contractors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Read Responsibility Provisions Closely

Some clients, design professionals, and contractors do not recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations" many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform a *geoenvironmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical engineering report does not usually relate any geoenvironmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own geoenvironmental information, ask your geotechnical consultant for risk management guidance. *Do not rely on an environmental report prepared for someone else.*

Obtain Professional Assistance To Deal with Mold

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the *express purpose* of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold prevention consultant. Because just a small amount of water or moisture can lead to the development of severe mold infestations, a number of mold prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical engineering study whose findings are conveyed in this report, the geotechnical engineer in charge of this project is not a mold prevention consultant; ***none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention. Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.***

Rely, on Your ASFE-Member Geotechncial Engineer for Additional Assistance

Membership in ASFE/The Best People on Earth exposes geotechnical engineers to a wide array of risk management techniques that can be of genuine benefit for everyone involved with a construction project. Confer with you ASFE-member geotechnical engineer for more information.

ASFE
THE BEST PEOPLE ON EARTH

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