

- Proposed Reconstruction Segments
- West Columbia City Limits





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**To:** Debbie Sutherland, City Manager (City of West Columbia)  
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**Cc:** Ashish Ghosh, P.E., Jim Webb, AICP, ENV SP (The Goodman Corporation)

**From:** Kirk Myers, EIT (The Goodman Corporation)

**Date:** October 21, 2022

**Re:** Roadway State of Good Repair – Pavement Assessment Report

## Background

The City of West Columbia (City) engaged The Goodman Corporation (TGC) with a contract to conduct a roadway pavement conditions inventory to develop a rehabilitation opinion of probable costs for FY 2024 federal funding application purposes. Task 1 of the contract consists of an assessment of pavement conditions. This work included a field investigation performed October 12, 2022, on approximately 50 lane-miles of local streets, and subsequent analysis of data collected in accordance with Texas Department of Transportation (TxDOT) pavement management and asset management procedures.<sup>1</sup>

The following pages provide the details on road conditions data collected, user and rehabilitation costs comparison, and additional information to aid the City in determining the priority of roadways for reconstruction or repair. The TGC analysis includes a map of the local, or off-system (non-TxDOT), roads by condition category within city limits (see Figure 1 on the following page) and a table summarizing rehabilitation costs and estimated public benefits from an improved state of good repair for City decision making, provided in Life Cycle Planning section on pages 4-6.

The purpose of this report is to obtain a decision by the City on the selection of roadway segments for inclusion in a reconstruction project for application for funding assistance. According to the contract, the scope of the reconstruction project will be limited to 10 total miles of roadway. TGC will use the identified roadway segments to develop the scope, budget, and conceptual design in the subsequent Task 2.

The recommendation from this report is to select up to 10 lane-miles of the segments identified as in poor condition in Appendix 1 that are not already programmed for rehabilitation to proceed with conceptual design (Task 2) and preparation of the application for funding (Task 3).

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<sup>1</sup> The TxDOT documents referenced by this pavement assessment report are the Pavement Management Information System Rater's Manual for Fiscal Year 2016 and the Texas Transportation Asset Management Plan (2020).

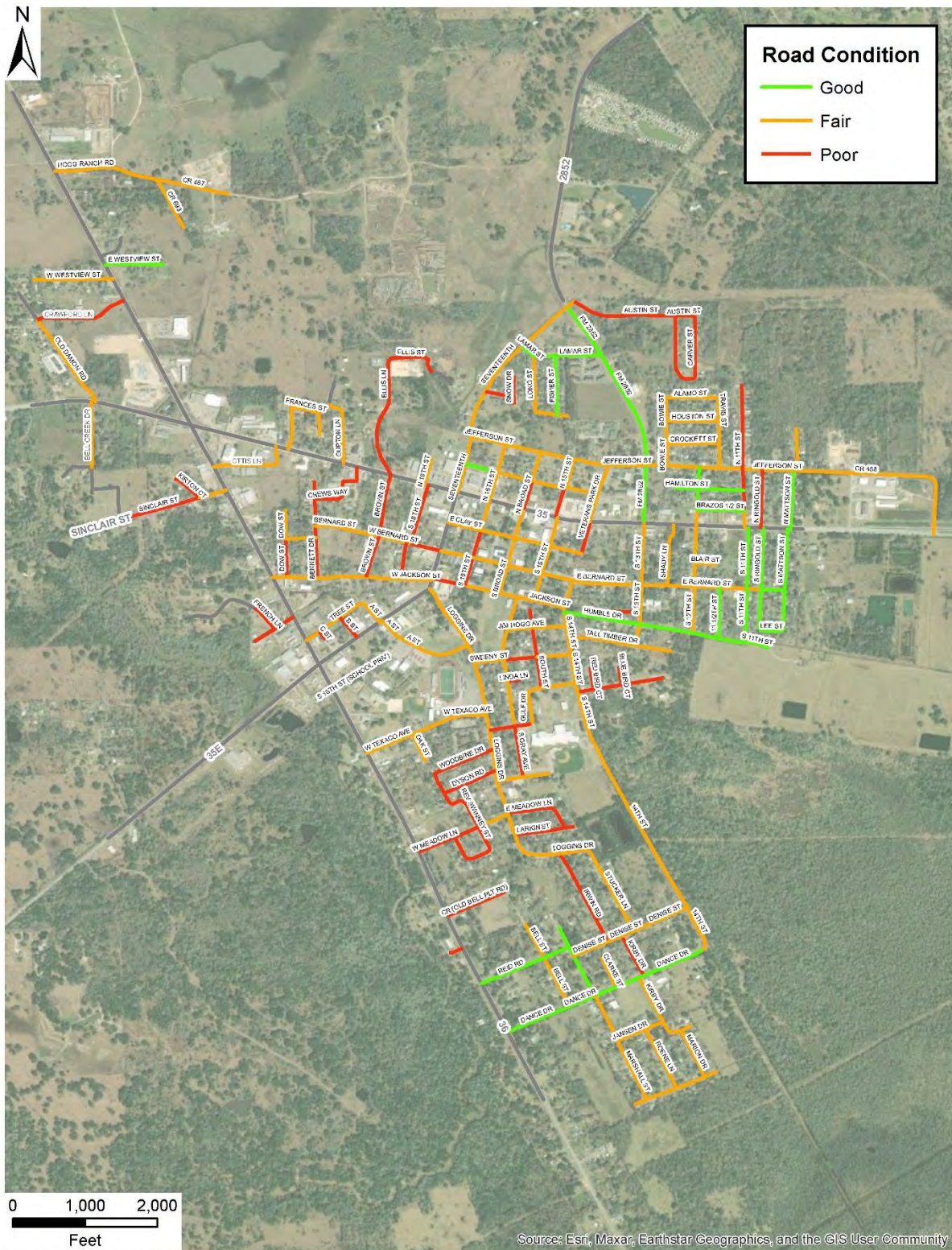


Figure 1: West Columbia Pavement Evaluation Findings Map

### Field Investigation Findings

The roadway inventory was limited to the off-system network, which consists of only local streets and no TxDOT-maintained roads. Based on TxDOT data and verified by field observations, the City’s local street network contains approximately 51 lane-miles of predominantly asphalt concrete pavement. The on-system roads that were not included in this assessment are the following:

- Jimmy Phillips Blvd, W Brazos Ave, and S 17<sup>th</sup> St (SR 35)
- N Columbia Dr and S Columbia Dr (SR 36)

The conditions of the pavement of the City’s streets were determined using a visual condition survey.<sup>2</sup> The network was broken down into segments by block, as detailed in the Pavement Conditions Inventory in Appendix 1. For the purposes of this inventory, the TxDOT condition classification system was simplified to three qualitative categories: good, fair, and poor. Each street segment was classified one of the three ratings according to observed distress and ride characteristics. Types of distress, or defects, typical for asphalt pavement include rutting, potholes, and cracking. The severity and frequency of pavement distresses will determine the roughness of the pavement, which refers to its ride quality, or how hard it is on vehicles traversing the roadway. A good ride quality means the road has smooth pavement with little to no defects. Fair condition refers to pavement with some defects but not to the point that seriously impacts ride quality. A rating of poor means the ride quality is significantly compromised by continuous defects and/or pavement failures.

The City’s street network state of repair compares favorably to TxDOT average off-system conditions. Of the 51 lane-miles of local streets in the City, 16% (8 lane-miles) are in good condition, 58% (30 lane-miles) are in fair condition, and 26% (13 lane-miles) are in poor condition. As shown in Figure 2, both good and fair condition percentages exceed the state average, while the poor condition percentage is lower than the state average. However, the current conditions of the City’s roads do not meet Federal Highway Administration (FHWA) pavement performance targets.

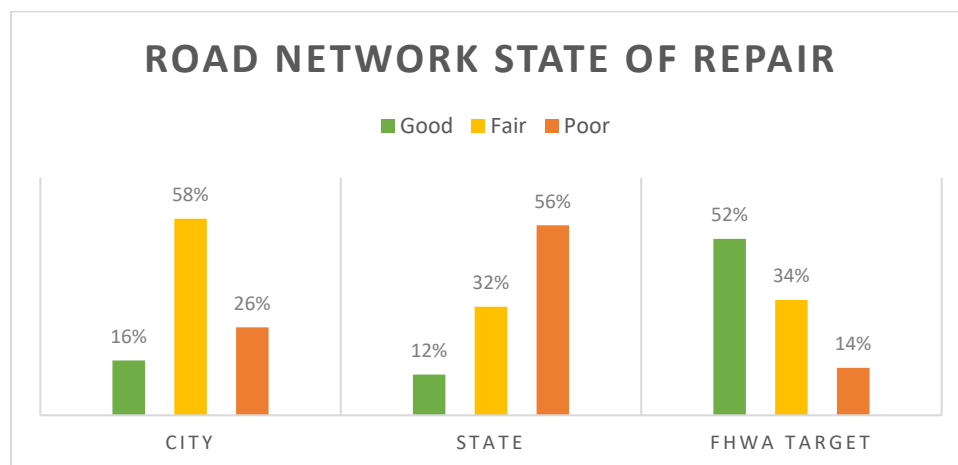


Figure 2: Comparison of City, State, and FHWA Target States of Repair

<sup>2</sup> Conditions of intersections were also observed and generally align with the by-segment pavement conditions noted in Appendix 1.

### Life Cycle Planning

The TxDOT asset management plan provides three basic strategies for pavement management. Generally, any new or good condition pavement can be maintained through preventive maintenance or light rehabilitation approximately every five years. Pavements in fair condition require light to medium rehabilitation to bring back to good condition. Poor or failed pavements require heavy rehabilitation or reconstruction to restore to good condition. As shown in Figure 3, each approach carries a progressively higher cost that may be somewhat offset by a deferment of several years. Many factors impact the rate of deterioration of any segment of pavement, including average and peak traffic volumes, truck or heavy vehicle percentages, quality of construction, and weather conditions. The City’s life cycle planning process for its road network should therefore incorporate routine pavement evaluations to monitor each segment’s life cycle and update the priority listing for rehabilitation or reconstruction as appropriate.

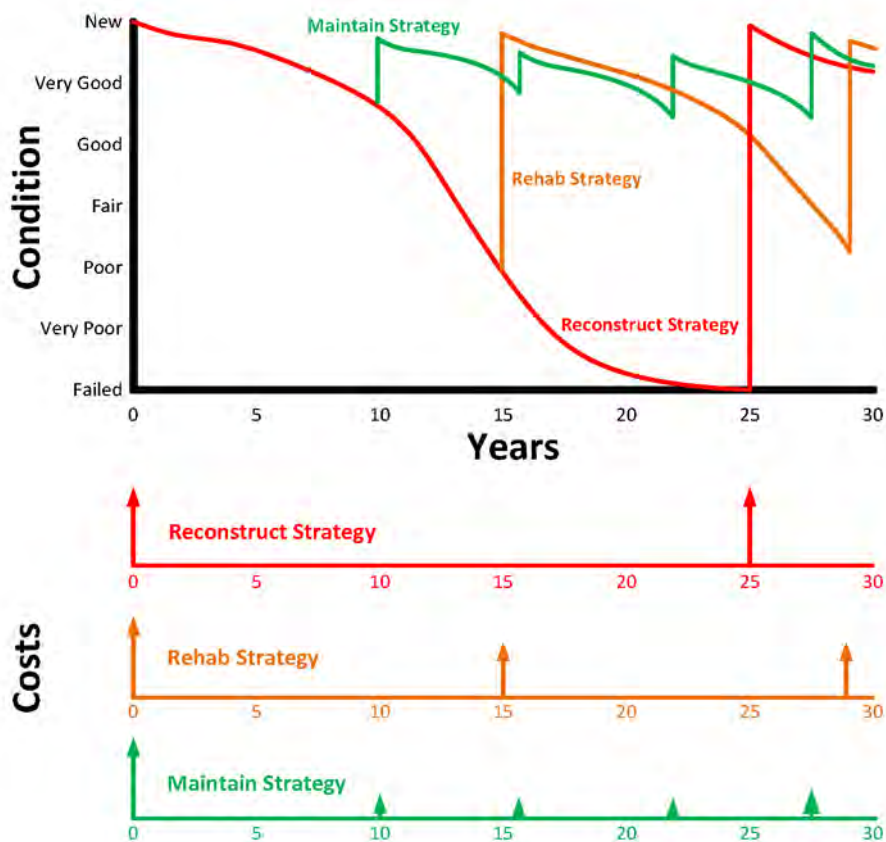


Figure 3: TxDOT Life Cycle Strategies

Treatment level will determine the cost of rehabilitating any pavement. The treatment level is in turn dependent on the current condition of the pavement, which is influenced by the factors mentioned above. Generally, preventive maintenance is the lowest-cost treatment, but is intended as a preventive maintenance method only. It mainly consists of spot repairs, chip and seal, and mill and overlay work up to 2” thick. Light or medium rehabilitation is used for more extensive milling and inlays or overlays up to 6” thick. These are effective treatments for pavements in fair condition where the subgrade has not been compromised. Poor condition or failed pavements typically need full-depth reconstruction or heavy

rehabilitation to repair the damage to subsurface layers. This work generally consists of overlays greater than 6” and other full-depth reclamation.

Typical treatment unit costs per lane-mile are available in the TxDOT Asset Management Plan. For asphalt pavement, which comprises 98% of the City’s network, the costs for each treatment are shown in Figure 4. The per lane-mile costs are based on inflated dollar amounts from TxDOT per lane-mile unit costs.<sup>3</sup> The figure summarizes total treatment costs for the City based on the asset management strategy previously covered. The strategy entails conducting light rehabilitation on pavements that are in good condition, between medium rehabilitation for those in fair condition, and heavy rehabilitation, or reconstruction, for the segments in poor condition.<sup>4</sup>

Treatment Type	Cost per Lane-mile	Condition Group	No. Lane-miles	Treatment Costs
Light Rehabilitation	\$269,800	Good	8.29	\$2,240,000
Medium Rehabilitation	\$361,100	Fair	29.77	\$10,750,000
Heavy Rehabilitation	\$574,600	Poor	13.31	\$7,650,000

Figure 4: Treatment Costs Table

A key public benefit of roadway reconstruction is the reduction of total vehicle operating and maintenance costs for all users on assessed road segments. Based on academic, peer-reviewed research conducted on the effects of pavement conditions on vehicle operating costs, TGC developed a software model that uses vehicle type, road classification, and pavement roughness indices developed as described earlier to estimate total operating and maintenance costs due to users driving on pavement that is in less than good condition. The model assumes continued degradation of conditions of pavement according to the life cycle curve shown in Figure 3. The model inputs include roadway length, average annual daily traffic, percent truck traffic, and evaluated pavement conditions. The output of the model is estimated annual vehicle operating costs for each stage of the evaluated pavement’s remaining life cycle.

A basic benefit-cost analysis of treatment costs and vehicle operating benefits provides a simple way to evaluate need for each condition group. For the purpose of this analysis, a generic daily traffic count of 500 and truck percentage of 2% were used with a classification designation of Collector for each group.<sup>5</sup> The results, shown in Figure 5, demonstrate how avoiding the escalation of vehicle operating costs over time and worsening pavement conditions can offset a portion of the costs of rehabilitating the pavement.

The benefit-cost ratios for treatment of each condition group suggest that the best value is in rehabilitating the roadways that are in poor condition. This aligns generally with the TxDOT strategy and

<sup>3</sup> An inflation factor of 22% was used based on data available from the Bureau of Labor Statistics at [https://www.bls.gov/data/inflation\\_calculator.htm](https://www.bls.gov/data/inflation_calculator.htm).

<sup>4</sup> Based on the typical asphalt pavement life cycle of 30 years, the quantity of lane-miles inventoried within each condition group may be valid for approximately five years. After that period, another field evaluation should be conducted to update the City’s inventory. Any road construction or resurfacing performed subsequent to this report will require appropriate revisions to the inventory to keep it current.

<sup>5</sup> The generic traffic count was estimated based on an average of available count data on the TxDOT Traffic Viewer ([https://txdot.public.ms2soft.com/TDMS.UI\\_Core/trafficviewer](https://txdot.public.ms2soft.com/TDMS.UI_Core/trafficviewer)).

FHWA targets in that the priority projects are those that return poor condition pavement to a good state of repair.

Condition Group	Lane-miles	Treatment Costs	Operating Benefits	Benefit-Cost Ratio
Good	8.29	\$2,240,000	\$177,315	0.079
Fair	29.77	\$10,750,000	\$1,394,365	0.130
Poor	13.31	\$7,650,000	\$1,130,050	0.148

Figure 5: Pavement Treatment Benefit-Cost

Based on TGC’s findings as shown in Figures 4 and 5, a reconstruction project targeted for \$3 million will rehabilitate approximately five lane-miles of poor condition pavement. The estimated net vehicle operating costs due to poor pavement conditions on those five lane-miles are \$443,000. This dollar amount represents the public cost differential between deferring appropriate rehabilitation until the pavement reaches the end of its life cycle in approximately 10 years and reconstructing it now. This differential is the operating benefit of a reconstruction project. The linear relationship between treatment costs and operating benefits permits the City to scale the project to meet any funding target and swap out any roadway segments within the poor condition group.

The analysis resulting in the benefit-cost ratios shown in Figure 5 and the data provided in Appendix 1 are intended to serve as decision-making tools for the City in determining which roadway segments will be prioritized for reconstruction. Part of this decision making includes consideration of programmed rehabilitation projects, which for the City consists of repaving requests submitted to the County. The repaving may address the worst conditions on these road segments and bring them up to at least fair condition, so may warrant a lower priority. The roadway segments observed in poor condition benefitting from this repaving total approximately 1.5 lane-miles. Other segments of poor condition roadways up to that total may be substituted for these in the selected reconstruction project.

Name	Extents (ft)	From	To
S 15 <sup>th</sup> St	130'	Church of Christ	E Jackson St
S 14 <sup>th</sup> St	600'	E Bernard St	Jim Hogg Ave
South St	250'	End	Jim Hogg Ave
Woodbine Dr	30'	Approach	Loggins Dr
Dyson Rd	30'	Approach	Loggins Dr
S Gray Ave	65'	Texaco St	Elementary School
Mockingbird Dr	150'	Blue Bird Ct	Approach
Red Bird Ct	175'	Approach	Mockingbird Dr
Red Bird Ct	80'	Cul de sac	N/A
Blue Bird Ct	150'	Approach	Mockingbird Dr
Blue Bird Ct	80'	Cul de sac	N/A

Figure 6: County Repaving Requested by City

Appendix 1 – Pavement Conditions Inventory

Street Name	Segment Length (Ft.)	Condition	Intersect Street 1	Intersect Street 2	Pavement Type	TxDOT Route No.
AUSTIN ST	1275.8	Poor	N 17TH ST	WASHINGTON ST	Asphalt	1251899
AUSTIN ST	244.8	Poor	WASHINGTON ST	CARVER ST	Asphalt	1251899
B ST	347.4	Poor	TREE ST	HWY 35 E	Asphalt	
BENNETT DR	257.4	Poor	none	CREWS WAY	Asphalt	1251903
BENNETT DR	367.3	Poor	CREWS WAY	BERNARD ST	Asphalt	1251903
BENNETT DR	163.2	Poor	BERNARD ST	SMITH ST	Asphalt	1251903
BENNETT DR	553.3	Poor	SMITH ST	W JACKSON ST	Asphalt	1251903
BLUE BIRD CT	240.9	Poor	none	MOCKINGBIRD LN	Asphalt	
BROWN ST	853.6	Poor	HWY 35	W BERNARD ST	Asphalt	1251909
BROWN ST	582.2	Poor	W BERNARD ST	W JACKSON ST	Asphalt	1251909
C ST	123.5	Poor	TREE ST	none	Asphalt	
CARVER ST	818.3	Poor	AUSTIN ST	WASHINGTON ST	Asphalt	1251911
CR (OLD BELL PLT RD)	772.2	Poor	HWY 36	none	Asphalt	
CRAWFORD LN	1141.6	Poor	OLD DAMON RD	HWY 36	Asphalt	
CREWS WAY	910.9	Poor	BENNETT DR	HWY 35	Asphalt	1251915
DOW ST	524.7	Poor	SMITH ST	W JACKSON ST	Asphalt	1251919
DYSON RD	693.8	Poor	STARFIELD LN	LOGGINS DR	Concrete	1251921
E JACKSON ST	495.9	Poor	none	S 13TH ST	Asphalt	1251924
E MEADOW LN	859.0	Poor	LOGGINS DR	LARKIN ST	Asphalt	1251925
E TEXACO AVE	312.6	Poor	LOGGINS DR	S GRAY AVE	Asphalt	1251926
E TEXACO AVE	197.1	Poor	S GRAY AVE	GULF DR	Asphalt	1251926
ELLIS LN	1719.0	Poor	ELLIS ST	HWY 35	Asphalt	
ELLIS ST	617.0	Poor	ELLIS LN	none	Asphalt	
FRENCH LN	385.7	Poor	none	FRENCH LN	Asphalt	
FRENCH LN	306.6	Poor	none	FRENCH LN	Asphalt	
FRENCH LN	281.2	Poor	FRENCH LN	HWY 36	Asphalt	
IRWIN RD	1345.8	Poor	LOGGINS DR	DENISE ST	Asphalt	1251939
JACKSON ST	406.8	Poor	HWY 35E	S 16TH ST	Asphalt	1251940
KIRBY DR	606.5	Poor	DENISE ST	DANCE DR	Asphalt	1251944
KIRTON CT	403.3	Poor	none	SINCLAIR ST	Asphalt	1251945
LARKIN ST	605.2	Poor	LOGGINS DR	E MEADOW LN	Asphalt	1251947
LARKIN ST	127.9	Poor	E MEADOW LN	none	Asphalt	1251947
LINDA LN	158.9	Poor	S GRAY AVE	none	Asphalt	1251950
MOCKINGBIRD LN	198.4	Poor	S 14TH ST	RED BIRD CT	Asphalt	1251958
MOCKINGBIRD LN	344.2	Poor	RED BIRD CT	BLUE BIRD CT	Asphalt	
MOCKINGBIRD LN	516.6	Poor	BLUE BIRD CT	none	Asphalt	



Street Name	Segment Length (Ft.)	Condition	Intersect Street 1	Intersect Street 2	Pavement Type	TxDOT Route No.
N 11TH ST	1155.2	Poor	none	JEFFERSON ST	Asphalt	1251959
N 11TH ST	296.2	Poor	JEFFERSON ST	HAMILTON ST	Asphalt	1251959
N 11TH ST	280.4	Poor	HAMILTON ST	BRAZOS 1/2 ST	Asphalt	1251959
N 15TH ST	413.2	Poor	HAMILTON ST	HWY 35	Asphalt	1251961
N BROAD ST	399.4	Poor	HAMILTON ST	HWY 35	Asphalt	1251965
N RINGOLD ST	812.8	Poor	JEFFERSON ST	HWY 35	Asphalt	1251967
PAPENDORF LN	177.5	Poor	none	HWY 36	Asphalt	
PREWITT LN	349.2	Poor	SEVENTEENTH	SNOW DR	Asphalt	1251972
RED BIRD CT	300.8	Poor	none	MOCKINGBIRD CT	Asphalt	
REV SWINNEY ST	587.5	Poor	STARFIELD LN	W MEADOW LN	Asphalt	1251975
REV SWINNEY ST	986.7	Poor	W MEADOW LN	W MEADOW LN	Asphalt	
S 14TH ST	450.5	Poor	HWY 35	E CLAY ST	Asphalt	1251982
S 16TH ST	391.7	Poor	E CLAY ST	E BERNARD ST	Asphalt	1251984
S 16TH ST	392.1	Poor	E BERNARD ST	JACKSON ST	Asphalt	1251984
S 18TH ST	837.3	Poor	none	W BERNARD ST	Asphalt	1251985
S 18TH ST	509.7	Poor	W BERNARD ST	W JACKSON ST	Asphalt	1251985
S GRAY AVE	705.7	Poor	E TEXACO AVE	MAGNOLIA ST	Asphalt	1251987
SINCLAIR ST	1010.4	Poor	BELL CREEK DR	KIRTON CT	Asphalt	1251991
SNOW DR	291.9	Poor	none	PREWITT LN	Asphalt	1251993
SNOW DR	107.4	Poor	PREWITT LN	none	Asphalt	1251993
SOUTH ST	262.4	Poor	none	JIM HOGG AVE	Asphalt	1251994
SOUTH ST	401.8	Poor	JIM HOGG AVE	SWEENEY ST	Asphalt	1251994
SOUTH ST	431.3	Poor	SWEENEY ST	GULF DR	Asphalt	1251994
STARFIELD LN	136.8	Poor	DYSON RD	REV SWINNEY ST	Concrete	1251995
SWEENEY ST	399.8	Poor	S GRAY AVE	SOUTH ST	Asphalt	1251997
W BERNARD ST	378.2	Poor	S 18TH ST	HWY 35E	Asphalt	1252002
W MEADOW LN	479.8	Poor	HWY 36	REV SWINNEY ST	Asphalt	1252004
W MEADOW LN	317.7	Poor	REV SWINNEY ST	REV SWINNEY ST	Asphalt	1252004
WASHINGTON ST	1053.2	Poor	AUSTIN ST	CARVER ST	Asphalt	1252006
WOODBINE DR	1071.4	Poor	STARFIELD LN	LOGGINS DR	Concrete	1252008
11 1/2TH ST	695.9	Good	E BERNARD ST	HUMBLE DR	Asphalt	1251896
BRAZOS 1/2 ST	570.3	Good	N 12TH ST	N 11TH ST	Asphalt	1251908
DANCE DR	829.8	Good	HWY 36	BELL ST	Asphalt	1251917
DANCE DR	339.0	Good	BELL ST	MARSHALL ST	Asphalt	1251917
DANCE DR	287.1	Good	MARSHALL ST	CLARKE ST	Asphalt	1251917
DANCE DR	305.6	Good	CLARKE ST	KIRBY DR	Asphalt	1251917
DANCE DR	61.1	Good	KIRBY DR	KIRBY DR	Asphalt	1251917
DANCE DR	816.3	Good	KIRBY DR	14TH ST	Asphalt	1251917
E BERNARD ST	286.0	Good	S RINGOLD ST	S MATTSON ST	Asphalt	1251922

Street Name	Segment Length (Ft.)	Condition	Intersect Street 1	Intersect Street 2	Pavement Type	TxDOT Route No.
E WESTVIEW ST	693.7	Good	HWY 36	none	Asphalt	
FISHER ST	813.2	Good	LAMAR ST	MILAM ST	Asphalt	1251929
FM 2852	765.8	Good	N 17TH ST	LAMAR ST	Asphalt	2852
FM 2852	1650.9	Good	LAMAR ST	JEFFERSON ST	Asphalt	2852
FM 2852	804.7	Good	JEFFERSON ST	HWY 35	Asphalt	2852
HAMILTON ST	405.1	Good	SEVENTEENTH	N 16TH ST	Asphalt	1251935
HAMILTON ST	272.1	Good	none	N 12TH ST	Asphalt	1251935
HAMILTON ST	550.8	Good	N 12TH ST	N 11TH ST	Asphalt	1251935
HUMBLE DR	928.2	Good	S 14TH ST	S 13TH ST	Asphalt	1251938
HUMBLE DR	653.9	Good	S 13TH ST	S 12TH ST	Asphalt	1251938
HUMBLE DR	319.5	Good	S 12TH ST	11 1/2TH ST	Asphalt	1251938
HUMBLE DR	321.9	Good	11 1/2TH ST	S 11TH ST	Asphalt	1251938
LAMAR ST	190.0	Good	SEVENTEENTH	LONG ST	Asphalt	1251946
LAMAR ST	258.8	Good	LONG ST	FISHER ST	Asphalt	1251946
LAMAR ST	550.5	Good	FISHER ST	FM 2852	Asphalt	1251946
LEE ST	316.5	Good	RINGOLD ST	S MATTSON ST	Asphalt	1251948
MARSHALL ST	282.6	Good	none	REID RD	Asphalt	1251956
MARSHALL ST	134.9	Good	REID RD	DENISE ST	Asphalt	1251956
MARSHALL ST	608.0	Good	DENISE ST	DANCE ST	Asphalt	1251956
N 12TH ST	293.2	Good	JEFFERSON ST	HAMILTON ST	Asphalt	1251960
N 12TH ST	292.5	Good	HAMILTON ST	BRAZOS 1/2 ST	Asphalt	1251960
N MATTSON ST	809.2	Good	JEFFERSON ST	HWY 35	Asphalt	1251966
REID RD	837.3	Good	HWY 36	BELL ST	Asphalt	1251974
REID RD	337.1	Good	BELL ST	MARSHALL ST	Asphalt	1251974
RINGOLD ST	533.0	Good	E BERNARD ST	LEE ST	Asphalt	1251976
S 11TH ST	834.7	Good	HWY 35	E BERNARD ST	Asphalt	1251979
S 11TH ST	727.3	Good	E BERNARD ST	HUMBLE DR	Asphalt	1251979
S 11TH ST	299.3	Good	HUMBLE DR	none	Asphalt	1251979
S MATTSON ST	841.9	Good	HWY 35	E BERNARD ST	Asphalt	1251988
S MATTSON ST	530.4	Good	E BERNARD ST	LEE ST	Asphalt	1251988
S RINGOLD ST	836.7	Good	HWY 35	E BERNARD ST	Asphalt	1251989
14TH ST	2136.5	Fair	S 14TH ST	DENISE ST	Asphalt	701
14TH ST	616.6	Fair	DENISE ST	DANCE DR	Asphalt	859
A ST	523.6	Fair	TREE ST	HWY 35 E	Asphalt	
A ST	281.1	Fair	HWY 36E	S 16TH ST	Asphalt	1251978
A ST	951.0	Fair	S 16TH ST	LOGGINS DR	Asphalt	1251897
ALAMO ST	639.0	Fair	BOWIE ST	TRAVIS ST	Asphalt	1251898
BELL CREEK DR	912.1	Fair	HWY 35	OTTIS LN	Asphalt	1251901
BELL ST	506.8	Fair	none	REID RD	Asphalt	1251902

Street Name	Segment Length (Ft.)	Condition	Intersect Street 1	Intersect Street 2	Pavement Type	TxDOT Route No.
BELL ST	734.0	Fair	REID RD	DANCE DR	Asphalt	1251902
BERNARD ST	472.1	Fair	BENNETT DR	W BERNARD ST	Asphalt	1251904
BLAIR ST	249.0	Fair	S 12TH ST	none	Asphalt	1251905
BOWIE ST	323.0	Fair	ALAMO ST	HOUSTON ST	Asphalt	1251907
BOWIE ST	313.2	Fair	HOUSTON ST	CROCKETT ST	Asphalt	1251907
BOWIE ST	291.2	Fair	CROCKETT ST	JEFFERSON ST	Asphalt	1251907
CLARKE ST	428.8	Fair	none	DANCE DR	Asphalt	1251912
CR 467	896.4	Fair	HOGG RANCH RD	none	Asphalt	
CR 468	2277.2	Fair	JEFFERSON ST	none	Asphalt	468
CR 693	745.0	Fair	HOGG RANCH RD	none	Asphalt	
CROCKETT ST	635.5	Fair	BOWIE ST	TRAVIS ST	Asphalt	1251916
DENISE ST	457.4	Fair	MARSHALL ST	IRWIN RD	Asphalt	1251918
DENISE ST	183.8	Fair	IRWIN RD	KIRBY DR	Asphalt	1251918
DENISE ST	164.1	Fair	KIRBY DR	STUCKER LN	Asphalt	1251918
DENISE ST	722.5	Fair	STUCKER LN	14TH ST	Asphalt	1251918
DOW ST	393.5	Fair	none	SMITH ST	Asphalt	1251919
DRAEGER ST	123.8	Fair	none	FRANCES ST	Asphalt	
DRAEGER ST	593.9	Fair	FRANCES ST	HWY 35	Asphalt	
E BERNARD ST	397.6	Fair	HWY 35E	S 16TH ST	Asphalt	1251922
E BERNARD ST	431.7	Fair	S 16TH ST	S BROAD ST	Asphalt	1251922
E BERNARD ST	432.7	Fair	S BROAD ST	S 15TH ST	Asphalt	1251922
E BERNARD ST	373.3	Fair	S 15TH ST	S 14TH ST	Asphalt	1251922
E BERNARD ST	852.1	Fair	S 14TH ST	S 13TH ST	Asphalt	1251922
E BERNARD ST	312.2	Fair	S 13TH ST	SHADY LN	Asphalt	1251922
E BERNARD ST	321.0	Fair	SHADY LN	S 12TH ST	Asphalt	1251922
E BERNARD ST	312.2	Fair	S 12TH ST	11 1/2TH ST	Asphalt	1251922
E BERNARD ST	327.8	Fair	11 1/2TH ST	S 11TH ST	Asphalt	1251922
E BERNARD ST	171.3	Fair	S 11TH ST	S RINGOLD ST	Asphalt	1251922
E CLAY ST	410.0	Fair	HWY 35E	S 16TH ST	Asphalt	1251923
E CLAY ST	422.4	Fair	S 16TH ST	S BROAD ST	Asphalt	1251923
E CLAY ST	441.4	Fair	S BROAD ST	S 15TH ST	Asphalt	1251923
E CLAY ST	392.5	Fair	S 15TH ST	S 14TH ST	Asphalt	1251923
FRANCES ST	341.8	Fair	DRAEGER ST	LILLIAN ST	Asphalt	
GREENFIELD ST	158.8	Fair	none	MARSHALL ST	Asphalt	
GREENFIELD ST	389.7	Fair	MARSHALL ST	ROENE LN	Asphalt	
GREENFIELD ST	374.2	Fair	ROENE LN	MARION DR	Asphalt	
GREENFIELD ST	154.3	Fair	MARION DR	none	Asphalt	
GULF DR	613.9	Fair	E TEXACO AVE	SOUTH ST	Asphalt	1251933
GULF DR	413.6	Fair	SOUTH ST	S 14TH ST	Asphalt	1251933

Street Name	Segment Length (Ft.)	Condition	Intersect Street 1	Intersect Street 2	Pavement Type	TxDOT Route No.
GUPTON LN	908.2	Fair	LILLIAN ST	HWY 35	Asphalt	
HAMILTON ST	433.5	Fair	N 16TH ST	N BROAD ST	Asphalt	1251935
HAMILTON ST	399.3	Fair	N BROAD ST	N 15TH ST	Asphalt	1251935
HAMILTON ST	29.2	Fair	N 15TH ST	N 15TH ST	Asphalt	1251935
HAMILTON ST	384.2	Fair	N 15TH ST	VETERANS PARK DR	Asphalt	1251935
HOGG RANCH RD	1257.0	Fair	HWY 36	CR 693	Asphalt	
HOUSTON ST	637.2	Fair	BOWIE ST	TRAVIS ST	Asphalt	1251937
JACKSON ST	429.6	Fair	S 16TH ST	S BROAD ST	Asphalt	1251940
JACKSON ST	218.1	Fair	S BROAD ST	S GRAY AVE	Asphalt	1251940
JACKSON ST	216.4	Fair	S GRAY AVE	S 15TH ST	Asphalt	1251940
JACKSON ST	372.8	Fair	S 15TH ST	S 14TH ST	Asphalt	1251940
JANSEN DR	360.1	Fair	MARSHALL ST	ROENE LN	Asphalt	
JANSEN DR	236.5	Fair	ROENE LN	KIRBY DR	Asphalt	
JEFFERSON ST	433.4	Fair	SEVENTEENTH	N 16TH ST	Asphalt	1251942
JEFFERSON ST	438.9	Fair	N 16TH ST	N BROAD ST	Asphalt	1251942
JEFFERSON ST	416.5	Fair	N BROAD ST	N 15TH ST	Asphalt	1251942
JEFFERSON ST	428.3	Fair	N 15TH ST	VETERANS PARK DR	Asphalt	1251942
JEFFERSON ST	445.5	Fair	VETERANS PARK DR	FM 2852	Asphalt	1251942
JEFFERSON ST	254.3	Fair	FM 2852	BOWIE ST	Asphalt	1251942
JEFFERSON ST	395.6	Fair	BOWIE ST	N 12TH ST	Asphalt	1251942
JEFFERSON ST	249.0	Fair	N 12TH ST	TRAVIS ST	Asphalt	1251942
JEFFERSON ST	277.1	Fair	TRAVIS ST	N 11TH ST	Asphalt	1251942
JEFFERSON ST	237.6	Fair	N 11TH ST	N RINGOLD ST	Asphalt	1251942
JEFFERSON ST	376.7	Fair	N RINGOLD ST	N WATSON ST	Asphalt	1251942
JEFFERSON ST	52.5	Fair	N MATTSON ST	N MATTSON ST	Asphalt	1251942
JEFFERSON ST	134.6	Fair	N MATTSON ST	CR 468	Asphalt	1251942
JIM HOGG AVE	300.6	Fair	S GRAY AVE	SOUTH ST	Asphalt	1251943
JIM HOGG AVE	408.7	Fair	SOUTH ST	S 14TH ST	Asphalt	1251943
KIRBY DR	674.0	Fair	DANCE DR	JANSEN DR	Asphalt	1251944
KIRBY DR	296.1	Fair	JANSEN DR	MARION DR	Asphalt	1251944
KIRBY DR	131.1	Fair	MARION DR	none	Asphalt	1251944
LILLIAN ST	157.4	Fair	FRANCES ST	GUPTON LN	Asphalt	
LILLIAN ST	306.6	Fair	FRANCES ST	none	Asphalt	
LOGGINS DR	354.3	Fair	HWY 36E	S 16TH ST	Asphalt	1251951
LOGGINS DR	558.8	Fair	S 16TH ST	A ST	Asphalt	1251951
LOGGINS DR	249.5	Fair	A ST	SWEENY ST	Asphalt	1251951
LOGGINS DR	740.9	Fair	SWEENY ST	W TEXACO AVE	Asphalt	1251951

Street Name	Segment Length (Ft.)	Condition	Intersect Street 1	Intersect Street 2	Pavement Type	TxDOT Route No.
LOGGINS DR	211.5	Fair	W TEXACO AVE	E TEXACO AVE	Asphalt	1251951
LOGGINS DR	263.8	Fair	E TEXACO AVE	WOODBINE DR	Asphalt	1251951
LOGGINS DR	294.0	Fair	WOODBINE DR	DYSON RD	Asphalt	1251951
LOGGINS DR	147.6	Fair	DYSON RD	MAGNOLIA AVE	Asphalt	1251951
LOGGINS DR	469.4	Fair	MAGNOLIA AVE	E MEADOW LN	Asphalt	1251951
LOGGINS DR	299.0	Fair	E MEADOW LN	LARKIN ST	Asphalt	1251951
LOGGINS DR	702.5	Fair	LARKIN ST	IRWIN RD	Asphalt	1251951
LOGGINS DR	364.1	Fair	IRWIN RD	STUCKER LN	Asphalt	1251951
LONG ST	773.0	Fair	LAMAR ST	MILAM ST	Asphalt	1251952
MAGNOLIA AVE	315.8	Fair	LOGGINS DR	S GRAY AVE	Asphalt	1251953
MAGNOLIA ST	322.2	Fair	S GRAY AVE	none	Asphalt	1251954
MARION DR	700.2	Fair	KIRBY DR	GREENFIELD ST	Asphalt	
MARSHALL ST	675.3	Fair	DANCE ST	JANSEN ST	Asphalt	1251956
MARSHALL ST	880.9	Fair	JANSEN ST	GREENFIELD ST	Asphalt	1251956
MILAM ST	262.1	Fair	LONG ST	FISHER ST	Asphalt	1251957
MILAM ST	125.2	Fair	FISHER ST	none	Asphalt	1251957
N 11TH ST	238.6	Fair	BRAZOS 1/2 ST	HWY 35	Asphalt	1251959
N 12TH ST	225.3	Fair	BRAZOS 1/2 ST	HWY 35	Asphalt	1251960
N 15TH ST	396.3	Fair	JEFFERSON ST	HAMILTON ST	Asphalt	1251961
N 16TH ST	396.8	Fair	JEFFERSON ST	HAMILTON ST	Asphalt	1251962
N 16TH ST	402.3	Fair	HAMILTON ST	HWY 35	Asphalt	1251962
N 17TH ST	117.0	Fair	FM 2852	AUSTIN ST	Asphalt	1251963
N 18TH ST	349.5	Fair	none	HWY 35	Asphalt	1251964
N BROAD ST	412.0	Fair	JEFFERSON ST	HAMILTON ST	Asphalt	1251965
N MATTSON ST	579.6	Fair	none	JEFFERSON ST	Asphalt	1251966
OAK ST	400.1	Fair	W TEXACO AVE	none	Asphalt	1251968
OLD DAMON RD	1331.5	Fair	CRAWFOR LN	HWY 35	Asphalt	
OTTIS LN	1008.6	Fair	HWY 36	HWY 35	Asphalt	
ROENE LN	897.1	Fair	JANSEN DR	GREENFIELD ST	Asphalt	
S 12TH ST	513.9	Fair	HWY 35	BLAIR ST	Asphalt	1251980
S 12TH ST	316.8	Fair	BLAIR ST	E BERNARD ST	Asphalt	1251980
S 12TH ST	642.7	Fair	E BERNARD ST	HUMBLE DR	Asphalt	1251980
S 13TH ST	837.9	Fair	HWY 35	E BERNARD ST	Asphalt	1251981
S 13TH ST	381.1	Fair	E BERNARD ST	HUMBLE DR	Asphalt	1251981
S 13TH ST	166.5	Fair	E JACKSON ST	HUMBLE DR	Asphalt	1251981
S 13TH ST	296.1	Fair	HUMBLE DR	TALL TIMBER DR	Asphalt	1251981
S 14TH ST	392.3	Fair	E BERNARD ST	JACKSON ST	Asphalt	1251982
S 14TH ST	64.0	Fair	JACKSON ST	HUMBLE DR	Asphalt	1251982
S 14TH ST	192.8	Fair	HUMBLE DR	JIM HOGG AVE	Asphalt	1251982

Street Name	Segment Length (Ft.)	Condition	Intersect Street 1	Intersect Street 2	Pavement Type	TxDOT Route No.
S 14TH ST	183.5	Fair	JIM HOGG AVE	TALL TIMBER DR	Asphalt	1251982
S 14TH ST	211.6	Fair	TALL TIMBER DR	SWEENY ST	Asphalt	1251982
S 14TH ST	397.5	Fair	SWEENY ST	GULF DR	Asphalt	1251982
S 14TH ST	126.0	Fair	GULF DR	MOCKINGBIRD LN	Asphalt	1251982
S 14TH ST	1126.3	Fair	MOCKINGBIRD LN	14TH ST	Asphalt	1251982
S 15TH ST	400.4	Fair	HWY 35	E CLAY ST	Asphalt	1251983
S 15TH ST	391.6	Fair	E CLAY ST		Asphalt	1251983
S 15TH ST	387.0	Fair	E BERNARD ST	JACKSON ST	Asphalt	1251983
S 16TH ST	420.7	Fair	HWY 35	E CLAY ST	Asphalt	1251984
S BROAD ST	407.0	Fair	HWY 35	E CLAY ST	Asphalt	1251986
S BROAD ST	390.0	Fair	E CLAY ST	E BERNARD ST	Asphalt	1251986
S BROAD ST	395.2	Fair	E BERNARD ST	JACKSON ST	Asphalt	1251986
S GRAY AVE	452.8	Fair	JACKSON ST	JIM HOGG AVE	Asphalt	1251987
S GRAY AVE	434.0	Fair	JIM HOGG AVE	SWEENY ST	Asphalt	1251987
S GRAY AVE	303.0	Fair	SWEENY ST	LINDA LN	Asphalt	1251987
S GRAY AVE	620.6	Fair	LINDA LN	E TEXACO AVE	Asphalt	1251987
SEVENTEENTH	771.0	Fair	LAMAR ST	FM 2852	Asphalt	270188
SEVENTEENTH	769.1	Fair	PREWITT LN	LAMAR ST	Asphalt	270188
SEVENTEENTH	654.2	Fair	PREWITT LN	JEFFERSON ST	Asphalt	270188
SEVENTEENTH	383.1	Fair	JEFFERSON ST	HAMILTON ST	Asphalt	270188
SEVENTEENTH	393.6	Fair	HAMILTON ST	HWY 35	Asphalt	270188
SHADY LN	852.4	Fair	HWY 35	E BERNARD ST	Asphalt	1251990
SINCLAIR ST	333.6	Fair	KIRTON CT	HWY 36	Asphalt	1251991
SMITH ST	363.2	Fair	DOW ST	BENNETT DR	Asphalt	1251992
STUCKER LN	1230.2	Fair	LOGGINS DR	DENISE ST	Asphalt	1251996
SWEENY ST	357.7	Fair	LOGGINS DR	S GRAY AVE	Asphalt	1251997
SWEENY ST	414.3	Fair	SOUTH ST	S 14TH ST	Asphalt	1251997
TALL TIMBER DR	821.7	Fair	S 14TH ST	S 13TH ST	Asphalt	1251998
TALL TIMBER DR	433.8	Fair	S 13TH ST	none	Asphalt	1251998
TRAVIS ST	304.2	Fair	ALAMO ST	HOUSTON ST	Asphalt	1251999
TRAVIS ST	309.9	Fair	CROCKETT ST	JEFFERSON ST	Asphalt	1251999
TRAVIS ST	337.8	Fair	CROCKETT ST	JEFFERSON ST	Asphalt	1251999
TREE ST	198.0	Fair	C ST	HWY 36	Asphalt	
TREE ST	315.5	Fair	B ST	C ST	Asphalt	
TREE ST	148.8	Fair	A ST	B ST	Asphalt	
VETERANS PARK DR	414.9	Fair	JEFFERSON ST	HAMILTON ST	Asphalt	1252001
VETERANS PARK DR	396.6	Fair	HAMILTON ST	HWY 35	Asphalt	1252001
W BERNARD ST	318.6	Fair	BERNARD ST	BROWN ST	Asphalt	1252002
W BERNARD ST	345.0	Fair	BROWN ST	S 18TH ST	Asphalt	1252002

Street Name	Segment Length (Ft.)	Condition	Intersect Street 1	Intersect Street 2	Pavement Type	TxDOT Route No.
W BERNARD ST	49.1	Fair	S 18TH ST	S 18TH ST	Asphalt	1252002
W JACKSON ST	176.5	Fair	HWY 36	DOW ST	Asphalt	1252003
W JACKSON ST	365.4	Fair	DOW ST	BENNETT DR	Asphalt	1252003
W JACKSON ST	592.4	Fair	BENNETT DR	BROWN ST	Asphalt	1252003
W JACKSON ST	418.4	Fair	BROWN ST	S 18TH ST	Asphalt	1252003
W JACKSON ST	380.9	Fair	S 18TH ST	HWY 35E	Asphalt	1252003
W MEADOW LN	403.3	Fair	REV SWINNEY ST	LOGGINS DR	Asphalt	1252004
W TEXACO AVE	604.9	Fair	HWY 36	OAK ST	Asphalt	1252005
W TEXACO AVE	958.2	Fair	OAK ST	LOGGINS DR	Asphalt	1252005
W WESTVIEW ST	949.8	Fair	none	HWY 36	Asphalt	
S 16TH ST	658.6		A ST	LOGGINS DR	Asphalt	1251984
S 16TH ST	1124.5		none	A ST	Concrete	1251984



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TBPE NO. F-19990

**To:** Debbie Sutherland, City Manager (City of West Columbia)  
Matthew Fisher, Superintendent (City of West Columbia)

**Cc:** Ashish Ghosh, P.E., Jim Webb, AICP, ENV SP (The Goodman Corporation)

**From:** Kirk Myers, EIT (The Goodman Corporation)

**Date:** December 21, 2022

**Re:** Roadway State of Good Repair – Reconstruction Planning Estimate

### Summary

The City of West Columbia (City) engaged The Goodman Corporation (TGC) with a contract to conduct a roadway pavement conditions inventory to develop a rehabilitation opinion of probable costs for FY 2024 federal funding application purposes. Task 1 of the contract consisted of an assessment of pavement conditions, which determined 13.31 lane-miles (26%) of local streets in the City are in poor condition and are due for reconstruction. According to the Texas Department of Transportation (TxDOT) Asset Management Plan, the cost of heavy rehabilitation for asphalt pavement is \$574,600 per lane-mile. The total cost for the reconstruction project on the per lane-mile basis is approximately \$7,650,000.

This report provides the reconstruction planning estimate, according to Task 2 of the contract, as shown in Figure 1 on the following page. The key assumptions of the estimate are that the new design will not incorporate any significant changes from the existing pavement and that proposed pavement will be asphalt in accordance with the Brazoria County Subdivision Regulations. In consultation with the City, TGC narrowed the scope for the estimate to the 13.31 lane-miles of poor condition roads (6.66 miles of roadway). According to the analysis presented in this report, the total project cost for all reconstruction of the poor condition streets is \$8,261,200.<sup>1</sup> This is a planning-stage estimate and includes a 20% contingency for incidental work.

This report and its enclosures provide information regarding the preliminary reconstruction project statement of work, layout, and cost estimate for an approximately \$3 million project. These products represent a portion of the total reconstruction scope described above and are intended to provide project information for funding pursuit, as detailed in Task 3. The selected roadway segments may be substituted for others on a per lane-mile basis as deemed appropriate by the City. Additional information is provided per the City's request for comparison of concrete versus asphalt paving at intersections and an estimate for a lighter treatment level option for lower priority roadways.

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<sup>1</sup> The cost analysis performed for this report utilized TxDOT specifications and average low-bid data for the Houston District.



**City of West Columbia Street Reconstruction Project**

Item Code	Item Description	Unit	Quantity	Unit Price	Subtotal
100	PREPARING ROW	STA	125	\$800	\$100,000
105	REMOVING STABILIZED BASE AND ASPHALT PAVEMENT	SY	33,000	\$10	\$330,000
110	EXCAVATION (ROADWAY)	CY	5,000	\$10	\$50,000
164	HYDROMULCH SEEDING	AC	10	\$1,200	\$12,000
275	CEMENT	TON	800	\$222	\$177,600
	CEMENT TREATMENT (MIXING EXISTING MATERIAL & NEW BASE)	SY	33,000	\$10	\$330,000
341	DENSE-GRADED HOT-MIX ASPHALT D-GR HMA (SQ) TY-D SAC-B PG64-22	TON	5,000	\$160	\$800,000
500	MOBILIZATION	LS	1	\$140,000	\$140,000
502	BARRICADES, SIGNS AND TRAFFIC HANDLING INCLUDING FLAGGER	LS	1	\$30,000	\$30,000
506	TEMPORARY EROSION, SEDIMENTATION, AND ENVIRONMENTAL CONTROLS	LS	1	\$9,000	\$9,000
600	SIGNING AND MARKINGS	LS	1	\$18,000	\$18,000
	CONTINGENCY FOR INCIDENTALS	LS	1	\$350,000	\$350,000
<b>CONSTRUCTION TOTAL</b>					<b>\$2,346,600</b>
	SURVEY			3%	\$70,000
	ENVIRONMENTAL			1%	\$23,000
	ENGINEERING PS&E			12%	\$282,000
	CONSTRUCTION MANAGEMENT			8%	\$188,000
	MATERIALS TESTING			3%	\$70,000
<b>ENGINEERING &amp; MANAGEMENT TOTAL</b>					<b>\$633,000</b>
<b>PROJECT TOTAL</b>					<b>\$2,979,600</b>

Figure 1: West Columbia Reconstruction Planning Estimate

### Reconstruction of Poor Condition Roadways

The Pavement Assessment Report provided a table of the City's 51 lane-miles of roadways categorized by evaluated condition. The portion identified as in poor condition, which was 26% (13 lane-miles), was characterized mainly by end-of-life types and severities of distress. The distressed sections of pavement on these sections exhibited rutting, potholes, and failure cracking, as shown in the photos. The poor condition segments selected for the estimate are included in the Statement of Work in Enclosure 1.



The observed defects of the poor condition streets suggest systemic failures throughout the pavement surface and base. This level of deterioration in the roadways will not be properly addressed by light or medium rehabilitation such as mill and overlay. There has been significant water infiltration and base degradation. The only suitable treatment for the poor condition streets is heavy rehabilitation, or full-depth reconstruction.



The roadways studied were all off-system, which consist of only local streets and no TxDOT-maintained roads. The typical street consisted of asphalt concrete pavement, though approximately 2% (3,000 ft), limited to the neighborhood around Woodbine Dr and a portion of S 16<sup>th</sup> St, are concrete pavement. For purposes of this planning estimate, all asphalt existing streets were selected to simplify analysis and the estimate (although concrete removal unit price is roughly equivalent to that of asphalt removal). This approach aligns with the Brazoria County Subdivision Regulations for rural street construction.



### Reconstruction Design Basis

The Brazoria County Subdivision Regulations provide the minimum design requirements for pavement thickness. It was assumed that for purposes of this cost estimate, all roads are considered Residential Local or Residential Collector. Therefore, minimum pavement thickness for concrete and asphalt is six (6) inches and three (3) inches, respectively. Minimum subgrade or base thickness is eight (8) inches. It was assumed that base replacement would be adequate treatment for asphalt roadway reconstruction. The typical section provided by the County Engineering Department is shown below.

Figure 2: Examples of Existing Pavement Distresses

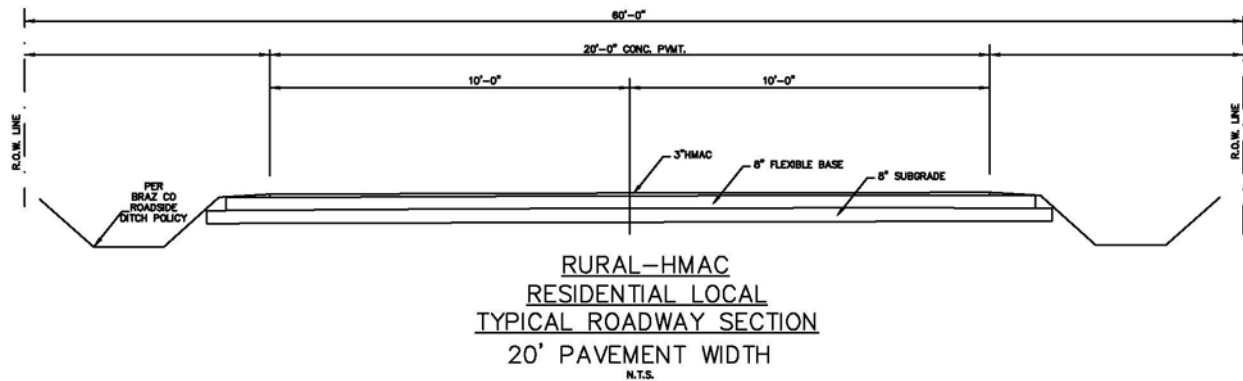


Figure 3: Typical Section

There were several parameters that needed to be established to perform quantity estimating. The project length was calculated by summing selected road segment lengths and dividing by 100 to set the number of stations. The right-of-way was assumed to be 60 ft for consistency and the project limits are assumed to extend to the edges of the right-of-way. Both existing and proposed pavement consist of two 10-ft travel lanes, for a total width of 20 ft. The base supporting the pavement is assumed to be 24 ft (2-ft offset from edges of pavement).

Several other assumptions were made in determining the specific work items and quantities. Since the project would be roadway reconstruction, it is assumed that the existing subgrade is adequate to bear the load of the roadway base and pavement, and that mixing existing base material with new material with cement treatment is acceptable. The pay limits for seeding are assumed for the portion of right-of-way not taken by the roadway. Other factors used as the basis for the estimate are summarized in the following table.

Estimate Parameter	Description and Use	Measurement and Units
Pavement Depth	Average existing pavement depth for removal quantity	6 in
Excavation Depth	Required additional depth for new base and pavement	5 in
Hot-mix Asphalt	Tonnage required for 3" pavement thickness	110 lb/SY-in 2.025 TON/CY
Cement	Tonnage required for 8" minimum base thickness	0.024 TON/SY

Figure 4: Treatment Costs Table

Several recent roadway reconstruction and rehabilitation projects let by Brazoria County and TxDOT were used as models for this project's estimate. The model projects' plans and bid tabs provided reference construction items and target quantities. They also provided for the calculation of percentages for lump sum and incidental items. All construction and quantities were then independently derived and measured using standard reference materials and direct observations performed for this project. Where practicable, quantities were rounded to simplify the estimate. The following table summarizes the development of the quantities used for this estimate.

Item No.	Description	Unit	Quantity	Notes
1	PREPARING ROW	STA	125	Approx. 12,500 LF Project length
2	REMOVING BASE/ASPHALT	SY	33,000	Pavement width x Project length
3	EXCAVATION (ROADWAY)	CY	5,000	Base width x Project length
4	HYDROMULCH SEEDING	AC	10	(ROW – Pavement width) x Project length
5	CEMENT	TON	800	Cement content x Cement treatment area
6	CEMENT TREATMENT (ROAD)	SY	33,000	Same as Base removal
7	DENSE-GRADED HOT-MIX ASPHALT	TON	5,00	Asphalt weight x Pavement volume Pavement volume = 3" thickness x Pavement width x Project length
8	MOBILIZATION	LS	1	8.0% of Construction Items
9	TRAFFIC HANDLING	LS	1	2.0% of Construction Items
10	ENVIRONMENTAL CONTROLS	LS	1	0.5% of Construction Items
11	SIGNING AND MARKINGS	LS	1	1.0% of Construction Items
12	PLANNING CONTINGENCY	LS	1	20% of Construction Items

Figure 5: Summary of Quantities

Design and other engineering fees associated with road reconstruction project management vary based on project scope, existing conditions, and local economic factors. Typical ranges of percent of construction for each activity are shown in the table below. In this case, recent project experience has indicated the percentages shown in the Project Estimate column are appropriate for a roadway reconstruction of this size.

Project Management Activity	Typical Range	Project Estimate
Right-of-Way / Survey	0 – 20%	3%
Environmental Documentation	0 – 10%	1%
Preliminary Engineering (including PS&E)	8 – 18%	12%
Construction Engineering (including Materials Testing)	5 – 15%	11%

Figure 6: County Repaving Requested by City

The preceding design basis and estimating produced a total project cost for reconstruction of the identified poor condition streets at \$2,979,600, as shown in Figure 1. There are approximately 4.7 lane-miles in this project, which means the cost per lane-mile is estimated at \$629,292. This cost is about 9.5% higher than that projected from the TxDOT heavy rehabilitation per lane-mile amount. However, this estimate employed a conservative approach to quantities and a 20% contingency for incidental work, such as sidewalks, drainage, driveway, and other improvements. Without the contingency, the project cost is \$535,536 per lane-mile, which is 6.8% lower than TxDOT.

The City requested a comparison of asphalt and concrete paving at intersections where heavy vehicles performing turning movements have caused faster degradation of the existing pavement. According to the County’s Subdivision Regulations, concrete residential collectors require 6-in thick pavement and 8-

in thick subgrade. Using the County’s pavement details, a basic intersection diagram was assembled to develop the quantities for the comparison. See the figure below for dimensions used for the comparison.

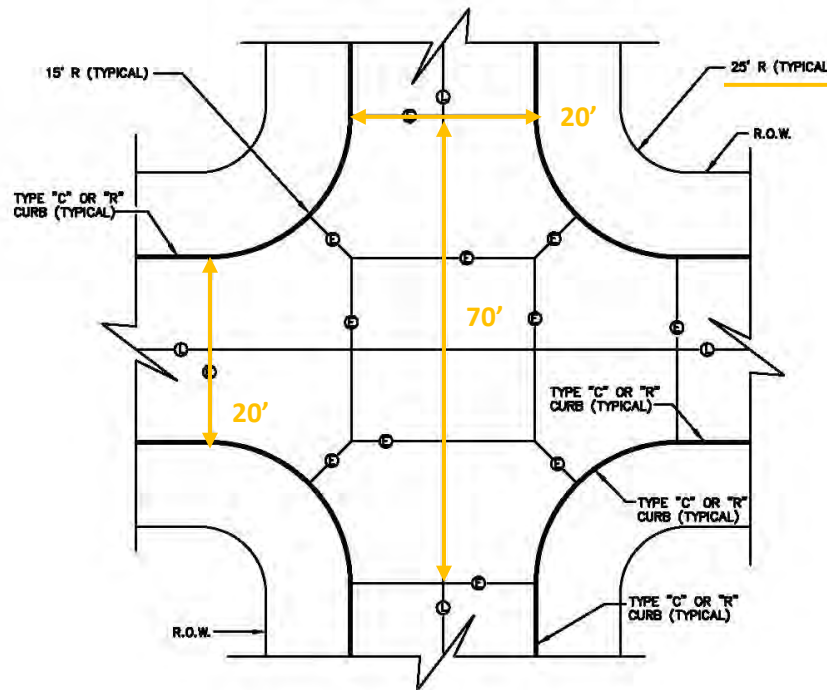


Figure 7: Intersection Diagram

The resulting base surface area requiring concrete pavement was estimated at 330 square yards, plus an additional 35 square yards for subgrade (2-ft base taper) and 28 cubic yards of excavation (thicker pavement). All other construction items being equal regardless of the paving alternative, the base or subgrade treatment costs are roughly equivalent for asphalt and concrete paving. However, the cost of concrete pavement is over twice that of asphalt. The option to upgrade an intersection to concrete pavement would thus be supported by evidence that existing asphalt intersections have required unscheduled repairs costing more than the intersection’s full replacement value within the expected lifespan (20 years) of the asphalt pavement. These results are shown in the following table.

Item	Unit	Quantity	Unit Price	Subtotal
<b>ASPHALT PAVING OPTION</b>				
CEMENT	TON	9	\$222	\$1,998
CEMENT TREATMENT	SY	365	\$10	\$3,650
DENSE-GRADED HOT-MIX ASPHALT	TON	56	\$160	\$8,960
<b>ASPHALT TOTAL</b>				<b>\$14,608</b>
<b>CONCRETE PAVING OPTION</b>				
EXCAVATION (ROADWAY)	CY	28	\$10	\$280
CONCRETE PAVEMENT	SY	330	\$80	\$26,400
LIME TREATMENT	SY	365	\$10	\$3,650
LIME	TON	6	\$250	\$1,500
<b>CONCRETE TOTAL</b>				<b>\$31,830</b>

Light or medium rehabilitation, typically conducted in the form of mill and overlay, is an option for the fair condition roadways as part of a pavement asset management program. There are nearly 80,000 linear feet of roads, or 30 lane-miles, in fair condition. To target, for example, a rehabilitation project cost of \$1 million, the scope of mill and overlay work would be approximately 10,000 linear feet, or 3.8 lane-miles. For planning purposes, the estimate below summarizes the construction items required for mill and overlay, including the same percentages of general items and engineering and management.

**City of West Columbia Street Mill & Overlay Project**

Item Code	Item Description	Unit	Quantity	Unit Price	Subtotal
316	ASPHALT SEAL COAT	GAL	7,100	\$5	\$35,500
	AGGREGATE	CY	170	\$190	\$32,300
354	PLANE ASPHALT CONCRETE PAVEMENT	SY	22,200	\$5	\$111,000
341	DENSE-GRADED HOT-MIX ASPHALT D-GR HMA (SQ) TY-D SAC-B PG64-22	TON	2,400	\$160	\$384,000
160	SEEDING	LS	1	\$8,000	\$8,000
500	MOBILIZATION	LS	1	\$39,000	\$39,000
502	BARRICADES, SIGNS AND TRAFFIC HANDLING INCLUDING FLAGGER	LS	1	\$11,000	\$11,000
506	TEMPORARY EROSION, SEDIMENTATION, AND ENVIRONMENTAL CONTROLS	LS	1	\$3,000	\$3,000
600	SIGNING AND MARKINGS	LS	1	\$6,000	\$6,000
	CONTINGENCY FOR INCIDENTALS	LS	1	\$113,000	\$113,000
<b>CONSTRUCTION TOTAL</b>					<b>\$742,800</b>
	SURVEY			3%	\$22,000
	ENVIRONMENTAL			1%	\$7,000
	ENGINEERING PS&E			12%	\$89,000
	CONSTRUCTION MANAGEMENT			8%	\$59,000
	MATERIALS TESTING			3%	\$22,000
<b>ENGINEERING &amp; MANAGEMENT TOTAL</b>					<b>\$199,000</b>
<b>PROJECT TOTAL</b>					<b>\$941,800</b>

Enclosure 1 – Reconstruction Statement of Work

The statement of work (SOW) includes all labor, materials, equipment, and necessary services required for the design, bidding, and construction of a total of 2.4 miles of two-lane residential streets and collectors. The Project is divided into two phases. Phase 1 consists of the design engineering services to complete bid ready documents. Phase 2 includes bid activities and construction.

Phase 1 includes preliminary engineering and detailed design activities to produce the plans, specifications, and estimates for construction. This phase requires survey, environmental, geotechnical, utility coordination, and other professional services typical for roadway reconstruction. Other services may include local government project coordination with TxDOT and bid phase engineering support to manage bidding and award the construction contract.

Phase 2 consists of construction phase activities, including construction engineering and inspection (CE&I) and construction, to complete the proposed reconstruction. The scope of CE&I includes all activities associated with project management and materials testing. Construction activities include constructing new roadway pavement, installing pavement markings, replacing roadside signs, and restoring roadside grass-lined ditch banks to the extent disturbed by construction activities. Additional work to be shown in the plans include stormwater drainage features, driveways, sidewalks, curbs, ramps, and landscaping.

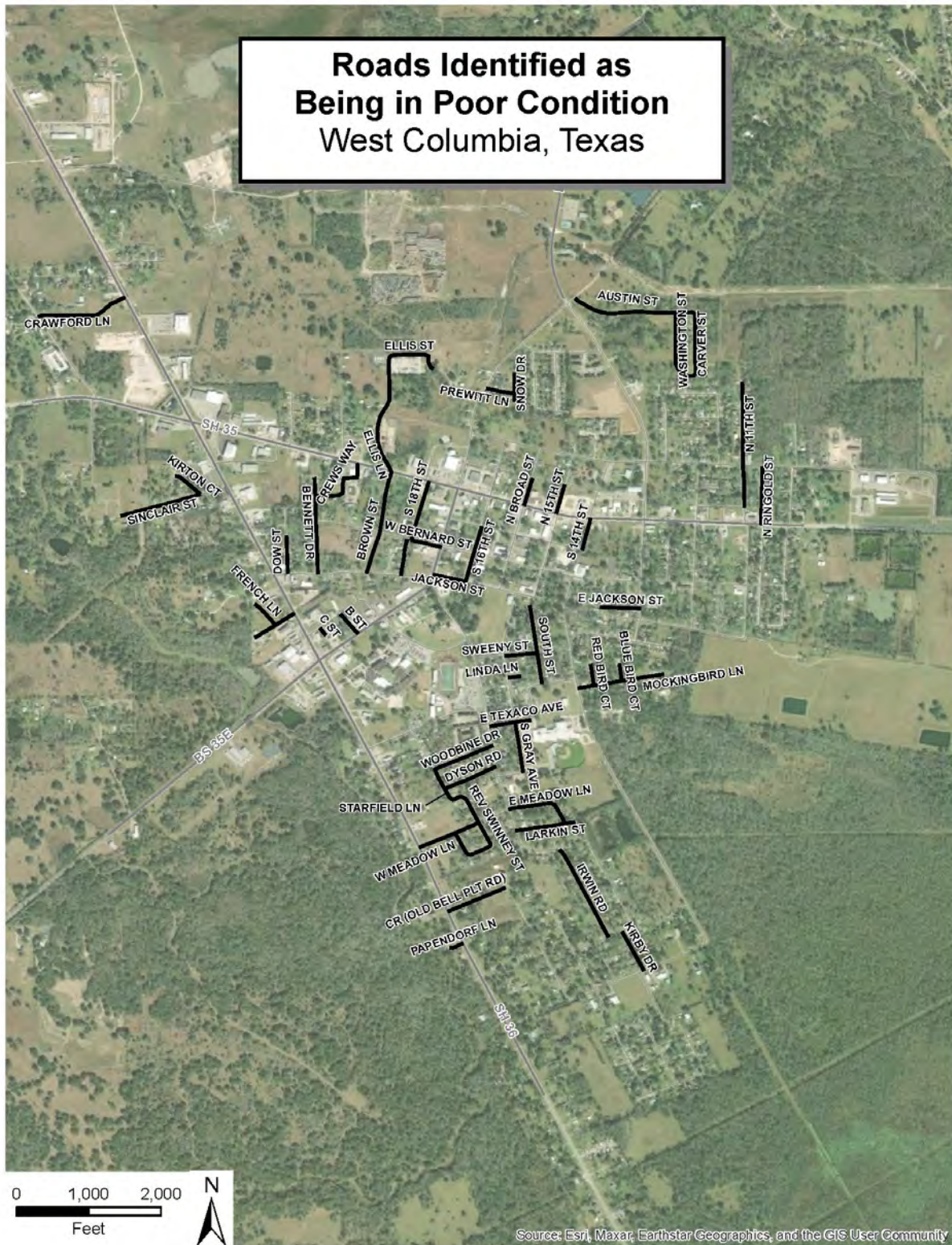
The roadway segments included in this SOW are:

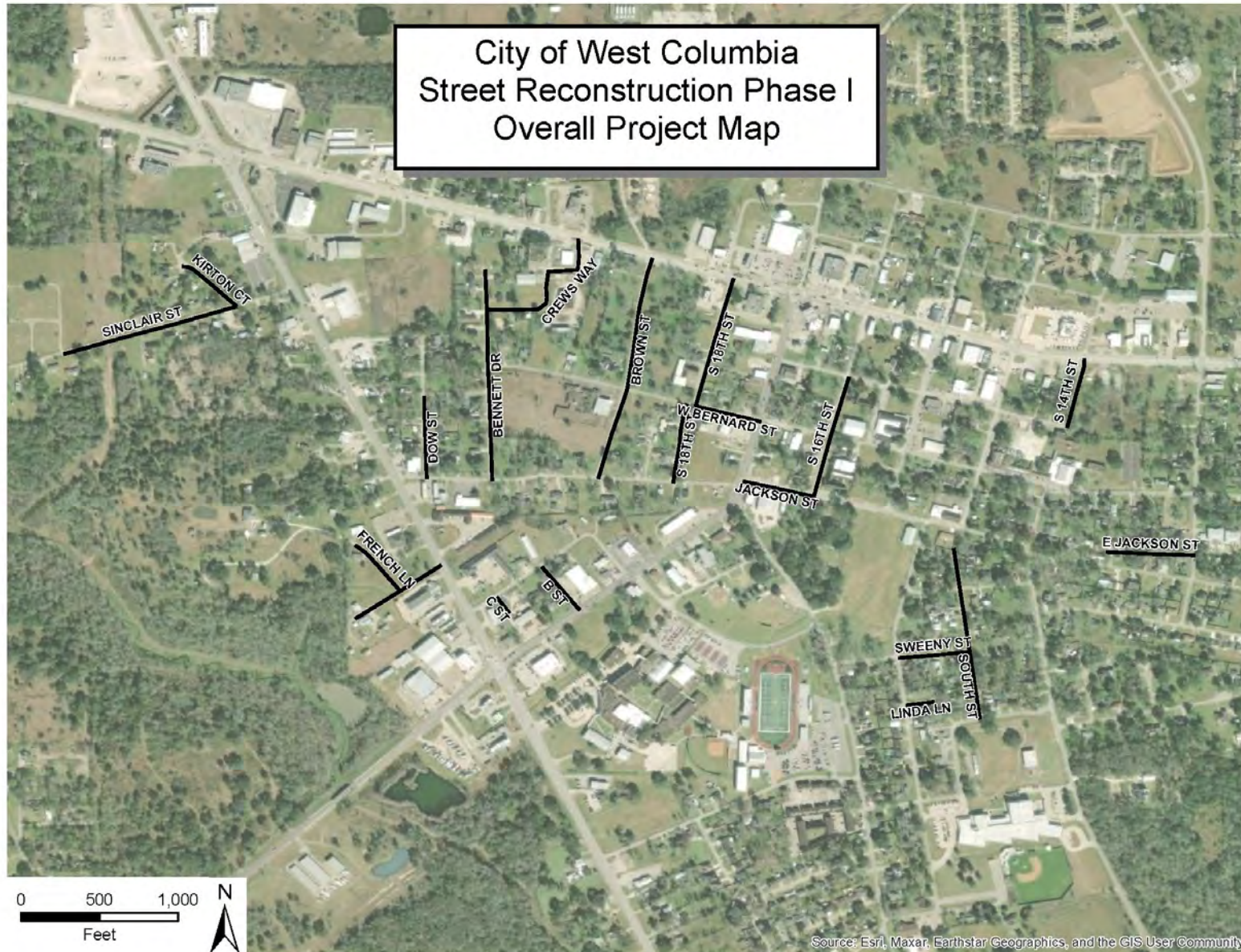
Street Name	Length (Ft.)	Intersect Street 1	Intersect Street 2
B ST	347	TREE ST	HWY 35 E
BENNETT DR	257	none	CREWS WAY
BENNETT DR	367	CREWS WAY	BERNARD ST
BENNETT DR	163	BERNARD ST	SMITH ST
BENNETT DR	553	SMITH ST	W JACKSON ST
BROWN ST	854	HWY 35	W BERNARD ST
BROWN ST	582	W BERNARD ST	W JACKSON ST
C ST	124	TREE ST	none
CREWS WAY	911	BENNETT DR	HWY 35
DOW ST	525	SMITH ST	W JACKSON ST
E JACKSON ST	496	none	S 13TH ST
FRENCH LN	386	none	FRENCH LN
FRENCH LN	307	none	FRENCH LN
FRENCH LN	281	FRENCH LN	HWY 36
JACKSON ST	407	HWY 35E	S 16TH ST
KIRTON CT	403	none	SINCLAIR ST
LINDA LN	159	S GRAY AVE	none
S 14TH ST	450	HWY 35	E CLAY ST
S 16TH ST	392	E CLAY ST	E BERNARD ST
S 16TH ST	392	E BERNARD ST	JACKSON ST
S 18TH ST	837	none	W BERNARD ST

Street Name	Length (Ft.)	Intersect Street 1	Intersect Street 2
S 18TH ST	510	W BERNARD ST	W JACKSON ST
SINCLAIR ST	1,010	BELL CREEK DR	KIRTON CT
SOUTH ST	262	none	JIM HOGG AVE
SOUTH ST	402	JIM HOGG AVE	SWEENEY ST
SOUTH ST	431	SWEENEY ST	GULF DR
SWEENEY ST	400	S GRAY AVE	SOUTH ST
W BERNARD ST	378	S 18TH ST	HWY 35E



Enclosure 2 – Reconstruction Project Layout





Enclosure 3 – Reconstruction Cost Estimate

Item No.	Spec No.	Items	Unit	Quantity	Unit Price	Extended Price	Notes
1	0100-6002	PREPARING ROW	STA	125	\$800	\$100,000	12,500 LF / 100 ft; price based on Brazoria Co. bid tabs + 20%
2	0105-6008	REMOVING STAB BASE AND ASPH PAV (6")	SY	33,000	\$10	\$330,000	Base width x Project length; price based on TxDOT avg. low bids + 20%
3	0110-6001	EXCAVATION (ROADWAY)	CY	5,000	\$10	\$50,000	Base width x Excavation depth x Project length; price based on TxDOT avg. low bids + 20%
4	0164	HYDROMULCH SEEDING	AC	10	\$1,200	\$12,000	Project length x Seeding section; match TxDOT avg. low bid per acre
5	0275-6001	CEMENT	TON	800	\$222	\$177,600	Treatment area x 0.024 T/SY; match TxDOT avg. low bid per acre
6	0275-6061	CEM TRT (MX EXT MTL/NW BASE)(DC)(10")	SY	33,000	\$10	\$330,000	Base width x Project length; match Brazoria Co. bid tabs avg. price (round up nearest \$1)
7	3076-6035	D-GR HMA (SQ) TY-D SAC-B PG64-22	TON	5,000	\$160	\$800,000	Pavement width x Thickness x 2.025 T/CY; price based on Brazoria Co. bid tabs + 10%
<b>Construction Subtotal</b>						<b>\$1,799,600</b>	
8	500	MOBILIZATION	LS		8.0%	\$140,000	Price based on Brazoria Co. bid tabs (round up nearest 1%)
9	502	BARRICADES, SIGNS AND TRAFFIC HANDLING INCL FLAGGER	LS		2.0%	\$30,000	Price based on Brazoria Co. bid tabs (round up nearest 1%)
10	506	SWPPP INCL PERMITTING	LS		0.5%	\$9,000	Price based on Brazoria Co. bid tabs (round up nearest 0.5%)
11	600	SIGNS & PAVEMENT MARKINGS	LS		1.0%	\$18,000	Price based on Brazoria Co. bid tabs (round up nearest 0.5%)
12		CONTINGENCY (DRAINAGE, DRIVEWAYS, ETC.)			20%	\$350,000	Standard preliminary cost contingency
<b>CONSTRUCTION</b>						<b>\$2,346,600</b>	
		SURVEY			3.0%	\$70,000	Engineering & Management costs derived from standard industry rates
		ENVIRONMENTAL			1.0%	\$23,000	
		ENGINEERING PS&E			12.0%	\$282,000	
		CONSTRUCTION MANAGEMENT			8.0%	\$188,000	
		MATERIALS TESTING			3.0%	\$70,000	
<b>ENGINEERING &amp; MANAGEMENT</b>						<b>\$633,000</b>	
<b>PROJECT TOTAL</b>						<b>\$2,979,600</b>	
<b>PROJECT TOTAL W/O CONTINGENCY</b>						<b>\$2,535,600</b>	

TxDOT Heavy Rehab per Lane Mile	\$574,600	Delta v TxDOT
This Estimate per Lane Mile	\$629,292	9.5%
This Estimate per Lane Mile w/o Contingency	\$535,536	-6.8%

**Estimate Parameters:**

Project Length (sum of segment lengths in poor condition)	125 STA
Right-of-way Width	60 ft
Proposed Pavement Width (2x 10-ft lanes)	20 ft
Proposed Base Width (tapered 2-ft edges)	24 ft
Excavation Depth (mix half new base / half existing base)	5 in
Seeding section (ROW - Base)	36 ft
Minimum asphalt pavement thickness (residential)	3 in
Minimum base thickness (residential) (maintain 10")	8 in

**City of West Columbia Street Reconstruction Project (Phases II & III)**

<b>Item Code</b>	<b>Item Description</b>	<b>Unit</b>	<b>Quantity</b>	<b>Unit Price</b>	<b>Subtotal</b>
100	PREPARING ROW	STA	226	\$1,000.00	\$226,000
105	REMOVING STABILIZED BASE AND ASPHALT PAVEMENT	SY	60,000	\$10.00	\$600,000
110	EXCAVATION (ROADWAY)	CY	9,000	\$18.00	\$162,000
164	HYDROMULCH SEEDING	AC	813,600	\$0.30	\$244,080
275	CEMENT	TON	1,400	\$213.00	\$298,200
	CEMENT TREATMENT (MIXING EXISTING MATERIAL & NEW BASE)	SY	60,000	\$25.00	\$1,500,000
341	DENSE-GRADED HOT-MIX ASPHALT D-GR HMA (SQ) TY-D SAC-B PG64-22	TON	8,000	\$205.00	\$1,640,000
500	MOBILIZATION	LS	1	\$370,000.00	\$370,000
502	BARRICADES, SIGNS AND TRAFFIC HANDLING INCLUDING FLAGGER	LS	1	\$90,000.00	\$90,000
506	TEMPORARY EROSION, SEDIMENTATION, AND ENVIRONMENTAL CONTROLS	LS	1	\$23,000.00	\$23,000
600	SIGNING AND MARKINGS	LS	1	\$47,000.00	\$47,000
	CONTINGENCY FOR INCIDENTALS	LS	1	\$930,000.00	\$930,000
<b>CONSTRUCTION TOTAL</b>					<b>\$6,130,280</b>
	SURVEY			3%	\$184,000
	ENVIRONMENTAL			1%	\$61,000
	ENGINEERING PS&E			11%	\$674,000
	CONSTRUCTION MANAGEMENT			8%	\$490,000
	MATERIALS TESTING			5%	\$307,000
<b>ENGINEERING &amp; MANAGEMENT TOTAL</b>					<b>\$1,716,000</b>
<b>PROJECT TOTAL</b>					<b>\$7,846,280</b>