

FINAL PAVEMENT REPORT

Turlock Pavement Rehabilitation
Location 1 – N. Johnson Road, Arbor Way, and Zinfandel
Lane/Charles Place Neighborhood
Turlock, California

Prepared by:



Crawford & Associates, Inc.
4701 Freeport Boulevard
Sacramento, CA 95822

May 8, 2025

Prepared for:



MARK THOMAS

Mark Thomas
2833 Junction Avenue, Suite 110
San Jose, CA 95134



Sacramento
Eureka
Modesto
Pleasanton
Santa Rosa
Seattle
Ukiah

May 8, 2025
Crawford File No. 23-931.3

Mr. Ed Noriega, PE
Mark Thomas
2833 Junction Avenue, Suite 110
San Jose, CA 95134

Subject: **City of Turlock 2024 Multiple Roads Rehabilitation
Location 1
Final Pavement Design Report**
Turlock, California

Dear Mr. Noriega,

Crawford & Associates, Inc. (Crawford) is pleased to submit this Final Pavement Design Report for Location 1 (within the N. Johnson Road, Arbor Way, and Zinfandel Lane/Charles Place neighborhood) as part of the City of Turlock Pavement Rehabilitation efforts in Turlock, California. We prepared this report in accordance with our February 27, 2024 agreement associated with City Contract No 2023-109. A separate report will be prepared for Location 2 (also included in City Contract No 2023-109). The purpose of this report is to provide pavement recommendations for consideration by the City of Turlock and the design team.

Thank you for selecting Crawford to be on your design team. Please call if you have questions or require additional information.

Sincerely,

Crawford & Associates, Inc.,

Reviewed By,

A handwritten signature in blue ink that reads 'Carmelo A. Pagan'.

A handwritten signature in blue ink that appears to read 'Benjamin Crawford'.

Carmelo Pagan
Staff Engineer

Benjamin Crawford, PE, GE
Principal

A handwritten signature in blue ink that reads 'Amando Castro'.

Amando Castro, PE
Project Manager



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1	INTRODUCTION	1
1.1	SCOPE OF SERVICES	1
2	PROJECT DESCRIPTION	1
3	HISTORICAL DATA.....	2
4	FIELDWORK	2
4.1	PAVEMENT CONDITION ASSESSMENT	2
4.1.1	SECTION 1	4
4.1.2	SECTION 2	5
4.2	PAVEMENT CORES	5
4.3	SUBGRADE CONDITIONS	7
5	CONCLUSIONS AND RECOMMENDATIONS	7
5.1	SECTION 1	8
5.2	SECTION 2	8
5.3	FULL DEPTH RECLAMATION (FDR)	8
5.4	FULL DEPTH HMA.....	9
5.5	TRADITIONAL PAVEMENT SECTION.....	9
6	CONSTRUCTION CONSIDERATIONS	10
7	RISK MANAGEMENT	10
8	LIMITATIONS	10

LIST OF TABLES

Table 1: Pavement Core Results	5
Table 4: Full Depth HMA Sections	9
Table 5: New Pavement Sections	10

FIGURES

Figures 1A-1C Vicinity and Exploration Maps

APPENDIX A

Core Logs and Photos

APPENDIX B

Laboratory Test Results



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File: 23-931.3
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1 INTRODUCTION

Crawford & Associates, Inc. (Crawford) is pleased to submit this Final Pavement Design Report for Location 1 (generally within the N. Johnson Road, Arbor Avenue and Zinfandel Lane/Charles Place Neighborhood) as part of the City of Turlock Pavement Rehabilitation efforts in Turlock, California. We prepared this report in accordance with our February 27, 2024 agreement associated with City Contract No 2023-109. A separate report will be prepared for Location 2 (also included in City Contract No 2023-109). The purpose of this report is to support the City of Turlock (City) and the design team during project design, plan, and specification development.

1.1 SCOPE OF SERVICES

To prepare this report, Crawford:

- Discussed the proposed improvements with Mr. Ed Noriega, PE and Ms. Cynthia Horner, PE, with Mark Thomas, and Mr. Fred Pezeshk, PE with the City;
- Conducted a site visit and marked USA on April 8, 2024;
- Conducted a pavement conditions assessment on April 19, 2024;
- Performed pavement coring and subsurface soil sampling between April 26 and May 8, 2024;
- Performed laboratory testing (R-values) on representative subgrade samples; and
- Performed calculations and engineering analysis.

2 PROJECT DESCRIPTION

We understand that this project is a part of the City of Turlock's larger CIP to improve the pavement condition index throughout the City. Based on our conversations with the design team and the City, the primary purpose of this project is to rehabilitate and repair 32 residential roadways (approximately 4 miles total) within the eastern portion of the City (within the N. Johnson Road, Arbor Way, and Zinfandel Lane/Charles Place neighborhood). The City desires the following design traffic index (TI) for this project, for local roads a TI of 6 (7 at intersections), for minor and major collectors a TI of 8 (9 at intersections), and for major and principal arterials a TI of 10 (11 at intersections).

Location 1, as defined in City Contract 2023-109, includes rehabilitating the following roadways as part of this project:

- North Johnson Road between East Hawkeye Avenue and East Tuolumne Avenue;
- Hammond Drive between N Johnson Road and N Johnson Road;
- Stuart Place between the South end and Hammond Drive;
- Ashley court between the West end and North Johnson Road;
- Jackson Court between the North end and North Johnson Road;
- Sconyers Court between the East end and North Johnson Road;
- North Quincy Avenue between Marie Drive and East Hawkeye Avenue;
- Linn Court between its North end and Mira Flores Drive;
- La Sombra Court between Mira Flores Drive and Mira Flores Drive;
- Novo Drive between East Canal Drive and Mira Flores Drive;
- Arbor Way between North Berkeley Avenue and North Quincy Road;

FINAL PAVEMENT REPORT

Turlock Pavement Rehabilitation – Location 1
Turlock, California

Crawford

File: 23-931.3

May 8, 2025

- Karen Way between Arbor Way and Christine Way;
- Christine Way between Karen Way and Heppner Way;
- Heppner Way between Arbor Way and Christine Way;
- California Avenue between North Berkeley Avenue and North Johnson Road;
- El Paseo Drive between East Canal Drive and Arbor Way;
- Linda Vista Drive between El Paseo Drive and North Johnson Road;
- Zinfandel Lane between North Johnson Road and Corello Street;
- Charles Place between Wallace Street and North Johnson Road;
- Wallace Street between E. Marshall Street and Charles Place;

3 HISTORICAL DATA

No as-built plans or maintenance reports were made available while this final pavement report was being prepared.

According to information provided by the City, Pavement Condition Index (PCI) values were assigned to the streets included in this project. PCI is a scale to quantify the condition of a street based on the surface condition observed including crack size, quantity, and depth, raveling, and rutting. Generally, PCI values above 75 (fair to good condition) require preservation methods, between 75 and 50 (fair to poor condition) require resurfacing, and below 50 (poor to very poor condition) require rehabilitation or reconstruction. We supplement the PCI assigned to each street with our pavement condition assessment and describe our findings in the sections below.

4 FIELDWORK

Crawford evaluated the condition of the existing pavement by walking the roadway and reviewing the pavement surface conditions. Crawford cored the pavement at 64 locations to measure the existing structural sections of Hot Mix Asphalt (HMA) and Aggregate Base (AB) thicknesses, identify historical overlays, the presence of paving fabric, and collect subgrade samples for laboratory testing.

We provide the overall project alignment in Figure 1A and present the core locations in Figures 1B and 1C.

4.1 PAVEMENT CONDITION ASSESSMENT

During our pavement assessment, we walked the project alignment and noted the current pavement conditions including cracking, patching/potholes, and surface distress. Based on the observations, and the PCI, project alignment can generally be broken down into two sections as presented in Table 1 below.

Table 1: Turlock Pavement Condition Assessment Generalized Sections

Section	Roadway	PCI Assigned
1	Jackson Court	83
	Sconyers Court	68

FINAL PAVEMENT REPORT

Turlock Pavement Rehabilitation – Location 1
Turlock, California

Crawford

File: 23-931.3

May 8, 2025

Section	Roadway	PCI Assigned
1	Hammond Drive (1740 Hammond Drive to N Johnson Rd)	71
	La Sombra Court (Mira Flores Dr to La Sombra Ct)	63
	Karen Way	69
	Ashley Court	77
	Jackson Court	83
	Arbor Way (Heppner Wy. to N. Quincy Rd)	53
	Christine Way	56
	Heppner Way	82
2	North Johnson Road (E. Hawkeye to Hammond Dr)	5
	North Johnson Road (Hammond Dr to Sconyers Ct)	28
	Hammond Drive (N. Johnson Rd to 1740 Hammond)	0
	North Quincy Road	25
	Linn Court	27
	Stuart Place	13
	La Sombra Court (La Sombra Ct to La Sombra Ct)	37
	La Sombra Court (La Sombra Ct to Mira Flores Dr)	29
	Novo Drive	34
	Arbor Way (N. Berkley Ave to Edward Dr)	24
	Arbor Way (Edward Dr to N. Johnson Rd)	4
	Arbor Way (N. Johnson Rd to Karen Wy)	13
	Arbor Way (Karen Wy to Heppner Wy.)	20
	California Ave	41
	El Paseo Drive (E. Canal Dr to El Capitan Dr)	21

FINAL PAVEMENT REPORT

Turlock Pavement Rehabilitation – Location 1
Turlock, California

Crawford

File: 23-931.3

May 8, 2025

Section	Roadway	PCI Assigned
2	El Paseo Drive (El Capitan Dr to Arbor Wy.)	34
	Linda Vista Drive	22
	Zinfandel Lane (N. Johnson Rd to Old Vineyard Rd)	14
	Zinfandel Lane (Old Vineyard Rd to N. Quincy Rd)	29
	Zinfandel Lane (N. Quincy Rd to Corrello St)	27
	Charles Place	33
	Wallace Street	15

The assessment of each section is discussed below.

4.1.1 SECTION 1

The streets included in this section were assigned a PCI above 50. This range of PCI correlates to pavement in generally fair to poor condition. The results of our pavement condition assessment generally agree with the assigned PCI values. We observed the streets in Section 1 to be in generally fair condition with low to moderate severity block cracks. Lack of maintenance was observed as vegetation was beginning to grow within the cracks and moderate to high severity raveling was present along all of the streets.



Photo 1: Section 1 Moderate Longitudinal Cracking

FINAL PAVEMENT REPORT

Turlock Pavement Rehabilitation – Location 1
Turlock, California

Crawford

File: 23-931.3

May 8, 2025

4.1.2 SECTION 2

Section 2 represents the heavily distressed roadways with PCI values ranging between 0 and 41. A PCI value below 50 typically indicates heavy distress features (like potholes, alligator cracks, rutting,... etc) and surface treatments will likely not produce the desired end product. Pavement failure in Section 2 is evidenced by the high-severity potholes and heavy alligator cracks we observed during our pavement condition assessment. The patch efforts and filled potholes have failed and are cracks intruding into the patches. Outside of the potholes, we observed high-severity alligator cracking, raveling and rutting (see Photo 2 below).



Photo 2: Section 2 Raveling, Alligator Cracks and Failed Patching

4.2 PAVEMENT CORES

We present the results of our pavement coring and R-value test results in Table 1 below.

Table 2: Pavement Core Results

Section	Core Number	Roadway	AC Thickness (ft)	AB Thickness (ft)	Subgrade Sample Depth (ft)	Existing TI Range	R-value Result
2	C-1	North Johnson Road	0.20	0.37	3.41	4-5	49
	C-2	North Johnson Road	0.16	0.33	2.25	3-4	
	C-3	North Johnson Road	0.16	0.33	4.5	3-4	
	C-4	North Johnson Road	0.16	0.50	4.33	4-5	49
	C-5	North Johnson Road	0.21	0.50	4.29	5-6	
	C-6	North Johnson Road	0.17	0.33	4.5	3-4	
	C-7	Sconyers Court	0.25	0.38	4.37	4-5	
1	C-8	Ashley Court	0.17	0.33	1.83	3-4	49
	C-9 ¹	Jackson Court	0.17	0.54	4.29	5-6	
	C-10	Hammond Drive	0.21	0.37	4.41	4-5	

FINAL PAVEMENT REPORT

Turlock Pavement Rehabilitation – Location 1
Turlock, California

Crawford

File: 23-931.3
May 8, 2025

Section	Core Number	Roadway	AC Thickness (ft)	AB Thickness (ft)	Subgrade Sample Depth (ft)	Existing TI Range	R-value Result
	C-11	Hammond Drive	0.25	0.50	4.25	5-6	60
2	C-12	Hammond Drive	0.16	0.50	4.33	4-5	
	C-13	Stuart Place	0.20	0.37	4.41	4-5	
	C-14 ¹	California Avenue	0.33	--	4.66	4-5	
	C-15 ¹	California Avenue	0.29	--	3.91	3-4	
	C-16 ¹	California Avenue	0.16	0.37	2.91	7-8	
	C-17	Arbor Way	0.25	0.25	4.5	5-6	
	C-18	Arbor Way	0.16	--	4.83	2-3	
	C-19 ¹	Arbor Way	0.20	0.45	4.33	6-7	
	C-20 ¹	Arbor Way	0.25	0.25	2.08	5-6	
1	C-21	Arbor Way	0.16	0.50	3.33	6-7	60
	C-22	Karen Way	0.22	0.33	4.43	5-6	
	C-23	Christine Way	0.16	0.33	3.16	6-7	
	C-24	Heppner Way	0.23	0.26	2.0	5-6	
2	C-25	North Quincy Road	0.16	0.33	4.5	4-5	
	C-26	North Quincy Road	0.37	0.16	3.79	5-6	
	C-27 ¹	El Paseo Street	0.10	--	3.02	4-3	
	C-28	El Paseo Street	0.45	--	4.54	5-6	
	C-29 ¹	El Paseo Street	0.08	--	2.58	5-6	
	C-30 ¹	Linda Vista Street	0.29	--	4.70	3-4	
	C-31	La Sombra Court	0.25	0.33	1.08	5-6	
	C-32	La Sombra Court	0.25	0.16	2.25	4-5	
	C-33	Linn Court	0.20	0.29	2.5	4-5	
	C-34	Novo Drive	0.16	0.25	4.58	4-5	
	C-35	Novo Drive	0.12	--	4.87	1-2	
	C-36 ¹	Wallace Street	0.45	--	3.37	3-4	23
	C-37 ¹	Charles Place	0.41	--	3.91	2-3	
	C-38	Charles Place	0.33	--	3.37	2-3	
	C-39	Zinfandel Lane	0.08	0.16	3.66	1-2	
	C-40	Zinfandel Lane	0.16	0.16	2.5	1-2	
	C-41	Zinfandel Lane	0.20	0.12	3.16	1-2	
	C-42	Zinfandel Lane	0.16	0.25	4.08	2-3	
2	C-43	North Johnson Road	0.16	--	--	3-4	49
	C-44	North Johnson Road	0.16	0.41	--	4-5	
	C-45	Sconyers Court	0.16	0.41	--	4-5	
1	C-46	Ashley Court	0.13	0.47	--	3-4	
	C-47	Jackson Court	0.16	0.47	--	5-6	
2	C-48	Hammond Drive	0.16	0.54	--	4-5	60
	C-49	Stuart Place	0.13	0.54	--	4-5	
	C-50	California Avenue	0.16	0.33	--	4-5	
	C-51 ¹	Arbor Way	0.08	--	--	4-5	
1	C-52	Karen Way	0.16	0.25	--	5-6	
	C-53	Christine Way	0.16	0.29	--	6-7	
	C-54	Heppner Way	0.13	5.5	--	5-6	
2	C-55	North Quincy Road	0.16	0.33	--	4-5	

FINAL PAVEMENT REPORT

Turlock Pavement Rehabilitation – Location 1
Turlock, California

Crawford

File: 23-931.3

May 8, 2025

Section	Core Number	Roadway	AC Thickness (ft)	AB Thickness (ft)	Subgrade Sample Depth (ft)	Existing TI Range	R-value Result
	C-56 ¹	El Paseo Street	0.16	--	--	5-6	
	C-57 ¹	Linda Vista Street	0.13	--	--	3-4	
	C-58	La Sombra Court	0.16	0.67	--	5-6	
	C-59	La Sombra Court	0.16	0.67	--	4-5	
	C-60	Linn Court	0.16	0.33	--	4-5	
	C-61	Novo Drive	0.16	0.42	--	4-5	
	C-62	Wallace Street	0.08	--	--	3-4	23
	C-63	Charles Place	0.13	--	--	2-3	
	C-64	Zinfandel Lane	0.16	0.46	--	1-2	

-- Not encountered.

¹ Oil Road Encountered

We used the Caltrans Highway Design Manual, Chapter 630 methodology to back-calculate the traffic index the existing pavement sections. We established in-place/aged gravel factors for the asphalt and aggregate base and used R-values obtained from our laboratory testing. The existing asphalt thickness was generally between 2 to 3 inches, however anomalies were encountered on Wallace Street, El Paseo Street, and Charles Place where approximately 5 inches of HMA was observed. No fabric was present in our cores and aggregate base thickness ranged between 1.5 and 6.5 inches. Oiled gravel/sand was encountered underneath cores 9, 14, 15, 16, 19, 20, 27, 29, 30, 36, and 37 and the thicknesses ranged between 1 to 7 inches.

4.3 SUBGRADE CONDITIONS

We visually classified the encountered subgrade as Poorly-graded Sand with Silt (SP-SM) to Silty Sand (SM). R-Value laboratory tests performed on three subgrade samples (C-5, C-30, and C-42) yielded results of 23, 49, and 60, respectively. We present the core logs with further subgrade descriptions in Appendix A, and laboratory results in Appendix B.

5 CONCLUSIONS AND RECOMMENDATIONS

The PCI for the pavement in Section 1 correlates with preservation-type treatments, like seals or micro-surfacing; however, the existing structural sections fail to support the desired design traffic index and the existing curb and gutter limit rehabilitation alternatives. The existing HMA sections encountered in all of our cores indicate an insufficiency in the structural sections eliminating the potential for a mill and overlay.

Our pavement condition assessment for Section 2 generally agrees with the PCI assigned to each street. The streets are in very poor condition and likely no longer supporting the traffic loading it is currently experiencing. Complete reconstruction or robust rehabilitation is warranted for the streets in Section 2.

We provide our recommended pavement strategies and options for the two sections below. It is our understanding that streets in this project are classified as local roads and minor collectors. Therefore, we provide pavement sections that satisfy a design TI ranging between 6 to 9. Below we provide a rehabilitation strategy that takes into consideration the current condition of the two sections, the existing pavement section thicknesses, and the design TI.

FINAL PAVEMENT REPORT

Turlock Pavement Rehabilitation – Location 1
Turlock, California

Crawford

File: 23-931.3

May 8, 2025

5.1 SECTION 1

Section 1 is fair to poor condition with moderate severity block cracks and fair condition patches. The existing section is significantly deficient when compared to the City's desired traffic index. The cracks present are exasperated by the high severity raveling. Many of the cracks show signs of water seepage, impacting the AB and subgrade.

The existing pavement thicknesses in Section 1 result in an average traffic index of 3 to 4, therefore, to achieve a traffic index of 6 (7 at intersections), an increase in the existing pavement sections would be required. An increase in the section thickness can be accomplished in three ways:

- 1) Remove the existing pavement section and replace it with a structurally adequate section using either full-depth HMA (recommendations in Section 5.4 of this report) or a traditional pavement section with HMA and AB (recommendations in Section 5.5 of this report).
- 2) Perform full-depth reclamation (FDR), which increases the section from the top down (recommendations in Section 5.3 of this report) and is typically more economical than a remove and replace (option 1 above).
- 3) Traditional remove and replace. This is the costliest option and we provide this as a reference for the City to compare to other rehabilitation options.

5.2 SECTION 2

Section 2 is in very poor condition and significant pavement failure was observed during our pavement assessment. To improve the PCI rating and meet the design traffic index, a significant rehabilitation strategy is required. This strategy includes:

- 1) Full Depth Reclamation (FDR). FDR is likely the most cost effective method of rehabilitation, and the minimum design sections can support TI's greater than the design TI.
- 2) Full Depth HMA. In lieu of a mill and overlay, complete removal of the HMA section, regrading to meet grade constraints, and placing a new HMA section to satisfy the design TI is an appropriate option for rehabilitation. This option is likely costlier than an FDR, however, still provides the support required to meet the design TI and not interfere with grade constraints.
- 3) While a mill and overlay (with a grade increase) could provide a sufficient HMA structural section to support the design TI, the remaining HMA (after milling) would be in very poor condition providing a base not conducive for an overlay (much of the remaining HMA would likely unravel during milling and cause constructability issues). The cracks would likely propagate to the surface within 5 years but a temporary increase in the PCI would occur. We do not recommend this option.

5.3 FULL DEPTH RECLAMATION (FDR)

FDR is the process of recycling the existing pavement section (HMA, AB, and subgrade) with cement and water. The FDR mix is then graded to meet the required grade constraints and compacted. Because FDR does not have the skid resistance or strength of HMA, a structural HMA wearing coarse is required.

In-Place Recycle rehabilitation should consist of thoroughly dismantling and mixing the existing (after milling) HMA, AB, and subgrade material with Portland cement (the amount will be

FINAL PAVEMENT REPORT

Turlock Pavement Rehabilitation – Location 1
Turlock, California

Crawford

File: 23-931.3

May 8, 2025

determined if this option is selected) and water to the required depth. Following mixing process, compact the recycled section to 95% relative compaction (ASTM D1557) at least 2% above optimum moisture content.

All exposed surfaces should be kept moist or bituminous cure sealed if exposure is expected to be greater than 3 days. We recommend microcracking the finished recycled section prior to HMA placement; this will help prevent shrinkage cracks from propagating through the HMA section. Finally, the In-Place Recycle section should be proof rolled for stability prior to placing HMA.

Table 3: Full Depth Recycled Sections

Roadway Section	Traffic Index	Thicknesses (ft)		
		HMA ²	FDR ^{3,4}	Total Pavement Thickness
Local Road	6.0 ¹	0.25	0.75	1.00
	7.0	0.25	1.00	1.25
Minor/Major Collector	8.0	0.30	1.15	1.45
	9.0	0.35	1.30	1.65

¹Traffic Index is based on the required HMA section, however actual Traffic Index is slightly higher due to using a minimum FDR section.

²New HMA wearing coarse.

³The depth and location of existing utilities would need to be determined to confirm ability to recycle in-place.

⁴Full Depth Recycling method ($G_r = 1.2$) based on a minimum developed unconfined compressive strength of 300 psi (CTM 373). Minimum recommended FDR section is 0.70 feet

Full Depth Reclamation (FDR) is more cost effective and relatively fast as compared to remove and replace methods (traditional pavement sections or full depth HMA). If FDR is selected, we can complete mix design(s) at a range of appropriate cement contents for bidding purposes.

5.4 FULL DEPTH HMA

We provide full depth HMA structural sections as an alternative to meet the design TI for the project using a design R-value of 23. This alternative requires the removal of the existing HMA, moisture conditioning and recompacting the exposed subgrade prior to placement of the new HMA.

Table 4: Full Depth HMA Sections

Roadway Section	Traffic Index	Hot Mix Asphalt (ft)
Local Road	6.0	0.65
	7.0	0.75
Minor/Major Collector	8.0	0.85
	9.0	0.95

5.5 TRADITIONAL PAVEMENT SECTION

We provide traditional pavement structural sections as an alternative to meet the design TI for the project using a design R-value of 23.

FINAL PAVEMENT REPORT

Turlock Pavement Rehabilitation – Location 1
Turlock, California

Crawford

File: 23-931.3

May 8, 2025

Table 5: New Pavement Sections

Roadway Section	Traffic Index	Thicknesses (ft)		
		HMA	AB	Total Pavement Thickness
Local Road	6.0	0.25	0.80	1.05
	7.0	0.30	0.95	1.25
Minor/Major Collector	8.0	0.40	1.10	1.50
	9.0	0.45	1.25	1.5

6 CONSTRUCTION CONSIDERATIONS

During our fieldwork, underground utilities were marked and avoided. The presence of underground utilities could significantly impact the rehabilitation alternatives for this project. Should any form of bottom-up construction methods be selected (such as FDR), special attention to existing utilities should be given. The contractor should be responsible for locating any utility within the project limits. Based on our experience and discussion with contractors, a minimum separation/cover of 1.25 ft to 1.5 ft (depending on the type of utility) between the utility and the proposed scarification/recycled section should be used to reduce impacts to utilities.

7 RISK MANAGEMENT

Our experience, and that of our profession, clearly indicates that the risks of costly design, construction, and maintenance problems can be significantly lowered by retaining the Geotechnical Engineer of Record to provide additional services during design and construction. For this project, Crawford should be retained as the Geotechnical Engineer of Record to:

- Review and provide comments on the civil plans and specifications prior to construction;
- Monitor construction to check and document our report assumptions. At a minimum, Crawford should monitor grading, scarification and compaction of the roadway subgrade;
- Update this report if design changes occur, 2 years or more lapse between this report and construction, and/or site conditions have changed.

If we are not retained to perform the above applicable services, we are not responsible for any other party's interpretation of our report, and subsequent addendums, letters, and discussions.

8 LIMITATIONS

Crawford performed services in accordance with generally accepted geotechnical engineering principles and practices currently used in this area. Where referenced, we used ASTM or Caltrans standards as a general (not strict) *guideline* only. We do not warranty our services.

Crawford based this report on the current site conditions. We assume the soil, AB, and HMA conditions encountered during our fieldwork are representative of the subsurface and pavement conditions at the site. Actual conditions between core and boring locations can be different.

Our scope did not include evaluation of on-site hazardous materials, site geology, site seismicity, or flooding potential.

FINAL PAVEMENT REPORT

Turlock Pavement Rehabilitation – Location 1
Turlock, California

Crawford

File: 23-931.3
May 8, 2025

The pavement core locations shown in Figures 1A to 1D are based on visual comparisons made in the field between site features and features shown on aerial mapping, therefore they are approximate.

Modern design and construction are complex, with many regulatory restrictions, involved parties, and construction alternatives. It is common to experience changes and delays. The owner should set aside a reasonable contingency fund based on complexities and cost estimates to cover changes and delay

FINAL PAVEMENT REPORT

Turlock Pavement Rehabilitation – Location 1
Turlock, California

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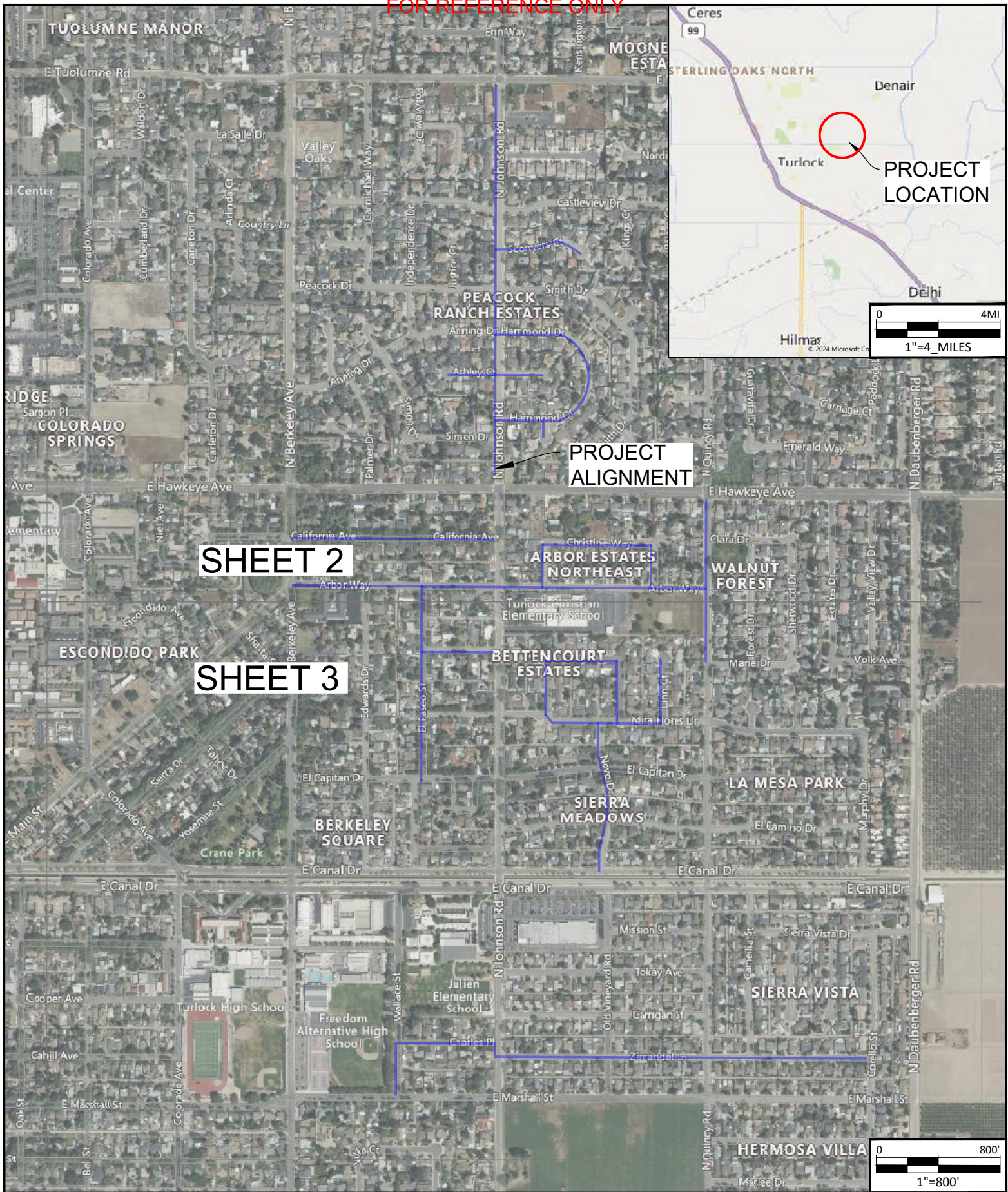
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May 8, 2025

FIGURES

Figures 1 – Vicinity Map

Figures 2 – Exploration Maps

FOR REFERENCE ONLY



NORTH

Source:

Basemap: AutoCAD Civil3D Geolocation Tool, using Bing Maps



TURLOCK PAVEMENT
REHABILITATION
LOCATION 3

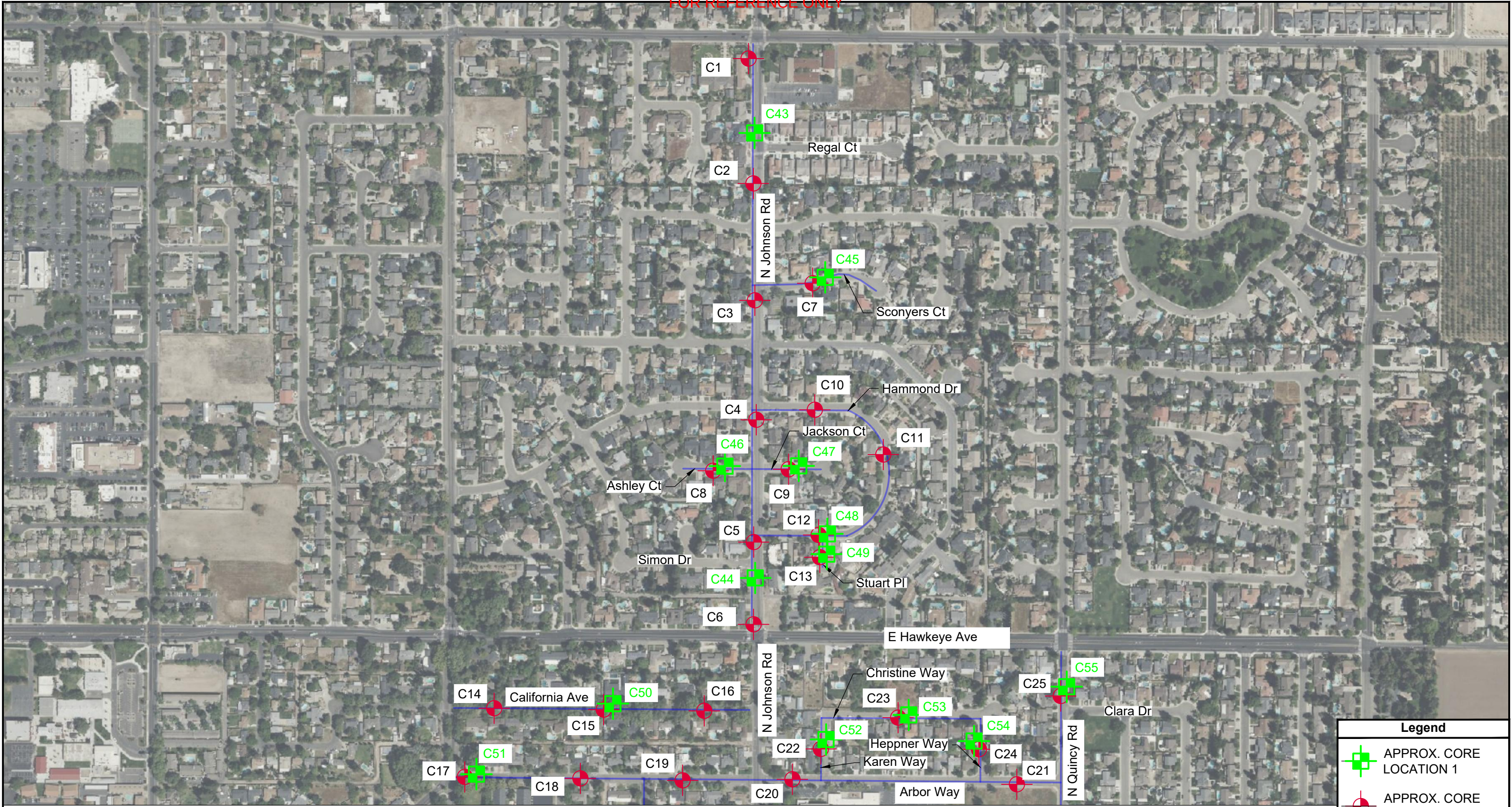
TURLOCK, CA

Figure 1

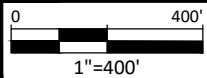
Vicinity
Map

Prj. No: 23-931.3
Date: 06/04/2024

FOR REFERENCE ONLY



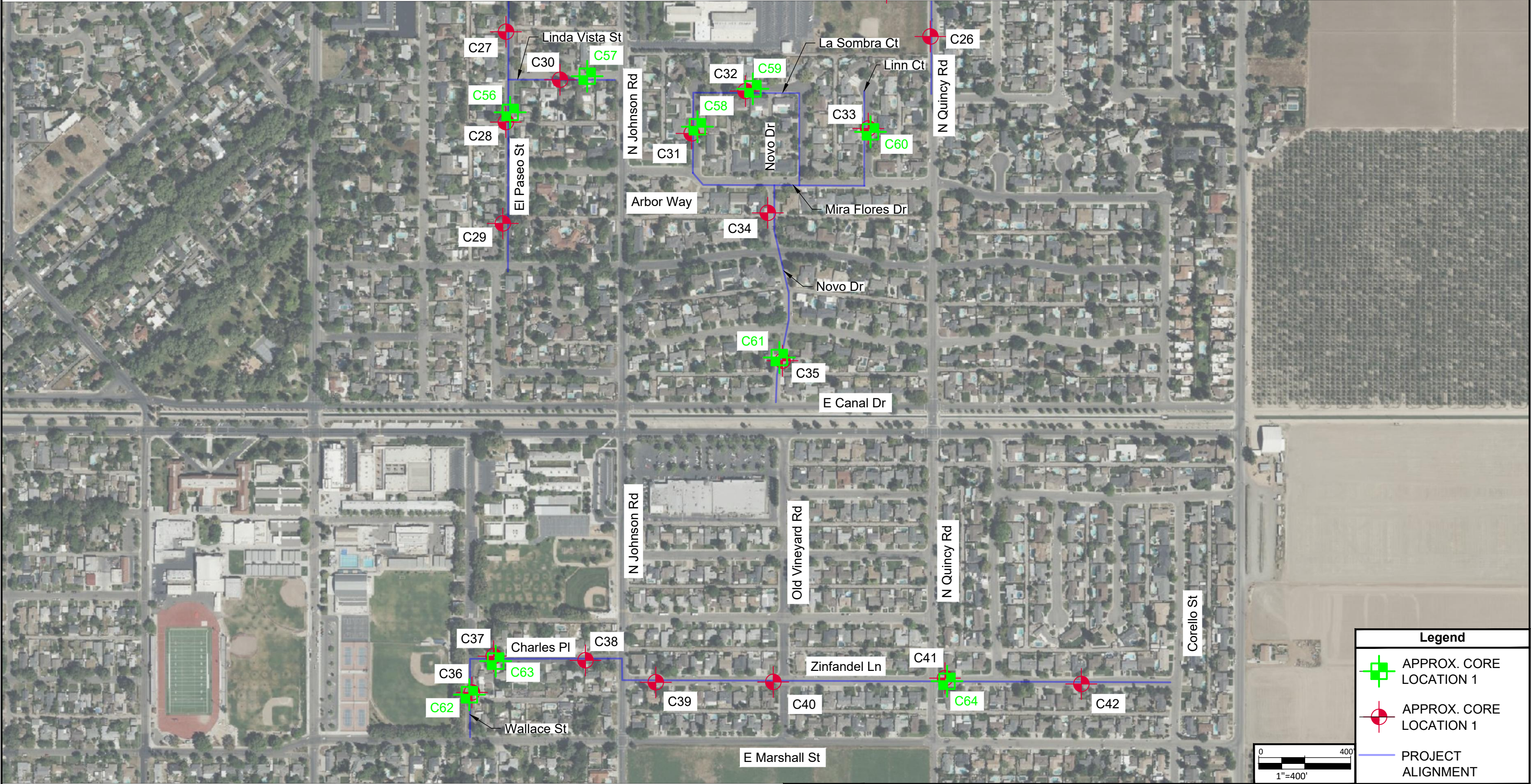
MATCHLINE- SEE SHEET 2 EXPLORATION MAP



Legend	
	APPROX. CORE LOCATION 1
	APPROX. CORE LOCATION 1
	PROJECT ALIGNMENT

 NORTH	Source: Basemap: AutoCAD Civil3D Geolocation Tool, using Bing Maps	 Crawford & Associates, Inc. Geotechnical Engineering, Design and Construction Services	TURLOCK PAVEMENT REHABILITATION LOCATION 1 & 3	Figure 2 Exploration Map 1 of 2
			TURLOCK, CA	

MATCHLINE- SEE SHEET 1 EXPLORATION MAP



Source:
Basemap: AutoCAD Civil3D Geolocation Tool, using
Bing Maps



TURLOCK PAVEMENT
REHABILITATION
LOCATION 1 & 3

TURLOCK, CA

Figure 2
Exploration
Map 2 of 2

Prj. No: 23-931.3
Date: 07/04/2024

FINAL PAVEMENT REPORT

Turlock Pavement Rehabilitation – Location 1
Turlock, California

Crawford

File: 23-931.3
May 8, 2025

APPENDIX A

Core Logs

PAVEMENT REPORT

Turlock Pavement Rehabilitation – Location 1
Turlock, California

Crawford & Associates, Inc.

File: 23-931.3

Core No.	AC (in)	AB (in)	Subgrade	Additional Notes	Photo
C-1	2.5	4.5	Silty Sand (SM)		
C-2	2	4	Silty Sand (SM)		

PAVEMENT REPORT

Turlock Pavement Rehabilitation – Location 1
Turlock, California

Crawford & Associates, Inc.

File: 23-931.3

Core No.	AC (in)	AB (in)	Subgrade	Additional Notes	Photo
C-3	2	4	Silty Sand (SM)		
C-4	2	6	Silty Sand (SM)		

PAVEMENT REPORT

Turlock Pavement Rehabilitation – Location 1
Turlock, California

Crawford & Associates, Inc.

File: 23-931.3

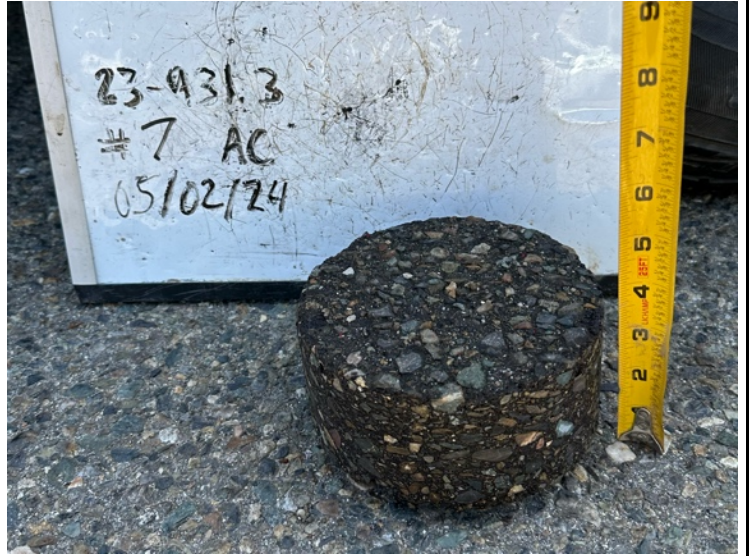
Core No.	AC (in)	AB (in)	Subgrade	Additional Notes	Photo
C-5	2.5	6	Silt with SAND (ML)		
C-6	2	4	Sandy Silt (ML)		

PAVEMENT REPORT

Turlock Pavement Rehabilitation – Location 1
Turlock, California

Crawford & Associates, Inc.

File: 23-931.3

Core No.	AC (in)	AB (in)	Subgrade	Additional Notes	Photo
C-7	3	4.5	Silty SAND (SM)		
C-8	2	4	Silty SAND (SM)		

PAVEMENT REPORT

Turlock Pavement Rehabilitation – Location 1
Turlock, California

Crawford & Associates, Inc.

File: 23-931.3

Core No.	AC (in)	AB (in)	Subgrade	Additional Notes	Photo
C-9	2	6.5	Silt with SAND (ML)		
C-10	2.5	4.5	Silt with SAND (ML)		

PAVEMENT REPORT

Turlock Pavement Rehabilitation – Location 1
Turlock, California

Crawford & Associates, Inc.

File: 23-931.3

Core No.	AC (in)	AB (in)	Subgrade	Additional Notes	Photo
C-11	3	6	Silt with SAND (ML)		
C-12	2	6	Silt with SAND (ML)		

PAVEMENT REPORT

Turlock Pavement Rehabilitation – Location 1
 Turlock, California

Crawford & Associates, Inc.

File: 23-931.3

Core No.	AC (in)	AB (in)	Subgrade	Additional Notes	Photo
C-13	2.5	4.5	Silt with SAND (ML)		
C-14	4	---	Silt with SAND (ML)		

PAVEMENT REPORT

Turlock Pavement Rehabilitation – Location 1
Turlock, California

Crawford & Associates, Inc.

File: 23-931.3

Core No.	AC (in)	AB (in)	Subgrade	Additional Notes	Photo
C-15	3.5	---	Silt with SAND (ML)		 A photograph of a cylindrical core sample, labeled C-15, which is a light brown, silty material with some sand. The core is placed on a dark, textured surface. To the right of the core is a yellow measuring tape showing inches from 2 to 9. Behind the core is a white label with handwritten text: "23-931.3", "#15 AC", and "5/01/24".
C-16	2.5	4.5	Silt with SAND (ML)		 A photograph of a cylindrical core sample, labeled C-16, which is a dark brown, silty material with some sand. The core is placed on a dark, textured surface. To the right of the core is a yellow measuring tape showing inches from 2 to 8. Behind the core is a white label with handwritten text: "23-931.3", "#16 AC", and "5/01/24".

PAVEMENT REPORT

Turlock Pavement Rehabilitation – Location 1
 Turlock, California

Crawford & Associates, Inc.

File: 23-931.3

Core No.	AC (in)	AB (in)	Subgrade	Additional Notes	Photo
C-17	3	3	Silt with SAND (ML)		
C-18	2	---	Silt with SAND (ML)		

PAVEMENT REPORT

Turlock Pavement Rehabilitation – Location 1
Turlock, California

Crawford & Associates, Inc.

File: 23-931.3

Core No.	AC (in)	AB (in)	Subgrade	Additional Notes	Photo
C-19	2.5	5.5	Silt with SAND (ML)		
C-20	3	3	Sandy Silt (ML)		

PAVEMENT REPORT

Turlock Pavement Rehabilitation – Location 1
Turlock, California

Crawford & Associates, Inc.

File: 23-931.3

Core No.	AC (in)	AB (in)	Subgrade	Additional Notes	Photo
C-21	2	6	Sandy Silt (ML)		
C-22	2.75	4	Sandy Silt (ML)		

PAVEMENT REPORT

Turlock Pavement Rehabilitation – Location 1
Turlock, California

Crawford & Associates, Inc.

File: 23-931.3

Core No.	AC (in)	AB (in)	Subgrade	Additional Notes	Photo
C-23	2	4	Sandy Silt (ML)		
C-24	3	3	Sandy Silt (ML)		

PAVEMENT REPORT

Turlock Pavement Rehabilitation – Location 1
Turlock, California

Crawford & Associates, Inc.

File: 23-931.3

Core No.	AC (in)	AB (in)	Subgrade	Additional Notes	Photo
C-25	2	4	Silt with SAND (ML)		
C-26	4.5	2	Sandy Silt (ML)		

PAVEMENT REPORT

Turlock Pavement Rehabilitation – Location 1
Turlock, California

Crawford & Associates, Inc.

File: 23-931.3

Core No.	AC (in)	AB (in)	Subgrade	Additional Notes	Photo
C-27	6	---	Sandy Silt (ML)		
C-28	5.5	---	Sandy Silt (ML)		

PAVEMENT REPORT

Turlock Pavement Rehabilitation – Location 1
Turlock, California

Crawford & Associates, Inc.

File: 23-931.3

Core No.	AC (in)	AB (in)	Subgrade	Additional Notes	Photo
C-29	8	---	Sandy Silt (ML)		
C-30	3.5	---	Sandy Silt (ML)		

PAVEMENT REPORT

Turlock Pavement Rehabilitation – Location 1
Turlock, California

Crawford & Associates, Inc.

File: 23-931.3

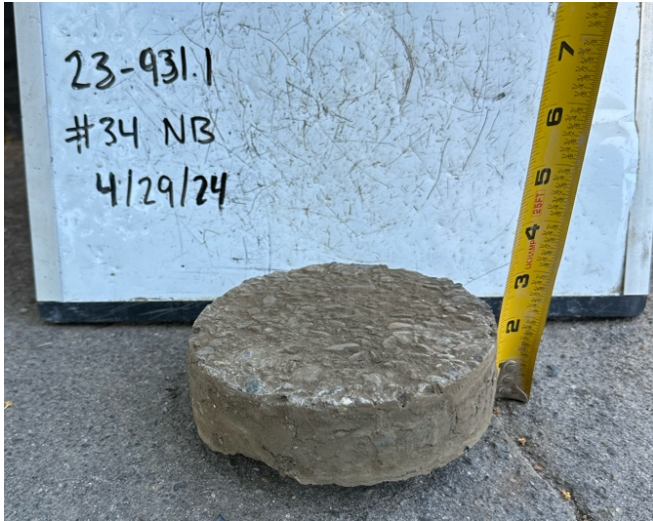
Core No.	AC (in)	AB (in)	Subgrade	Additional Notes	Photo
C-31	3	4	Sandy Silt (ML)		
C-32	3	2	Sandy Silt (ML)		

PAVEMENT REPORT

Turlock Pavement Rehabilitation – Location 1
Turlock, California

Crawford & Associates, Inc.

File: 23-931.3

Core No.	AC (in)	AB (in)	Subgrade	Additional Notes	Photo
C-33	2.5	3.5	Sandy Silt (ML)		
C-34	2	3	Sandy Silt (ML)		

PAVEMENT REPORT

Turlock Pavement Rehabilitation – Location 1
Turlock, California

Crawford & Associates, Inc.

File: 23-931.3

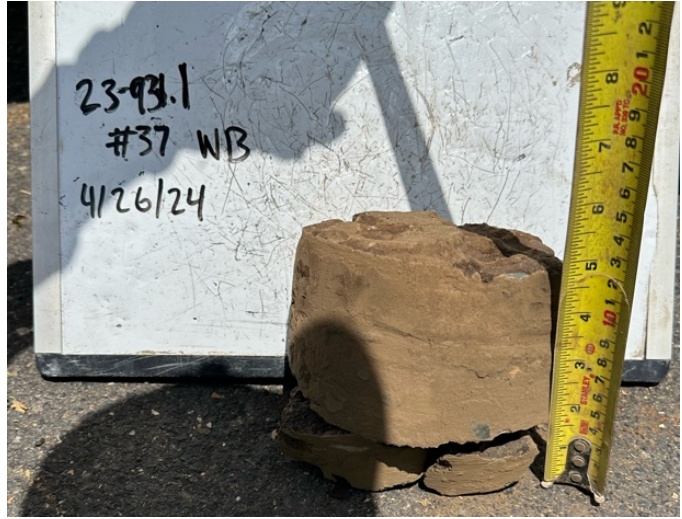
Core No.	AC (in)	AB (in)	Subgrade	Additional Notes	Photo
C-35	1.5	---	Sandy Silt (ML)		
C-36	5.5	---	Sandy Silt (ML)		

PAVEMENT REPORT

Turlock Pavement Rehabilitation – Location 1
Turlock, California

Crawford & Associates, Inc.

File: 23-931.3

Core No.	AC (in)	AB (in)	Subgrade	Additional Notes	Photo
C-37	5	---	Sandy Silt (ML)		
C-38	4	---	Sandy Silt (ML)		

PAVEMENT REPORT

Turlock Pavement Rehabilitation – Location 1
 Turlock, California

Crawford & Associates, Inc.

File: 23-931.3

Core No.	AC (in)	AB (in)	Subgrade	Additional Notes	Photo
C-39	1	2	Silt with SAND (ML)		
C-40	2	2	Silt with SAND (ML)		

PAVEMENT REPORT

Turlock Pavement Rehabilitation – Location 1
 Turlock, California

Crawford & Associates, Inc.

File: 23-931.3

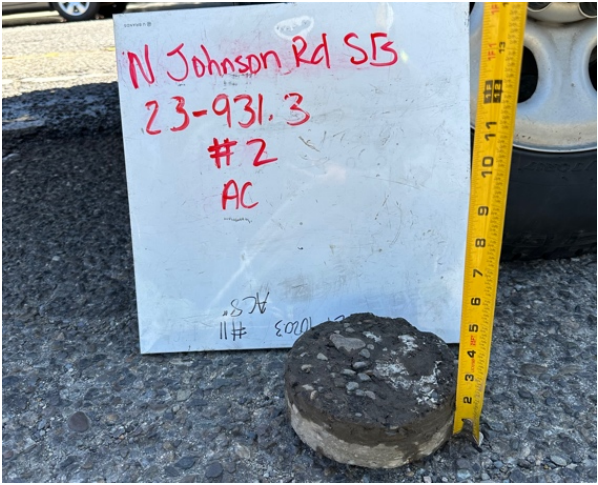
Core No.	AC (in)	AB (in)	Subgrade	Additional Notes	Photo
C-41	2.5	1.5	SANDY Silt (ML)		
C-42	2	3	Silt with SAND (ML)		

PAVEMENT REPORT

Turlock Pavement Rehabilitation – Location 1
Turlock, California

Crawford & Associates, Inc.

File: 23-931.3

Core No.	AC (in)	AB (in)	Subgrade	Additional Notes	Photo
C-43	2	-	Silty SAND (ML)		
C-44	2	5	Silty SAND (ML)		

PAVEMENT REPORT

Turlock Pavement Rehabilitation – Location 1
Turlock, California

Crawford & Associates, Inc.

File: 23-931.3

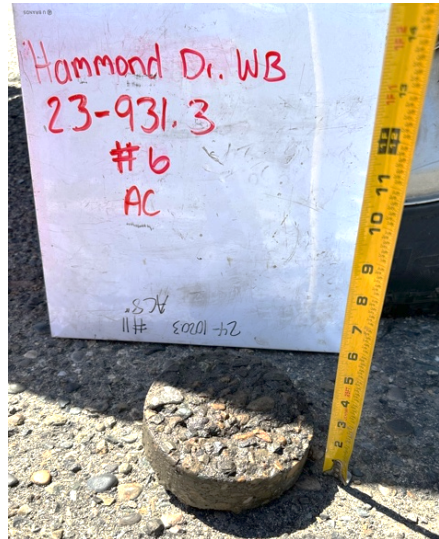
Core No.	AC (in)	AB (in)	Subgrade	Additional Notes	Photo
C-45	2	5	Silty SAND (ML)		
C-46	1.5	5.5	Silty SAND (ML)		

PAVEMENT REPORT

Turlock Pavement Rehabilitation – Location 1
Turlock, California

Crawford & Associates, Inc.

File: 23-931.3

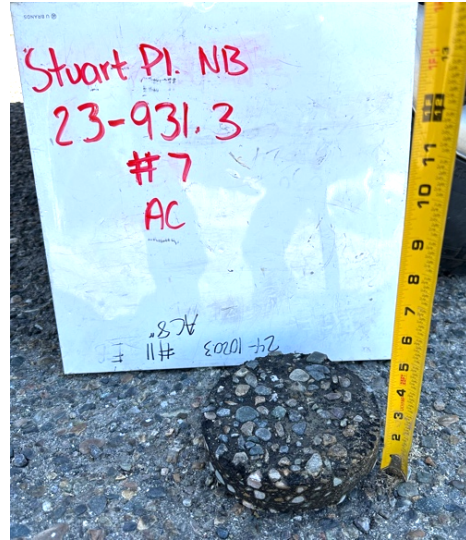
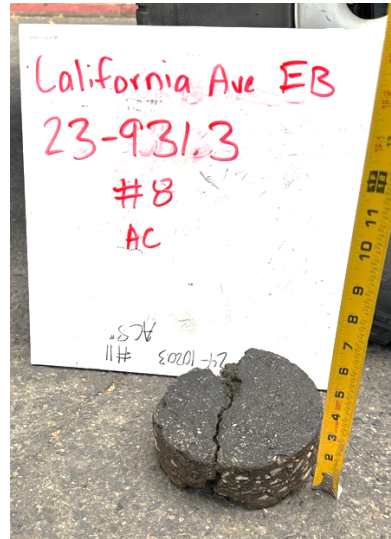
Core No.	AC (in)	AB (in)	Subgrade	Additional Notes	Photo
C-47	2	5.5	Silt with SAND (ML)		
C-48	2	6.5	Sandy SILT (ML)		

PAVEMENT REPORT

Turlock Pavement Rehabilitation – Location 1
Turlock, California

Crawford & Associates, Inc.

File: 23-931.3

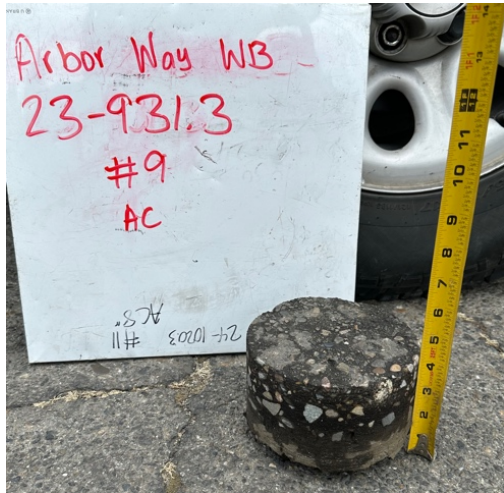
Core No.	AC (in)	AB (in)	Subgrade	Additional Notes	Photo
C-49	1.5	6.5	Silty SAND (ML)		
C-50	2	4	Silty SAND (ML)		

PAVEMENT REPORT

Turlock Pavement Rehabilitation – Location 1
Turlock, California

Crawford & Associates, Inc.

File: 23-931.3

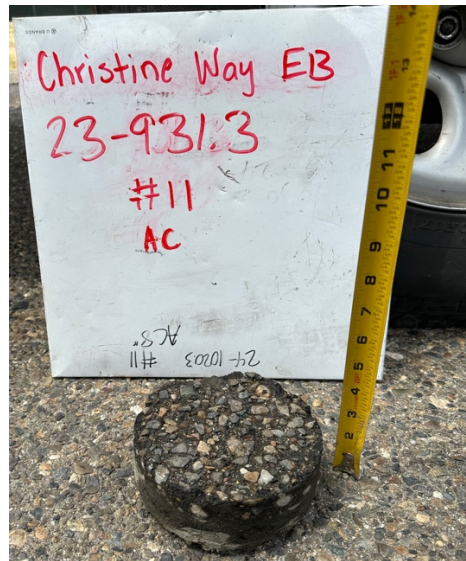
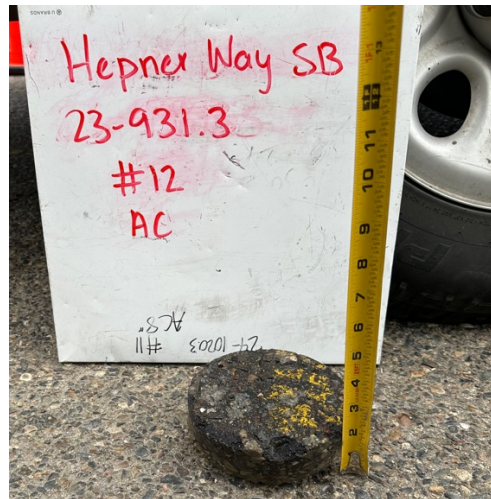
Core No.	AC (in)	AB (in)	Subgrade	Additional Notes	Photo
C-51	1	-	Silt with SAND (ML)	2.5" of oil road	
C-52	2	3	Silt with SAND (ML)		

PAVEMENT REPORT

Turlock Pavement Rehabilitation – Location 1
Turlock, California

Crawford & Associates, Inc.

File: 23-931.3

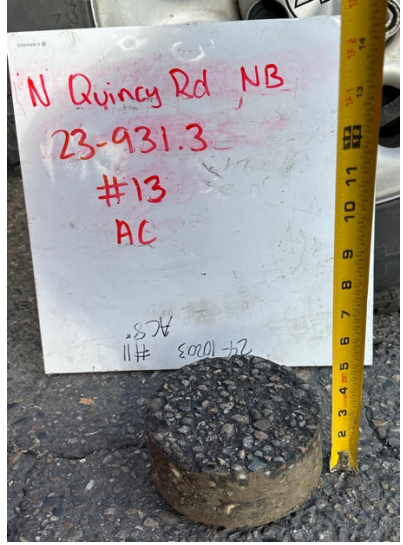
Core No.	AC (in)	AB (in)	Subgrade	Additional Notes	Photo
C-53	2	3.5	Silt with SAND (ML)		
C-54	1.5	5.5	Silt with SAND (ML)		

PAVEMENT REPORT

Turlock Pavement Rehabilitation – Location 1
Turlock, California

Crawford & Associates, Inc.

File: 23-931.3

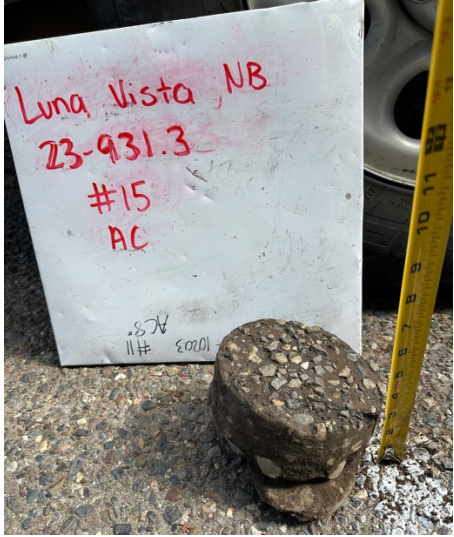
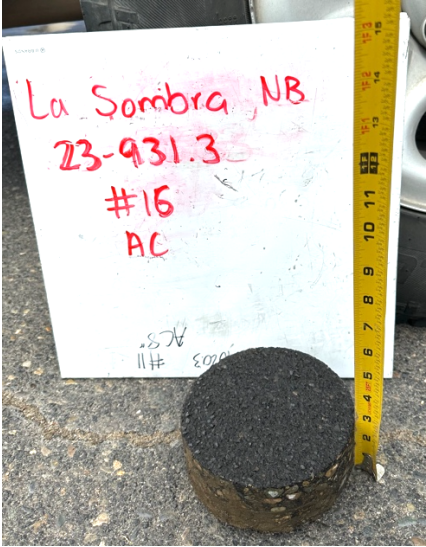
Core No.	AC (in)	AB (in)	Subgrade	Additional Notes	Photo
C-55	2	4	Silt with SAND (ML)		
C-56	2		Silt with SAND (ML)	5" of oil road	

PAVEMENT REPORT

Turlock Pavement Rehabilitation – Location 1
Turlock, California

Crawford & Associates, Inc.

File: 23-931.3

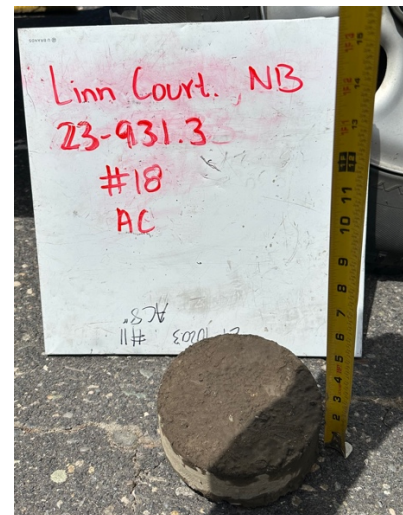
Core No.	AC (in)	AB (in)	Subgrade	Additional Notes	Photo
C-57	1.5	-	Silt with SAND (ML)	3.5" of oil road	
C-58	2	6	Silt with SAND (ML)		

PAVEMENT REPORT

Turlock Pavement Rehabilitation – Location 1
Turlock, California

Crawford & Associates, Inc.

File: 23-931.3

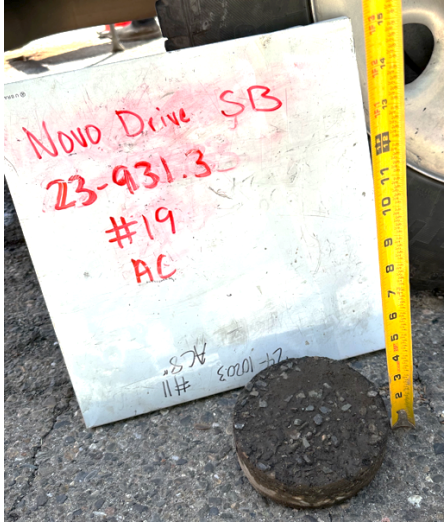
Core No.	AC (in)	AB (in)	Subgrade	Additional Notes	Photo
C-59	2	8	Silt with SAND (ML)		
C-60	2	4	Silt with SAND (ML)		

PAVEMENT REPORT

Turlock Pavement Rehabilitation – Location 1
Turlock, California

Crawford & Associates, Inc.

File: 23-931.3

Core No.	AC (in)	AB (in)	Subgrade	Additional Notes	Photo
C-61	2	5	Silt with SAND (ML)		
C-62	4	-	Sandy SILT (ML)	3" of oil road	

PAVEMENT REPORT

Turlock Pavement Rehabilitation – Location 1
Turlock, California

Crawford & Associates, Inc.

File: 23-931.3

Core No.	AC (in)	AB (in)	Subgrade	Additional Notes	Photo
C-63 (Says #20 but correct location is #21)	1.5	-	Sandy SILT (ML)	3.25" of oil road	
C-64	1.5	5.5	Sandy SILT (ML)		

FINAL PAVEMENT REPORT

Turlock Pavement Rehabilitation – Location 1
Turlock, California

Crawford

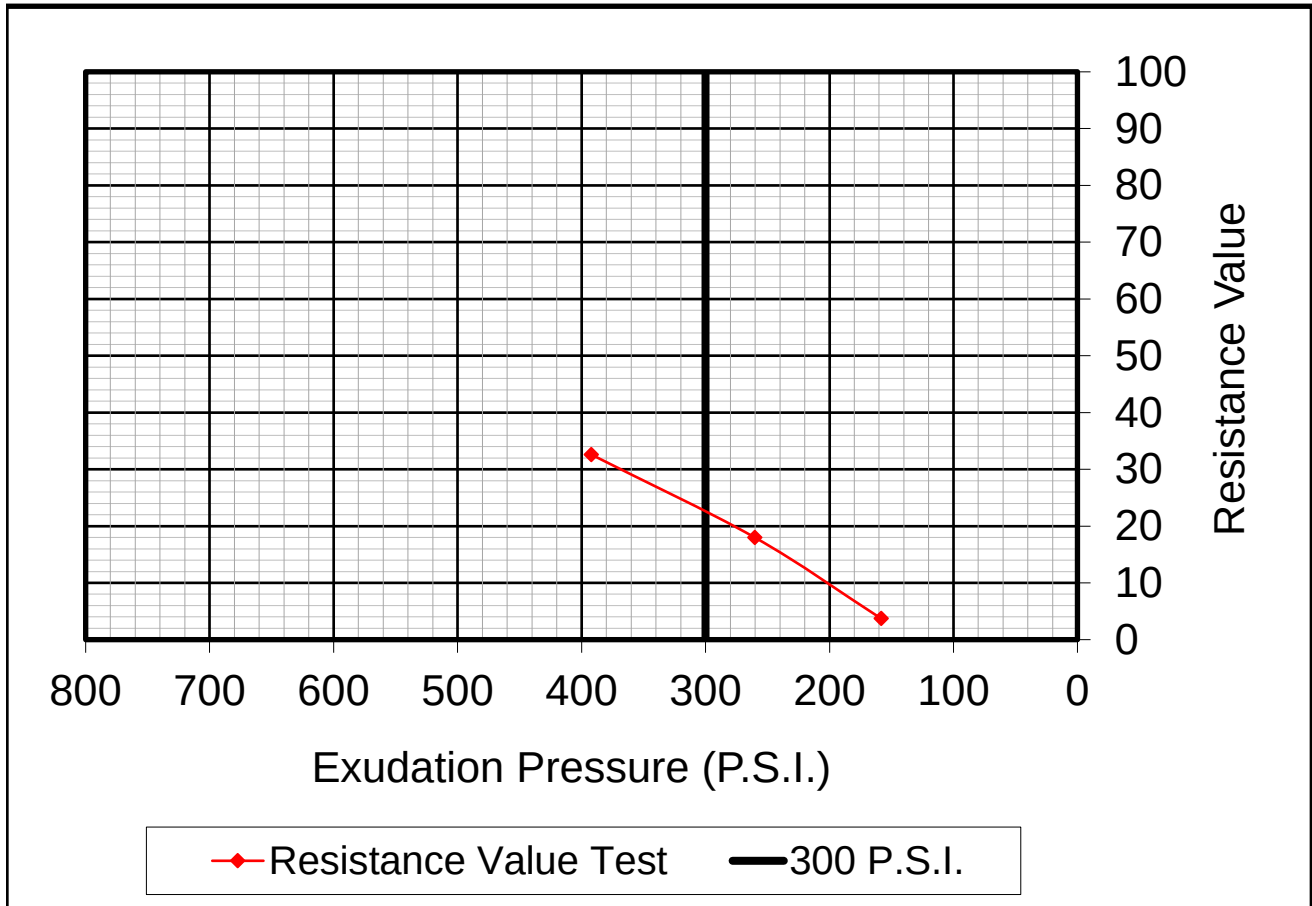
File: 23-931.3
May 8, 2025

APPENDIX B

Laboratory Test Results

RESISTANCE (R) VALUE TEST
California Test 301

Laboratory No.: L241037
 Project No.: 240017 (Crawford & Associates Project: 23-931.3)
 Sample Date: April 26, 2024
 Report Date: May 20, 2024
 Client: Crawford & Associates, Inc.
 Project Name: 2024 Laboratory Testing - Turlock Pavement Rehabilitation
 Sample Description: Brown Clayey Silt
 Sample Location: C41 @ 4"-34"



Specimen No.	1	2	3
Moisture Content (%)	22.4	21.3	22.9
Dry Density (PCF)	110.7	112.6	110.1
Resistance Value (R)	18	33	4
Exudation Pressure (PSI)	260	392	158
Expansion Pressure	22	52	0
As Received Moisture Content (%)	22.4		

RESISTANCE VALUE AT 300 P.S.I. 23

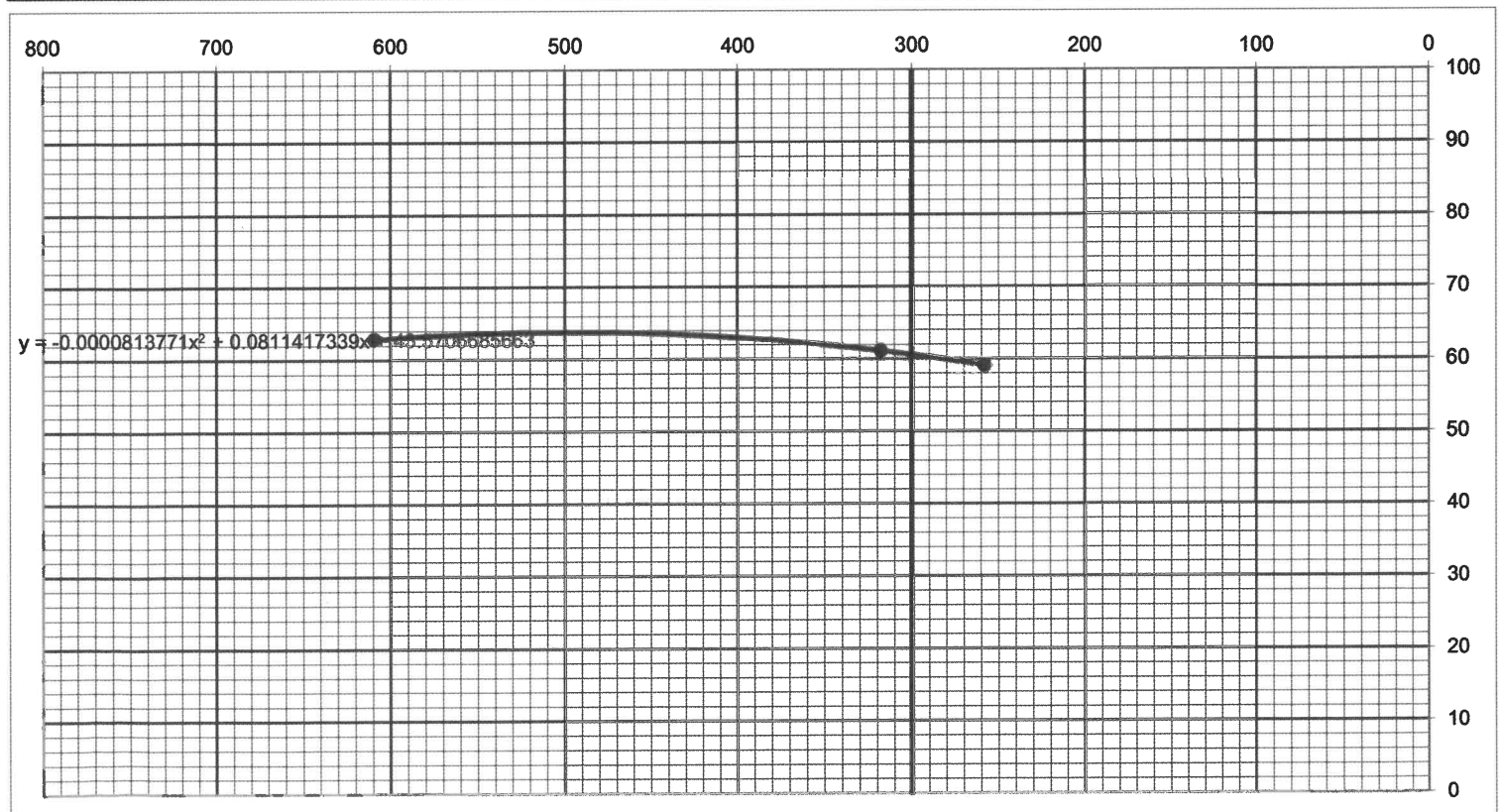


Reviewed By: _____

Brandon Rodebaugh
 Materials Engineer

FOR REFERENCE ONLY
RESISTANCE VALUE
 California Test Method No. 301

Job Number:	23-931.3	Date Tested:	5/24/2024	R-value:	60
Project:	Turlock Pavement Rahab			Sample :	C30
Classification of Material:	Sm, Silty Sand , Brown			Technician: D.S.	
Initial Sample Weight	1100	1100	1100		
Mold Number	D	F	E		
Air Pressure-PSI	100	75	60		
Initial Moisture %	5.2	5.2	5.2		
Water Added ml/g	50	55	60		
Water Added %	4.8	5.3	5.7		
Final Moist %	10.0	10.5	11.0		
Soil + Mold Weight-Grams	3203.5	3197.3	3162.8		
Mold Weight-Grams	2073	2067	2029		
Soil Weight-Grams	1130.5	1130.3	1133.8		
Height of Sample-Inches	2.55	2.55	2.54		
Density-PCF	122.1	121.6	121.9		
Dial Reading (x.0001 inches)	91	96	107		
Expansion Pressure (psf)	394	416	463		
Stabilometer at 1000 lbs.	24	26	28		
2000 lbs.	42	44	46		
Displacement	4.16	4.19	4.29		
Exudation Pressure-Lbs	7650	3990	3240		
Exudation-PSI	609	318	258		
R-Value Calculated	63	61	59		
Corrected R-Value	63	61	59		



FOR REFERENCE ONLY
RESISTANCE VALUE
 California Test Method No. 301

Job Number:	23-931.3	Date Tested:	5/24/2024	R-value:	49
Project:	Turlock Pavement Rahab			Sample :	C5
Classification of Material:	Sm, Silty Sand , Brown			Technician:	D.S.
Initial Sample Weight	1105	1100	1100		
Mold Number	A	B	C		
Air Pressure-PSI	100	75	50		
Initial Moisture %	5.4	5.4	5.4		
Water Added ml/g	55	57	60		
Water Added %	5.2	5.5	5.7		
Final Moist %	10.6	10.8	11.1		
Soil + Mold Weight-Grams	3218.9	3212.4	3211.1		
Mold Weight-Grams	2086	2085	2083		
Soil Weight-Grams	1132.9	1127.4	1128.1		
Height of Sample-Inches	2.48	2.49	2.47		
Density-PCF	125.1	123.8	124.5		
Dial Reading (x.0001 inches)	78	89	99		
Expansion Pressure (psf)	338	385	429		
Stabilometer at 1000 lbs.	30	31	33		
2000 lbs.	49	54	60		
Displacement	4.88	4.91	4.98		
Exudation Pressure-Lbs	7650	3990	3240		
Exudation-PSI	609	318	258		
R-Value Calculated	54	50	46		
Corrected R-Value	54	50	46		

