



## **AGENDA**

### **CITY COUNCIL MEETING**

January 20, 2022 | 7:00 PM

Council Chambers | Video Conference

City Hall | 665 Country Club Road, Lucas, Texas

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*Notice is hereby given that a meeting of the Lucas City Council will be held on Thursday, January 20, 2022, beginning at 7:00 pm at Lucas City Hall, 665 Country Club Road, Lucas, Texas 75002-7651 and by video conference, at which time the following agenda will be discussed. As authorized by Section 551.071 of the Texas Government Code, the City Council may convene into closed Executive Session for the purpose of seeking confidential legal advice from the City Attorney on any item on the agenda at any time during the meeting.*

To join the meeting, please click this URL:

<https://us06web.zoom.us/j/95534828374?pwd=ZkJ5cTZkVWNEEL3o0WFNCQXBjQ0RvZz09>

and enter your name and email address.

Join by phone: 1-346-248-7799

Webinar ID: 955 3482 8374

Passcode: 712285

If you would like to watch the meeting live, and not participate via Zoom, you may go to the City's live streaming link at <https://www.lucastexas.us/live-streaming-videos/>.

#### **How to Provide Input at a Meeting:**

**Speak In Person:** Request to Speak forms will be available at the meeting. Please fill out the form and give to the City Secretary prior to the start of the meeting. This form will also allow a place for comments.

**Speak Remotely Via Zoom:** If you would like to attend a meeting remotely and speak via Zoom, email the City Secretary at [shenderson@lucastexas.us](mailto:shenderson@lucastexas.us) by 4:00 pm noting the item you wish to speak on and noting your attendance will be remote. Please note, any requests received after 4:00 pm will not be included at the meeting.

**Submit Written Comments:** If you are unable to attend a meeting and would like to submit written comments regarding a specific agenda item, email the City Secretary at [shenderson@lucastexas.us](mailto:shenderson@lucastexas.us) by no later than 4:00 pm the day of the meeting. The email must contain the person's name, address, phone number, and the agenda item(s) for which comments will be made. Any requests received after 4:00 pm will not be included at the meeting.

#### **Call to Order**

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- Roll Call
- Determination of Quorum
- Reminder to turn off or silence cell phones
- Pledge of Allegiance

## Citizen Input

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1. Citizen Input

## Community Interest

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*Pursuant to Section 5510415 of the Texas Government Code, the City Council may report on the following items: 1) expression of thanks, congratulations or condolences; 2) information about holiday schedules; 3) recognition of individuals; 4) reminders about upcoming City Council events; 5) information about community events; and 6) announcements involving imminent threat to public health and safety.*

2. Items of Community Interest

## Consent Agenda

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*All items listed under the consent agenda are considered routine and are recommended to the City Council for a single vote approval. If discussion is desired, an item may be removed from the consent agenda for a separate vote.*

3. Consent Agenda:
  - A. Approval of the minutes of the December 16, 2021, City Council meeting. **(City Secretary Stacy Henderson)**
  - B. Approval of Resolution R 2022-01-00525 designating the Allen American as the official newspaper of the City of Lucas for 2022 beginning January 20, 2022 through December 31, 2022. **(City Secretary Stacy Henderson)**
  - C. Approval of Resolution R 2022-01-00524 supporting the proposed trail project and authorizing participation in the Recreational Trails Grant Program of the Texas Parks and Wildlife. **(Assistant to the City Manager Kent Souriyasak)**

## Regular Agenda

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4. Receive a presentation by Republic Services on Industry Updates of Municipal Recycling and Waste. **(Assistant to the City Manager Kent Souriyasak, Republic Services Manager Municipal Sales Rick Bernas)**
5. Consider a Development Agreement with Liberty Bankers Life Insurance Company for roadway improvements to the first 0.28 miles of Blondy Jhune Road east of FM 1378 and appropriating funds in an amount not to exceed \$306,489 from cash account 11-1009 General Fund Roadway Impact Fees to account 21-8210-491-300 Blondy Jhune Road Alignment and credit the owner for calculated roadway and water impact fees of \$289,374 per Section 3.2 of the Development Agreement. **(Development Services Director Joe Hilbourn)**
6. Consider recommendations from the Lemontree Country Estates and Kingwood Estates Drainage Improvements Study dated January 12, 2022 provided by Birkhoff, Hendricks & Carter, LLP and provide direction to the City Manager. **(Public Works Director Scott Holden)**

7. Receive the Limited Bridge Evaluation Report for the Winningkoff Bridge from BCC Engineering, LLC dated December 2021 and provide direction to the City Manager. **(Public Works Director Scott Holden, Development Services Director Joe Hilbourn)**
8. Consider receiving a donation of a house located at 525 Stinson Road and relocating to city-owned property for a future public use. **(City Manager Joni Clarke, Development Services Director Joe Hilbourn)**
9. Consider authorizing the City Manager to enter into a contract with Records Consultants, Inc. (RCI) in the amount of \$26,606.50 for scanning the City's permanent records appropriating funds from Unrestricted General Fund Reserves to account 11-6110-239 Records Management. **(City Secretary Stacy Henderson)**
10. Consider nominations for 2022 Service Tree Awards and appoint Councilmembers to serve on the Service Tree Subcommittee. **(City Council)**

## **Executive Agenda**

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11. Executive Session.

An Executive Session is not scheduled for this meeting.

As authorized by Section 551.071 of the Texas Government Code, the City Council may convene into closed Executive Session for the purpose of seeking confidential legal advice from the City Attorney regarding any item on the agenda at any time during the meeting. This meeting is closed to the public as provided in the Texas Government Code.

12. Reconvene from Executive Session and take any action necessary as a result of the Executive Session.
13. Adjournment.

## **Certification**

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*I do hereby certify that the above notice was posted in accordance with the Texas Open Meetings Act on the bulletin board at Lucas City Hall, 665 Country Club Road, Lucas, TX 75002 and on the City's website at [www.lucastexas.us](http://www.lucastexas.us) on or before 5:00 p.m. on January 14, 2022.*

\_\_\_\_\_  
*Stacy Henderson, City Secretary*

*In compliance with the American with Disabilities Act, the City of Lucas will provide for reasonable accommodations for persons attending public meetings at City Hall. Requests for accommodations or interpretive services should be directed to City Secretary Stacy Henderson at 972.912.1211 or by email at [shenderson@lucastexas.us](mailto:shenderson@lucastexas.us) at least 48 hours prior to the meeting.*



# City of Lucas City Council Agenda Request January 20, 2022

Item No. 01

Requester: Mayor Jim Olk

## **Agenda Item Request**

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Citizen Input

## **Background Information**

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NA

## **Attachments/Supporting Documentation**

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NA

## **Budget/Financial Impact**

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NA

## **Recommendation**

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NA

## **Motion**

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NA





# City of Lucas

## City Council Agenda Request

### January 20, 2022

Item No. 02

Requester: Mayor Jim Olk

#### **Agenda Item Request**

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Items of Community Interest

#### **Background Information**

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NA

#### **Attachments/Supporting Documentation**

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NA

#### **Budget/Financial Impact**

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NA

#### **Recommendation**

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NA

#### **Motion**

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NA



# City of Lucas

## City Council Agenda Request

### January 20, 2022

Item No. 03

Requester: City Secretary Stacy Henderson  
Assistant to the City Manager Kent Souriyasak

#### **Agenda Item Request**

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Consent Agenda:

- A. Approval of the minutes of the December 16, 2021, City Council meeting.
- B. Approval of Resolution R 2022-01-00525 designating the Allen American as the official newspaper of the City of Lucas for 2022 beginning January 20, 2022 through December 31, 2022.
- C. Approval of Resolution R 2022-01-00524 supporting the proposed trail project and authorizing participation in the Recreational Trails Grant Program of the Texas Parks and Wildlife.

#### **Background Information**

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##### Agenda Item C:

At the City Council meeting on November 18, 2021, the Council directed staff to proceed with filing a grant application to be considered for the Recreational Trails Grant Program of Texas Parks and Wildlife. The Council supported the proposed trail project starting at Lovejoy High School on Estates Parkway and east to Country Club Road. For the maximum grant award of \$300,000, the City would be able to install a 1,150-foot trail made of crushed granite materials. This is 21.3% of the approximate 5,400 feet of trail needed to go from the far east driveway of Lovejoy High School along Estates Parkway to Country Club Road. The proposed trail project is included as a trail section of the Central Loop in the Trails Master Plan.

As part of the grant application, the City will need to submit an approved resolution supporting the proposed trail project and authorizing participation in the Recreational Trails Grant Program. Staff will be submitting the grant application by February 1, 2022. Texas Parks and Wildlife will be announcing grant award winners in June 2022.

#### **Attachments/Supporting Documentation**

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- 1. Minutes of the December 16, 2021 City Council meeting.
- 2. Resolution R 2022-01-00525 designating official newspaper
- 3. Resolution R 2022-01-00524 supporting the proposed trail project and authorizing participation in the Recreational Trails Grant Program of the Texas Parks and Wildlife.
- 4. Proposed Trail Project Map



# City of Lucas

## City Council Agenda Request

### January 20, 2022

#### **Budget/Financial Impact**

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##### Agenda Item C:

The Recreational Trails Grant Program provides funding on a cost reimbursement basis. Individual grant awards for non-motorized trail projects will be awarded up to \$300,000. Awarded projects will be reimbursed up to 80% of allowable costs and 20% must come from matching funds.

#### **Recommendation**

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City Staff recommends approval of the Consent Agenda.

#### **Motion**

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I make a motion to approve/deny the Consent Agenda as presented.



# MINUTES CITY COUNCIL REGULAR MEETING

December 16, 2021 | 6:00 PM  
Council Chambers | Video Conference  
City Hall | 665 Country Club Road, Lucas, Texas

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## City Councilmembers Present:

Mayor Jim Olk  
Mayor Pro Tem Kathleen Peele  
Councilmember Tim Johnson  
Councilmember Tim Baney  
Councilmember David Keer  
Councilmember Phil Lawrence (*attending remotely*)  
Councilmember Debbie Fisher

## City Staff Present:

City Manager Joni Clarke  
City Secretary Stacy Henderson  
City Attorney Joe Gorfida  
Development Services Director Joe Hilbourn  
Public Works Director Scott Holden  
Assistant to the City Manager Kent Souriyasak

The regular City Council meeting was called to order at 6:00 pm.

## Executive Session Agenda

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### 1. Executive Session:

The City Council will convene into Executive Session pursuant to Section 551.071 of the Texas Government Code to consult with the City Attorney regarding City of Lucas, Texas v. Robert Kubicek and the following real property: 2205 Estates Parkway, Lucas, Texas, In Rem, Cause No. 417-00147-2018 in the 417th Judicial District Court of Collin County, Texas.

Per Section 551.071 of the Texas Government Code, the City Council will also seek legal advice from the City Attorney during Executive Session regarding Agenda Items 12 and 13 on this agenda.

The City Council convened into Executive Session at 6:01 pm.

### 2. Reconvene from Executive Session and take any action necessary as a result of the Executive Session.

The City Council reconvened from Executive Session at 7:11 pm. There was no action taken as a result of the Executive Session.

## Citizen Input

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### 3. Citizen Input

There was no citizen input at this meeting.

## Community Interest

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### 4. Items of Community Interest

Mayor Olk discussed service tree award nominations, candidate filing for the May 7, 2022, election and city offices closed for the Christmas and New Year's holidays.

## Consent Agenda

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### 5. Consent Agenda:

- A. Approval of the minutes of the December 2, 2021, City Council meeting.
- B. Approval of the City of Lucas Investment Report for quarter ended September 2021.
- C. Consider authorizing the City Manager to enter into a contract with Hydromax USA, LLC for fire hydrant and valve maintenance utilizing an interlocal with the City of Garland, Texas in the amount not to exceed \$100,000.

Councilmember Fisher noted a correction to the minutes on page 4 by adding the language "Remove Highland Drive as a through roadway from FM 1378 to Lewis Lane".

**MOTION:** A motion was made by Councilmember Fisher, seconded by Mayor Pro Tem Peele to approve the Consent Agenda including the minutes as amended. The motion passed unanimously by a 7 to 0 vote.

## Public Hearing Agenda

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6. **Public hearing to consider adopting Ordinance 2021-12-00942 approving a request by Bill Shipley on behalf of Golden Chick for a Specific Use Permit (SUP) to allow a drive-thru restaurant on a proposed tract of land, zoned Commercial Business, being 0.833 acres, on Lot 1, Block A, Pennington Addition, William Snider Survey, Abstract No. 821, Collin County Texas, also known as 451 South Angel Parkway.**

Mayor Olk opened the public hearing at 7:25 pm, there being no one wishing to speak, the public hearing was closed.

After some discussion related to the detention pond on site, access to the site, and operating hours, the following motion was made.

**MOTION:** A motion was made by Councilmember Johnson, seconded by Mayor Pro Tem Peele to adopt Ordinance 2021-12-00942 approving a specific use permit for Golden Chick to allow a drive-thru restaurant on a proposed tract of land, zoned Commercial Business, being 0.833 acres, on Lot 1, Block A, Pennington Addition, William Snider Survey, Abstract No. 821, Collin County Texas, also known as 451 South Angel Parkway with the amended condition that allowable hours of operation shall be from 6:00 am to 1:00 am and the additional condition that no glare directly or indirectly shall be created at the property line from luminaires. The motion passed unanimously by a 7 to 0 vote.

## Regular Agenda

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The City Council moved to Agenda Items 12 and 13 at this time.

- 12. Consider First Amendment to the Development Agreement between the City of Lucas, Texas and Megatel Homes, III, LLC and an addendum to declaration of covenants, conditions, and restrictions for Enchanted Creek Homeowners Association, Inc.**

After discussion with the City Attorney regarding the deletion of Sections 5.01 and 5.02 from the development agreement, the following motion was made.

**MOTION:** A motion was made by Mayor Olk, seconded by Councilmember Lawrence to approve the First Amendment to the Development Agreement between the City of Lucas and Centurion Homes and MM Lucas 135 LLC and an addendum to the declaration of covenants, conditions, and restrictions for Enchanted Creek Homeowners Association, Inc., with the amendment that Section 5.01 and Section 5.02 be deleted from the Development Agreement. The motion passed unanimously by a 7 to 0 vote.

- 13. Consider an appeal made by Robert Miklos on behalf of Matt Dorsett with Spiars Engineering and Surveying and Brock Babb with Centurion American CTMGT Lucas 238 LLC, on behalf of property owners Steve Lenart with CTMGT Lucas 238, LLC and Mehrdad Moayedi for the denial of an extension of a preliminary plat for Enchanted Creek Estates Phase 2, expiring December 1, 2021, for the property located in the James Anderson Survey, Abstract No. 17 and John McKinney Survey, Abstract No. 596, being 135.743 acres, 700 feet north of the intersection of Enchanted Way and Lillyfield Drive.**

**MOTION:** A motion was made by Councilmember Baney, seconded by Mayor Pro Tem Peele, to approve the extension of the preliminary plat. The motion passed unanimously by a 7 to 0 vote.

The City Council moved back to Agenda Item No. 7.

- 7. Discussion regarding the regulations pertaining to a home-based business.**

The following individuals spoke regarding regulations to home-based businesses.

- Jenny Tissing, 1190 Stinson Road, discussed nuisances created by the home-based business occurring at the property at 1180 Stinson. Due to the home-based business, vehicle traffic had increased on site as well as the number of individuals visiting the home at all hours of the night and weekend. Noise and traffic levels had also increased in the residential area.
- Wayne Millsap, 318 McMillan, suggested ways in which to tighten up what is defined as a nuisance and not define home based businesses based on the number of employees as this could cause many home-based businesses to be in violation.

The City Council discussed current regulations, various types of home-based businesses, enforcement using the court system, and having the resident testify to violations and nuisances they have witnessed if it could not be seen from the street by the Code Officer.

The City Council directed the City Attorney to draft language for consideration that included:

Home occupation shall not create a nuisance to persons of ordinary sensibilities that occupy surrounding property such as offensive, noises, vibrations, sound, smoke dust, odors, heat, glare, x-rays or electrical disturbances to radio and telephone instruments, and to include an exemption related to farm animals.

There was no action on this item, it was for discussion purposes only.

- 8. Consider authorizing the City Manager to enter into a bank depository service agreement with American National Bank of Texas for a three-year period commencing on December 27, 2021, through December 27, 2024, with the option to renew for two additional one-year extensions under the same terms and conditions.**

**MOTION:** A motion was made by Councilmember Fisher seconded by Councilmember Lawrence to approve authorizing the City Manager to enter into a bank depository service agreement with American National Bank of Texas for a three-year period commencing on December 27, 2021, through December 27, 2024, with the option to renew for two additional one-year extensions under the same terms and conditions. The motion passed unanimously by a 7 to 0 vote.

- 9. Consider authorizing the City Manager to enter into a professional services agreement with Birkhoff, Hendricks, & Carter, LLP (BH&C) in the amount of \$93,800 to complete the following:**

- A. Water Master Plan Update including engineering analysis and reports for the Water Distribution System Map and Water Impact Fee Update appropriating funds from Unrestricted Water Fund Reserves to account 51-6409-309 Professional Services in the amount of \$63,800.00; and
- B. Engineering analysis for the Roadway Impact Fee Update appropriating funds from Unrestricted General Fund Reserves to account 11-6209-309 Professional Services in the amount of \$30,000.00.

**MOTION:** A motion was made by Mayor Pro Tem Peele, seconded by Councilmember Keer to approve authorizing the City Manager to enter into a professional services agreement with Birkhoff, Hendricks, & Carter, LLP (BH&C) in the amount of \$93,800 for a Water Master Plan Update including engineering analysis and reports for the Water Distribution System Map and Water Impact Fee Update appropriating funds from Unrestricted Water Fund Reserves to account 51-6409-309 Professional Services in the amount of \$63,800.00; and an engineering analysis for the Roadway Impact Fee Update appropriating funds from Unrestricted General Fund Reserves to account 11-6209-309 Professional Services in the amount of \$30,000.00. The motion passed unanimously by a 7 to 0 vote.

- 10. Consider approval of the Request for Proposal for Residential Solid Waste Services per the City of Lucas Specifications and provide direction to the City Manager regarding the proposal submission and evaluation process.**

The City Council asked for the following additional information:

- Reports from Republic Recycling on how much recycling is being collecting in the City.
- How much recycling is being collected in the Brockdale and Seis Lagos areas; have the numbers increased from previous years; include the number of subscribers.
- Trash Committee will determine rating system, preliminary evaluations, and bring forward a recommendation to the City Council.
- Collect information from businesses and schools regarding their trash/recycling providers.

The City Council recommended the following updates to the draft Request for Proposal:

- Add option to include commercial property in RFP
- Option to combine trash and recycling billing together if advantageous
- Option for both subscription-based recycling and trash and recycling subscriptions combined
- Enhanced bulk pickup service provided for a fee
- Concierge service for pickup of items closer to the home

There was no formal action on this item, it was for discussion purposes only.

**11. Consider amending FY 21/22 budget by appropriating \$57,300 from 2017 Certificates of Obligation funding to account 21-8210-490-130 and authorize the City Manager to enter into an agreement with Interstate Contracting & Coating, Inc. to replace the stem in the McGarity Elevated Tank.**

After some discussion with Public Works Director Scott Holden regarding materials, repairs needed, and water conservation efforts during the time of repair, the following motion was made.

**MOTION:** A motion was made by Councilmember Johnson, seconded by Councilmember Lawrence to approve amending FY 21/22 budget by appropriating \$57,300 from 2017 Certificates of Obligation funding to account 21-8210-490-130 and authorize the City Manager to enter into an agreement with Interstate Contracting & Coating, Inc. to replace the stem in the McGarity Elevated Tank. The motion passed unanimously by a 7 to 0 vote.

**12. Adjournment.**

**MOTION:** A motion was made by Councilmember Johnson seconded by Mayor Olk to adjourn the meeting at 9:15 pm. The motion passed unanimously by a 7 to 0 vote.

APPROVED:

ATTEST:

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Mayor Jim Olk

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City Secretary Stacy Henderson





**RESOLUTION R 2022-01-00525**  
[Designating Official Newspaper]

**A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF LUCAS, TEXAS, DESIGNATING THE *ALLEN AMERICAN* AS THE OFFICIAL NEWSPAPER OF THE CITY OF LUCAS, COLLIN COUNTY, TEXAS, FOR 2022 BEGINNING JANUARY 20, 2022 THROUGH DECEMBER 31, 2022; AND PROVIDING FOR AN EFFECTIVE DATE.**

**WHEREAS**, Section 3.17 of the City Charter states that the City Council pursuant to state law shall designate by resolution a newspaper of general circulation in the City as the official newspaper of the City as provided by State law; and

**WHEREAS**, the City Council of the City of Lucas, Texas, therefore, designates the Allen American as the official newspaper of the City;

**NOW, THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF LUCAS, TEXAS:**

**SECTION 1.** That the City Council of Lucas, Texas, hereby designates the *Allen American*, a public newspaper in and for the City of Lucas, Collin County, Texas, as the official newspaper of the City, the same to continue as such until another is selected, and shall cause to be published therein all ordinances, notices and other matters required by law or by ordinance to be published.

**SECTION 2.** This Resolution shall become effective from and after its passage.

**DULY PASSED** by the City Council of the City of Lucas, Texas, on this the 20th day of January 2022.

CITY OF LUCAS, TEXAS:

ATTEST:

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Jim Olk, Mayor

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Stacy Henderson, City Secretary



## RESOLUTION R 2022-01-00524

[SUPPORTING PROJECT AND AUTHORIZING APPLICATION TO THE TEXAS PARKS AND WILDLIFE RECREATIONAL TRAILS GRANT PROGRAM]

**A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF LUCAS, TEXAS, SUPPORTING THE PROPOSED TRAIL PROJECT AND AUTHORIZING THE PARTICIPATION IN THE RECREATIONAL TRAILS GRANT PROGRAM OF THE TEXAS PARKS AND WILDLIFE CERTIFYING THAT THE CITY OF LUCAS IS ELIGIBLE TO RECEIVE PROGRAM ASSISTANCE, CERTIFYING THE CITY'S MATCHING SHARE IS READILY AVAILABLE, AND PROVIDING AN EFFECTIVE DATE.**

**WHEREAS**, the City of Lucas supports the proposed trail project to construct a new public recreational trail for multi-purpose use; and

**WHEREAS**, the City of Lucas is fully eligible to receive assistance under the Recreational Trails Grant Program; and

**WHEREAS**, the City of Lucas authorizes an official to represent and act for the City in dealing with the Texas Parks and Wildlife Recreational Trails Grant Program application.

**NOW, THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF LUCAS, TEXAS:**

**SECTION 1.** The City of Lucas hereby supports the proposed trail project and application to the Texas Parks and Wildlife Recreational Trails Grant Program, and hereby certifies that the matching share for the application is readily available at this time.

**SECTION 2.** The City of Lucas hereby authorizes and directs the Assistant to the City Manager Kent Souriyasak to act for the City in working with the Texas Parks and Wildlife for the purposes of the Recreational Trails Grant Program.

**SECTION 3.** The City of Lucas hereby specifically authorizes the representative to make application to the Texas Parks and Wildlife Recreational Trails Grant Program concerning the project to be known as Lovejoy High School Trail Connection in the City of Lucas and is hereby dedicated (or will be dedicated upon completion of the proposed project) to remain open and maintained for at least 20 years.

**SECTION 4.** This Resolution shall become effective from and after its passage.

**DULY PASSED** by the City Council of the City of Lucas, Texas, on this the 20<sup>th</sup> day of January 2022.

CITY OF LUCAS, TEXAS:

ATTEST:

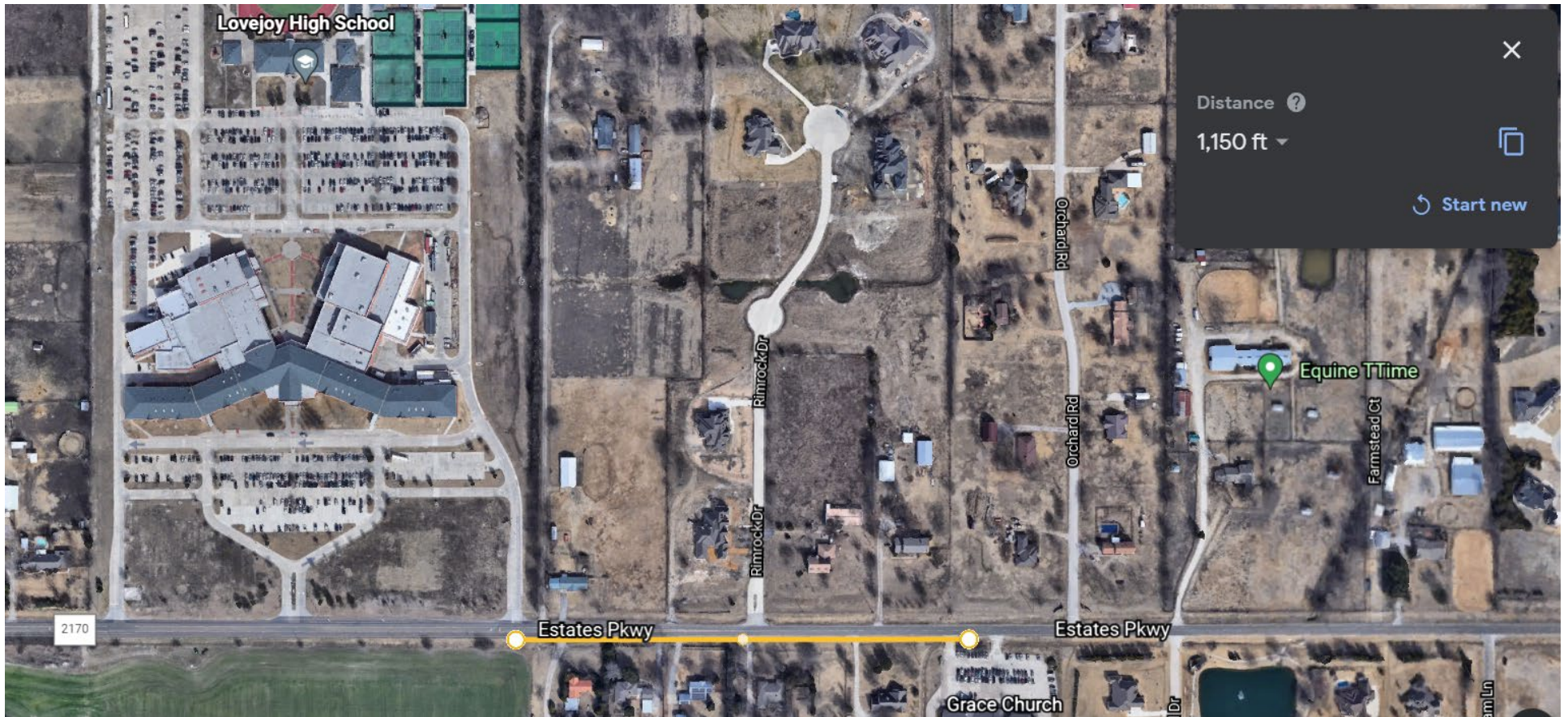
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Jim Olk, Mayor

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Stacy Henderson, City Secretary

Proposed Trail Project Map  
2022 Recreational Trails Grant Program  
Texas Parks & Wildlife



**Note:** Length of trail is highlighted in orange on the map.



# City of Lucas City Council Agenda Request January 20, 2022

Requester: Assistant to the City Manager Kent Souriyasak  
Republic Services Manager Municipal Sales Rick Bernas

## Agenda Item Request

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Receive a presentation by Republic Services on Industry Updates of Municipal Recycling and Waste.

## Background Information

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In 2018, the City entered into an agreement with Allied Waste Systems, Inc., d/b/a Republic Services for the collection of recyclable materials on a subscription basis. The contract was executed on February 12, 2018, with an initial term commencing on April 1, 2018, and continuing for five years terminating on March 31, 2023. Republic Services collects recyclable materials in a 95-gallon poly cart with an automated sideload vehicle every other week.

At the City Council meeting on December 16, 2021, the City Council requested information regarding the total number of recycling subscribers and collection totals within Lucas and the extraterritorial jurisdiction (ETJ), such as Seis Lagos and Brockdale. Republic has provided the information in the below tables:

### City of Lucas Recycling Subscribers

Year	Total Household Subscribers
2021	793
2020	779
2019	655

### City of Lucas Collection Volumes

Year	Total Collection Volumes (in tons)
2021	262
2020	264
2019	226

### Extraterritorial Jurisdiction (Seis Lagos and Brockdale)

Year	Total Residential Subscribers
2021	234

Year	Total Collection Volumes (in tons)
2021	79



**City of Lucas**  
**City Council Agenda Request**  
**January 20, 2022**

Item No. 04

**Attachments/Supporting Documentation**

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1. Presentation: Industry Update on Municipal Recycling and Waste (Republic Services)

**Budget/Financial Impact**

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NA

**Recommendation**

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NA

**Motion**

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There is no motion required. This is a presentation only.





# Industry Update Municipal Recycling & Waste

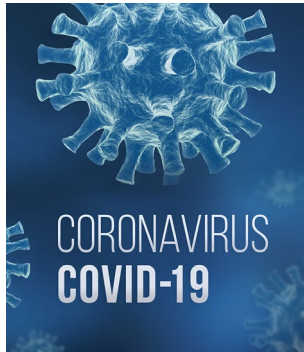
*Update*

Rick Bernas

*Manager Municipal Sales*



# Top of Mind in 2022



## COVID Pandemic Recovery

- Reopening enabling partial volume recovery
- Supply chain impacts to capital costs
- Cases continue to hinder operations in some markets



## China Sword / Recycling

- Continued investments in domestic mills and capacity
- Global capacity still well below pre-China Sword levels
- 2021 commodity markets up due to pandemic-induced demand



## Industry Wide Challenges

- National CDL driver and technician shortages driving wages up
- Labor shortages attributed to pandemic (eg: Call Center agents)

## Our 2030 Sustainability Goals

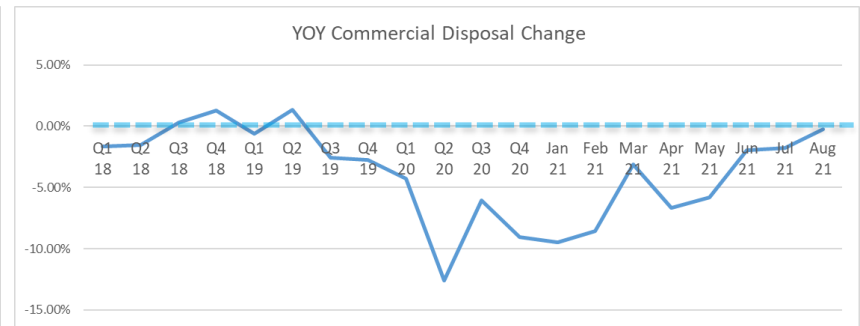
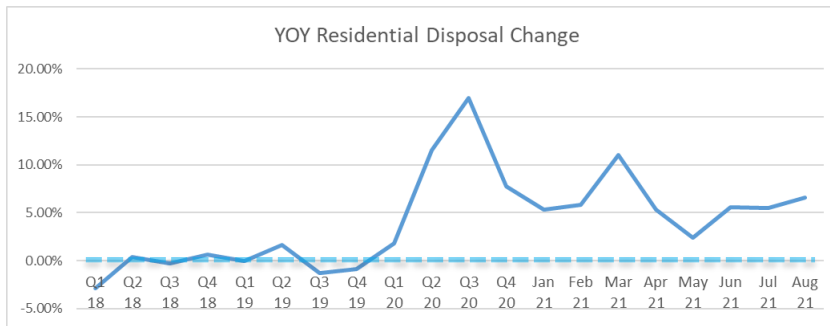


## Sustainability Commitments

- Investing in organics operations
- Upgrades to recycling facilities
- Commitment to electric vehicles
- Environmental Services Partner

The recycling and waste industry is far from “normal” in 2021. We continue to navigate multiple unanticipated headwinds.

# Pandemic Volume – Resi Remains Elevated



## Residential

- Volume mirrors attempts to restore mobility
- Consistent increase over pre-pandemic levels, driven by continued work-from-home realities

## Commercial

- Volumes mirror slow reopening of businesses
- Close to pre-pandemic averages

## Industrial

- No significant changes

Are residential volumes at a new norm?  
Continued work-from-home volume drives economic headwinds from additional disposal costs, in the lowest price line of business.



# Pandemic Impacts to Supply Chain and Capital

## Price of steel continues to soar

Hot-Rolled Coil Steel Futures Continuous Contract

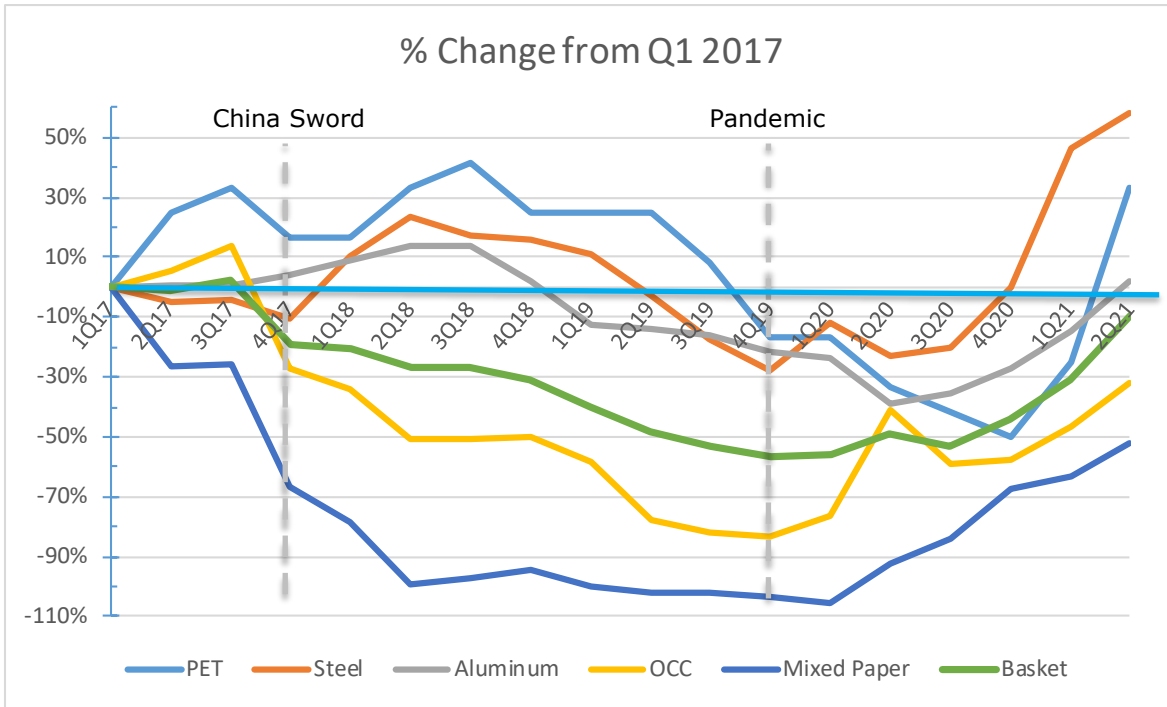


CHART: LANCE LAMBERT • SOURCE: MARKETWATCH

FORTUNE

Our industry is extremely capital intensive, requiring careful navigation of escalating costs.

# Recycling: Commodity Trends



## % of Republic Services Material Sold

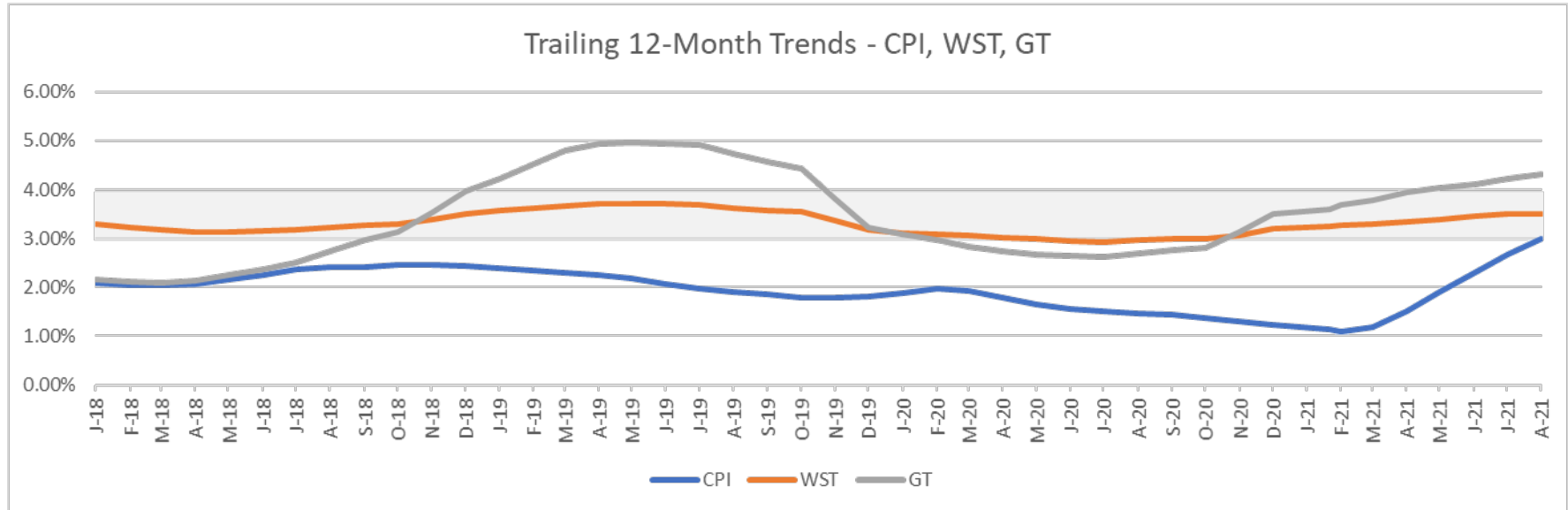
	<b>2019</b>	<b>2020</b>	<b>2021*</b>
<b>PET</b>	4.5%	4.9%	4.5%
<b>Steel</b>	1.8%	1.6%	1.3%
<b>Alum</b>	1.2%	1.4%	1.3%
<b>OCC</b>	50%	53%	54%
<b>Mix Paper</b>	25%	23%	24%

Source: STIFEL, June 2020 and June 2021

\* - 2021 "Basket" is based on Jan. through July data

Residential tons are up... and commodity values are improving.  
Is your Municipality missing out on the upside?

# Annual Price Increase – Are You Exposed?

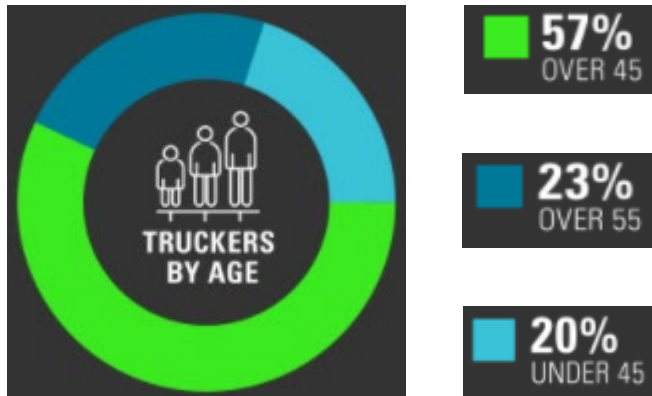


	<b>Jan</b>	<b>Feb</b>	<b>Mar</b>	<b>Apr</b>	<b>May</b>	<b>Jun</b>	<b>Jul</b>
CPI Monthly	1.40%	1.68%	2.62%	4.16%	4.99%	5.39%	5.37%
WST Monthly	3.57%	3.61%	3.53%	3.55%	3.44%	3.57%	3.69%
GT Monthly	4.42%	4.62%	4.69%	4.88%	4.34%	4.13%	4.54%

CPI will exceed industry average cost increases by end of 2021.

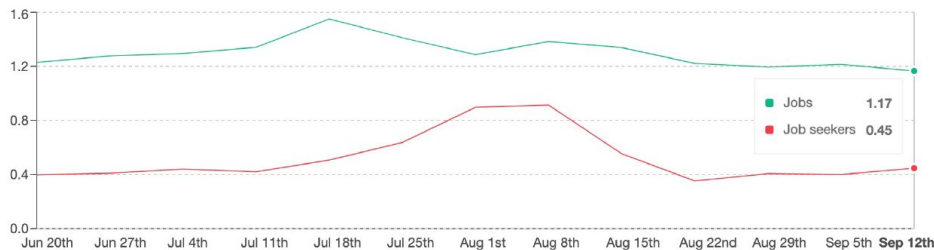
Cities not on WST or GT should change quickly to protect themselves and align with the proper industry index.

# National CDL Driver Shortage



- **Fewer Drivers** – Younger workers are not entering the driver industry at a rate high enough to replace an aging driver workforce

Job Volume and Job Seeker Change – Commercial Driver



- **Growing Gap** – Open positions vs applicants
  - CDL Job Volume +17%
  - CDL Job Seeking -55%

Sources: Coyote Collective Report, EMSI Report, 2021  
Indeed – US Data, August 2021

The growing gap between positions and applicants are forcing companies to offer higher pay, including \$5-10k signing bonuses and more time off.

# City of Lucas – Trends

- Homes subscribed
- 2019 – 655 homes
- 2020 – 779 homes
- 2021- 793 homes
  
- Volumes Trends
- 2019 – 226 tons
- 2020 – 264 tons
- 2021 – 262 tons
  
- Seis Lagos, Brockdale
- 234 subscribers
- 79 tons in 2021



# Lucas Recycle Outlets

- All materials collected from Lucas are sent to mills located throughout the United States. Some examples of these are listed below.
- Plastics – Carpet and new plastic bottles
- Paper / Cardboard – New Corrugated boxes
- Glass – mixed for new glass and road base products
- Aluminum – Inners for new car products
- Metal / Tin – melted and made into new product



Sustainability Yearbook  
Member 2021  
S&P Global



Member of  
Dow Jones  
Sustainability Indices  
Powered by the S&P Global CSA



**Rick Bernas**

Manager Municipal Sales

e: [Rbernas@republicservices.com](mailto:Rbernas@republicservices.com)

o: 469.443.7006 c: 972.880.0276



Item No. 05

**City of Lucas**  
**City Council Agenda Request**  
**January 20, 2022**

Requester: Development Services Director Joe Hilbourn

### **Agenda Item Request**

---

Consider a Development Agreement with Liberty Bankers Life Insurance Company for roadway improvements to the first 0.28 miles of Blondy Jhune Road east of FM 1378 and appropriating funds in an amount not to exceed \$306,489 from cash account 11-1009 General Fund Roadway Impact Fees to account 21-8210-491-300 Blondy Jhune Road Alignment and credit the owner for calculated roadway and water impact fees of \$289,374 per Section 3.2 of the Development Agreement.

### **Background Information**

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This project is located at the intersection of Blondy Jhune and Country Club Road. The property is currently zoned Residential 2-acre (R-2) and has an approved preliminary plat.

As part of the project, Blondy Jhune Road will be realigned, and a concrete road will be built to replace the existing asphalt pavement. The owner will construct roadway facilities that consist of replacing and realigning the existing Blondy Jhune Road (approximately 1,321 feet). The city will be responsible for its rough proportional share of roadway improvements, in this case the City's responsibility is substantial.

Article III, Roadway Facilities of the Development Agreement states the following:

3.1 Roadway Improvements. Owner agrees to design and construct the Roadway Improvements in accordance with the applicable standards, ordinances and regulations adopted by the City. Owner shall submit plans for the design and construction of the Roadway Improvements ("Construction Plans") to the City Engineer for review and approval. Subject to extensions for delay or caused by events of Force Majeure and to the City's approval of the Approved Plans, Owner agrees, at Owner's sole cost, to construct or cause the construction of the Roadway Improvements. Upon Completion of Construction Owner shall provide City with construction pay applications and maintenance bonds and such other records as City may request to document all the actual costs of the design and construction of the Roadway Improvements including but not limited to, affidavits of payment/affidavits as to debts and liens and any other evidence be required by City.

3.2 City's Participation. City agrees to credit the Owner the calculated roadway and water impact fees of \$289,374 for the proposed improvements. Such credit shall be paid quarterly to Owner as City receives such fees per building permit issued.

3.3 Maximum Participation. In addition, to the provisions of Section 3.2, the City agrees to pay Owner in an amount not to exceed \$306,489 (the "City's Cost Participation").





# City of Lucas

## City Council Agenda Request

### January 20, 2022

Owner shall be responsible for any costs that exceed the city's Cost Participation Amount. In no case shall the City Cost Participation to the Roadway Facility exceed thirty percent (30%) of the actual costs of design, engineering, site preparation and construction of any improvements, including buildings or the Roadway Facility itself, on the Property as required by the development regulations, whether constructed by Owner or another party ("the Development Infrastructure"), unless the contracts for construction of the Development infrastructure has been procured and entered into in compliance with the applicable competitive sealed bid procedures set forth in Chapter 252 of the Texas Local Government Code, as amended.

### **Attachments/Supporting Documentation**

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1. Proposed Development Agreement
2. Traffic Impact Study
3. Opinion of Probable Cost, On-Site Improvements
4. Opinion of Probable Summary
5. General Fund Roadway Impact Fee Schedule

### **Budget/Financial Impact**

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The city's participation cost includes the following:

- \$289,374 Credit in Impact Fees for Permits Issued
- \$306,489 Funding from General Fund Roadway Impact Fees

### **Recommendation**

---

Staff recommends approval of the Development Agreement as presented.

### **Motion**

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I make a motion to approve/deny a Development Agreement with Liberty Bankers Life Insurance Company for roadway improvements to the first 0.28 miles of Blondy Jhune Road east of FM 1378 and appropriating funds in an amount not to exceed \$306,489 from cash account 11-1009 General Fund Roadway Impact Fees to account 21-8210-491-300 Blondy Jhune Road Alignment and credit the owner for calculated roadway and water impact fees of \$289,374 per Section 3.2 of the Development Agreement.

STATE OF TEXAS           §  
  §           **DEVELOPMENT AGREEMENT**  
COUNTY OF COLLIN       §

This Development Agreement (“Agreement”) is executed this 20<sup>th</sup> day of January 2022, by and between the City of Lucas, Texas, a municipal corporation existing under the laws of the State of Texas (“City”), and Liberty Bankers Life Insurance Company, duly qualified to transact business in the State of Texas (“Owner”) (each a “Party” and collectively the “Parties”), acting by and through their authorized representatives.

**RECITALS:**

**WHEREAS**, Liberty Bankers Life Insurance Company. is the owner of the Property, which is located in Lucas, Texas, and which Owner desires to develop the Property in accordance with the Development Regulations and other applicable City ordinances, including the construction of Public Improvement; and

**WHEREAS**, Owner intends to develop the Property and to design and construct certain Roadway Improvements, on and for the benefit of the Property; and

**WHEREAS**, in association with the construction of the Development, the Parties find it to be in their mutual benefit and interest that Owner construct or cause to be constructed Roadway Facilities that consist of replacing and realigning existing Blondy Jhune Road (approximately 1321 feet).

**WHEREAS**, Texas Local Government Code §212.071, as amended, authorizes municipalities to participate in the Owner’s costs of construction of public improvements related to the development of subdivisions within the municipality without compliance with Chapter 252 of the Texas Local Government Code, as amended;

**NOW THEREFORE**, in consideration of the premises and the mutual covenants contained herein and other valuable consideration the sufficiency and receipt of which are hereby acknowledged, the Parties agree as follows

**Article I**  
**Definitions**

Wherever used in this Agreement, the following terms shall have the meanings ascribed to them in this Article I unless the context clearly indicates a different meaning:

“City” shall mean City of Lucas, Texas.

“City Engineer” shall mean City of Lucas City Engineer, or designee.

“Commencement of Construction” shall mean that: (i) the Construction Documents have

been prepared and all approvals thereof required by applicable governmental authorities have been obtained for construction of Roadway Facilities; (ii) all necessary permits for the construction of the Roadway Facility pursuant to the Construction Documents therefore have been issued by all applicable governmental authorities; and (iii) grading of the Roadway Facilities has commenced.

“Completion of Construction” shall mean: (i) the Roadway Facilities have been substantially completed in accordance with the Construction Documents; and (ii) the respective Roadway Facilities have been accepted by City.

“Construction Documents” shall mean the plans and specifications submitted for the design, installation and construction of the Roadway Facilities, as approved by City Engineer.

“Owner” shall mean Liberty Bankers Life Insurance Company . and any subsequent owner of any portion of the Property.

“Effective Date” shall mean the last date of execution of this Agreement.

“Force Majeure” shall mean any delays due to strikes, riots, acts of God, shortages of labor or materials, war, adverse market conditions, governmental approvals, laws, regulations, or restrictions, or other cause beyond the control of the Party.

“Property” shall mean the real property described and depicted in Exhibit “A-1” attached hereto.

“Roadway Improvements” shall mean the design and construction of the road base and concrete surface of Blondy Jhune Road as well as the design and construction of the 12” water line improvements and storm sewer improvements resulting from the roadway realignment. The base shall be twenty-six (26) feet wide and a sub-grade consisting of lime stabilized subgrade. The pavement shall be a minimum of eight (8) inches thick and twenty-four (24) feet wide of reinforced concrete pavement in accordance with the current City of Lucas Standard Construction Details and as depicted in Exhibit “C” in accordance with the Construction Documents. The water line shall be C900 Minimum DR 18 12” Water Pipe. The storm sewer shall be 24” Class III reinforced concrete pipe.

## **Article II**

### **Term**

The Term of this Agreement shall commence on the Effective Date and shall continue until the Parties have fully satisfied all terms and conditions of this Agreement unless sooner terminated as provided herein.

### **Article III Roadway Facilities**

3.1 Roadway Improvements. Owner agrees to design and construct the Roadway Improvements in accordance with the applicable standards, ordinances and regulations adopted by the City. Owner shall submit plans for the design and construction of the Roadway Improvements (“Construction Plans”) to the City Engineer for review and approval. Subject to extensions for delay or caused by events of Force Majeure and to the City’s approval of the Approved Plans, Owner agrees, at Owner’s sole cost, to construct or cause the construction of the Roadway Improvements by 01/12/2024. Upon Completion of Construction Owner shall provide City with construction pay applications and maintenance bonds and such other records as City may reasonably request to document all the actual costs of the design and construction of the Roadway Improvements including but not limited to, affidavits of payment/affidavits as to debts and liens and any other evidence reasonably be required by City.

3.2 City’s Participation. City agrees to credit the Owner the calculated roadway and water impact fees of \$289,374 for the proposed improvements. Such credit shall be paid quarterly to Owner as City receives such fees per building permit issued.

3.3 Maximum Participation. In addition, to the provisions of Section 3.2, the City agrees to pay Owner in an amount not to exceed \$306,489 (the “City’s Cost Participation”). Owner shall be responsible for any costs that exceed the city’s Cost Participation Amount. In no case shall the City Cost Participation to the Roadway Facility exceed thirty percent (30%) of the actual costs of design, engineering, site preparation and construction of any improvements, including buildings or the Roadway Facility itself, on the Property as required by the development regulations, whether constructed by Owner or another party ("the Development Infrastructure"), unless the contracts for construction of the Development Infrastructure have been procured and entered into in compliance with the applicable competitive sealed bid procedures set forth in Chapter 252 of the Texas Local Government Code, as amended.

### **Article IV Termination**

This Agreement shall terminate upon any one of the following:

- (a) the written agreement of the parties;
- (b) the Expiration Date;
- (c) the election by either party in the event the other party breaches any of the terms or conditions of this Agreement and such breach is not cured within thirty (30) days after written notice thereof to the breaching party;
- (d) the election by the City, if the Owner suffers an Event of Bankruptcy or Insolvency;
- (e) the election by the City, if any Impositions owed to the City or the State of Texas by the Owner shall become delinquent (provided, however the Owner retains the right to timely and properly protest and contest any such Impositions); and

- (f) the election by the City, if any subsequent Federal or State legislation or any decision of a court of competent jurisdiction declares or renders this Agreement invalid, illegal or unenforceable.

## **Article V Miscellaneous**

5.1 Release. Upon the full and final satisfaction by City and Owner of their respective obligations contained herein, City and Owner shall execute and record, in the Deed Records of Collin County, a release of City and Owner from their obligations set forth herein.

5.2 Books and Records. Owner and City agree to make their respective books and records relating to the construction of the Project available for inspection by the other Party, until acceptance of the Project by City.

5.3 Indemnification/Hold Harmless. **OWNER DOES HEREBY RELEASE, INDEMNIFY AND HOLD HARMLESS CITY, ITS OFFICERS, AGENTS, EMPLOYEES, AND THIRD PARTY REPRESENTATIVES (COLLECTIVELY REFERRED TO AS "CITY") FROM ANY AND ALL CLAIMS, DAMAGES, CAUSES OF ACTION OF ANY KIND WHATSOEVER, STATUTORY OR OTHERWISE, PERSONAL INJURY (INCLUDING DEATH), PROPERTY DAMAGE AND LAWSUITS AND JUDGMENTS, INCLUDING COURT COST, EXPENSES AND ATTORNEY'S FEES, AND ALL OTHER EXPENSES ARISING DIRECTLY OR INDIRECTLY FROM OWNER'S PERFORMANCE OF THIS AGREEMENT. THE FOREGOING RELEASE AND INDEMNITY SHALL SURVIVE TERMINATION OF THIS AGREEMENT.**

5.4 Project Plans. Except as otherwise provided herein, prior to Commencement of Construction, Owner shall submit all Construction Documents for all Roadway Facilities to City Engineer for review and approval.

5.5 Compliance with Laws. Except as otherwise provided herein, Owner shall fully comply with all local, state and federal laws, including all codes, ordinances and regulations applicable to this Agreement and the work to be done hereunder, which exist or which may be enacted later by governmental bodies having jurisdiction or authority for such enactment.

5.6 Successors and Assigns. All obligations and covenants of Owner under this Agreement shall be binding on Owner, its successors and permitted assigns. Owner may not assign this Agreement without the prior written consent of City, which shall not be unreasonably withheld.

5.7 Binding Agreement. The terms and conditions of this Agreement are binding upon the successors and assigns of all Parties hereto.

5.8 Limitation on Liability. It is acknowledged and agreed by the Parties that the terms hereof are not intended to and shall not be deemed to create a partnership or joint venture among

the Parties. It is understood and agreed between the Parties that Owner, in satisfying the conditions of this Agreement, has acted independently, and City assumes no responsibilities or liabilities to third parties in connection with these actions.

5.9 Authorization. Each Party represents that it has full capacity and authority to grant all rights and assume all obligations that are granted and assumed under this Agreement.

5.10 Notice. Any notice required or permitted to be delivered hereunder shall be deemed received three (3) days after it is sent by United States Mail, postage prepaid, certified mail, return receipt requested, addressed to the Party at the address set forth below or on the day actually received when sent by courier or otherwise hand delivered.

If intended for Owner, to:

Liberty Bankers Life Insurance Company  
Attn: Dave Wilcox  
1605 LBJ Freeway, Suite 700  
Dallas, TX. 75234

If intended for City, to:

City of Lucas  
Attn: Joni Clarke, City Manager  
665 Country Club Road  
Lucas, Texas 75002

With a copy to:

Joseph J. Gorfida, Jr.  
Nichols, Jackson, Dillard, Hager & Smith, L.L.P.  
1800 Ross Tower  
500 N. Akard  
Dallas, Texas 75201

5.11 Entire Agreement. This Agreement embodies the complete agreement of the Parties hereto, superseding all oral or written, previous and contemporary, agreements between the Parties and relating to the matters in this Agreement.

5.12 Governing Law. The validity of this Agreement and any of its terms and provisions, as well as the rights and duties of the Parties, shall be governed by the laws of the State of Texas; and venue for any action concerning this Agreement shall be in State District Court of competent jurisdiction in Collin County, Texas. The Parties agree to submit to the personal and subject matter jurisdiction of said court.

5.13 Amendment. This Agreement may be amended by the mutual written agreement of the Parties.

5.14 Legal Construction. In the event any one or more of the provisions contained in this Agreement shall for any reason be held to be invalid, illegal, or unenforceable in any respect, such invalidity, illegality, or unenforceability shall not affect other provisions, and it is the intention of the Parties to this Agreement that in lieu of each provision that is found to be illegal, invalid, or unenforceable, a provision be added to this Agreement which is legal, valid and

enforceable and is as similar in terms as possible to the provision found to be illegal, invalid or unenforceable.

5.15 Recitals. The recitals to this Agreement are incorporated herein and are found to be true and correct.

5.16 Counterparts. This Agreement may be executed in any number of counterparts, each of which shall be deemed an original and constitute one and the same instrument.

5.17 Exhibits. Any exhibits to this Agreement are incorporated herein by reference for all purposes wherever reference is made to the same.

5.18 Survival of Covenants. The representations, warranties, covenants, and obligations of Owner set forth in this Agreement shall survive termination.

5.19 Recordation of Agreement. An original of this Agreement shall be recorded in the Deed Records of Collin County, Texas.

5.20 Covenants Run With Property. The provisions of this Agreement are hereby declared covenants running with the Property and are fully binding on Owner and each and every subsequent owner of all or any portion of the Property but only during the term of such Party's ownership thereof (except with respect to defaults that occur during the term of such person's ownership) and shall be binding on all successors, heirs, and assigns of Owner which acquire any right, title, or interest in or to the Property, or any part thereof. Any person who acquires any right, title, or interest in or to the Property, or any part hereof, thereby agrees and covenants to abide by and fully perform the provisions of this Agreement with respect to the right, title or interest in such Property.

5.21 Effective Date. The effective date of this Development Agreement shall be the date on which this Development Agreement is approved by the City Council of the City.

*(signature page to follow)*

**SIGNED AND AGREED** this 20<sup>th</sup> day of January, 2022.

**CITY:**

**OWNER:**

**City of Lucas, Texas**

**Liberty Bankers Life Insurance Company**

By: \_\_\_\_\_  
Joni Clarke, City Manager

By: \_\_\_\_\_  
Dave J. Wilcox, Vice President  
Real Estate Investments

Approved as to Form:

By \_\_\_\_\_  
Joseph J. Gorfida, Jr., City Attorney

THE STATE OF TEXAS           §  
  §  
COUNTY OF COLLIN           §

This instrument was acknowledged before me on the 20<sup>th</sup> day of January 2022, by Joni Clarke, City Manager of the City of Lucas, Texas, a municipal corporation on behalf of such municipal corporation.

\_\_\_\_\_  
Notary Public in and for the State of Texas

THE STATE OF TEXAS           §  
  §  
COUNTY OF DALLAS           §

This instrument was acknowledged before me on the \_\_\_ day of \_\_\_\_\_, 2022, by Dave J. Wilcox, VP – Real Estate Investments, Liberty Bankers Life Insurance Company.

\_\_\_\_\_  
Notary Public in and for the State of Texas



## MEMORANDUM

To: RLO Haggard, LLC  
 From: Scot Johnson, P.E., PTOE  
 Steven Roberts, EIT  
 Date: November 23, 2021  
 Subject: Traffic Impact  
 Proposed Hendrick Farms Development



### Introduction

The Hendrick Farms site is approximately 72.4 acres and located in Lucas, Texas on the east side of Country Club Road and on the north and south sides of Blondy Jhune Road. A vicinity map of the area can be found in **Exhibit 1**. This memo is intended to document the site’s anticipated trip generation and discuss the reconstruction of Blondy Jhune Road.

The current site plan is attached, which includes a table of land use totals for the existing zoning and proposed zoning. The site plan can be found in **Exhibit 2**. The existing and proposed travel lanes and intersection control can be found in **Exhibit 3**.

Traffic counts were collected on July 7, 2021 on Blondy Jhune Road and on Country Club Road. The existing traffic volumes can be found in **Exhibit 4**.

### Trip Generation

Site-generated traffic estimates are determined through a process known as trip generation. Rates and equations are applied to the proposed land use to estimate traffic generated by the development during a specific time interval. Per the City of Lucas, the daily trip generation rate for single-family detached housing is 10 trips per lot.

The acknowledged source for trip generation rates is the 10<sup>th</sup> edition of *Trip Generation Manual* published by the Institute of Transportation Engineers (ITE). ITE has established trip rates in nationwide studies of similar land uses. The trips indicated are one-way trips or trip ends, where one vehicle entering and exiting the site is counted as one inbound trip and one outbound trip. ITE trip generation was used to evaluate trips in the AM and PM peak hours. No reductions were taken for internal capture, pass-by trips, or multimodal use.

The site will have 34 single family houses, each on a two- or greater acre lot, which is within the currently allowed zoning for the site.

**Table 1** shows the resulting weekday daily, AM peak hour, and PM peak hour vehicle trip generation for the proposed zoning.

**Table 1 – Proposed Zoning Trip Generation**

Land Uses	Amount	Units	ITE Code	Daily One-Way Trips	AM Peak Hour One-Way Trips			PM Peak Hour One-Way Trips		
					IN	OUT	TOTAL	IN	OUT	TOTAL
<b>Single Family Detached Housing</b>	34	DU	210	340	8	23	31	25	14	39

The 31 AM and 39 PM peak hour vehicle trips were distributed out to the intersection of Blondy Jhune Road and Country Club Road. The vehicles were then assigned based on the general traffic distribution observed in the 2018 counts at this location. Approximately 90% of the vehicles were assigned to the intersection of Blondy Jhune Road and Country Club Road, and 10% were assigned to Blondy Jhune Road to and from the east. Of those at Blondy Jhune Road and Country Club Road, half were assigned to and from the north and the other half were assigned to and from the south. The assignment percentages can be seen in **Exhibit 5**, and the resulting site-generated trips can be found in **Exhibit 6**.

Historical traffic counts on Country Club Road and Blondy Jhune Road, dating back to 1999 and 2009, respectively, were used to find the growth rates of this area of Lucas, which was observed to be 6% per year.

Due to the lowered traffic volumes with circumstances surrounding COVID-19, the historic peak hour volumes of the traffic counts along the main corridors were compared to find an appropriate adjustment factor. **Table 2** displays the calculations of adjustment factors for the daily, AM, and PM peak hour that were applied to the surrounding street network to obtain more accurate 2021 traffic volumes.

**Table 2 – COVID-19 Adjustment Factors**

Year	Country Club Road			Blondy Jhune Road		
	ADT Volume	AM Peak Period (7:00 AM - 8:00 AM)	PM Peak Period (5:00 PM - 6:00 PM)	ADT Volume	AM Peak Period (7:00 AM - 8:00 AM)	PM Peak Period (5:00 PM - 6:00 PM)
		Volume	Volume		Volume	Volume
2018	9,610	1,024	876	1,968	185	211
2021 (Observed)	9,403	650	738	2,114	147	173
2021 (Expected)	11,446	1,220	1,043	2,344	220	251
Growth Factor Pre Covid	ADT Correction Factor	AM Peak Correction Factor	PM Peak Correction Factor	ADT Correction Factor	AM Peak Correction Factor	PM Peak Correction Factor
6.0%	1.22	1.88	1.41	1.11	1.50	1.45

As a Type B thoroughfare, Country Club Road sees significantly more traffic daily than Blondy Jhune Road. Since Country Club Road is the larger roadway, it was judged that the impacts of COVID-19 within Lucas are more fully captured in the count data from Country Club Road. To ensure a conservatively high peak hour intersection analysis, the AM and PM peak correction factors of Country Club Road were used in the intersection analysis rather than Blondy Jhune Road.

The daily proportion of site traffic discussed later was calculated with the specific ADT correction factors for each road from **Table 2** (i.e., 1.11 for Blondy Jhune Road).

The 6% yearly growth factor was applied to the adjusted 2021 counts to calculate the 2025 background traffic, which can be found in **Exhibit 7**. The site-generated traffic was added on top of the 2025 background traffic to model the expected buildout year of the site. The background plus site-generated traffic volumes are displayed in **Exhibit 8**.

To analyze the existing, 2025 background, and 2025 background plus site traffic scenarios, capacity analyses were conducted using the *Synchro*<sup>TM</sup> software package and *Highway Capacity Manual* reports for the intersections. The results of these analyses are displayed in **Tables 3** and **4**.

**Table 3 – Traffic Operational Results – Weekday AM Peak Hour**

INTERSECTION	APPROACH	2021 Existing Traffic		2025 Background Traffic		2025 Background plus Site Traffic	
		AM Peak Hour		AM Peak Hour		AM Peak Hour	
		DELAY (SEC/VEH)	LOS	DELAY (SEC/VEH)	LOS	DELAY (SEC/VEH)	LOS
Blondy Jhune Road @ Country Club Road	WB*	46.4	E	200+	F	200+	F
	SBL	9.7	A	10.8	B	10.9	B
Blondy Jhune Road @ West Drive	EBL	-	-	-	-	7.7	A
	SB*	-	-	-	-	9.6	A
Blondy Jhune Road @ East Drive	NB*	-	-	-	-	10.8	B
	WBL	-	-	-	-	-	-

\* Stop-Controlled Approach  
 - No movements in Time Period

**Table 4 – Traffic Operational Results – Weekday PM Peak Hour**

INTERSECTION	APPROACH	2021 Existing Traffic		2025 Background Traffic		2025 Background plus Site Traffic	
		PM Peak Hour		PM Peak Hour		PM Peak Hour	
		DELAY (SEC/VEH)	LOS	DELAY (SEC/VEH)	LOS	DELAY (SEC/VEH)	LOS
Blondy Jhune Road @ Country Club Road	WB*	29.4	D	97.3	F	135.2	F
	SBL	8.6	A	9.2	A	9.3	A
Blondy Jhune Road @ West Drive	EBL	-	-	-	-	7.5	A
	SB*	-	-	-	-	9.3	A
Blondy Jhune Road @ East Drive	NB*	-	-	-	-	10.4	B
	WBL	-	-	-	-	7.6	A

\* Stop-Controlled Approach  
 - No movements in Time Period

Capacity analysis results are listed in terms of Level of Service (LOS). LOS is a qualitative term describing operating conditions a driver will experience while traveling on a particular street or highway during a specific time interval. It ranges from A (very little delay) to F (long delays and congestion). **Table 5** shows the definition of level of service for signalized and unsignalized intersections.

**Table 5 – Level of Service Definitions**

Level of Service	Signalized Intersection Average Total Delay (sec/veh)	Unsignalized Intersection Average Total Delay (sec/veh)
A	≤10	≤10
B	>10 and ≤20	>10 and ≤15
C	>20 and ≤35	>15 and ≤25
D	>35 and ≤55	>25 and ≤35
E	>55 and ≤80	>35 and ≤50
F	>80	>50

Definitions provided from the Highway Capacity Manual, Special Report 209, Transportation Research Board, 2010.

Study area intersections were analyzed based on average total delay analysis for signalized and unsignalized intersections. For the unsignalized analysis, the level of service (LOS) for a two-way stop-controlled intersection is defined for each movement. Unlike signalized intersections which define LOS for each approach and for the intersection as a whole, LOS for two-way stop-controlled intersections is not defined as a whole.

Currently, the westbound approach to the intersection of Blondy Jhune Road and Country Club Road operates at LOS E and LOS D during the AM and PM peak hours, respectively. With the addition of background growth, the approach changes to LOS F during both peak hours. Both Blondy Jhune Road and Country Club Road are City of Lucas Thoroughfares, per the March 2017 version to the City Comprehensive Plan. It is understandable that at their intersection, there will be higher delays as the City builds out.

With the addition of Hendrick Farms site-generated traffic, there is a small amount of additional delay, but there is not a change in level of service during either peak hour. The delay experienced by vehicles attempting to turn from Blondy Jhune Road out onto Country Club Road is typical for making an unsignalized turn onto a relatively busy thoroughfare road. Currently, Country Club Road is a two-lane roadway. It is designated on the City Thoroughfare Plan as a four-lane road, and its intersection with Blondy Jhune Road has been specifically identified on the plan as a “proposed intersection improvement location.” When converted to a four-lane road, the gaps in the north-south through traffic needed for turning movements will be more frequent, and the delays at this intersection will decrease.

**Blondy Jhune Road Reconstruction**

Per City wishes, the intersection of Blondy Jhune Road and Country Club Road will remain at its current location but will be realigned and reconstructed from Country Club Road to the eastern edge of the Hendrick Farm development. The reconstruction provides adequate sight distance, allows the intersection to be much closer to a right-angle by extending the approach length to the intersection, and removes the sharp turning radius that exists on Blondy Jhune Road today. Rather than the less than 100 foot turning radius that exists today, which necessitates the current 15-mph curve advisory sign on westbound Blondy Jhune Road, the proposed turning radii are greater than 200 feet. In addition to making the driving experience more comfortable, the increase in radius will make the turns safer by decreasing the chance of a vehicle sliding off the road during inclement weather.

**Site Traffic Percentage of Blondy Jhune Road**

Percentage of site traffic in relation to total traffic is provided in **Table 6** to help aid in pro-rata cost discussions between the development and the City.

**Table 6 – Blondy Jhune Road Site Traffic Percentage**

Blondy Jhune Road Rough Proportionality - Daily Traffic					
2021 Background (Observed)	2021 Background (Adjusted)	2025 Background (Projected)	Daily Site Traffic	2025 Total Background + Site	Site Traffic Percentage
2,114	2,344	2,959	306	3,265	9.4%

1. The observed count on Blondy Jhune Road in 2021 was 2,114 vehicles per day.
2. After 11% increase for COVID effects (where the traffic “should” be), Blondy Jhune Road would have 2,344 vehicles per day.
3. After 4 years of 6% annual growth, Blondy Jhune Road would have 2,959 vehicles per day in 2025.
4. 90% of Hendricks Farm daily traffic uses Blondy Jhune Road west of the access point, that is 306 vehicles per day.
5. Adding 2,959 background traffic to 306 Hendricks Farm traffic results in a combined 3,265 vehicles per day on Blondy Jhune Road at site buildout in 2025.
6. **306 Hendricks Farms daily vehicles make up 9.4% of the total 3,265 vehicles per day on Blondy Jhune Road in 2025.**

**Site Traffic Percentage of Country Club Road**

For completeness, the same site traffic proportion was calculated for Country Club Road in **Table 7**.

**Table 7 – Country Club Road Site Traffic Percentage**

Country Club Road Rough Proportionality - Daily Traffic					
2021 Background (Observed)	2021 Background (Adjusted)	2025 Background (Projected)	Daily Site Traffic	2025 Total Background + Site	Site Traffic Percentage
9,403	11,446	14,450	153	14,603	1.0%

1. The observed count on Country Club Road in 2021 was 9,403 vehicles per day.
2. After 22% increase for COVID effects (where the traffic “should” be), Country Club Road would have 11,446 vehicles per day.
3. After 4 years of 6% annual growth, Country Club Road would have 14,450 vehicles per day in 2025.
4. 45% of Hendricks Farm daily traffic uses Country Club Road in each direction, that is 153 vehicles per day.
5. Adding 14,450 background traffic to 153 Hendricks Farm traffic results in a combined 14,603 vehicles per day on Country Club Road at site buildout in 2025.
6. 153 Hendricks Farms vehicles make up 1.0% of the total 14,603 vehicles per day on Country Club Road in 2025.

Due to the higher existing traffic level on Country Club Road, the proportion of the Country Club Road’s daily traffic made up of Hendricks Farm site traffic is only 1%, lower than the 9.4% site traffic proportion seen on Blondy Jhune Road.

**Summary**

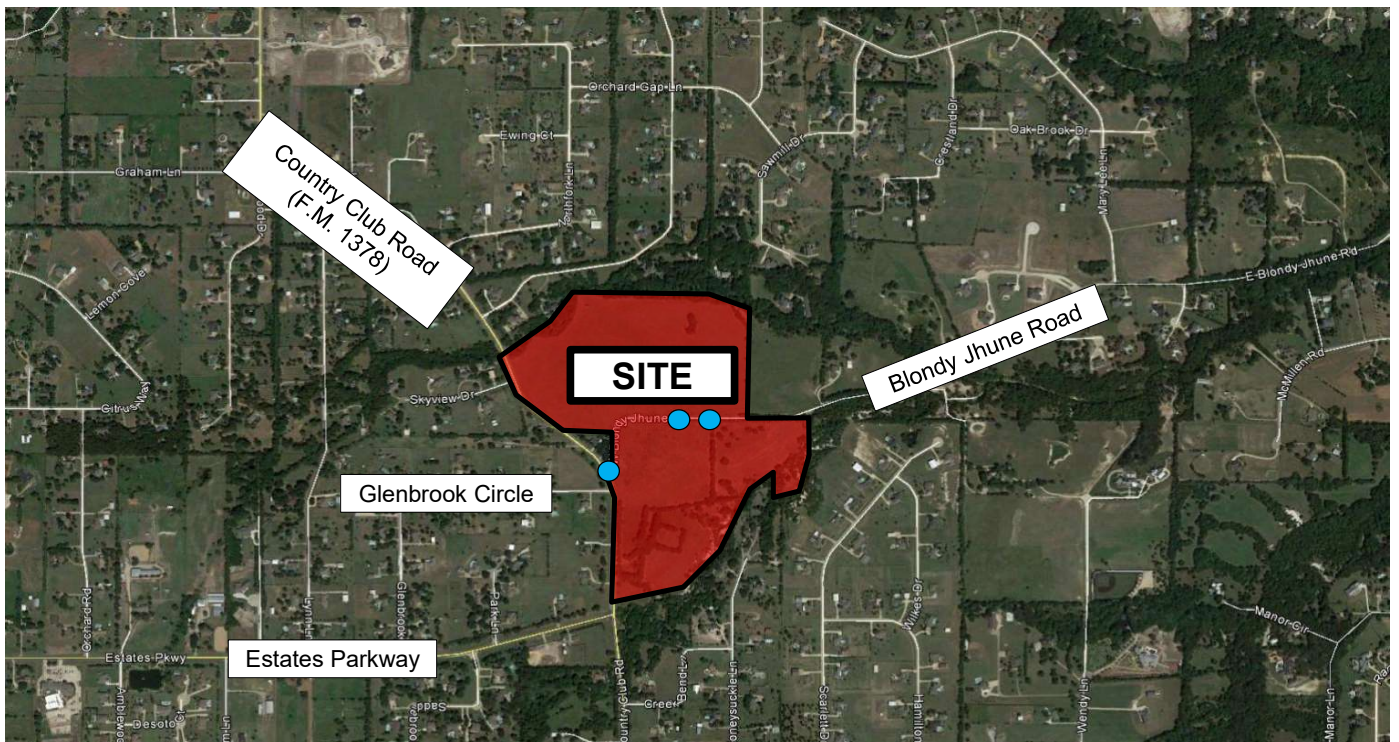
The Hendrick Farms development is building 34 single family houses, each on a two- or greater acre lot, which is within the currently allowed zoning for the site. These 34 homes will produce 31 AM peak hour trips and 39 PM peak hour trips. Based on the analysis included in this report, the site-generated traffic does not significantly affect the current traffic operations at the intersection of Blondy Jhune Road and Country Club Road. However, the project includes a reconstruction of the intersection of the two roads that will improve the driving experience and safety of Blondy Jhune Road, benefitting the current residents of the City of Lucas. The future widening of Country Club Road, as indicated on the City’s Thoroughfare Plan, will improve the operating conditions of this intersection as well.

During the projected buildout year of 2025, the Hendrick Farms development will account for approximately 9.4% of traffic along the western portion of Blondy Jhune Road.


**END**

Attachments: Exhibit 1: Vicinity Map  
Exhibit 2: Conceptual Site Plan  
Exhibit 3: Lane Assignment and Intersection Control  
Exhibit 4: 2021 Existing Traffic Volumes  
Exhibit 5: Trip Distribution and Traffic Assignment  
Exhibit 6: Site-Generated Traffic Volumes  
Exhibit 7: 2025 Background Traffic Volumes  
Exhibit 8: 2025 Background plus Site-Generated Traffic Volumes  
Historical Traffic Counts  
2018 Traffic Counts  
2021 Traffic Counts  
2021 existing traffic Synchro Output  
2025 background traffic Synchro Output  
2025 background plus site-generated traffic Synchro Output

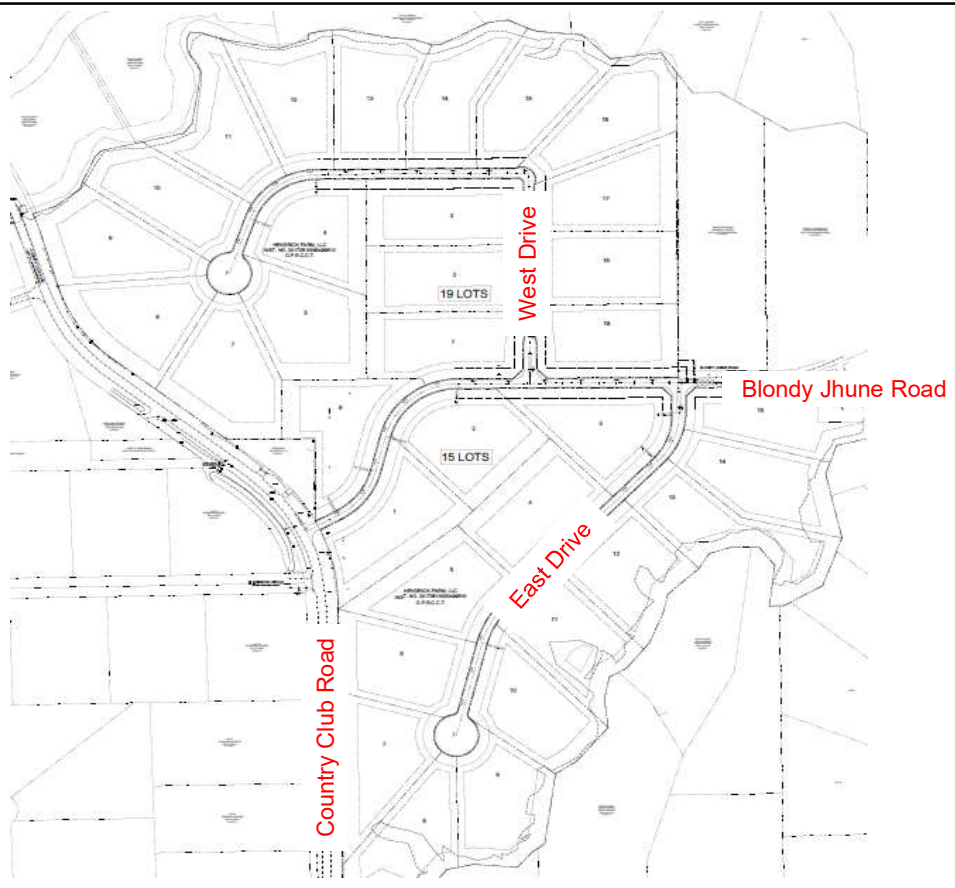




**EXHIBIT 1**  
Vicinity Map

**LEGEND:**  
 = Study Intersection

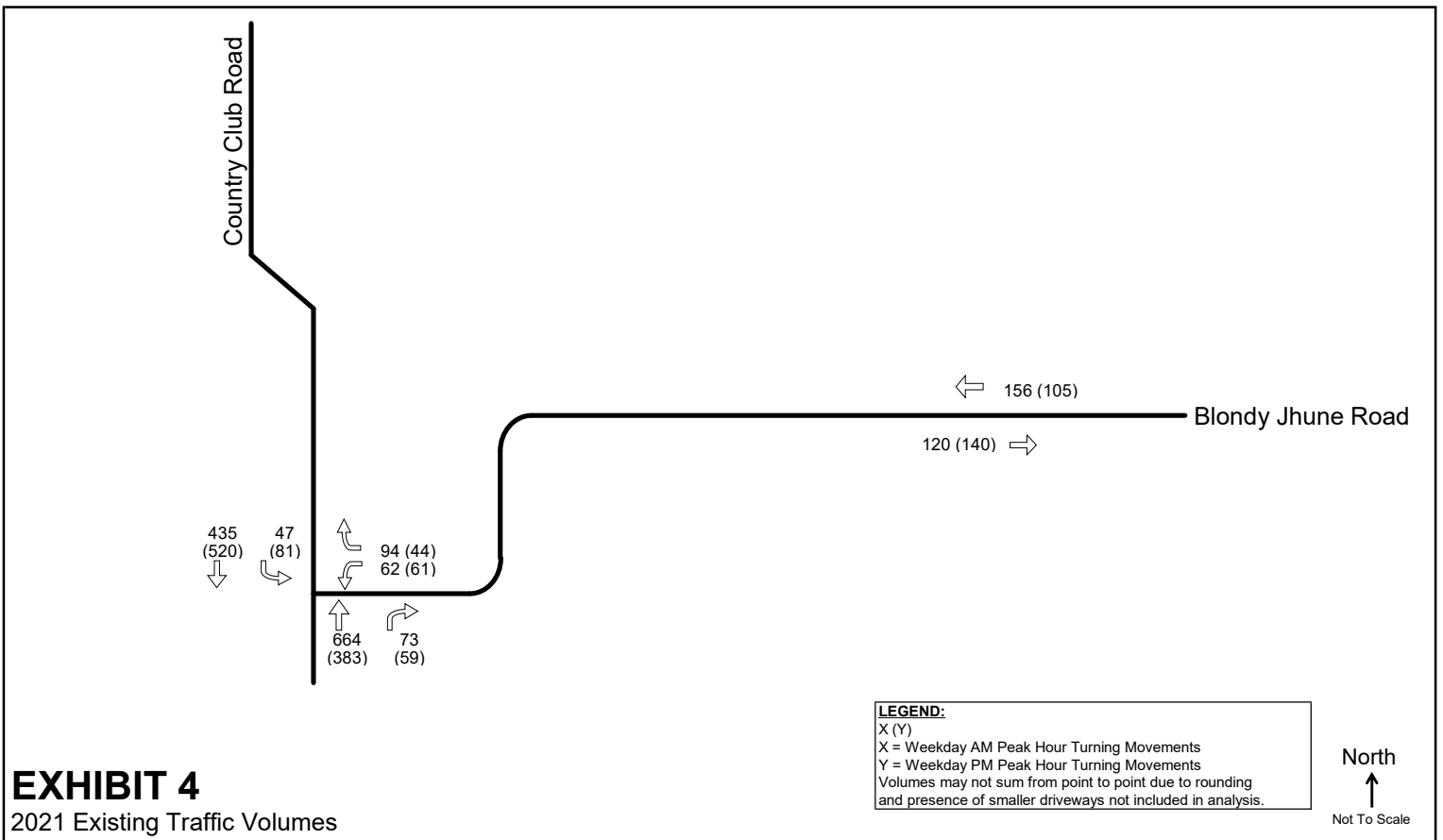
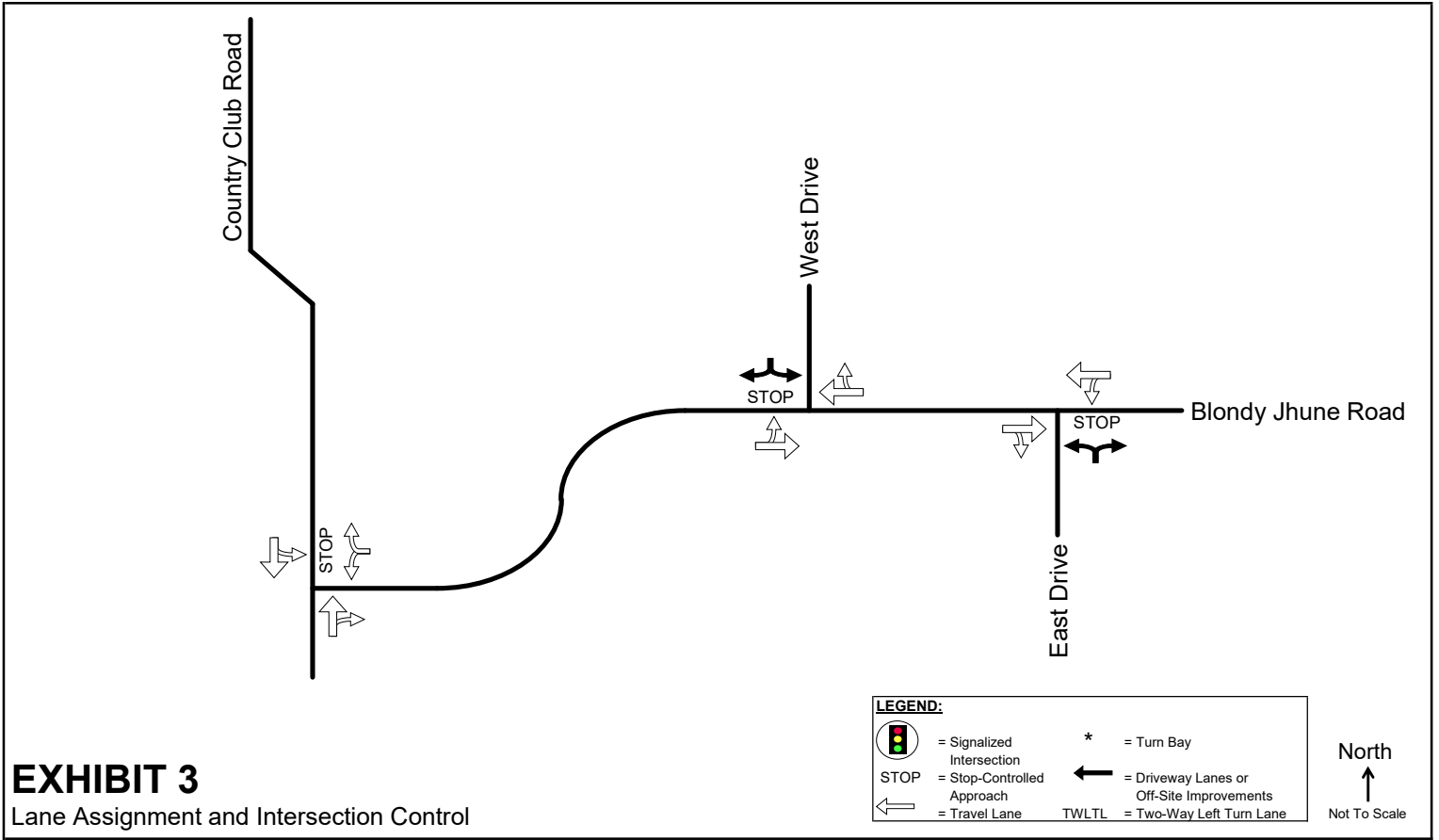
North  
  
 Not To Scale

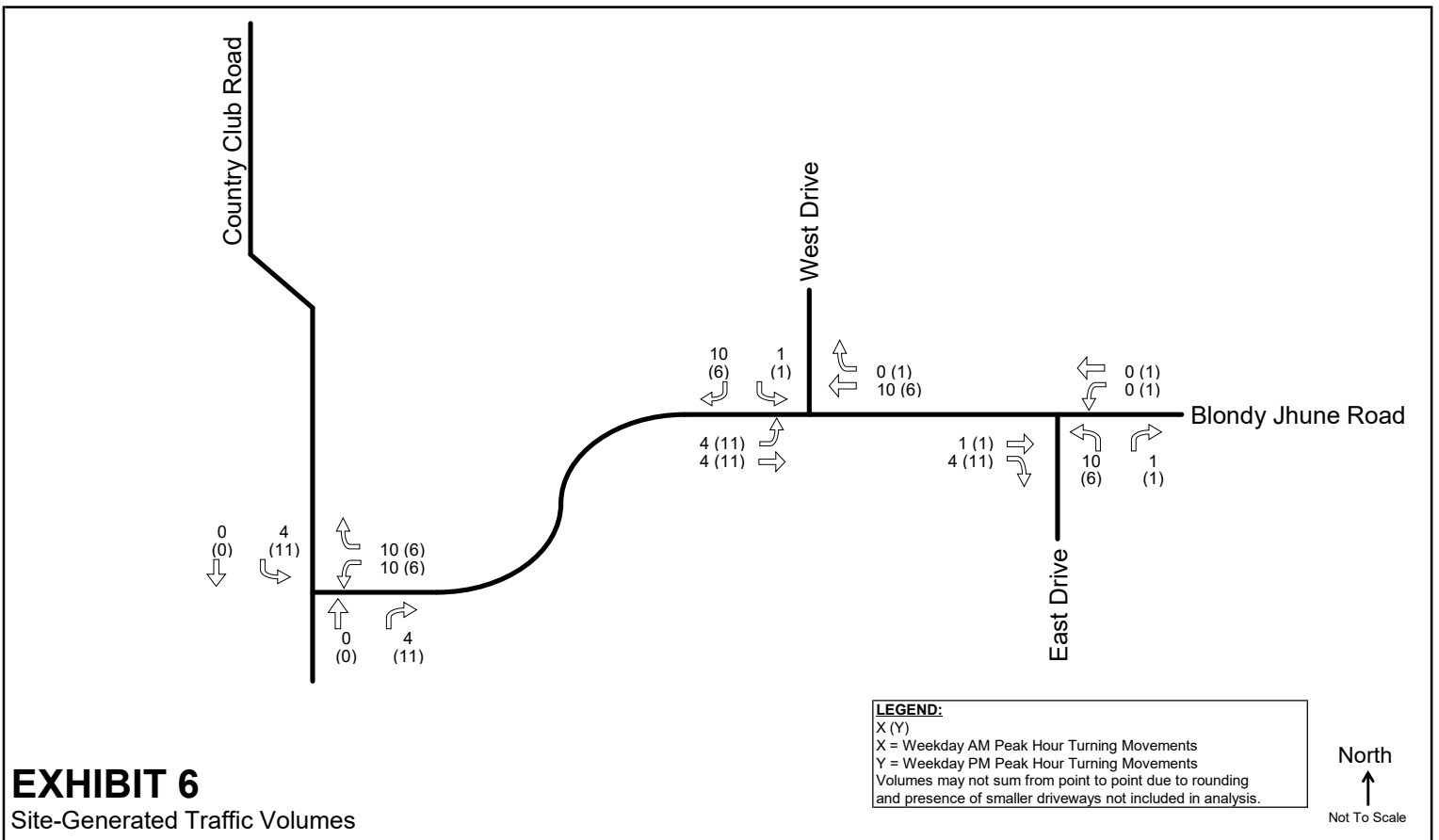
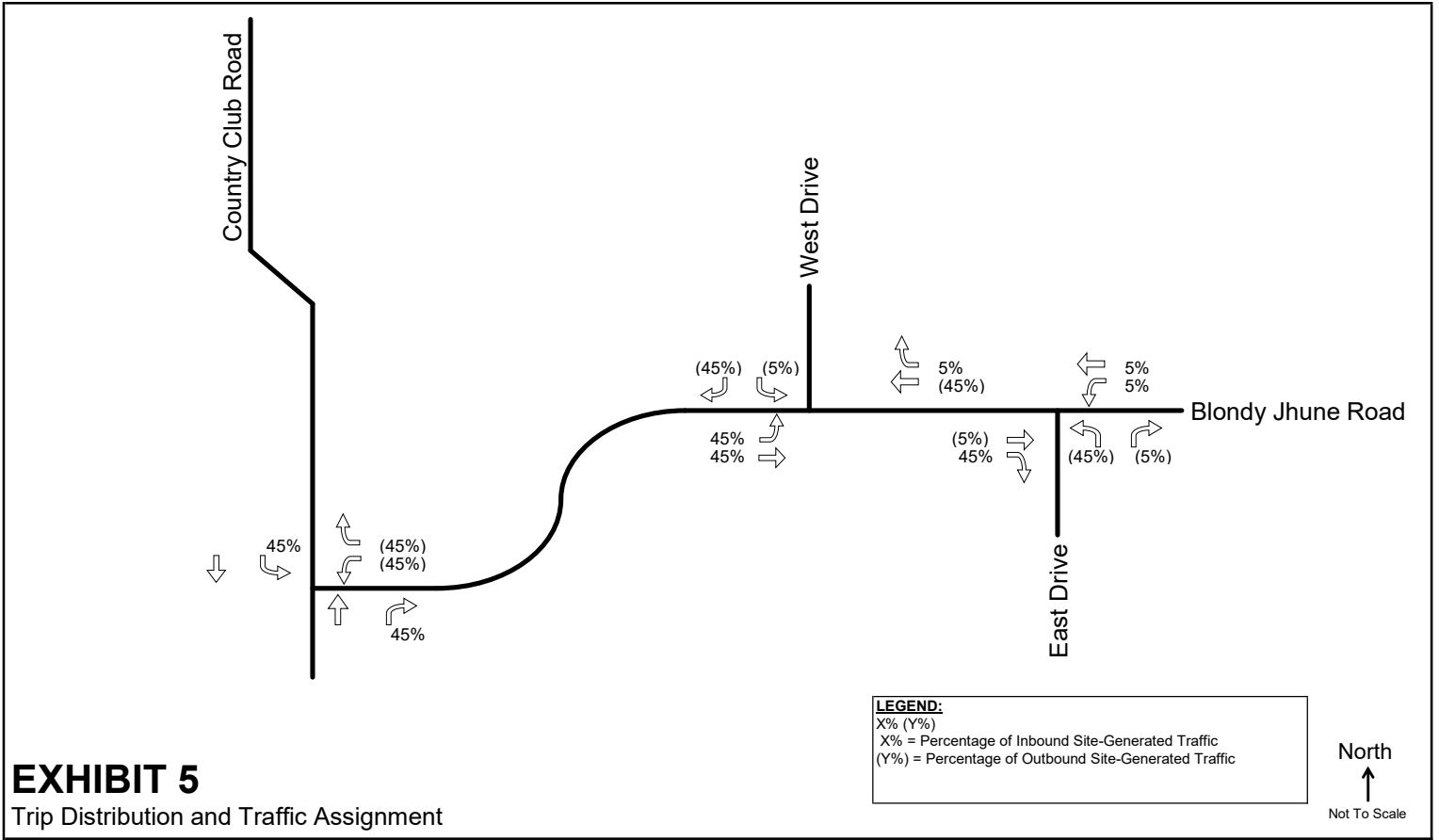


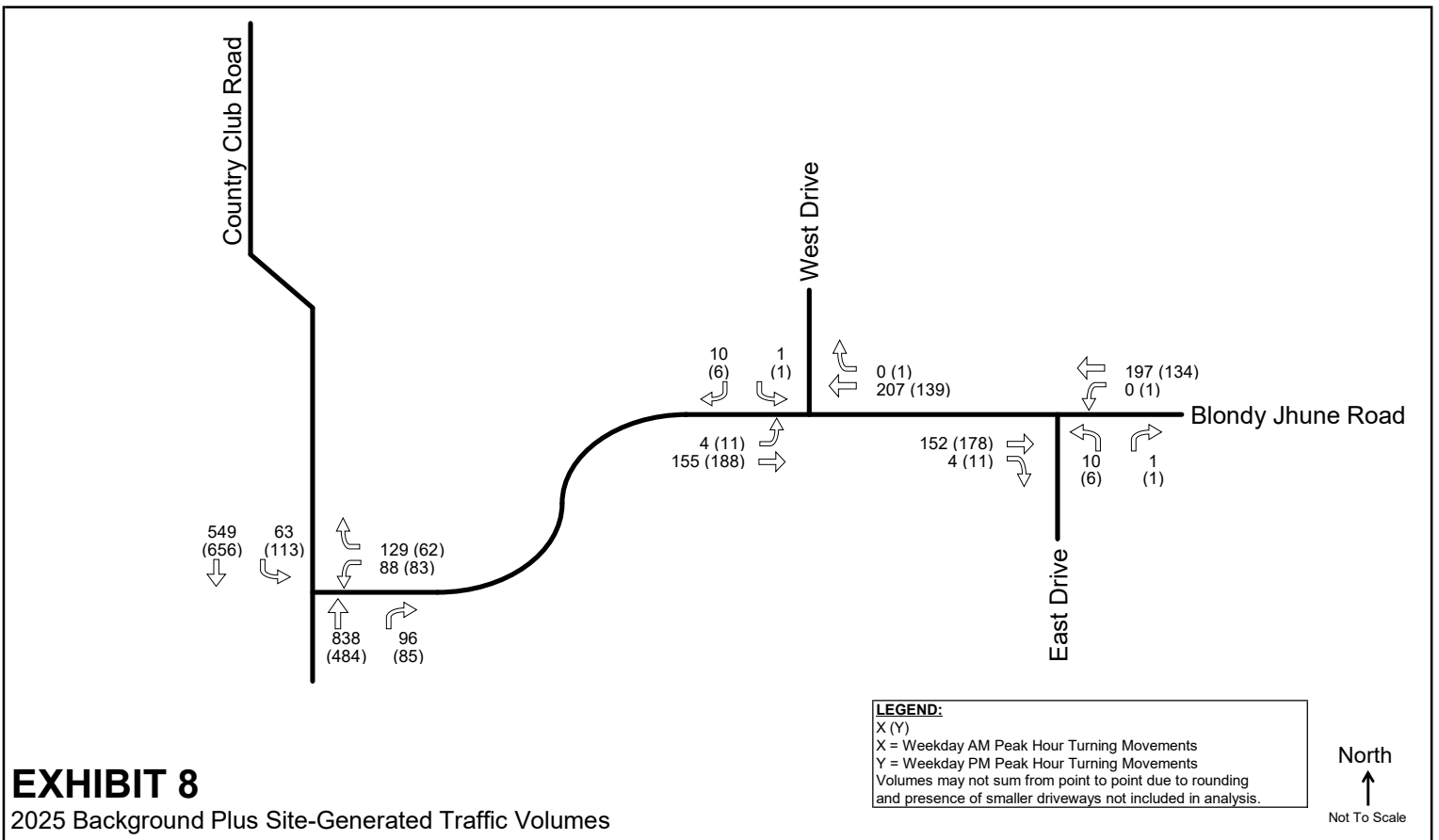
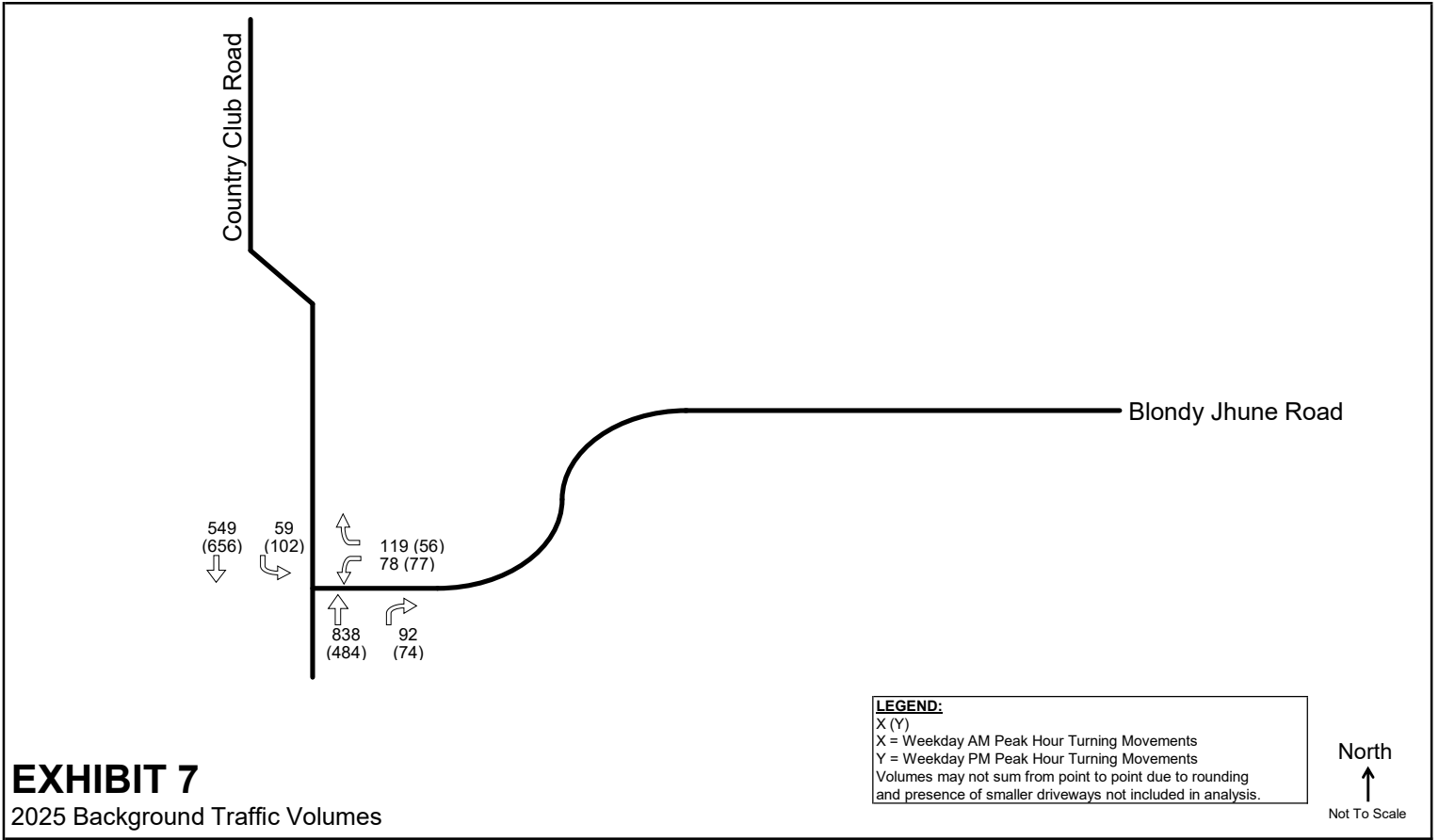
**EXHIBIT 2**  
Conceptual Site Plan

North  
  
 Not To Scale









## Hendricks Farm Residential Development - Lucas, Texas

### Historical Link Volumes and Growth Rates

<b>Country Club Road</b>						
Record	Year	Link Start	Link End	Source	24-Hour Volume	Annual Growth Rate
1	1999	Blondy Jhune Road	Forest Grove Road	TxDOT	3,561	-
2	2004	Blondy Jhune Road	Forest Grove Road	TxDOT	4,462	4.6%
3	2009	Blondy Jhune Road	Forest Grove Road	TxDOT	5,874	5.7%
4	2014	Blondy Jhune Road	Forest Grove Road	TxDOT	8,049	6.5%
5	2018	Blondy Jhune Road	Forest Grove Road	KHA	9,610	4.5%
6	2021*	Blondy Jhune Road	Forest Grove Road	KHA	9,403	N/A
					<b>Average Growth 1999 - 2018:</b>	<b>5.4%</b>

\*Irregular Volumes due to COVID-19

<b>Blondy Jhune Road</b>						
Record	Year	Link Start	Link End	Source	24-Hour Volume	Annual Growth Rate
1	2009	Country Club Road	Winningkoff Road	TxDOT	1,127	-
2	2014	Country Club Road	Winningkoff Road	TxDOT	1,339	3.5%
3	2018	Country Club Road	Winningkoff Road	KHA	1,968	10.1%
4	2021*	Country Club Road	Winningkoff Road	KHA	2,114	N/A
					<b>Average Growth 2009 - 2018:</b>	<b>6.4%</b>

\*Irregular Volumes due to COVID-19

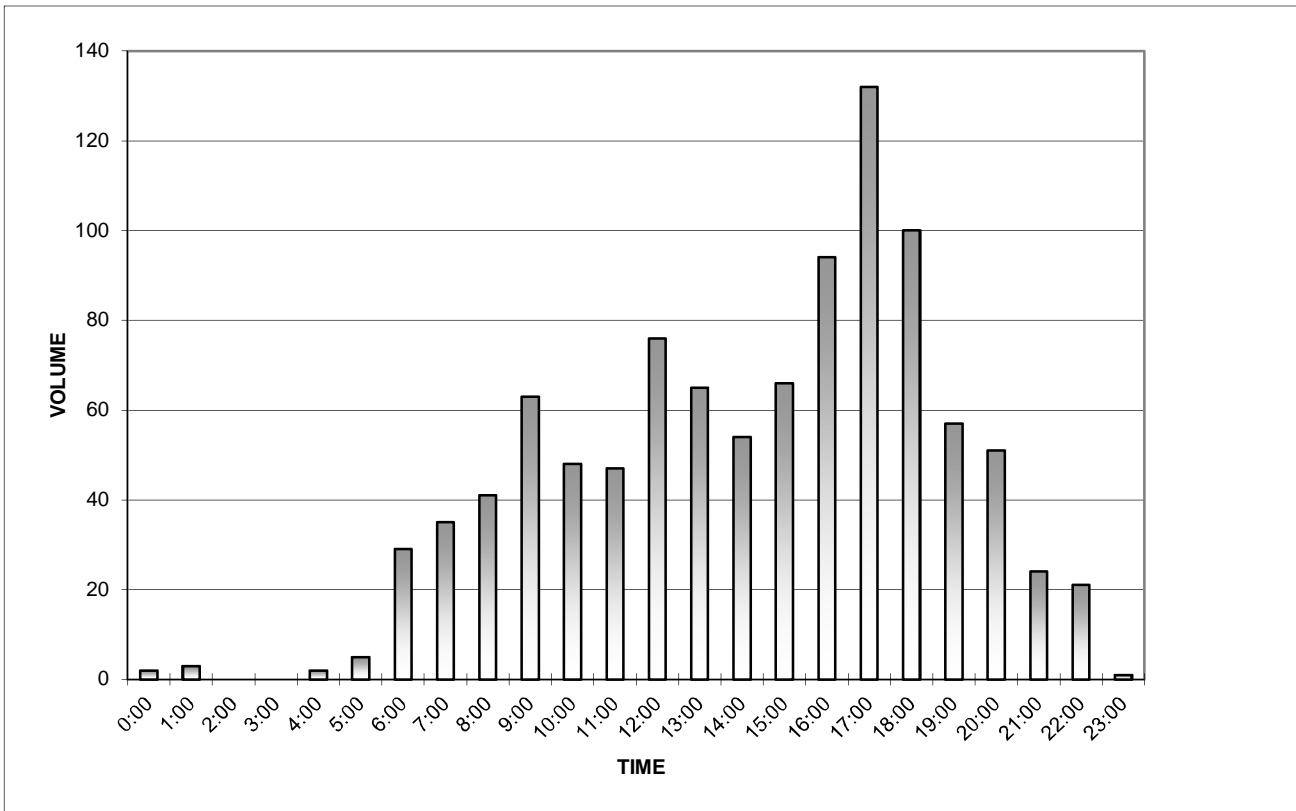
**EB Blondy Jhune Road East of Country Club Road**

Date Began:  
1/25/2018

TIME	0:00	0:15	0:30	0:45	TOTAL
0:00	0	1	1	0	2
1:00	0	1	0	2	3
2:00	0	0	0	0	0
3:00	0	0	0	0	0
4:00	0	0	1	1	2
5:00	1	0	1	3	5
6:00	1	1	12	15	29
7:00	9	5	10	11	35
8:00	8	8	8	17	41
9:00	22	16	15	10	63
10:00	16	6	6	20	48
11:00	18	7	12	10	47
12:00	20	17	17	22	76
13:00	20	19	14	12	65
14:00	21	13	9	11	54
15:00	17	11	20	18	66
16:00	20	27	23	24	94
17:00	25	46	35	26	132
18:00	22	28	22	28	100
19:00	12	13	20	12	57
20:00	14	14	10	13	51
21:00	15	1	5	3	24
22:00	3	10	4	4	21
23:00	0	1	0	0	1

TOTAL: 1016

The A.M. peak hour from 8:45 to 9:45 is 70
The P.M. peak hour from 17:00 to 18:00 is 132



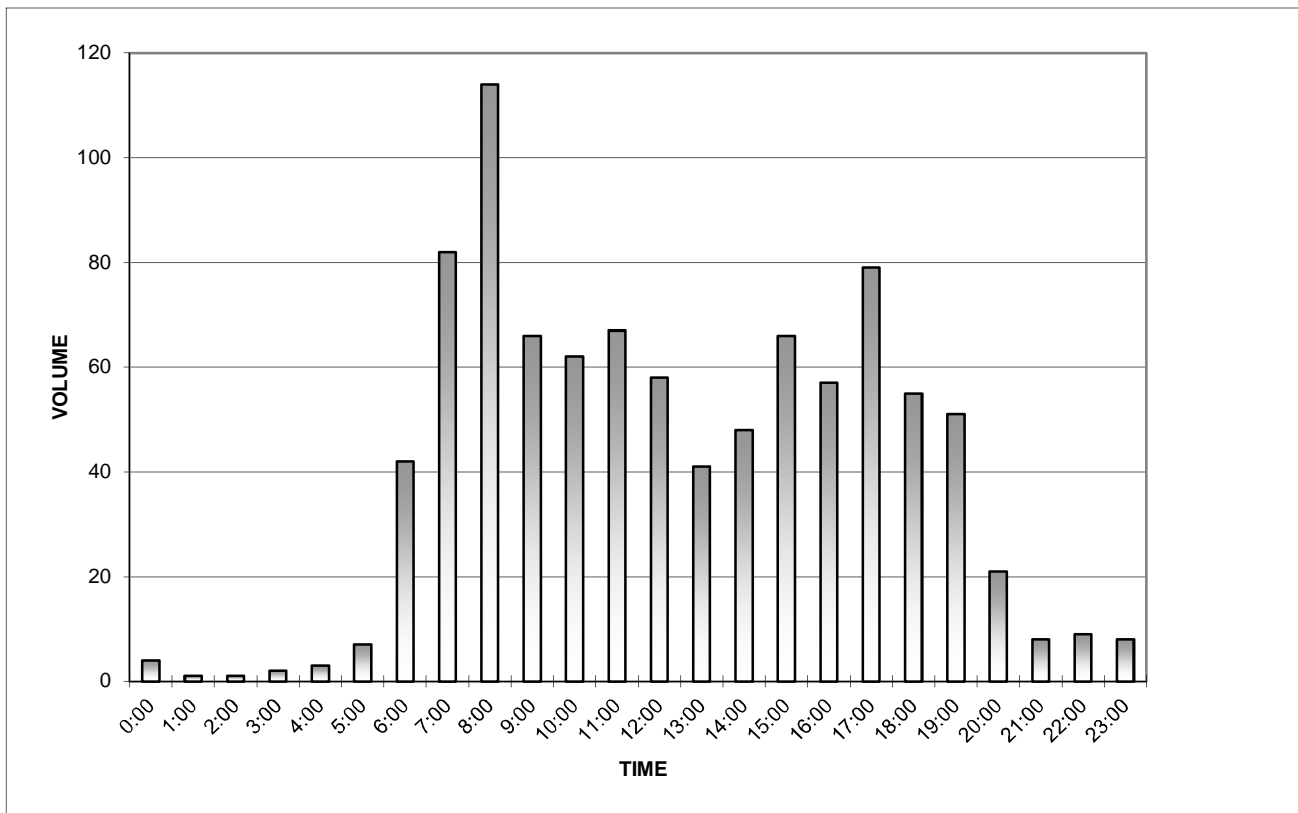
**WB Blondy Jhune Road East of Country Club Road**

Date Began:  
1/25/2018

TIME	0:00	0:15	0:30	0:45	TOTAL
0:00	1	0	2	1	4
1:00	1	0	0	0	1
2:00	1	0	0	0	1
3:00	1	0	0	1	2
4:00	0	1	2	0	3
5:00	1	1	0	5	7
6:00	8	7	11	16	42
7:00	18	17	24	23	82
8:00	30	25	37	22	114
9:00	14	13	23	16	66
10:00	14	14	16	18	62
11:00	17	12	18	20	67
12:00	17	13	14	14	58
13:00	10	8	12	11	41
14:00	13	10	15	10	48
15:00	16	18	13	19	66
16:00	9	18	13	17	57
17:00	23	20	16	20	79
18:00	13	11	17	14	55
19:00	18	9	13	11	51
20:00	7	8	2	4	21
21:00	1	3	2	2	8
22:00	0	2	6	1	9
23:00	2	5	1	0	8

TOTAL: 952

The A.M. peak hour from 7:45 to 8:45 is 115
The P.M. peak hour from 17:00 to 18:00 is 79

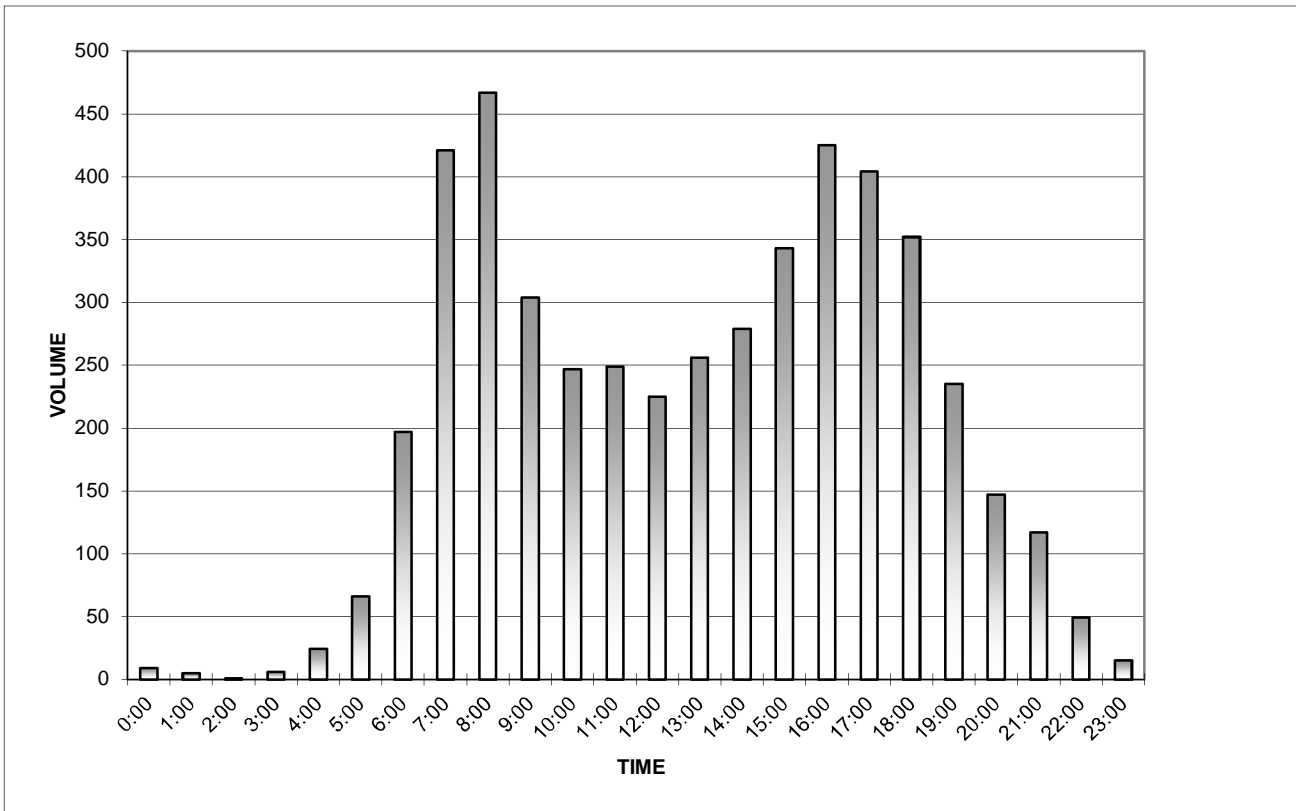


**NB Country Club Road North of Blondy Jhune Road**

Date Began:  
1/25/2018

TIME	0:00	0:15	0:30	0:45	TOTAL
0:00	3	0	2	4	9
1:00	2	1	2	0	5
2:00	0	1	0	0	1
3:00	1	0	3	2	6
4:00	6	3	8	7	24
5:00	7	13	15	31	66
6:00	24	48	56	69	197
7:00	87	104	130	100	421
8:00	120	122	88	137	467
9:00	93	88	70	53	304
10:00	57	61	64	65	247
11:00	52	69	59	69	249
12:00	62	49	60	54	225
13:00	55	59	68	74	256
14:00	66	66	78	69	279
15:00	78	91	98	76	343
16:00	94	115	114	102	425
17:00	114	93	118	79	404
18:00	102	88	82	80	352
19:00	70	45	64	56	235
20:00	30	39	38	40	147
21:00	31	39	26	21	117
22:00	15	16	10	8	49
23:00	2	4	3	6	15
<b>TOTAL:</b>					<b>4843</b>

The A.M. peak hour from 7:30 to 8:30 is 472
The P.M. peak hour from 16:15 to 17:15 is 445

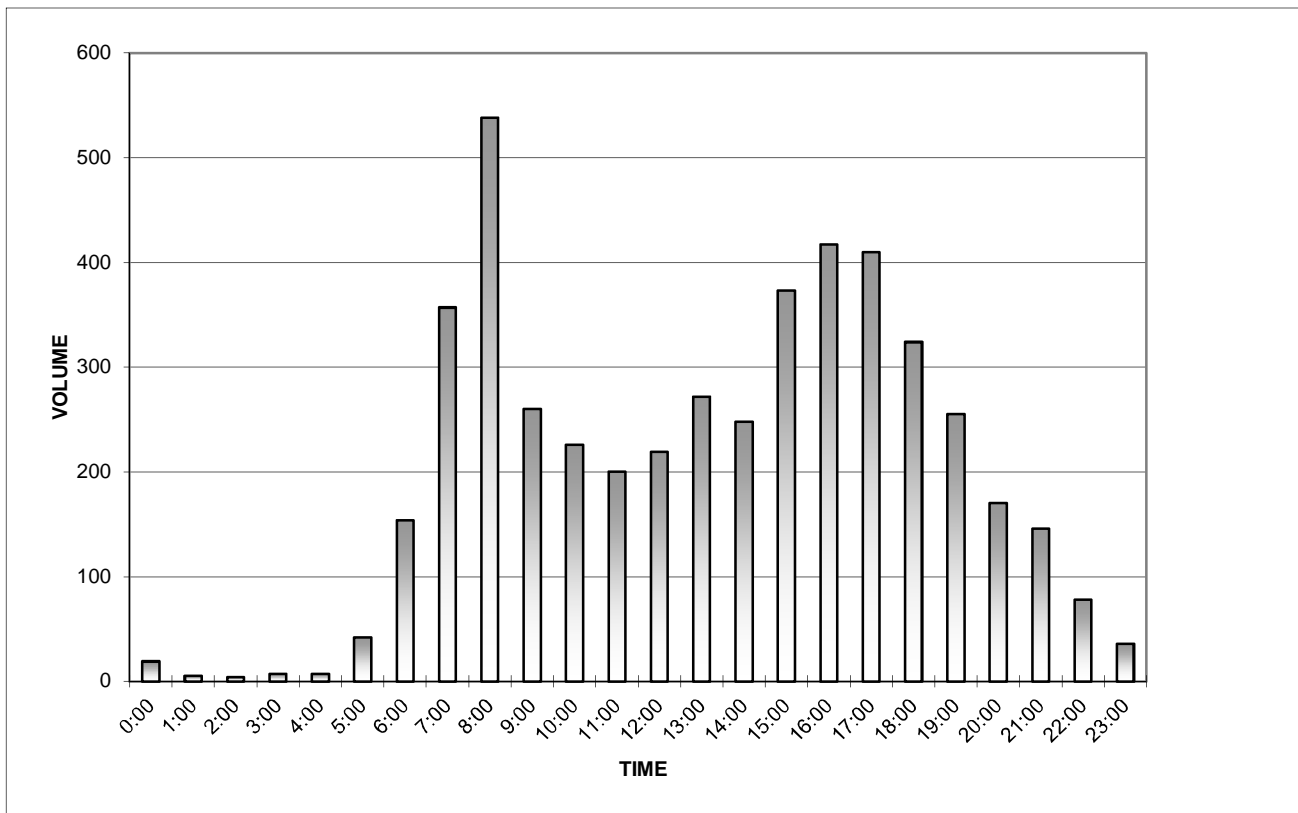


**SB Country Club Road North of Blondy Jhune Road**

Date Began:  
1/25/2018

TIME	0:00	0:15	0:30	0:45	TOTAL
0:00	7	5	5	2	19
1:00	3	2	0	0	5
2:00	2	2	0	0	4
3:00	0	3	3	1	7
4:00	2	1	2	2	7
5:00	5	10	11	16	42
6:00	19	31	52	52	154
7:00	61	73	90	133	357
8:00	127	131	161	119	538
9:00	72	57	64	67	260
10:00	58	56	58	54	226
11:00	42	51	59	48	200
12:00	50	62	53	54	219
13:00	59	64	74	75	272
14:00	55	71	71	51	248
15:00	85	77	87	124	373
16:00	113	92	102	110	417
17:00	88	104	110	108	410
18:00	85	89	76	74	324
19:00	53	81	60	61	255
20:00	42	46	40	42	170
21:00	44	40	32	30	146
22:00	24	20	13	21	78
23:00	12	9	7	8	36
<b>TOTAL:</b>					<b>4767</b>

The A.M. peak hour from 7:45 to 8:45 is 552
The P.M. peak hour from 15:45 to 16:45 is 431



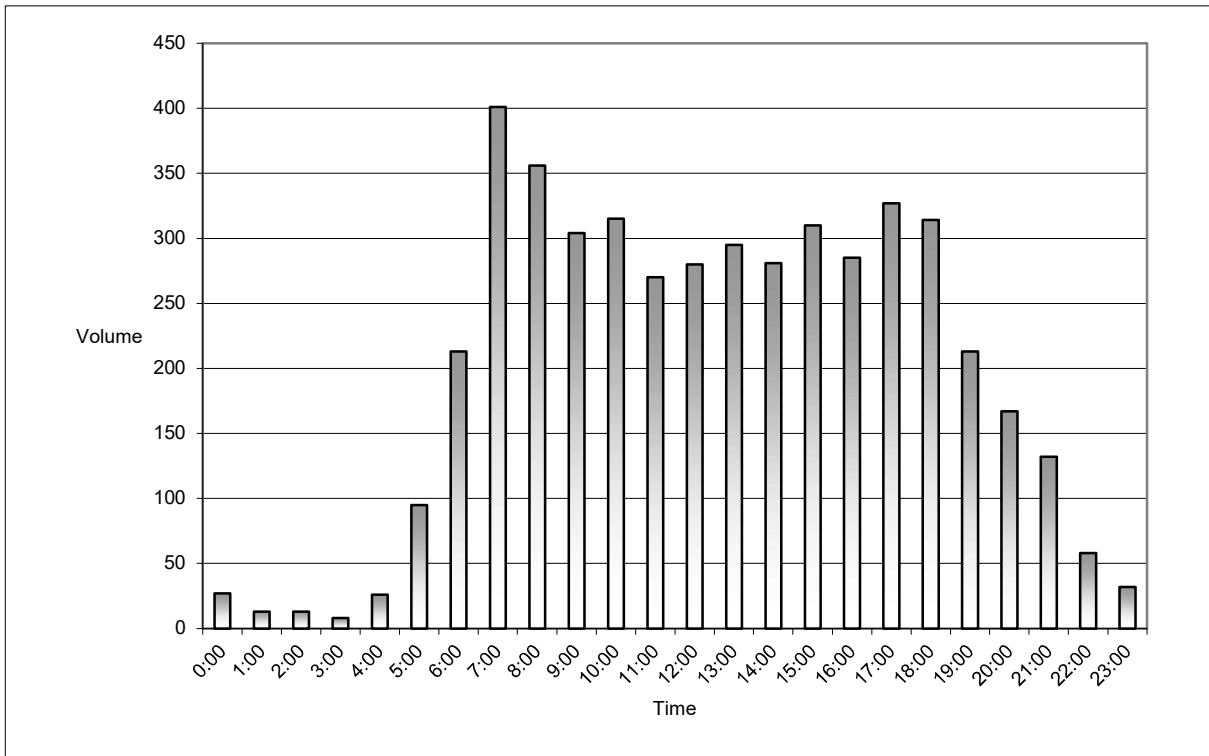


### NB Country Club Road (FM 1378) North of Blondy Jhune Road

Date Began:  
7/7/2021

TIME	0:00	0:15	0:30	0:45	Total
0:00	5	4	13	5	27
1:00	2	3	6	2	13
2:00	4	6	3	0	13
3:00	3	0	2	3	8
4:00	1	6	7	12	26
5:00	7	26	29	33	95
6:00	39	48	69	57	213
7:00	87	94	110	110	401
8:00	79	95	109	73	356
9:00	70	78	92	64	304
10:00	69	95	90	61	315
11:00	64	63	82	61	270
12:00	72	75	66	67	280
13:00	78	71	75	71	295
14:00	67	77	62	75	281
15:00	73	68	79	90	310
16:00	70	68	79	68	285
17:00	80	86	87	74	327
18:00	71	87	85	71	314
19:00	75	56	41	41	213
20:00	41	38	41	47	167
21:00	43	31	31	27	132
22:00	25	12	15	6	58
23:00	13	8	5	6	32
	<b>TOTAL:</b>				<b>4735</b>

The A.M. peak hour from 7:00 to 7:59 is 401  
The P.M. peak hour from 17:00 to 17:59 is 327

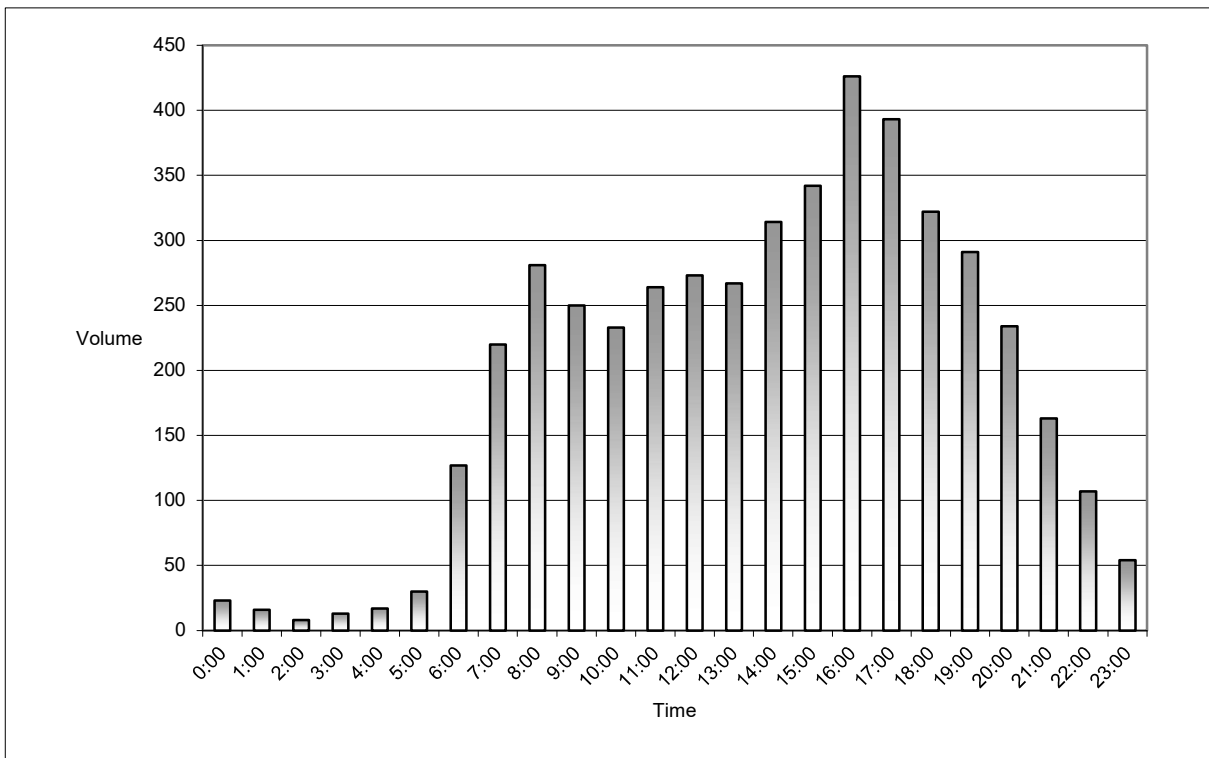


### SB Country Club Road (FM 1378) North of Blondy Jhune Road

Date Began:  
7/7/2021

TIME	0:00	0:15	0:30	0:45	Total
0:00	8	5	8	2	23
1:00	7	3	4	2	16
2:00	3	3	1	1	8
3:00	2	6	3	2	13
4:00	4	2	7	4	17
5:00	3	8	13	6	30
6:00	23	28	35	41	127
7:00	55	64	57	44	220
8:00	61	74	78	68	281
9:00	56	62	50	82	250
10:00	53	54	50	76	233
11:00	61	63	60	80	264
12:00	58	68	80	67	273
13:00	65	63	61	78	267
14:00	69	86	82	77	314
15:00	72	96	86	88	342
16:00	88	111	123	104	426
17:00	93	105	89	106	393
18:00	89	81	84	68	322
19:00	72	72	75	72	291
20:00	64	61	62	47	234
21:00	41	37	44	41	163
22:00	38	31	17	21	107
23:00	14	19	10	11	54
	<b>TOTAL:</b>				<b>4668</b>

The A.M. peak hour from 11:45 to 12:44 is 286
The P.M. peak hour from 16:15 to 17:14 is 431

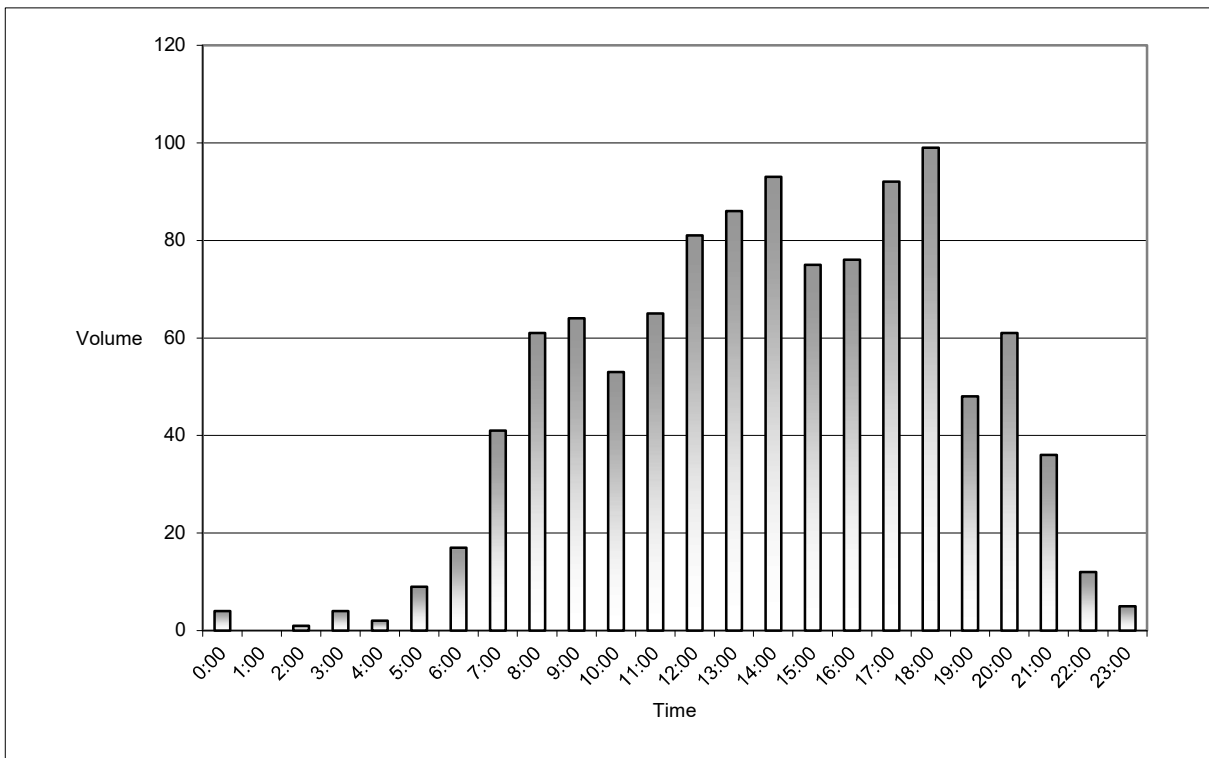


**EB Blondy Jhune Road East of Country Club Road (FM 1378)**

Date Began:  
7/7/2021

TIME	0:00	0:15	0:30	0:45	Total
0:00	3	0	1	0	4
1:00	0	0	0	0	0
2:00	0	1	0	0	1
3:00	0	1	3	0	4
4:00	0	1	1	0	2
5:00	0	2	3	4	9
6:00	2	6	4	5	17
7:00	4	12	12	13	41
8:00	15	16	15	15	61
9:00	14	21	12	17	64
10:00	13	13	9	18	53
11:00	16	16	16	17	65
12:00	17	18	20	26	81
13:00	25	22	25	14	86
14:00	25	25	22	21	93
15:00	16	21	17	21	75
16:00	13	23	22	18	76
17:00	24	16	31	21	92
18:00	23	24	26	26	99
19:00	12	15	9	12	48
20:00	12	20	14	15	61
21:00	10	9	11	6	36
22:00	3	7	2	0	12
23:00	1	2	0	2	5
<b>TOTAL:</b>					<b>1085</b>

The A.M. peak hour from 11:45 to 12:44 is 72
The P.M. peak hour from 18:00 to 18:59 is 99

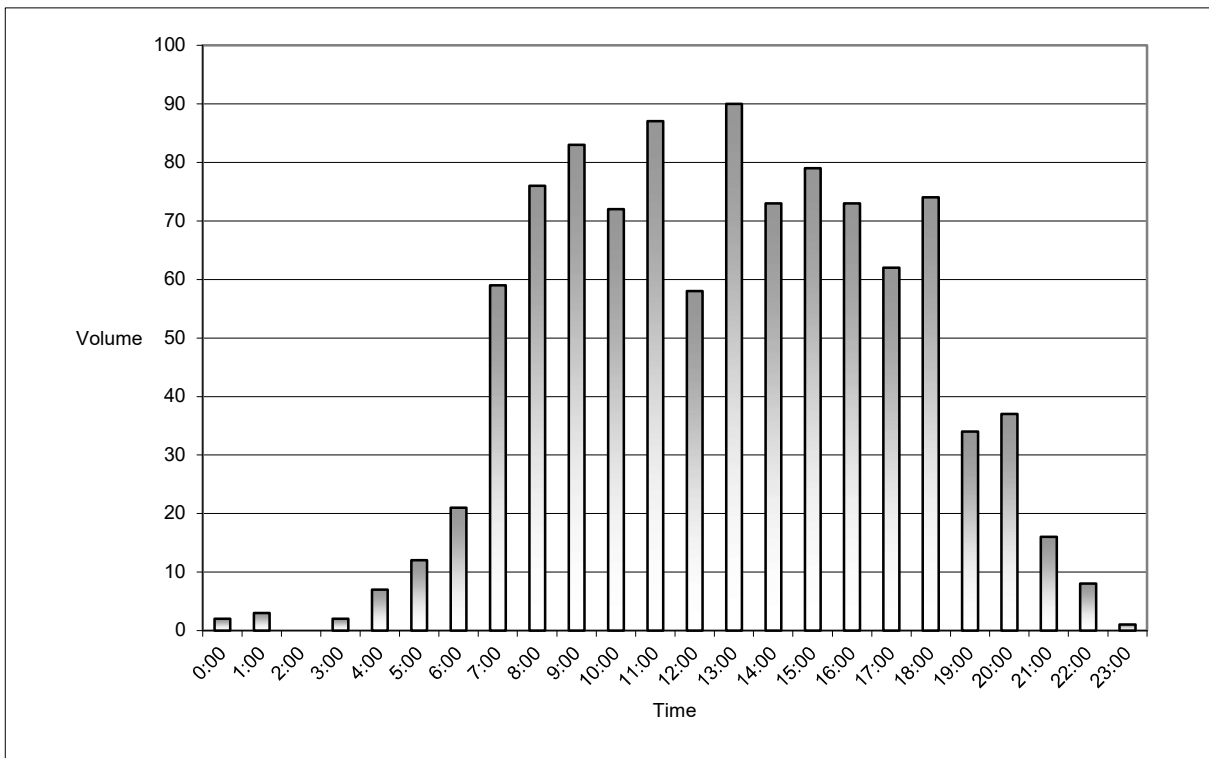


### WB Blondy Jhune Road East of Country Club Road (FM 1378)

Date Began:  
7/7/2021

TIME	0:00	0:15	0:30	0:45	Total
0:00	0	0	1	1	2
1:00	0	1	0	2	3
2:00	0	0	0	0	0
3:00	1	0	0	1	2
4:00	2	1	2	2	7
5:00	1	2	6	3	12
6:00	4	4	2	11	21
7:00	13	21	11	14	59
8:00	17	19	21	19	76
9:00	16	22	27	18	83
10:00	16	13	22	21	72
11:00	17	19	27	24	87
12:00	17	14	16	11	58
13:00	17	23	28	22	90
14:00	22	15	19	17	73
15:00	14	24	25	16	79
16:00	13	19	21	20	73
17:00	13	21	13	15	62
18:00	24	14	15	21	74
19:00	16	4	9	5	34
20:00	10	11	8	8	37
21:00	7	2	4	3	16
22:00	4	1	2	1	8
23:00	0	0	0	1	1
<b>TOTAL:</b>					<b>1029</b>

The A.M. peak hour from 11:15 to 12:14 is 87
The P.M. peak hour from 13:15 to 14:14 is 95



Lucas Hendrick Farm Traffic Memorandum  
 HCM 6th TWSC

2021 AM  
 1: Country Club Road & Blondy Jhune Road

Intersection						
Int Delay, s/veh	5.6					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	Y		B			A
Traffic Vol, veh/h	62	94	664	73	47	435
Future Vol, veh/h	62	94	664	73	47	435
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	67	102	722	79	51	473

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	1337	762	0	0	801
Stage 1	762	-	-	-	-
Stage 2	575	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12
Critical Hdwy Stg 1	5.42	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218
Pot Cap-1 Maneuver	169	405	-	-	822
Stage 1	461	-	-	-	-
Stage 2	563	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	155	405	-	-	822
Mov Cap-2 Maneuver	155	-	-	-	-
Stage 1	461	-	-	-	-
Stage 2	516	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	46.4	0	0.9
HCM LOS	E		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	247	822
HCM Lane V/C Ratio	-	-	0.686	0.062
HCM Control Delay (s)	-	-	46.4	9.7
HCM Lane LOS	-	-	E	A
HCM 95th %tile Q(veh)	-	-	4.5	0.2

Lucas Hendrick Farm Traffic Memorandum  
 HCM 6th TWSC

2021 PM  
 1: Country Club Road & Blondy Jhune Road

Intersection						
Int Delay, s/veh	3.3					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	Y		B			A
Traffic Vol, veh/h	61	44	383	59	81	520
Future Vol, veh/h	61	44	383	59	81	520
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	66	48	416	64	88	565

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	1189	448	0	0	480
Stage 1	448	-	-	-	-
Stage 2	741	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12
Critical Hdwy Stg 1	5.42	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218
Pot Cap-1 Maneuver	208	611	-	-	1082
Stage 1	644	-	-	-	-
Stage 2	471	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	183	611	-	-	1082
Mov Cap-2 Maneuver	183	-	-	-	-
Stage 1	644	-	-	-	-
Stage 2	415	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	29.4	0	1.2
HCM LOS	D		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	259	1082
HCM Lane V/C Ratio	-	-	0.441	0.081
HCM Control Delay (s)	-	-	29.4	8.6
HCM Lane LOS	-	-	D	A
HCM 95th %tile Q(veh)	-	-	2.1	0.3

Lucas Hendrick Farm Traffic Memorandum  
 HCM 6th TWSC

2025 AM  
 1: Country Club Road & Blondy Jhune Road

Intersection						
Int Delay, s/veh	29.6					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	Y		B			A
Traffic Vol, veh/h	78	119	838	92	59	549
Future Vol, veh/h	78	119	838	92	59	549
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	85	129	911	100	64	597

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	1686	961	0	0	1011
Stage 1	961	-	-	-	-
Stage 2	725	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12
Critical Hdwy Stg 1	5.42	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218
Pot Cap-1 Maneuver	103	311	-	-	686
Stage 1	371	-	-	-	-
Stage 2	479	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	89	311	-	-	686
Mov Cap-2 Maneuver	89	-	-	-	-
Stage 1	371	-	-	-	-
Stage 2	412	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	257.8	0	1
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	156	686
HCM Lane V/C Ratio	-	-	1.373	0.093
HCM Control Delay (s)	-	-	257.8	10.8
HCM Lane LOS	-	-	F	B
HCM 95th %tile Q(veh)	-	-	13.3	0.3

Lucas Hendrick Farm Traffic Memorandum  
 HCM 6th TWSC

2025 PM  
 1: Country Club Road & Blondy Jhune Road

Intersection						
Int Delay, s/veh	9.6					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	Y		+			+
Traffic Vol, veh/h	77	56	484	74	102	656
Future Vol, veh/h	77	56	484	74	102	656
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	84	61	526	80	111	713

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	1501	566	0	0	606
Stage 1	566	-	-	-	-
Stage 2	935	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12
Critical Hdwy Stg 1	5.42	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218
Pot Cap-1 Maneuver	134	524	-	-	972
Stage 1	568	-	-	-	-
Stage 2	382	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	109	524	-	-	972
Mov Cap-2 Maneuver	109	-	-	-	-
Stage 1	568	-	-	-	-
Stage 2	310	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	97.3	0	1.2
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	164	972
HCM Lane V/C Ratio	-	-	0.881	0.114
HCM Control Delay (s)	-	-	97.3	9.2
HCM Lane LOS	-	-	F	A
HCM 95th %tile Q(veh)	-	-	6.2	0.4



Lucas Hendrick Farm Traffic Memorandum  
 HCM 6th TWSC

2025 AM plus Site  
 1: Country Club Road & Blondy Jhune Road

Intersection						
Int Delay, s/veh	41.2					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	Y		Y			Y
Traffic Vol, veh/h	88	129	838	96	63	549
Future Vol, veh/h	88	129	838	96	63	549
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	96	140	911	104	68	597

Major/Minor	Minor1	Major1	Major2	Minor2
Conflicting Flow All	1696	963	0	0
Stage 1	963	-	-	-
Stage 2	733	-	-	-
Critical Hdwy	6.42	6.22	-	4.12
Critical Hdwy Stg 1	5.42	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-
Follow-up Hdwy	3.518	3.318	-	2.218
Pot Cap-1 Maneuver	102	310	-	683
Stage 1	370	-	-	-
Stage 2	475	-	-	-
Platoon blocked, %	-	-	-	-
Mov Cap-1 Maneuver	- 87	310	-	683
Mov Cap-2 Maneuver	- 87	-	-	-
Stage 1	370	-	-	-
Stage 2	404	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	331.6	0	1.1
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	152	683	-
HCM Lane V/C Ratio	-	1.552	0.1	-
HCM Control Delay (s)	-	331.6	10.9	0
HCM Lane LOS	-	F	B	A
HCM 95th %tile Q(veh)	-	16	0.3	-

Notes  
 -: Volume exceeds capacity    \$: Delay exceeds 300s    +: Computation Not Defined    \*: All major volume in platoon

Lucas Hendrick Farm Traffic Memorandum  
 HCM 6th TWSC

2025 AM plus Site  
 2: Blondy Jhune Road & West Drive

Intersection						
Int Delay, s/veh	0.4					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		Y	Y		Y	
Traffic Vol, veh/h	4	155	207	0	1	10
Future Vol, veh/h	4	155	207	0	1	10
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	4	168	225	0	1	11

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	225	0	0
Stage 1	-	-	225
Stage 2	-	-	176
Critical Hdwy	4.12	-	6.42
Critical Hdwy Stg 1	-	-	5.42
Critical Hdwy Stg 2	-	-	5.42
Follow-up Hdwy	2.218	-	3.518
Pot Cap-1 Maneuver	1344	-	605
Stage 1	-	-	812
Stage 2	-	-	855
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	1344	-	603
Mov Cap-2 Maneuver	-	-	603
Stage 1	-	-	810
Stage 2	-	-	855

Approach	EB	WB	SB
HCM Control Delay, s	0.2	0	9.6
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1344	-	-	-	789
HCM Lane V/C Ratio	0.003	-	-	-	0.015
HCM Control Delay (s)	7.7	0	-	-	9.6
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0

Intersection						
Int Delay, s/veh	0.3					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↔			↔	↔	
Traffic Vol, veh/h	152	4	0	197	10	1
Future Vol, veh/h	152	4	0	197	10	1
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	165	4	0	214	11	1

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	169
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	4.12
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	2.218
Pot Cap-1 Maneuver	-	-	1409
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	1409
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	10.8
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	638	-	-	1409	-
HCM Lane V/C Ratio	0.019	-	-	-	-
HCM Control Delay (s)	10.8	-	-	0	-
HCM Lane LOS	B	-	-	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0	-

Lucas Hendrick Farm Traffic Memorandum  
 HCM 6th TWSC

2025 PM plus Site  
 1: Country Club Road & Blondy Jhune Road

Intersection						
Int Delay, s/veh	13.9					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	Y		Y			Y
Traffic Vol, veh/h	83	62	484	85	113	656
Future Vol, veh/h	83	62	484	85	113	656
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	90	67	526	92	123	713

Major/Minor	Minor1	Major1	Major2	Minor2
Conflicting Flow All	1531	572	0	0
Stage 1	572	-	-	-
Stage 2	959	-	-	-
Critical Hdwy	6.42	6.22	-	4.12
Critical Hdwy Stg 1	5.42	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-
Follow-up Hdwy	3.518	3.318	-	2.218
Pot Cap-1 Maneuver	129	520	-	962
Stage 1	565	-	-	-
Stage 2	372	-	-	-
Platoon blocked, %	-	-	-	-
Mov Cap-1 Maneuver	102	520	-	962
Mov Cap-2 Maneuver	102	-	-	-
Stage 1	565	-	-	-
Stage 2	293	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	135.2	0	1.4
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	155	962
HCM Lane V/C Ratio	-	-	1.017	0.128
HCM Control Delay (s)	-	-	135.2	9.3
HCM Lane LOS	-	-	F	A
HCM 95th %tile Q(veh)	-	-	7.9	0.4

Lucas Hendrick Farm Traffic Memorandum  
 HCM 6th TWSC

2025 PM plus Site  
 2: Blondy Jhune Road & West Drive

Intersection						
Int Delay, s/veh	0.4					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		Y	Y		Y	Y
Traffic Vol, veh/h	11	188	139	1	1	6
Future Vol, veh/h	11	188	139	1	1	6
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	12	204	151	1	1	7

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	152	0	0
Stage 1	-	-	152
Stage 2	-	-	228
Critical Hdwy	4.12	-	6.42
Critical Hdwy Stg 1	-	-	5.42
Critical Hdwy Stg 2	-	-	5.42
Follow-up Hdwy	2.218	-	3.518
Pot Cap-1 Maneuver	1429	-	622
Stage 1	-	-	876
Stage 2	-	-	810
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	1429	-	616
Mov Cap-2 Maneuver	-	-	616
Stage 1	-	-	868
Stage 2	-	-	810

Approach	EB	WB	SB
HCM Control Delay, s	0.4	0	9.3
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1429	-	-	-	840
HCM Lane V/C Ratio	0.008	-	-	-	0.009
HCM Control Delay (s)	7.5	0	-	-	9.3
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0

Intersection						
Int Delay, s/veh	0.3					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↻			↻	↻	
Traffic Vol, veh/h	178	11	1	134	6	1
Future Vol, veh/h	178	11	1	134	6	1
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	193	12	1	146	7	1

Major/Minor	Major1	Major2	Minor1	Minor2	Minor3
Conflicting Flow All	0	0	205	0	347
Stage 1	-	-	-	-	199
Stage 2	-	-	-	-	148
Critical Hdwy	-	-	4.12	-	6.42
Critical Hdwy Stg 1	-	-	-	-	5.42
Critical Hdwy Stg 2	-	-	-	-	5.42
Follow-up Hdwy	-	-	2.218	-	3.518
Pot Cap-1 Maneuver	-	-	1366	-	650
Stage 1	-	-	-	-	835
Stage 2	-	-	-	-	880
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	1366	-	649
Mov Cap-2 Maneuver	-	-	-	-	649
Stage 1	-	-	-	-	835
Stage 2	-	-	-	-	879

Approach	EB	WB	NB
HCM Control Delay, s	0	0.1	10.4
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	671	-	-	1366	-
HCM Lane V/C Ratio	0.011	-	-	0.001	-
HCM Control Delay (s)	10.4	-	-	7.6	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0	-	-	0	-

# RLO HAGGARD



## OPINION OF PROBABLE COST ON-SITE IMPROVEMENTS

PROJECT NAME: <i>Hendrick Farm</i>	LOTS: 34	DATE: 7/12/2021
CITY: <i>Lucas, Texas</i>	LF STREET: 2880	CREATED BY: JMM
JOB NUMBER: <i>069229802</i>	NET ACRES: 70.5	CHECKED BY: SES
	GROSS ACRES: 73.4	REVISED BY: JMM

IMPACT AND DEVELOPMENT FEES				
ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	ITEM COST
ROADWAY IMPACT FEES	LOT	34	\$5,038.01	\$171,292.34
WATER IMPACT FEES	LOT	34	\$3,473.00	\$118,082.00
<b>SUB - TOTAL IMPACT AND DEVELOPMENT FEES</b>				<b>\$289,374.34</b>

**OPINION OF PROBABLE COST SUMMARY**

<b>PROJECT NAME:</b> <i>Hendrick Farm</i>	LOTS: 34	DATE: 7/12/2021
<b>CITY:</b> <i>Lucas, Texas</i>	LF STREET: 4301	CREATED BY: JMM
<b>JOB NUMBER:</b> <i>069229802</i>	NET ACRES: 73.4	CHECKED BY: SES
	GROSS ACRES: 73.4	REVISED BY: JMM

<b>COMBINED SUMMARY</b>	Blondy Jhune	On-Site	Combined
A. CLEARING, EXCAVATION & EROSION CONTROL	<b>\$22,202.00</b>	<b>\$196,134.50</b>	<b>\$218,336.50</b>
B. STORM SEWER SYSTEM	<b>\$31,894.00</b>	<b>\$235,549.00</b>	<b>\$267,443.00</b>
C. WATER DISTRIBUTION SYSTEM	<b>\$77,547.00</b>	<b>\$281,977.50</b>	<b>\$359,524.50</b>
D. STREET AND ALLEY PAVING	<b>\$349,564.58</b>	<b>\$498,408.97</b>	<b>\$847,973.55</b>
E. MISCELLANEOUS ITEMS	<b>\$86,894.00</b>	<b>\$252,631.00</b>	<b>\$339,525.00</b>
<i>SUB-TOTAL (EXCLUDING IMPACT FEES)</i>	\$568,101.58	\$1,464,700.97	\$2,032,802.55
<i>INSPECTION</i>		3%	\$60,984.08
<i>CONSTRUCTION MATERIALS TESTING</i>		2%	\$40,656.05
<i>CONTINGENCIES:</i>		10%	\$203,280.25
<b>TOTAL CONSTRUCTION COSTS (EXCLUDING IMPACT FEES):</b>			<b>\$2,337,722.93</b>

NOTES:

General

1. This OPC is based on construction drawings for Hendrick Farm as of 5/21/2018.
2. The project is located within the City of Lucas. OPC is based on current City standards of construction.
3. Inflation or unit price variations are not within the scope of this estimate. Contractors or suppliers should be consulted for unit price inquiries that match construction timing.
4. Unit prices do not reflect rock excavation, need Geotech to confirm. Additional costs due to rock would be \$2.50 to \$3.00/CY.
5. This OPC assumes all on-site construction will occur as a single phase. Additional costs will result if constructed as separate phases.

Excavation and Grading

1. Grading assumes that pad grading will not be required. All proposed grading is for roadway and drainage considerations only. No pad grading has been provided as part of this OPC. Pad grading will be required by the homebuilder.
2. OPC assumes unclassified excavation will balance. OPC assumes excess dirt can be placed on-site.
3. OPC assumes no moisture conditioning is required for the streets. To be verified upon final geotechnical report.
4. Additional erosion control may be required.
5. OPC assumes existing asphalt surface of Blondy Jhune road cannot be used as part of proposed subgrade and will be required to be exported offsite.

NOTES (cont.):

Storm Sewer

1. Floodplain elevations are estimated from the approved flood study.
2. This OPC assumes TxDOT acceptance of proposed construction plans, where applicable in TxDOT ROW.
3. This OPC assumes the developer is not responsible for constructing or providing private driveway culverts. A schedule for required culvert sizes will be included on the Final Plat for future construction.

**OPINION OF PROBABLE COST  
SUMMARY**

<b>PROJECT NAME:</b> <i>Hendrick Farm</i>	LOTS: 34	DATE: 7/12/2021
<b>CITY:</b> <i>Lucas, Texas</i>	LF STREET: 4301	CREATED BY: JMM
<b>JOB NUMBER:</b> <i>069229802</i>	NET ACRES: 73.4	CHECKED BY: SES
	GROSS ACRES: 73.4	REVISED BY: JMM

**COMBINED SUMMARY**

Blondy Jhune

On-Site

Combined

Water Distribution

1. Water line includes all fittings, tees, crosses, etc.
2. Fire hydrant assembly includes all fittings tees, and valves.
3. Assumes all water lines are less than 10' deep.
4. All water services lines and meters are 1".
5. This OPC assumes no irrigation meters or services will be required for this development.

Street Paving

1. OPC was completed without a preliminary or final geotechnical report.

**OPINION OF PROBABLE COST  
BLONDY JHUNE IMPROVEMENTS**

<b>PROJECT NAME:</b> <i>Hendrick Farm</i>	LOTS: 34	DATE: 7/12/2021
<b>CITY:</b> <i>Lucas, Texas</i>	LF STREET: 1421	CREATED BY: JMM
<b>JOB NUMBER:</b> <i>069229802</i>	NET ACRES: 2.9	CHECKED BY: SES
	GROSS ACRES: 73.4	REVISED BY: JMM

<b>A. CLEARING, EXCAVATION &amp; EROSION CONTROL</b>				
<i>ITEM DESCRIPTION</i>	<i>UNIT</i>	<i>QUANTITY</i>	<i>UNIT PRICE</i>	<i>ITEM COST</i>
CLEARING AND GRUBBING	ACRE	3.00	\$1,200.00	\$3,600.00
UNCLASSIFIED EXCAVATION	CY	2,560	\$2.25	\$5,760.00
EROSION CONTROL	LS	1	\$10,000.00	\$10,000.00
CURLEX	LF	2,842	\$1.00	\$2,842.00
<b>SUB - TOTAL EXCAVATION</b>				<b>\$22,202.00</b>

<b>B. STORM SEWER SYSTEM</b>				
<i>ITEM DESCRIPTION</i>	<i>UNIT</i>	<i>QUANTITY</i>	<i>UNIT PRICE</i>	<i>ITEM COST</i>
18" R.C.P.	LF	49	\$55.00	\$2,695.00
24" R.C.P.	LF	145	\$70.00	\$10,150.00
18" 4:1 SLOPED HEADWALL	EA	2	\$2,500.00	\$5,000.00
24" 4:1 SLOPED HEADWALL	EA	4	\$3,500.00	\$14,000.00
TRENCH SAFETY	LF	49	\$1.00	\$49.00
<b>SUB - TOTAL STORM SEWER SYSTEM</b>				<b>\$31,894.00</b>

<b>C. WATER DISTRIBUTION SYSTEM</b>				
<i>ITEM DESCRIPTION</i>	<i>UNIT</i>	<i>QUANTITY</i>	<i>UNIT PRICE</i>	<i>ITEM COST</i>
12" C900, DR-18,PVC WATER	LF	561	\$70.00	\$39,270.00
12" GATE VALVE & BOX	EA	3	\$2,500.00	\$7,500.00
CONNECT TO EXISTING WATER LINE	EA	3	\$1,000.00	\$3,000.00
FIRE HYDRANT ASSEMBLY	EA	1	\$5,500.00	\$5,500.00
FIRE HYDRANT REMOVE & REPLACE	EA	1	\$3,500.00	\$3,500.00
REMOVE 12" WATER LINE	LF	807	\$15.00	\$12,105.00
20" STEEL ENCASMENT	LF	37	\$150.00	\$5,550.00
TRENCH SAFETY	LF	561	\$1.00	\$561.00
TESTING (EXCLUDING GEOTECH)	LF	561	\$1.00	\$561.00
<b>SUB - TOTAL WATER DISTRIBUTION SYSTEM</b>				<b>\$77,547.00</b>



**OPINION OF PROBABLE COST  
BLONDY JHUNE IMPROVEMENTS**

<b>PROJECT NAME:</b> <i>Hendrick Farm</i>	LOTS: 34	DATE: 7/12/2021
<b>CITY:</b> <i>Lucas, Texas</i>	LF STREET: 1421	CREATED BY: JMM
<b>JOB NUMBER:</b> <i>069229802</i>	NET ACRES: 2.9	CHECKED BY: SES
	GROSS ACRES: 73.4	REVISED BY: JMM

<b>D. STREET PAVING</b>				
<i>ITEM DESCRIPTION</i>	<i>UNIT</i>	<i>QUANTITY</i>	<i>UNIT PRICE</i>	<i>ITEM COST</i>
8" REINF. CONCRETE STREET PAVEMENT	SY	3,570	\$50.00	\$178,500.00
6" ASPHALT TRANSITION	SY	260	\$100.00	\$26,000.00
6" SUBGRADE PREPARATION	SY	4,139	\$3.50	\$14,486.50
HYDRATED LIME (ASSUMES 7% LIME, 46#/SY)	TON	95	\$175.00	\$16,659.48
PAVEMENT HEADER	LF	24	\$25.00	\$600.00
SAWCUT & REMOVE EXISTING PAVEMENT	LF	121	\$3.00	\$363.00
REMOVE EX. ASPHALT PAVEMENT & DISPOSE OFFSITE	SY	4,792	\$20.00	\$95,840.00
SEED ROW AND DITCH	SF	51,156	\$0.10	\$5,115.60
TRAFFIC CONTROL	LS	1	\$12,000.00	\$12,000.00
<b>SUB - TOTAL STREET AND ALLEY PAVING</b>				<b>\$349,564.58</b>

<b>E. MISCELLANEOUS ITEMS</b>				
<i>ITEM DESCRIPTION</i>	<i>UNIT</i>	<i>QUANTITY</i>	<i>UNIT PRICE</i>	<i>ITEM COST</i>
VARIABLE TYPE FENCE REMOVE & DISPOSE	LF	4,087	\$2.00	\$8,174.00
REMOVE & DISPOSE EXISTING TREE	EA	26	\$720.00	\$18,720.00
REMOVE EXISTING POWER POLE	EA	6	\$2,500.00	\$15,000.00
INSTALL PROPOSED POWER POLE	EA	6	\$2,500.00	\$15,000.00
RELOCATE EXISTING POWER POLE	EA	2	\$4,000.00	\$8,000.00
TRAFFIC SIGNS	EA	22	\$1,000.00	\$22,000.00
<b>SUB - TOTAL MISCELLANEOUS ITEMS</b>				<b>\$86,894.00</b>

**OPINION OF PROBABLE COST  
BLONDY JHUNE IMPROVEMENTS**

<b>PROJECT NAME:</b> <i>Hendrick Farm</i>	LOTS: 34	DATE: 7/12/2021
<b>CITY:</b> <i>Lucas, Texas</i>	LF STREET: 1421	CREATED BY: JMM
<b>JOB NUMBER:</b> <i>069229802</i>	NET ACRES: 2.9	CHECKED BY: SES
	GROSS ACRES: 73.4	REVISED BY: JMM

**SUMMARY**

A. CLEARING, EXCAVATION & EROSION CONTROL		<b>\$22,202.00</b>
B. STORM SEWER SYSTEM		<b>\$31,894.00</b>
C. WATER DISTRIBUTION SYSTEM		<b>\$77,547.00</b>
D. STREET AND ALLEY PAVING		<b>\$349,564.58</b>
E. MISCELLANEOUS ITEMS		<b>\$86,894.00</b>
<i>SUB-TOTAL (EXCLUDING IMPACT FEES)</i>		\$568,101.58
	<i>INSPECTION</i>	3% \$17,043.05
	<i>CONSTRUCTION MATERIALS TESTING</i>	2% \$11,362.03
	<i>GEOTECHNICAL INVESTIGATION</i>	\$4,400.00
	<i>CONTINGENCIES:</i>	10% \$56,810.16
<b>TOTAL CONSTRUCTION COSTS (EXCLUDING IMPACT FEES):</b>		<b>\$657,716.81</b>

# RLO HAGGARD



## OPINION OF PROBABLE COST ON-SITE IMPROVEMENTS

<b>PROJECT NAME:</b> <i>Hendrick Farm</i>	LOTS: 34	DATE: 7/12/2021
<b>CITY:</b> <i>Lucas, Texas</i>	LF STREET: 2880	CREATED BY: JMM
<b>JOB NUMBER:</b> <i>069229802</i>	NET ACRES: 70.5	CHECKED BY: SES
	GROSS ACRES: 73.4	REVISED BY: JMM

<b>A. CLEARING, EXCAVATION &amp; EROSION CONTROL</b>				
<i>ITEM DESCRIPTION</i>	<i>UNIT</i>	<i>QUANTITY</i>	<i>UNIT PRICE</i>	<i>ITEM COST</i>
CLEARING AND GRUBBING	ACRE	15.60	\$1,200.00	\$18,720.00
UNCLASSIFIED EXCAVATION	CY	28,630	\$2.25	\$64,417.50
SILT FENCE	LF	5,936	\$2.00	\$11,872.00
CONSTRUCTION EXIT	EA	2	\$2,500.00	\$5,000.00
ROCK CHECK DAM	EA	2	\$3,000.00	\$6,000.00
SWPPP	LS	1	\$2,500.00	\$2,500.00
EC PERIMITING, MAINTENANCE, AND INSPECTION	LS	1	\$7,500.00	\$7,500.00
PROCESS AND PLACE UTILITY SPOILS	CY	1,940	\$2.25	\$4,365.00
CURLEX	LF	5,760	\$1.00	\$5,760.00
POND HYDROSEED	SF	200,000	\$0.35	\$70,000.00
<b>SUB - TOTAL EXCAVATION</b>				<b>\$196,134.50</b>

<b>B. STORM SEWER SYSTEM</b>				
<i>ITEM DESCRIPTION</i>	<i>UNIT</i>	<i>QUANTITY</i>	<i>UNIT PRICE</i>	<i>ITEM COST</i>
18" R.C.P.	LF	154	\$55.00	\$8,470.00
21" R.C.P.	LF	155	\$65.00	\$10,075.00
24" R.C.P.	LF	75	\$70.00	\$5,250.00
4' X 3' RCB	LF	193	\$200.00	\$38,600.00
18" 4:1 SLOPED HEADWALL	EA	2	\$2,500.00	\$5,000.00
18" TXDOT CH-FW-0 HEADWALL	EA	3	\$2,500.00	\$7,500.00
21" TXDOT CH-FW-0 HEADWALL	EA	1	\$3,000.00	\$3,000.00
21" TXDOT SW-0 HEADWALL	EA	1	\$3,000.00	\$3,000.00
24" 4:1 SLOPED HEADWALL	EA	1	\$3,500.00	\$3,500.00
24" TXDOT CH-FW-0 HEADWALL	EA	1	\$4,000.00	\$4,000.00
24" TXDOT CH-FW-45 HEADWALL	EA	2	\$4,500.00	\$9,000.00
4' X 3' TXDOT FW-0 HEADWALL	EA	1	\$5,500.00	\$5,500.00
4' X 3' TXDOT SW-0 HEADWALL	EA	1	\$5,500.00	\$5,500.00
1.125' THICK STONE RIPRAP PER TXDOT ITEM 432	SY	1,025	\$120.00	\$123,000.00
STEEL RESTRICTOR PLATE	EA	4	\$1,000.00	\$4,000.00
TRENCH SAFETY	LF	154	\$1.00	\$154.00
<b>SUB - TOTAL STORM SEWER SYSTEM</b>				<b>\$235,549.00</b>

**OPINION OF PROBABLE COST  
ON-SITE IMPROVEMENTS**

<b>PROJECT NAME:</b> <i>Hendrick Farm</i>	LOTS: 34	DATE: 7/12/2021
<b>CITY:</b> <i>Lucas, Texas</i>	LF STREET: 2880	CREATED BY: JMM
<b>JOB NUMBER:</b> <i>069229802</i>	NET ACRES: 70.5	CHECKED BY: SES
	GROSS ACRES: 73.4	REVISED BY: JMM

<b>C. WATER DISTRIBUTION SYSTEM</b>				
<i>ITEM DESCRIPTION</i>	<i>UNIT</i>	<i>QUANTITY</i>	<i>UNIT PRICE</i>	<i>ITEM COST</i>
12" C900, DR-18,PVC WATER	LF	430	\$70.00	\$30,100.00
12" GATE VALVE & BOX	EA	2	\$2,500.00	\$5,000.00
8" C900, DR-18,PVC WATER	LF	3,945	\$38.00	\$149,910.00
8" GATE VALVE & BOX	EA	9	\$1,500.00	\$13,500.00
12" X 8" CUT IN TEE	EA	2	\$7,500.00	\$15,000.00
CONNECT TO EXISTING WATER LINE	EA	8	\$1,000.00	\$8,000.00
FIRE HYDRANT ASSEMBLY	EA	7	\$5,500.00	\$38,500.00
1" SINGLE WATER SERVICE (WITH 1" METER)	EA	1	\$1,100.00	\$1,100.00
REMOVE 12" WATER LINE	LF	146	\$15.00	\$2,190.00
16" STEEL ENCASMENT	LF	37	\$120.00	\$4,440.00
CONCRETE ENCASMENT	LF	60	\$55.00	\$3,300.00
TRENCH SAFETY	LF	4,375	\$1.00	\$4,375.00
TESTING (EXCLUDING GEOTECH)	LF	4,375	\$1.50	\$6,562.50
<b>SUB - TOTAL WATER DISTRIBUTION SYSTEM</b>				<b>\$281,977.50</b>

<b>D. STREET PAVING</b>				
<i>ITEM DESCRIPTION</i>	<i>UNIT</i>	<i>QUANTITY</i>	<i>UNIT PRICE</i>	<i>ITEM COST</i>
6" REINF. CONCRETE STREET PAVEMENT	SY	10,183	\$40.00	\$407,320.00
6" SUBGRADE PREPARATION	SY	10,923	\$3.25	\$35,499.75
HYDRATED LIME (ASSUMES 7% LIME, 46#/SY)	TON	251	\$180.00	\$45,221.22
SEED ROW AND DITCH	SF	103,680	\$0.10	\$10,368.00
<b>SUB - TOTAL STREET AND ALLEY PAVING</b>				<b>\$498,408.97</b>

**OPINION OF PROBABLE COST  
ON-SITE IMPROVEMENTS**

<b>PROJECT NAME:</b> <i>Hendrick Farm</i>	LOTS: 34	DATE: 7/12/2021
<b>CITY:</b> <i>Lucas, Texas</i>	LF STREET: 2880	CREATED BY: JMM
<b>JOB NUMBER:</b> <i>069229802</i>	NET ACRES: 70.5	CHECKED BY: SES
	GROSS ACRES: 73.4	REVISED BY: JMM

<b>E. MISCELLANEOUS ITEMS</b>				
<i>ITEM DESCRIPTION</i>	<i>UNIT</i>	<i>QUANTITY</i>	<i>UNIT PRICE</i>	<i>ITEM COST</i>
VARIABLE TYPE FENCE REMOVE & DISPOSE	LF	2,228	\$2.00	\$4,456.00
ENTRY FEATURE	EA	2	\$20,000.00	\$40,000.00
REMOVE & DISPOSE EXISTING TREE	EA	104	\$720.00	\$74,880.00
ON-SITE POWER POLES	LOT	21	\$2,500.00	\$52,500.00
PARK FEES	LOT	34	\$1,000.00	\$34,000.00
TREE MITIGATION FEES	LS	1	\$45,705.00	\$45,705.00
FINAL PLAT FEE (CITY)	LS	1	\$1,090.00	\$1,090.00
<b>SUB - TOTAL MISCELLANEOUS ITEMS</b>				<b>\$252,631.00</b>

**COMBINED SUMMARY**

A. CLEARING, EXCAVATION & EROSION CONTROL	<b>\$196,134.50</b>
B. STORM SEWER SYSTEM	<b>\$235,549.00</b>
C. WATER DISTRIBUTION SYSTEM	<b>\$281,977.50</b>
D. STREET AND ALLEY PAVING	<b>\$498,408.97</b>
E. MISCELLANEOUS ITEMS	<b>\$252,631.00</b>

<i>SUB-TOTAL (EXCLUDING IMPACT FEES)</i>		\$1,464,700.97
<i>INSPECTION</i>	3%	\$43,941.03
<i>CONSTRUCTION MATERIALS TESTING</i>	2%	\$29,294.02
<i>CONTINGENCIES:</i>	10%	\$146,470.10
<b>TOTAL CONSTRUCTION COSTS (EXCLUDING IMPACT FEES):</b>		<b>\$1,684,406.12</b>

**OPINION OF PROBABLE COST  
ON-SITE IMPROVEMENTS**

<b>PROJECT NAME:</b> <i>Hendrick Farm</i>	LOTS: 34	DATE: 7/12/2021
<b>CITY:</b> <i>Lucas, Texas</i>	LF STREET: 2880	CREATED BY: JMM
<b>JOB NUMBER:</b> <i>069229802</i>	NET ACRES: 70.5	CHECKED BY: SES
	GROSS ACRES: 73.4	REVISED BY: JMM

<b>IMPACT AND DEVELOPMENT FEES</b>				
<i>ITEM DESCRIPTION</i>	<i>UNIT</i>	<i>QUANTITY</i>	<i>UNIT PRICE</i>	<i>ITEM COST</i>
ROADWAY IMPACT FEES	LOT	34	\$5,038.01	\$171,292.34
WATER IMPACT FEES	LOT	34	\$3,473.00	\$118,082.00
<b>SUB - TOTAL IMPACT AND DEVELOPMENT FEES</b>				<b>\$289,374.34</b>

City of Lucas  
General Fund Roadway Impact Fee Schedule  
Account 11-1009

		<u>General</u>	
Beginning Balance	9/30/2021	\$	1,289,717.95
FY 21-22 Budgeted Impact Fee Collections		\$	350,000.00
FY 21-22 Capital Project Expenditures:			
21-8210-491-127 Winningkoff Phase 2		\$	<u>(168,873.00)</u>
Total GF Remaining		\$	<u><u>1,470,844.95</u></u>



# City of Lucas

## City Council Agenda Request

### January 20, 2022

Item No. 06

Requester: Public Works Director Scott Holden

#### **Agenda Item Request**

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Consider recommendations from the Lemontree Country Estates and Kingwood Estates Drainage Improvements Study dated January 12, 2022 provided by Birkhoff, Hendricks & Carter, LLP and provide direction to the City Manager.

#### **Background Information**

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At the July 1 2021 City Council meeting, the City Council authorized Birkhoff, Hendricks & Carter, LLP to perform the following tasks associated with drainage in the Lemontree and Kingswood subdivisions:

Provide drainage design for the Lemontree subdivision downstream to Reid Branch Tributary 1 just downstream of the existing culvert crossing at Lynn Lane. This also includes design of a channel south of Kingswood Drive and culverts at Lynn Lane. Only design is included. No specifications, bidding or construction phase services are included. This alternate combined with alternate 4 will provide design for the solution. (Listed as Alternate 2 in the Lemontree Drainage Analysis Professional Engineering Services Agreement – Amendment No. 2 dated June 23, 2021)

Prepare study with hydraulic models using HEC-RAS for the existing culvert structure at Lynn Lane and for a proposed culvert hydraulic model for Lynn Lane with channel improvements to match the existing channel within 300 feet each side of Lynn Lane. (Listed as Alternate 4 in the Lemontree Drainage Analysis Professional Engineering Services Agreement – Amendment No. 2 dated June 23, 2021)

Birkhoff, Hendricks & Carter Engineering L.L.P. provided an executive summary to the City of Lucas which was sent to City Council for review on December 14, 2021, with six recommendations.

Joe Carter, PE from Birkhoff, Hendricks & Carter, LLP will be presenting the firm's findings associated with the Lemontree Country Estates and Kingwood Estates Drainage Improvements Study dated January 12, 2022.

#### **Attachments/Supporting Documentation**

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1. Executive Summary - Lemontree Country Estates and Kingswood Estates Drainage Improvements Study dated December 2, 2021
2. Lemontree Country Estates and Kingswood Estates Drainage Improvements Study dated January 12, 2022





# City of Lucas

## City Council Agenda Request

### January 20, 2022

#### **Budget/Financial Impact**

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- Recommendation 1 – Claremont Springs Retention/Detention Pond for Phase 1 – funding to be provided by Claremont Springs HOA
- Recommendation 2 – Future Farmstead Retention/Detention Pond – funding to be provided by developer
- Recommendation 3 – Lovejoy High School Detention Pond – funding to be provided by Lovejoy ISD
- Recommendation 4 – Rimrock Detention Pond- \$200,000
- Recommendation 5 – Orchard Road Crossing at Outfall from Rimrock – \$360,000
- Recommendation 6 – Lynn Lane Crossing Reid Branch Tributary 1- \$500,000

Note: Construction cost estimates are based on conceptual design and may vary significantly and does not include the cost of design.

#### **Recommendation**

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City staff recommends proceeding with the obtaining proposals for engineering design services from Birkhoff, Hendricks & Carter, LLP for Recommendations 4, 5, and 6. Each recommendation should have a separate proposal for future City Council consideration.

#### **Motion**

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I make a motion to approve/deny authorizing the City Manager to proceed with obtaining proposals for engineering design services from Birkhoff, Hendricks & Carter, LLP for Recommendations 4, 5, and 6.

**BIRKHOFF, HENDRICKS & CARTER, L.L.P.**  
**PROFESSIONAL ENGINEERS**

11910 Greenville Ave., Suite 600

Dallas, Texas 75243

Phone (214) 361-7900

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JOHN W. BIRKHOFF, P.E.  
GARY C. HENDRICKS, P.E., R.P.L.S.  
JOE R. CARTER, P.E.  
MATT HICKEY, P.E.  
ANDREW MATA, JR., P.E.

DEREK B. CHANEY, P.E., R.P.L.S.  
CRAIG M. KERKHOFF, P.E.  
JUSTIN R. IVY, P.E.  
JULIAN T. LE, P.E.  
COOPER E. REINBOLD, P.E.

December 2, 2021

Mr. Scott Holden, P.E.  
Public Works Director  
City of Lucas  
665 Country Club Road  
Lucas, Texas 75002

Re: Lemontree and Kingswood Drainage Design

Dear Mr. Holden:

As requested, we prepared the Engineer's Opinions of Probable Construction Cost (EOPCC) for Recommendations 4, 5, and 6 that are described in the Executive Summary for the Lemontree and Kingswood Drainage Design project. We attached two (2) copies of each EOPCC to this letter.

The following lists the recommended order of completion for the recommended projects follows with a brief explanation for the placement in the order, as requested:

1. Recommendation 1 – Claremont Springs Retention/Detention Pond for Phase 1.

City staff indicates the HOA will raise the embankment around the detention/retention pond at no cost to the City. This will alleviate the potential for the pond overtopping during a 100-year event.

2. Recommendation 2 – Future Farmstead Retention/Detention Pond

The developer indicated willingness to oversize the retention/detention pond to help alleviate flooding issues. City staff indicates the larger retention/detention pond will be at HOA no cost to the City. This will mitigate some or all of the slight increase in flow from south of Estates Parkway.

3. Recommendation 3 – Lovejoy High School Detention Pond

The engineer for Lovejoy ISD indicated that the school district intends to make modifications to the existing detention pond including modifying the outfall structure and raising the embankment at no cost to the City. This will allow the pond to function as intended and increase the effectiveness during more frequent rainfall events.

4. Recommendation 5 – Orchard Road Crossing at Outfall from Rimrock

The property owners expressed a willingness to cooperate with the City to improve the channel and the culverts crossing Orchard Road from the property line at the outfall from Rimrock to the east end of the Lemontree Addition. The conceptual design for these improvements includes rock riprap at the west property line (outfall from Rimrock) and a deeper channel with a 6-foot bottom and 8:1 side slopes to a new three barrel 3'h x 5'w box culvert crossing Orchard Road and a deeper channel with a 6-foot bottom and 8:1 side slopes to outfall near the elevation of the channel just east of Lemontree. This project will mitigate most of the current problems in the area of the existing channel.

5. Recommendation 4 – Rimrock Detention Pond

The embankment along the common property line between the Rimrock development and the Lemontree Addition needs to be raised. The conceptual design includes a total of approximately 900 linear feet of additional embankment averaging approximately 10 to 12 -inches in height with rock rip rap on the west side (towards Rimrock) and block sod on the top and east sides. This project will mitigate overtopping during larger storm events and allow pond to function as intended during 100-year events.

6. Recommendation 6 – Lynn Lane Crossing Reid Branch Tributary 1

The existing culverts at Lynn Lane provide capacity for the 5-year frequency storm without overtopping the road. The City requested that any improvement be limited to not exceed the capacity of the existing two 8'h x 10' w culverts downstream at Country Club Road. This limits the maximum area to 160 square feet. The proposed model uses three 5'h x 10' wide culverts to avoid significantly raising Lynn Lane at the crossing and stay with standard size box culverts. This project increases the capacity to pass a 10-year event; however, the 25-year event overtops the road. The 100-year culvert size would require raising Lynn Lane and would be larger than the existing culverts at Country Club Road.

The final report will include recommended improvements to the channels and culverts in the Lemontree Addition and to channels through the Kingswood Addition to provide adequate capacity and allow runoff to be conveyed more efficiently to reduce potential flooding concerns.

Let us know if there are any questions regarding our recommendations. We are available to discuss this report and our recommendations at your convenience.

Sincerely,



Joe R. Carter, P.E., CFM

Enclosures

Client: CITY OF LUCAS, TEXAS  
 Project: LEMONTREE & KINGSWOOD DRAINAGE DESIGN  
ORCHARD ROAD SOUTH CULVERT AND CHANNEL

Date: 2-Dec-21  
 By: JRC

**ENGINEER'S OPINION OF CONSTRUCTION COST**

Item No.	Description	Quantity	Unit	Price	Amount
1	Mobilization (at 5% Maximum All Other Items)	1	L.S.	\$ 13,700.00	\$ 13,700.00
2	Prepare Right-of-Way, Clearing and Grubbing	5.5	Sta.	\$ 2,400.00	\$ 13,200.00
3	Unclassified Channel Excavation	1,561	C.Y.	\$ 25.00	\$ 39,025.00
4	Remove Reinf. Concrete Pavement	67	S.Y.	\$ 25.00	\$ 1,675.00
5	Remove Existing 2 - 21" CMP and Headwalls	1	L.S.	\$ 2,200.00	\$ 2,200.00
6	12" to 18" Rock Riprap	408	S.Y.	\$ 200.00	\$ 81,600.00
7	Block Sod	2,622	S.Y.	\$ 7.00	\$ 18,354.00
8	Three 5's x 3'r Box Culverts	40	L.F.	\$ 1,650.00	\$ 66,000.00
9	Type PW Headwalls	2	Ea.	\$ 20,000.00	\$ 40,000.00
10	Construct 6" Flexible Base	67	S.Y.	\$ 30.00	\$ 2,010.00
11	Construct 8" Reinf Concrete Pavement	67	S.Y.	\$ 85.00	\$ 5,695.00
12	Furnish & Install Temporary Erosion Control	1	L.S.	\$ 2,200.00	\$ 2,200.00
13	Remove Temporary Erosion Control	1	L.S.	\$ 1,100.00	\$ 1,100.00
	<b>Subtotal (Without Mobilization) :</b>				\$ 273,059.00
	<b>Subtotal (With Mobilization) :</b>				\$ 286,759.00
	*Drainage and Construction Easements (500' x 60') :	30,000	S.f.	\$ -	\$ -
	Contingencies and Miscellaneous Items :	25%			\$ 71,689.75
	<b>Total :</b>				\$ 358,448.75
	*Surveys and Engineering for Detailed Construction Plans :	20%			\$ -
	* Items Not Included in Cost at Owner's Direction				
	<b>TOTAL WITHOUT EASEMENTS OR DETAILED DESIGN (Rounded Up to Nearest \$10,000) :</b>				\$ 360,000.00

**\*\* DISCLAIMER**

OPINION OF PROBABLE CONSTRUCTION COST IS BASED ON A CONCEPTUAL DESIGN, NOT A DETAILED ENGINEERING DESIGN. THE ACTUAL COST MAY VARY SIGNIFICANTLY DEPENDING ON MANY FACTORS INCLUDING BUT NOT LIMITED TO INFLATION, EASEMENT COST, PHASING AND TEMPORARY ACCESS, TREE MITIGATION, SIZE AND SCOPE OF THE AS BID PROJECT, ENGINEERING AND SURVEYING, WORKING ROOM, MATERIAL AVAILABILITY, UTILITY CONFLICTS, ETC.



Client: CITY OF LUCAS, TEXAS

Date: 2-Dec-21

Project: LEMONTREE & KINGSWOOD DRAINAGE DESIGN  
LYNN LANE CULVERT AND CHANNEL

By: JRC

**ENGINEER'S OPINION OF CONSTRUCTION COST**

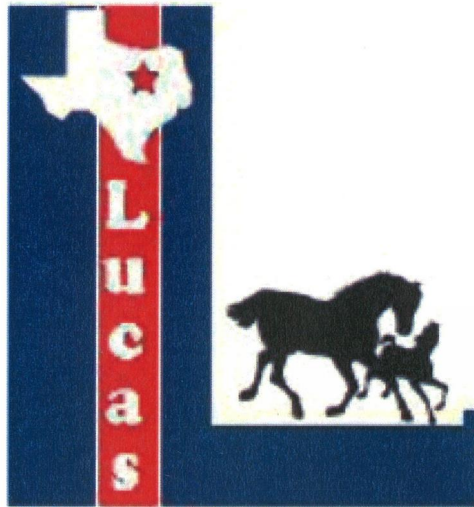
Item No.	Description	Quantity	Unit	Price	Amount
1	Mobilization (at 5% Maximum All Other Items)	1	L.S.	\$ 18,800.00	\$ 18,800.00
2	Prepare Right-of-Way, Clearing and Grubbing	2.5	Sta.	\$ 2,400.00	\$ 6,000.00
3	Unclassified Channel & Roadway Excavation	400	C.Y.	\$ 25.00	\$ 10,000.00
4	Remove Reinf. Concrete Pavement	200	S.Y.	\$ 25.00	\$ 5,000.00
5	Remove Existing 8 - 48" RCP and Headwalls	1	L.S.	\$ 12,000.00	\$ 12,000.00
6	12" to 18" Rock Riprap	360	S.Y.	\$ 200.00	\$ 72,000.00
7	Block Sod	800	S.Y.	\$ 7.00	\$ 5,600.00
8	Three 10's x 5'r Box Culverts	40	L.F.	\$ 3,600.00	\$ 144,000.00
9	Type PW Headwalls	2	Ea.	\$ 32,000.00	\$ 64,000.00
10	Construct 6" Flexible Base	200	S.Y.	\$ 30.00	\$ 6,000.00
11	Construct 8" Reinf Concrete Pavement	200	S.Y.	\$ 85.00	\$ 17,000.00
12	Furnish & Install T501 Traffic Rail	100	L.F.	\$ 240.00	\$ 24,000.00
13	Construct 5' Wide Reinf Concrete Sidewalk	84	S.Y.	\$ 90.00	\$ 7,560.00
14	Furnish & Install Temporary Erosion Control	1	L.S.	\$ 2,500.00	\$ 2,500.00
15	Remove Temporary Erosion Control	1	L.S.	\$ 1,250.00	\$ 1,250.00
	<b>Subtotal (Without Mobilization) :</b>				\$ 376,910.00
	<b>Subtotal (With Mobilization) :</b>				\$ 395,710.00
	*Drainage and Construction Easements (50' x 150') :	7,500	S.f.	\$ -	\$ -
	Contingencies and Miscellaneous Items :	25%			\$ 98,927.50
	<b>Total :</b>				\$ 494,637.50
	*Surveys and Engineering for Detailed Construction Plans :	20%			\$ -
	* Items Not Included in Cost at Owner's Direction				
	<b>TOTAL WITHOUT EASEMENTS OR DETAILED DESIGN (Rounded Up to Nearest \$10,000) :</b>				\$ 500,000.00

**\*\* DISCLAIMER**

OPINION OF PROBABLE CONSTRUCTION COST IS BASED ON A CONCEPTUAL DESIGN, NOT A DETAILED ENGINEERING DESIGN. THE ACTUAL COST MAY VARY SIGNIFICANTLY DEPENDING ON MANY FACTORS INCLUDING BUT NOT LIMITED TO INFLATION, EASEMENT COST, PHASING AND TEMPORARY ACCESS, TREE MITIGATION, SIZE AND SCOPE OF THE AS BID PROJECT, ENGINEERING AND SURVEYING, WORKING ROOM, MATERIAL AVAILABILITY, UTILITY CONFLICTS, ETC.



**LEMONTREE COUNTRY ESTATES  
AND  
KINGSWOOD ESTATES  
DRAINAGE IMPROVEMENTS STUDY**



*Joe Richard Carter*  
*Jan. 12, 2022*

Prepared By  
Birkhoff, Hendricks & Carter, L.L.P.  
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January, 2022

**CITY OF LUCAS, TEXAS**  
**LEMONTREE AND KINGSWOOD DRAINAGE DESIGN**  
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**City of Lucas, Texas**  
**Lemontree Country Estates and Kingswood Estates**  
**Drainage Design Report**

**I. PURPOSE**

The City of Lucas is aware of drainage problems in the Lemontree Country Estates and Kingswood Estates subdivisions and retained Birkhoff, Hendricks & Carter, L.L.P. to analyze the current drainage systems. This report focuses on the 100-year and 25-year frequency rainfall events. A 100-year frequency event is a rainfall event with a 1% chance (1/100) of being equaled or exceeded every year. A 25-year frequency event has a 4% chance (1/25) of being equaled or exceeded every year. The purposes for this report are as follows:

1. To determine the quantity of storm water runoff in the Lemontree Country Estates and Kingswood Estates subdivisions for the 100-year and 25-year frequency rainfall events.
2. To provide recommendations to the City of Lucas and residents of those subdivisions for improvements to improve the storm water drainage systems in those subdivisions.
3. To analyze the existing Lynn Lane culvert capacity at the Reid Branch Tributary 1 crossing.
4. To make recommendations for improvements to the culverts at Lynn Lane.

Lynn Lane crosses Reid Branch Tributary 1 upstream of the Zone A floodplain shown Flood Insurance Rate Map Panel 48085C0405J, Effective Date June 2, 2009, in Collin County, Texas. The community shown on the map panel is the City of Lucas (Community No.481545).

**II. PROJECT LOCATION**

The Lemontree Country Estates and Kingswood Estates subdivisions are located north of Estates Parkway (F.M. 2170) and west of Country Club Road (F.M. 1378) in the City of Lucas, Collin County, Texas. A Location Map is included as Figure 1 in this report. Both subdivisions contribute flow to Reid Branch Tributary 1, shown on Flood Insurance Rate Map Panel 48085C0405J.

**III. PROCEDURES**

This drainage design report uses rainfall intensities from the iSWM Technical Manual developed by the North Central Texas Council of Governments (NCTCOG) as directed by the City of Lucas. The open channels are designed using a spreadsheet currently used by several municipalities near the City of Lucas. Driveway and street culverts (except at Lynn Lane) were designed using the HY8 program developed by the Federal Highway Administration (FHWA). The culverts at Lynn Lane are designed using the HEC-RAS computer software developed by the US Army Corps of

Engineers. The HEC-RAS method is used for large culvert structures and channels with a large amount of drainage.

### **Hydrologic Calculations**

Hydrology is the determination of the quantity of flow from storm events. The terminology used to describe various events such as 100-year and 25-year are based on probabilities. The term 100-year storm refers to a rainfall event with a probability of 1/100 (1%) that an event equal to or greater will occur each year. The term 25-year storm refers to a rainfall event with a probability of 1/25 (4%) that an event equal to or greater will occur each year.

There was no existing hydrologic model for the drainage area upstream of Lynn Lane crossing Reid Branch Tributary 1. The City of Lucas approved development of a HEC-HMS computer model (developed by the US Army Corps of Engineers) to calculate runoff for the drainage area upstream of Lynn Lane. This computer program is a commonly used for large drainage basins, generally over 200 acres. The total area contributing flow to Reid Branch Tributary 1 upstream of Lynn Lane is approximately 446 acres.

The NRCS Win TR-55 computer model was used to calculate weighted SCS Curves and to calculate the time of concentration for the sub-areas greater than 10-acres in the hydrologic model. A HEC-HMS computer model was used to calculate flows for the 2, 5, 10, 25, and 100-year frequency storm events for the existing conditions. The lag time used in the HEC-HMS model is 60% of the time of concentration from the NRCS Win TR-55 model. The 24-hour rainfall for the various frequency event was taken from the NRCS Win TR-55 standard table for Collin County, Texas. The initial abstraction (amount absorbed) for each sub-area is based on Table X from the iSWM Technical Manual and Hydrologic Class D soils (clay). A Type III SCS Unit Hydrograph was used for the 24-hour storm event. The HEC-HMS model includes the retention and detention ponds in the drainage basin based on the plans provided by the City of Lucas for the Lovejoy High School, Phases 1 and 2 of the Claremont Springs subdivision and the Rimrock subdivision.

The following maps, exhibits, and model output data are included in this report:

- Project Drainage Area Map with Aerial Images and 2007 Contours from NCTCOG
- HEC-HMS Model Schematic
- HEC-HMS Model Global Summary Table for 2, 5, 10, 25, and 100 Year Frequencies

The drainage areas for the street and driveway culverts and roadway ditches in the Lemontree Country Estates subdivision are too small to use the HEC-HMS software. An excel spreadsheet calculated the amount of runoff with the Rational Method based on uses rainfall intensities from the iSWM Technical Manual developed by the North Central Texas Council of Governments (NCTCOG).

## **Hydraulic Calculations**

The HEC-RAS computer program (Version 5.0.3) developed by the US Army Corps of Engineers was used to calculate water surface elevations for the 2, 5, 10, 25, and 100-year frequency flows for the existing conditions and the proposed project conditions at Lynn Lane. The water surface elevations generated by the program show the existing culverts at Lynn Lane do not have adequate capacity for a 10-year (10%) frequency event.

The driveway and street culverts were sized using the HY8 program developed by the Federal Highway Administration (FHWA). The resulting sizes are listed in Appendix B of this report.

### **Existing Conditions HEC-RAS Model**

The existing conditions model includes the channel for Reid Branch Tributary 1 from approximately 300 feet upstream of Lynn Lane to approximately 300 feet downstream of Lynn Lane. The channel and culverts were surveyed to obtain elevation and reach data for the HEC-RAS model. There are currently six 48-inch RCP pipe culverts at Lynn Lane. Field surveys were supplemented by information from NCTCOG 2007 contours when water surface elevations exceeded the highest surveyed elevations.

The beginning water surface elevation (boundary condition) is based on normal depth with an energy slope of 0.01 ft/ft., consistent with the energy slope at the downstream limit of the study.

Manning's "n" values were based on field observations and the engineer's experience in modeling floodplains.

The Existing Conditions Model HEC-RAS report with section and profile plots are included in Appendix C of this report:

### **Proposed Project HEC-RAS Model**

The proposed project model includes minor channel improvements at the upstream and downstream face of the culverts crossing Lynn Lane. The proposed culvert sizes are based on not exceeding the existing culvert capacity for the culverts crossing Country Club Road downstream of Lynn Lane. There are two 8'h x 10'w box culverts currently crossing Country Club Road on Reid Branch Tributary 1. This provides a total opening of approximately 160 square feet. Three 5'h x 10' wide boxes were modeled for the proposed Lynn Lane crossing for a total opening of approximately 150 square feet.

The proposed project does have capacity for the 10-year frequency flow; however, the 25-year and 100-year frequency flows overtop Lynn Lane.

The Proposed Project Model HEC-RAS report with section and profile plots are included in Appendix C of this report:

#### **IV. RESULTS AND OBSERVATIONS**

##### Lemontree Country Estates

There is no record of a drainage design for the Lemontree Country Estates subdivision. The street and driveway culverts in the subdivision do not have adequate capacity for a 25-year rainfall event. Many of the lots in the subdivision were not graded to provide positive drainage resulting in low spots where runoff collects until the water either percolates into the clay soil or evaporates.

This report provides recommendations for a system of proposed channels and culverts in Appendix B designed for a 100-year rainfall event. It is recommended that the improvements be performed as a complete project to have the most impact on improving drainage within the subdivision. Improvements performed by individual property owners may not alleviate the flooding issues and may create additional problems without careful consideration of downstream and upstream impacts.

Side yard ditches are recommended for all lots in the subdivision to be provided with a slope of at least 0.50% from the recommended street channel up to the back of the lot and the lots should be graded to drain to the side yard ditches with a minimum slope of 0.50%. The grading required for each lot will vary depending on existing conditions and the elevations of channels available to drain the side yard ditches.

##### Kingswood Estates

The Kingswood Estates subdivision did not include a drainage design with recommendations for street channels and driveway culverts. The drainage generally flows from the lots to the street and south along the street to the cul-de-sac. There is no clear path for the runoff from the cul-de-sac to the existing side yard swale on the east side of the lot near the south end of Kingswood Drive and the yard is slightly higher than the pavement in the cul-de-sac. It is recommended to provide a concrete flume a minimum of 4 feet in width with a slope of at least 0.50% for a clear path runoff to drain from the end of the cul-de-sac to the eastern side yard ditch.

There are reports of standing water in several areas in the subdivision, usually on the side of the lots. Side yard ditches are recommended for all lots in the subdivision to be provided with a slope of at least 0.50% from the street up to the back of the lot and the lots should be graded to drain to the side yard ditches with a minimum slope of 0.50%. The grading required for each lot will vary depending on existing conditions and the elevation of the street available to drain the side yard ditch.

There is a channel at the southwest corner of Kingswood Estates that conveys a large amount of the runoff from Lemontree Country Estates to a channel south of Kingswood Estates. The channel south of Kingswood Estates is a tributary to Reid Branch Tributary 1. This report includes a recommended channel section in Appendix B with a 0.50% grade to convey the 100-year event.

### Lynn Lane Improvements

Lynn Lane crosses Reid Branch Tributary 1 with eight 48-inch RCP culverts. The existing conditions analysis shows these culverts have capacity to convey the 2-year event. The 10-year event overtops the road at a depth of approximately 1 foot and the 100-year event overtops the road at a depth of approximately 2.5 feet.

The City of Lucas requested that the proposed improvements model not exceed the capacity of the existing culverts downstream of Lynn Lane where Reid Branch Tributary 1 crosses Country Club Road. There are two 8'h x 10'w box culverts currently crossing Country Club Road on Reid Branch Tributary 1. This provides a total opening of approximately 160 square feet. Three 5'h x 10' wide boxes were modeled for the proposed Lynn Lane crossing for a total opening of approximately 150 square feet.

The proposed project does have capacity for the 10-year frequency flow; however, the 25-year event overtops the road at a depth of approximately 1 foot and and 100-year event overtops the road at a depth of approximately 2 feet. The proposed improvements do not convey the 100-year event because of the restricted size due to the culverts downstream; however, the depth of flow is reduced in Reid Branch Tributary 1 by approximately 1.5 feet for the 10-year event, approximately 9-inches for the 25-year event, and 6-inches for the 100-year event. The proposed project will reduce the depth of flow in Reid Branch Tributary 1 upstream of the crossing and could reduce flooding. Exhibits related to the proposed improvements at Lynn Lane are included in Appendix C of this report.

### Property Owner's Input

The City of Lucas contacted property owners and invited them to email the City with comments and photographs of their observations related to drainage problems. Two public meetings were held at the City of Lucas and property owners were invited to provide their input about their observations on drainage problems. Attending the meeting with property owners was the Mayor and City Council, City of Lucas Staff and Joe Carter from Birkhoff, Hendricks, and Carter, L.L.P.

The first meeting included the Lemontree Country Estates property owners and owners provided input and perceptions about the drainage problems and what they felt were sources of the problems. Several citizens indicated that they believed that flows from developments including the Lovejoy High School, the Claremont Estates development, and the Rimrock development have increased the flooding problems in their subdivision. One property owner said that the flooding issues on their lot

had almost entered the house and they hired an engineer that told them to build a berm around their lot. One citizen called into the meeting and said that the drainage problems have existed since she moved to Lemontree over thirty years ago. In her opinion, the problems were made worse by overlays on Orchard Road making the water deeper before it flowed over the road. Another citizen asked to meet individually with City Staff and the design engineer. He proposed several retention/detention ponds to help reduce the quantity of runoff together with berms to divert flow from back yards and some channel improvements. He also said that he was certain the Claremont Springs development was one of the major contributors to flooding in the creek.

The second meeting included the Kingswood Estates property owners and owners provided input and perceptions about the drainage problems. The input was mostly related to standing water in their lots and driveways and at the end of the cul-de-sac. One property owner had provided a video of the water flowing through the channel along the south side of his property and in the channel south of his property and said that these channels do not have capacity for large rain events. Another property owner said that the City cleaning the channel downstream of Lynn Lane had improved the flow in that area but was concerned about rising flood levels.

City of Lucas staff informed Birkhoff, Hendricks, and Carter, L.L.P. that they did not want to include design of detention ponds in the proposed project due to property rights and maintenance issues.

## **V. SUMMARY**

An executive summary was provided separate from this report. The executive summary included recommendations to improve the most dramatic flooding problems. Those recommendations are listed as follows:

1. Raise the top of embankment on the Phase 1 Claremont Springs retention/detention pond from 618.70 to 619.20 (6-inches), to provide approximately 6-inches of freeboard for the 100-year event.
2. Reduce the flow to Reid Branch Tributary 1 by oversizing the future Farmstead detention pond to decrease the flow out of Lemontree by approximately 47 cfs if feasible. This will drop the slight increase from the Claremont Springs development.
3. Lovejoy ISD to construct proposed improvements to the detention pond as submitted to the City of Lucas.
4. Raise the pond top of embankment for the Rimrock detention pond and channel along the property line with Lemontree Country Estates from 619.50 to 620.30 (9.6-inches), to provide approximately 6-inches of freeboard for the 100-year event.
5. The channel from the Rimrock outfall to Orchard Road should have a 6-foot wide bottom with a 4:1 side slope, and a depth of 2.50 feet to provide approximately 6-inches of freeboard. The existing two (2) 21-inch CMP culverts should be replaced with three (3) 5'w x 3' h box culverts for the 100-year design event. The channel downstream (east) of the Orchard Road crossing

should have a 6-foot wide bottom with a 4:1 side slope, and a depth of 2.75 feet to provide approximately 6-inches of freeboard. The report includes a recommended slope for the proposed channel.

6. Substitute three (3) 10'w x 5'h box culverts for the eight (8) 48-inch RCP culverts. This provides 150 sf of opening to not exceed the capacity downstream at Country Club Road. This provides capacity for the 10-year event, but the 25-year event slightly overtops the roadway. This also lowers the water surface upstream of Lynn Lane by approximately 6-inches during the 100-year event.

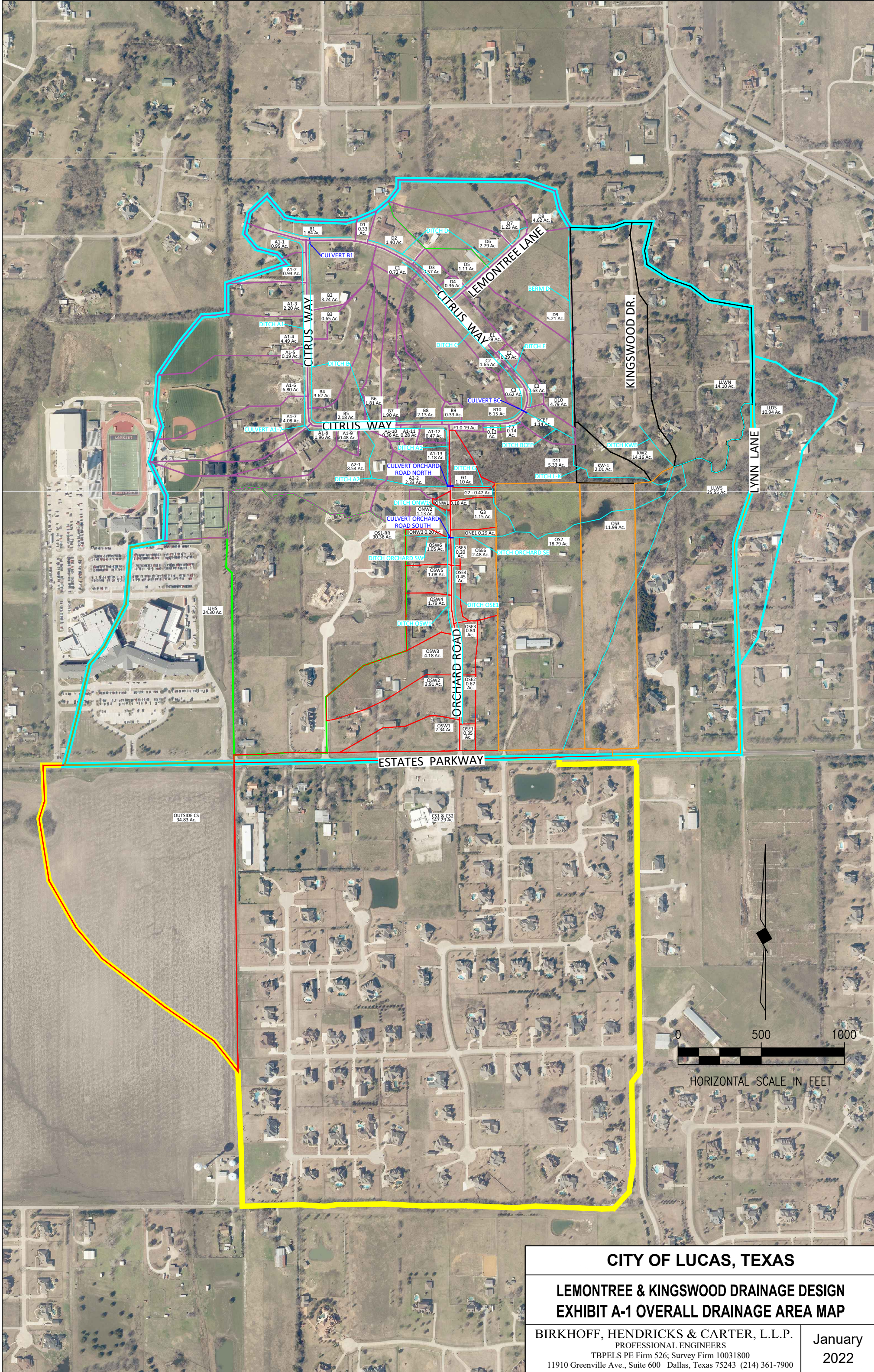
The executive summary mentions recommended improvements to reduce localized flooding as "Other Improvements". Those recommendations are described as follows:

7. Construct new driveway and street culverts with roadside ditches in the Lemontree Country Estates development as recommended in the report.
8. Construct improvements the major ditch at the south end of the Kingswood Estates development and grade the cul-de-sac to drain to the side yard ditch on the east side of the cul-de-sac as recommended in the report.

***APPENDIX A***

***HYDROLOGY***





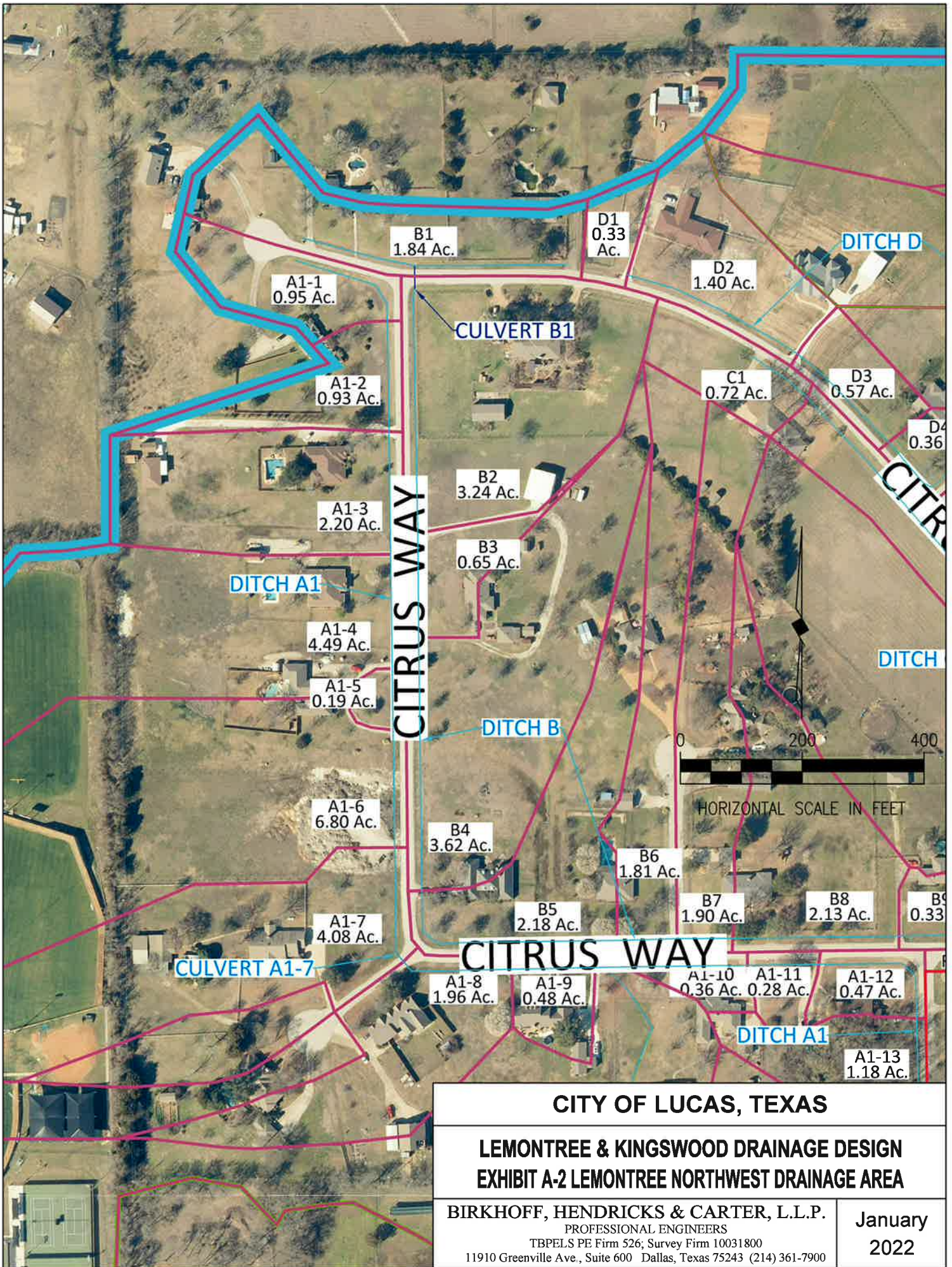
**CITY OF LUCAS, TEXAS**

**LEMONTREE & KINGSWOOD DRAINAGE DESIGN  
EXHIBIT A-1 OVERALL DRAINAGE AREA MAP**

BIRKHOFF, HENDRICKS & CARTER, L.L.P.  
PROFESSIONAL ENGINEERS  
TBPELS PE Firm 526; Survey Firm 10031800  
11910 Greenville Ave., Suite 600 Dallas, Texas 75243 (214) 361-7900

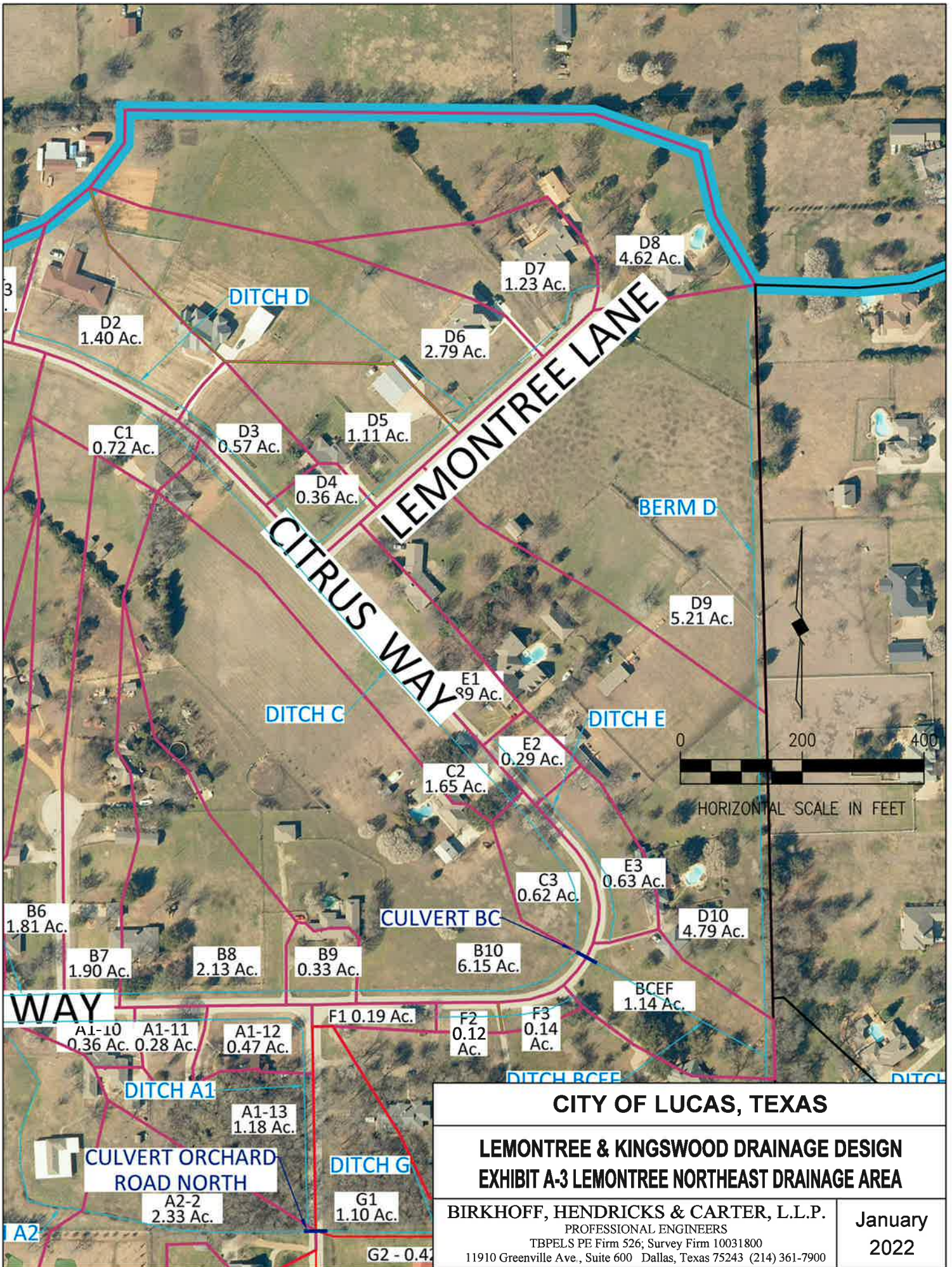
January  
2022





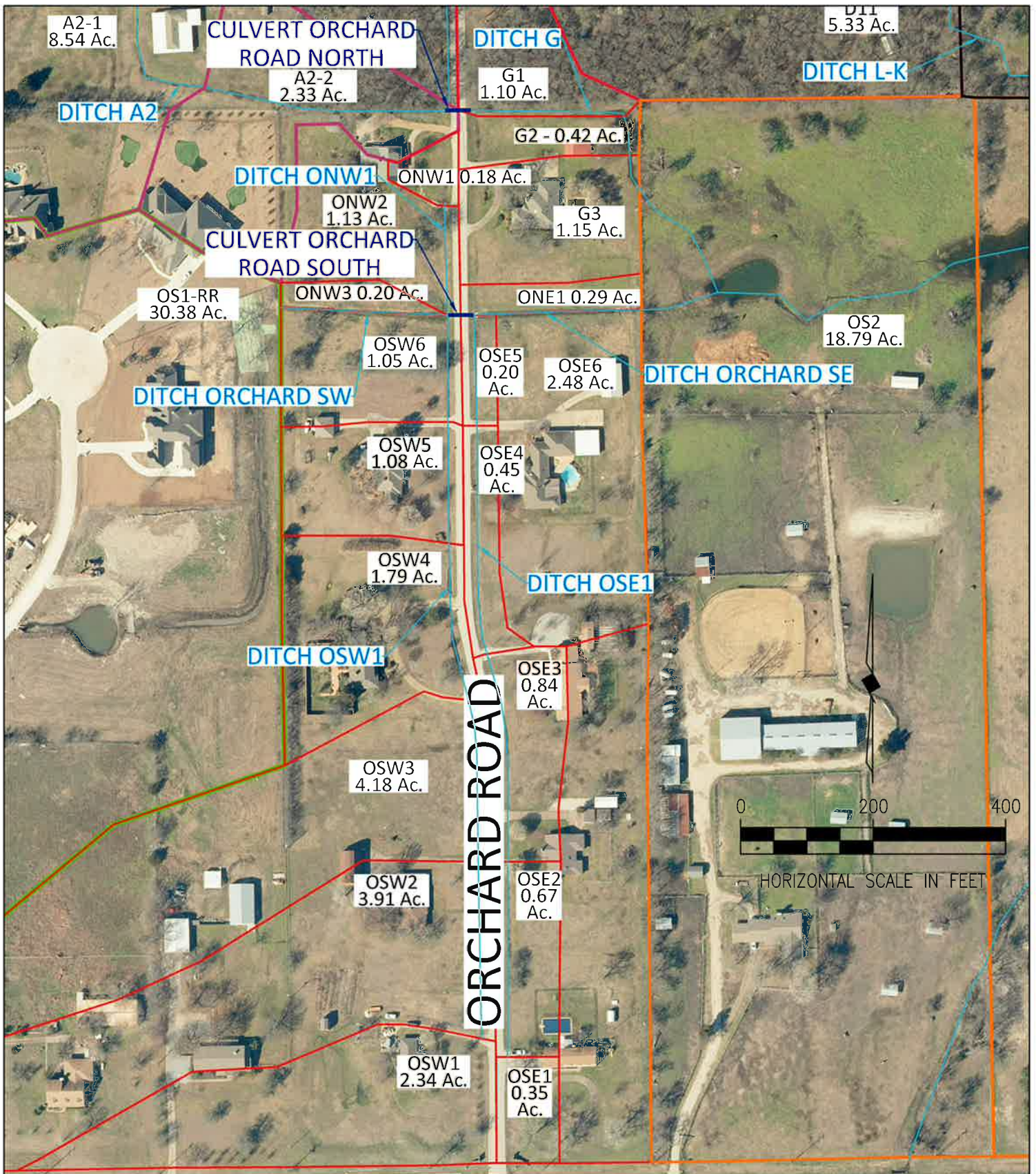
<b>CITY OF LUCAS, TEXAS</b>	
<b>LEMONTREE &amp; KINGSWOOD DRAINAGE DESIGN EXHIBIT A-2 LEMONTREE NORTHWEST DRAINAGE AREA</b>	
BIRKHOFF, HENDRICKS & CARTER, L.L.P. PROFESSIONAL ENGINEERS TBPELS PE Firm 526; Survey Firm 10031800 11910 Greenville Ave., Suite 600 Dallas, Texas 75243 (214) 361-7900	
January 2022	





<b>CITY OF LUCAS, TEXAS</b>	
<b>LEMONTREE &amp; KINGSWOOD DRAINAGE DESIGN EXHIBIT A-3 LEMONTREE NORTHEAST DRAINAGE AREA</b>	
BIRKHOFF, HENDRICKS & CARTER, L.L.P. PROFESSIONAL ENGINEERS TBPELS PE Firm 526; Survey Firm 10031800 11910 Greenville Ave., Suite 600 Dallas, Texas 75243 (214) 361-7900	
January 2022	





**ESTATES PARKWAY**

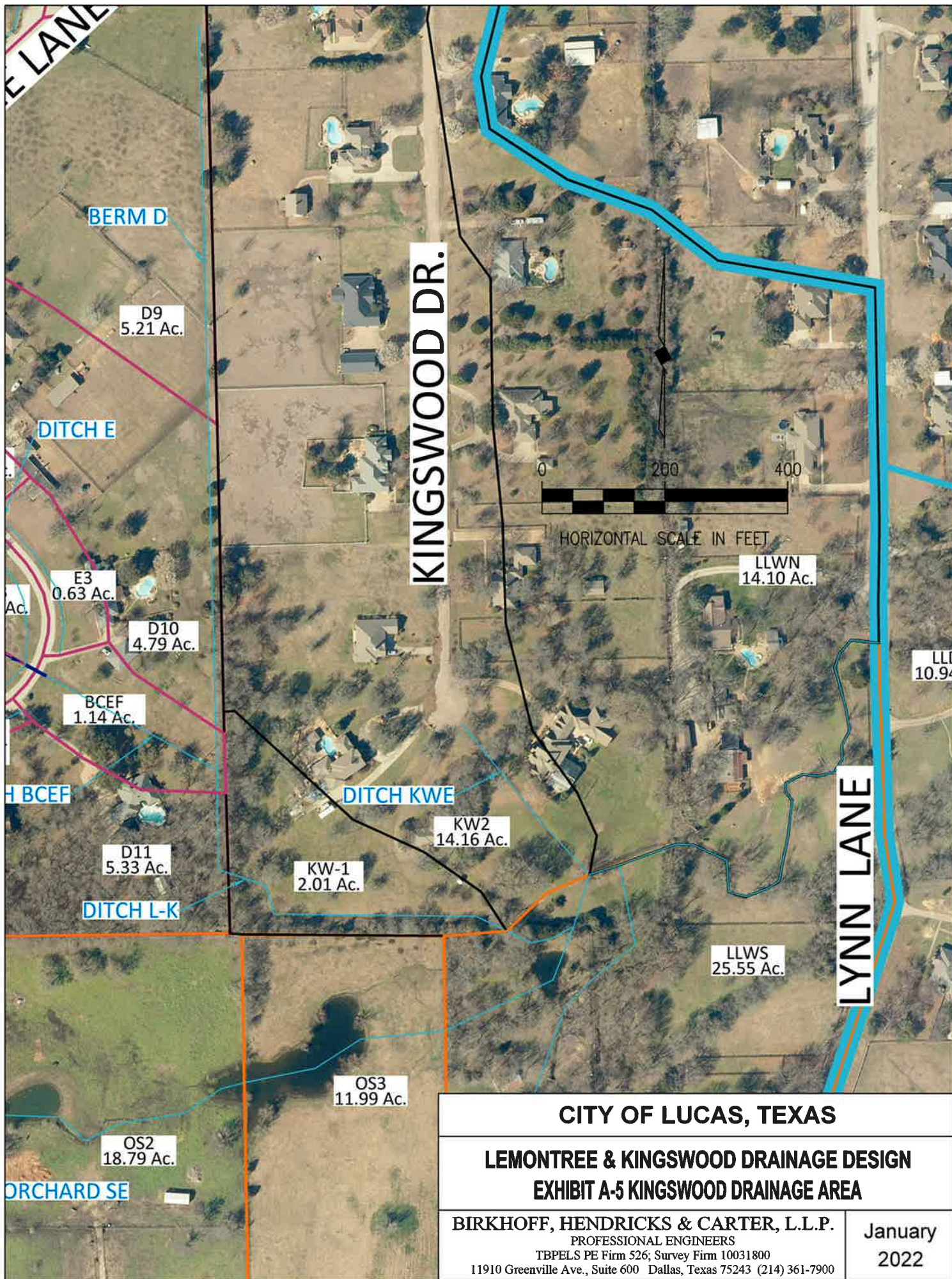
**CITY OF LUCAS, TEXAS**

**LEMONTREE & KINGSWOOD DRAINAGE DESIGN  
EXHIBIT A-4 LEMONTREE SOUTH DRAINAGE AREA**

BIRKHOFF, HENDRICKS & CARTER, L.L.P.  
PROFESSIONAL ENGINEERS  
TBPELS PE Firm 526; Survey Firm 10031800  
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January  
2022





**CITY OF LUCAS, TEXAS**

**LEMONTREE & KINGSWOOD DRAINAGE DESIGN  
EXHIBIT A-5 KINGSWOOD DRAINAGE AREA**

**BIRKHOFF, HENDRICKS & CARTER, L.L.P.**  
 PROFESSIONAL ENGINEERS  
 TBPELS PE Firm 526; Survey Firm 10031800  
 11910 Greenville Ave., Suite 600 Dallas, Texas 75243 (214) 361-7900

January  
2022



**EXHIBIT A-6**  
**100-YR. RUNOFF CALCULATIONS**

**Client:** City of Lucas, Texas  
**Project:** Lemontree & Kingswood Drainage Design  
Lemontree Estates

**Date:** 11/18/21  
**By:** JRC

Area No.	Incremental Drainage Area						Incremental "CA"	Accumulated "CA"	Time of Concentration (Min.)	Design Storm Frequency (Yrs.)	Intensity (I) (In./Hr.)	Total Flow (Q) (c.f.s.)
	Total Area (Ac.)	Offsite Area (Ac.)	Offsite Area "C"	Onsite Area (Ac.)	Onsite Area "C"	Effective Runoff "C"						
1	2	3	4	5	6	7	8	9	10	11	12	13
<b>DITCH A-1 (WEST/SOUTH OF CITRUS WAY)</b>												
A1-1	0.95	0.00	0.00	0.95	0.45	0.45	0.43	0.43	10.00	100-yr.	9.20	3.93
A1-2	0.93	0.00	0.00	0.93	0.45	0.45	0.42	0.85	11.51	100-yr.	8.74	7.39
A1-3	2.20	0.00	0.00	2.20	0.45	0.45	0.99	1.84	12.86	100-yr.	8.37	15.37
A1-4	4.49	1.69	0.35	2.80	0.45	0.41	1.85	3.69	13.90	100-yr.	8.11	29.91
A1-5	0.19	0.00	0.00	0.19	0.45	0.45	0.09	3.77	14.46	100-yr.	7.98	30.10
A1-6	6.80	3.35	0.40	3.45	0.45	0.43	2.89	6.67	15.41	100-yr.	7.77	51.77
A1-7	4.08	1.73	0.50	2.35	0.45	0.47	1.92	8.59	16.20	100-yr.	7.60	65.26
A1-7a	0.87	0.00	0.00	0.87	0.45	0.45	0.39	8.98	16.20	100-yr.	7.60	68.23
A1-8a	1.34	0.72	0.50	0.62	0.45	0.48	0.64	9.62	16.37	100-yr.	7.56	72.76
A1-8	1.96	0.00	0.00	1.96	0.45	0.45	0.88	10.50	17.09	100-yr.	7.42	77.92
A1-9	0.48	0.00	0.00	0.48	0.45	0.45	0.22	10.72	17.69	100-yr.	7.31	78.30
A1-10	0.36	0.00	0.00	0.36	0.45	0.45	0.16	10.88	18.79	100-yr.	7.11	77.31
A1-11	0.28	0.00	0.00	0.28	0.45	0.45	0.13	11.00	19.30	100-yr.	7.02	77.23
A1-12	0.47	0.00	0.00	0.47	0.45	0.45	0.21	11.22	20.30	100-yr.	6.85	76.86
A1-13	1.18	0.00	0.00	1.18	0.25	0.25	0.30	11.51	21.42	100-yr.	6.68	76.85
	26.58											
<b>DITCH A2 (SOUTH OF CITRUS TO ORCHARD NORTH CULVERT)</b>												
A2-1	8.54	3.54	0.60	5.00	0.45	0.51	4.37	4.37	15.00	100-yr.	7.86	34.36
A2-2	2.33	0.00	0.00	2.33	0.45	0.45	1.05	5.42	17.04	100-yr.	7.43	40.29
	10.87											
<b>TOTAL FLOW TO ORCHARD CULVERT NORTH (WEST)</b>												
								16.93	21.42	100-yr.	6.68	113.05
<b>DITCH ONW (WEST OF ORCHARD TO ORCHARD CULVERT SOUTH)</b>												
ONW1	0.18	0.00	0.00	0.18	0.45	0.45	0.08	0.08	5.00	100-yr.	11.24	0.91
ONW2	1.13	0.00	0.00	1.13	0.45	0.45	0.51	0.59	7.31	100-yr.	10.17	6.00
<b>DITCH OSW (WEST OF ORCHARD TO ORCHARD CULVERT SOUTH)</b>												
OSW1	2.34	0.00	0.00	2.34	0.45	0.45	1.05	1.05	10.00	100-yr.	9.20	9.68
OSW2	3.91	0.00	0.00	3.91	0.45	0.45	1.76	2.81	11.98	100-yr.	8.61	24.20
OSW3	4.18	0.00	0.00	4.18	0.45	0.45	1.88	4.69	13.44	100-yr.	8.22	38.59
OSW4	1.79	0.00	0.00	1.79	0.45	0.45	0.81	5.50	14.69	100-yr.	7.93	43.58
OSW5	1.08	0.00	0.00	1.08	0.45	0.45	0.49	5.99	15.62	100-yr.	7.72	46.21
OSW6	1.05	0.00	0.00	1.05	0.45	0.45	0.47	6.46	16.42	100-yr.	7.55	48.78
	14.35											
<b>DITCH OSE (WEST OF ORCHARD TO ORCHARD SOUTH (CULVERT))</b>												
OSE1	0.35	0.00	0.00	0.35	0.45	0.45	0.16	0.16	5.00	100-yr.	11.24	1.77
OSE2	0.67	0.00	0.00	0.67	0.45	0.45	0.30	0.46	8.28	100-yr.	9.79	4.50
OSE3	0.84	0.00	0.00	0.84	0.45	0.45	0.38	0.84	11.06	100-yr.	8.87	7.42
OSE4	0.45	0.00	0.00	0.45	0.45	0.45	0.20	1.04	13.80	100-yr.	8.13	8.45
OSE5	0.20	0.00	0.00	0.20	0.45	0.45	0.09	1.13	15.09	100-yr.	7.84	8.85
	2.51											

Client: City of Lucas, Texas  
 Project: Lemontree & Kingswood Drainage Design  
Lemontree Estates

Date: 11/18/21  
 By: JRC

Incremental Drainage Area							Incremental "CA"	Accumulated "CA"	Time of of Concentration (Min.)	Design Storm Frequency (Yrs.)	Intensity (I) (In./Hr.)	Total Flow (Q) (c.f.s.)
Area No.	Total Area (Ac.)	Offsite Area (Ac.)	Offsite Area "C"	Onsite Area (Ac.)	Onsite Area "C"	Effective Runoff "C"						
1	2	3	4	5	6	7	8	9	10	11	12	13
<b>DITCH B (EAST/NORTH OF CITRUS WAY)</b>												
B1	1.84	0.00	0.00	1.84	0.45	0.45	0.83	0.83	10.00	100-yr.	9.20	7.61
B2	3.24	0.00	0.00	3.24	0.45	0.45	1.46	2.29	13.14	100-yr.	8.30	18.97
B3	0.65	0.00	0.00	0.65	0.45	0.45	0.29	2.58	14.24	100-yr.	8.03	20.70
B4	3.62	0.00	0.00	3.62	0.45	0.45	1.63	4.21	16.81	100-yr.	7.48	31.46
B5	2.18	0.00	0.00	2.18	0.45	0.45	0.98	5.19	18.99	100-yr.	7.07	36.69
B6	1.81	0.00	0.00	1.81	0.45	0.45	0.81	6.00	19.52	100-yr.	6.98	41.91
B7	1.90	0.00	0.00	1.90	0.45	0.45	0.86	6.86	20.00	100-yr.	6.90	47.33
B8	2.13	0.00	0.00	2.13	0.45	0.45	0.96	7.82	21.38	100-yr.	6.68	52.24
B9	0.33	0.00	0.00	0.33	0.45	0.45	0.15	7.97	21.94	100-yr.	6.60	52.56
B10	6.15	0.00	0.00	6.15	0.45	0.45	2.77	10.73	23.81	100-yr.	6.34	68.00
	23.85											
<b>DITCH C (SOUTH/WEST OF CITRUS WAY)</b>												
C1	0.72	0.00	0.00	0.72	0.45	0.45	0.32	0.32	10.00	100-yr.	9.20	2.98
C2	1.65	0.00	0.00	1.65	0.45	0.45	0.74	1.07	17.60	100-yr.	7.32	7.81
C3	0.62	0.00	0.00	0.62	0.45	0.45	0.28	1.35	19.83	100-yr.	6.93	9.32
	2.99											
<b>TOTAL FLOW TO CITRUS CULVERT (SOUTHEAST)</b>												
								12.08	23.81	100-yr.	6.34	76.53
<b>DITCH D - BERM (NORTH OF CITRUS/WEST OF LEMONTREE TO BERM AT KINGSWOOD)</b>												
D1	0.33	0.00	0.00	0.33	0.45	0.45	0.15	0.15	5.00	100-yr.	11.24	1.67
D2	1.40	0.00	0.00	1.40	0.45	0.45	0.63	0.78	8.69	100-yr.	9.64	7.51
D3	0.57	0.00	0.00	0.57	0.45	0.45	0.26	1.04	10.34	100-yr.	9.09	9.40
D4	0.36	0.00	0.00	0.36	0.45	0.45	0.16	1.20	11.95	100-yr.	8.61	10.31
D5	1.11	0.00	0.00	1.11	0.45	0.45	0.50	1.70	13.26	100-yr.	8.27	14.03
D6	2.79	0.00	0.00	2.79	0.45	0.45	1.26	2.95	14.51	100-yr.	7.97	23.52
D7	1.23	0.00	0.00	1.23	0.45	0.45	0.55	3.51	15.46	100-yr.	7.75	27.18
D8	4.62	0.00	0.00	4.62	0.45	0.45	2.08	5.58	17.26	100-yr.	7.39	41.26
D9	5.21	0.00	0.00	5.21	0.45	0.45	2.34	7.93	21.69	100-yr.	6.64	52.61
D10	4.79	0.00	0.00	4.79	0.45	0.45	2.16	10.08	25.06	100-yr.	6.17	62.25
	22.41											
<b>DITCH E (EAST OF CITRUS)</b>												
E1	0.89	0.00	0.00	0.89	0.45	0.45	0.40	0.40	5.00	100-yr.	11.24	4.50
E2	0.29	0.00	0.00	0.29	0.45	0.45	0.13	0.53	6.07	100-yr.	10.71	5.69
E3	0.63	0.00	0.00	0.63	0.45	0.45	0.28	0.81	8.38	100-yr.	9.75	7.95
	1.81											
<b>DITCH F (EAST OF CITRUS - EAST OF ORCHARD)</b>												
F1	0.19	0.00	0.00	0.19	0.45	0.45	0.09	0.09	5.00	100-yr.	11.24	0.96
F2	0.12	0.00	0.00	0.12	0.45	0.45	0.05	0.14	5.88	100-yr.	10.80	1.51
F3	0.14	0.00	0.00	0.14	0.45	0.45	0.06	0.20	6.93	100-yr.	10.33	2.09
	0.45											

**Client:** City of Lucas, Texas  
**Project:** Lemontree & Kingswood Drainage Design  
Lemontree Estates

**Date:** 11/18/21  
**By:** JRC

Incremental Drainage Area							Incremental "CA"	Accumulated "CA"	Time of of Concentration (Min.)	Design Storm Frequency (Yrs.)	Intensity (I) (In./Hr.)	Total Flow (Q) (c.f.s.)	
Area No.	Total Area (Ac.)	Offsite Area (Ac.)	Offsite Area "C"	Onsite Area (Ac.)	Onsite Area "C"	Effective Runoff "C"							
1	2	3	4	5	6	7	8	9	10	11	12	13	
<b>DITCH BCEF (SE OF CITRUS TO KINGSWOOD BERM)</b>													
DITCH B								10.73	23.81	100-yr.	6.34	68.00	
DITCH C								12.08	23.81	100-yr.	6.34	76.53	
DITCH E								12.89	23.81	100-yr.	6.34	81.69	
DITCH F								13.10	23.81	100-yr.	6.34	82.97	
BCEF1	1.14	0.00	0.00	1.14	0.45	0.45	0.51	13.61	23.81	100-yr.	6.34	86.22	
<b>DITCH L-K (WEST OF BERM TO SOUTH PROPERTY LINE)</b>													
DITCH D-BERM								10.08	25.06	100-yr.	6.17	62.25	
DITCH BCEF								23.69	25.63	100-yr.	6.10	144.56	
D11	5.33	0.00	0.00	5.33	0.45	0.45	2.40	26.09	26.63	100-yr.	5.98	156.09	
D12	2.01	0.00	0.00	2.01	0.45	0.45	0.90	27.00	28.70	100-yr.	5.75	155.25	
<b>DITCH G (EAST OF NORTH ORCHARD CULVERT)</b>													
DITCH A1+A2								16.93	21.42	100-yr.	6.68	113.05	
G1	1.10	0.00	0.00	1.10	0.25	0.25	0.28	17.21	21.56	100-yr.	6.66	114.54	
G2	0.42	0.00	0.00	0.42	0.45	0.45	0.19	17.40	22.64	100-yr.	6.50	113.04	
G3	1.15	0.00	0.00	1.15	0.45	0.45	0.52	17.92	22.84	100-yr.	6.47	115.88	



**EXHIBIT A-7**  
**25-YR. RUNOFF CALCULATIONS**

Client: City of Lucas, Texas

Date: 11/18/21

Project: Lemontree & Kingswood Drainage Design  
Lemontree Estates

By: JRC

Incremental Drainage Area							Incremental "CA"	Accumulated "CA"	Time of Concentration (Min.)	Design Storm Frequency (Yrs.)	Intensity (I) (In./Hr.)	Total Flow (Q) (c.f.s.)
Area No.	Total Area (Ac.)	Offsite Area (Ac.)	Offsite Area "C"	Onsite Area (Ac.)	Onsite Area "C"	Effective Runoff "C"						
1	2	3	4	5	6	7	8	9	10	11	12	13
<b>DITCH A-1 (WEST/SOUTH OF CITRUS WAY)</b>												
A1-1	0.95	0.00	0.00	0.95	0.45	0.45	0.43	0.43	10.00	25-yr.	7.55	3.23
A1-2	0.93	0.00	0.00	0.93	0.45	0.45	0.42	0.85	11.77	25-yr.	7.10	6.01
A1-3	2.20	0.00	0.00	2.20	0.45	0.45	0.99	1.84	13.46	25-yr.	6.73	12.35
A1-4	4.49	1.69	0.35	2.80	0.45	0.41	1.85	3.69	15.02	25-yr.	6.42	23.66
A1-5	0.19	0.00	0.00	0.19	0.45	0.45	0.09	3.77	15.73	25-yr.	6.29	23.73
A1-6	6.80	3.35	0.40	3.45	0.45	0.43	2.89	6.67	16.87	25-yr.	6.09	40.60
A1-7	4.08	1.73	0.50	2.35	0.45	0.47	1.92	8.59	17.77	25-yr.	5.95	51.06
A1-7a	0.87	0.00	0.00	0.87	0.45	0.45	0.39	8.98	17.77	25-yr.	5.95	53.39
A1-8a	1.34	0.72	0.50	0.62	0.45	0.48	0.64	9.62	17.77	25-yr.	5.95	57.19
A1-8	1.96	0.00	0.00	1.96	0.45	0.45	0.88	10.50	17.94	25-yr.	5.92	62.16
A1-9	0.48	0.00	0.00	0.48	0.45	0.45	0.22	10.72	18.70	25-yr.	5.80	62.21
A1-10	0.36	0.00	0.00	0.36	0.45	0.45	0.16	10.88	19.41	25-yr.	5.70	62.01
A1-11	0.28	0.00	0.00	0.28	0.45	0.45	0.13	11.00	21.03	25-yr.	5.48	60.31
A1-12	0.47	0.00	0.00	0.47	0.45	0.45	0.21	11.22	22.13	25-yr.	5.34	59.92
A1-13	1.18	0.00	0.00	1.18	0.25	0.25	0.30	11.51	23.32	25-yr.	5.20	59.87
<b>DITCH A2 (SOUTH OF CITRUS TO ORCHARD NORTH CULVERT)</b>												
A2-1	8.54	3.54	0.60	5.00	0.45	0.51	4.37	4.37	15.00	25-yr.	6.42	28.09
A2-2	2.33	0.00	0.00	2.33	0.45	0.45	1.05	5.42	17.11	25-yr.	6.05	32.82
<b>TOTAL FLOW TO ORCHARD CULVERT NORTH (WEST)</b>												
								16.93	23.32	25-yr.	5.20	88.07
<b>DITCH ONW (WEST OF ORCHARD TO ORCHARD CULVERT SOUTH)</b>												
ONW1	0.18	0.00	0.00	0.18	0.45	0.45	0.08	0.08	5.00	25-yr.	9.28	0.75
ONW2	1.13	0.00	0.00	1.13	0.45	0.45	0.51	0.59	7.52	25-yr.	8.31	4.90
<b>DITCH OSW (WEST OF ORCHARD TO ORCHARD CULVERT SOUTH)</b>												
OSW1	2.34	0.00	0.00	2.34	0.45	0.45	1.05	1.05	10.00	25-yr.	7.55	7.95
OSW2	3.91	0.00	0.00	3.91	0.45	0.45	1.76	2.81	12.23	25-yr.	7.00	19.67
OSW3	4.18	0.00	0.00	4.18	0.45	0.45	1.88	4.69	13.74	25-yr.	6.67	31.29
OSW4	1.79	0.00	0.00	1.79	0.45	0.45	0.81	5.50	15.08	25-yr.	6.41	35.23
OSW5	1.08	0.00	0.00	1.08	0.45	0.45	0.49	5.99	16.06	25-yr.	6.23	37.28
OSW6	1.05	0.00	0.00	1.05	0.45	0.45	0.47	6.46	16.91	25-yr.	6.08	39.29
<b>DITCH OSE (WEST OF ORCHARD TO ORCHARD SOUTH (CULVERT))</b>												
OSE1	0.35	0.00	0.00	0.35	0.45	0.45	0.16	0.16	5.00	25-yr.	9.28	1.46
OSE2	0.67	0.00	0.00	0.67	0.45	0.45	0.30	0.46	8.51	25-yr.	7.98	3.66
OSE3	0.84	0.00	0.00	0.84	0.45	0.45	0.38	0.84	11.45	25-yr.	7.18	6.01
OSE4	0.45	0.00	0.00	0.45	0.45	0.45	0.20	1.04	14.33	25-yr.	6.55	6.81
OSE5	0.20	0.00	0.00	0.20	0.45	0.45	0.09	1.13	15.72	25-yr.	6.29	7.10

Client: City of Lucas, Texas  
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Lemontree Estates

Date: 11/18/21  
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Incremental Drainage Area							Incremental "CA"	Accumulated "CA"	Time of Concentration (Min.)	Design Storm Frequency (Yrs.)	Intensity (I) (In./Hr.)	Total Flow (Q) (c.f.s.)
Area No.	Total Area (Ac.)	Offsite Area (Ac.)	Offsite Area "C"	Onsite Area (Ac.)	Onsite Area "C"	Effective Runoff "C"						
1	2	3	4	5	6	7	8	9	10	11	12	13
<b>DITCH B (EAST/NORTH OF CITRUS WAY)</b>												
B1	1.84	0.00	0.00	1.84	0.45	0.45	0.83	0.83	10.00	25-yr.	7.55	6.25
B2	3.24	0.00	0.00	3.24	0.45	0.45	1.46	2.29	13.33	25-yr.	6.75	15.43
B3	0.65	0.00	0.00	0.65	0.45	0.45	0.29	2.58	14.47	25-yr.	6.52	16.82
B4	3.62	0.00	0.00	3.62	0.45	0.45	1.63	4.21	17.14	25-yr.	6.05	25.44
B5	2.18	0.00	0.00	2.18	0.45	0.45	0.98	5.19	19.40	25-yr.	5.70	29.59
B6	1.81	0.00	0.00	1.81	0.45	0.45	0.81	6.00	19.94	25-yr.	5.63	33.78
B7	1.90	0.00	0.00	1.90	0.45	0.45	0.86	6.86	20.44	25-yr.	5.56	38.13
B8	2.13	0.00	0.00	2.13	0.45	0.45	0.96	7.82	21.86	25-yr.	5.38	42.02
B9	0.33	0.00	0.00	0.33	0.45	0.45	0.15	7.97	22.46	25-yr.	5.30	42.24
B10	6.15	0.00	0.00	6.15	0.45	0.45	2.77	10.73	24.38	25-yr.	5.08	54.55
<b>DITCH C (SOUTH/WEST OF CITRUS WAY)</b>												
C1	0.72	0.00	0.00	0.72	0.45	0.45	0.32	0.32	10.00	25-yr.	7.55	2.45
C2	1.65	0.00	0.00	1.65	0.45	0.45	0.74	1.07	18.07	25-yr.	5.90	6.29
C3	0.62	0.00	0.00	0.62	0.45	0.45	0.28	1.35	20.41	25-yr.	5.56	7.48
<b>TOTAL FLOW TO CITRUS CULVERT (SOUTHEAST)</b>												
								12.08	24.38	25-yr.	5.08	61.38
<b>DITCH D - BERM (NORTH OF CITRUS/WEST OF MANGO? TO BERM AT KINGSWOOD)</b>												
D1	0.33	0.00	0.00	0.33	0.45	0.45	0.15	0.15	5.00	25-yr.	9.28	1.38
D2	1.40	0.00	0.00	1.40	0.45	0.45	0.63	0.78	7.58	25-yr.	8.28	6.45
D3	0.57	0.00	0.00	0.57	0.45	0.45	0.26	1.04	9.20	25-yr.	7.78	8.05
D4	0.36	0.00	0.00	0.36	0.45	0.45	0.16	1.20	10.83	25-yr.	7.33	8.78
D5	1.11	0.00	0.00	1.11	0.45	0.45	0.50	1.70	12.14	25-yr.	7.01	11.90
D6	2.79	0.00	0.00	2.79	0.45	0.45	1.26	2.95	13.30	25-yr.	6.76	19.95
D7	1.23	0.00	0.00	1.23	0.45	0.45	0.55	3.51	14.29	25-yr.	6.56	22.99
D8	4.62	0.00	0.00	4.62	0.45	0.45	2.08	5.58	15.77	25-yr.	6.28	35.07
D9	5.21	0.00	0.00	5.21	0.45	0.45	2.34	7.93	20.60	25-yr.	5.54	43.91
D10	4.79	0.00	0.00	4.79	0.45	0.45	2.16	10.08	24.26	25-yr.	5.10	51.39
<b>DITCH E (EAST OF CITRUS)</b>												
E1	0.89	0.00	0.00	0.89	0.45	0.45	0.40	0.40	5.00	25-yr.	9.28	3.72
E2	0.29	0.00	0.00	0.29	0.45	0.45	0.13	0.53	6.07	25-yr.	8.84	4.69
E3	0.63	0.00	0.00	0.63	0.45	0.45	0.28	0.81	8.38	25-yr.	8.02	6.54
<b>DITCH F (EAST OF CITRUS - EAST OF ORCHARD)</b>												
F1	0.19	0.00	0.00	0.19	0.45	0.45	0.09	0.09	5.00	25-yr.	9.28	0.79
F2	0.12	0.00	0.00	0.12	0.45	0.45	0.05	0.14	5.88	25-yr.	8.91	1.24
F3	0.14	0.00	0.00	0.14	0.45	0.45	0.06	0.20	6.93	25-yr.	8.51	1.72

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Incremental Drainage Area							Incremental "CA"	Accumulated "CA"	Time of of Concentration (Min.)	Design Storm Frequency (Yrs.)	Intensity (I) (In./Hr.)	Total Flow (Q) (c.f.s.)	
Area. No.	Total Area (Ac.)	Offsite Area (Ac.)	Offsite Area "C"	Onsite Area (Ac.)	Onsite Area "C"	Effective Runoff "C"							
1	2	3	4	5	6	7	8	9	10	11	12	13	
<b>DITCH BCEF (SE OF CITRUS TO KINGSWOOD BERM)</b>													
DITCH B								10.73	24.38	25-yr.	5.08	54.55	
DITCH C								12.08	24.38	25-yr.	5.08	61.38	
DITCH E								12.89	24.38	25-yr.	5.08	65.52	
DITCH F								13.10	24.38	25-yr.	5.08	66.55	
BCEF1	1.14	0.00	0.00	1.14	0.45	0.45	0.51	13.61	24.38	25-yr.	5.08	69.16	
<b>DITCH L-K (WEST OF BERM TO SOUTH PROPERTY LINE)</b>													
DITCH D-BERM								10.08	24.26	25-yr.	5.10	51.39	
DITCH BCEF								23.69	24.84	25-yr.	5.03	119.26	
D11	5.33	0.00	0.00	5.33	0.45	0.45	2.40	26.09	25.83	25-yr.	4.93	128.63	
D12	2.01	0.00	0.00	2.01	0.45	0.45	0.90	27.00	27.80	25-yr.	4.74	127.93	
<b>DITCH G (EAST OF NORTH ORCHARD CULVERT)</b>													
DITCH A1+A2								16.93	23.32	25-yr.	5.20	88.07	
G1	1.10	0.00	0.00	1.10	0.25	0.25	0.28	17.21	23.49	25-yr.	5.18	89.17	
G2	0.42	0.00	0.00	0.42	0.45	0.45	0.19	17.40	23.60	25-yr.	5.17	89.93	
G3	1.15	0.00	0.00	1.15	0.45	0.45	0.52	17.92	23.83	25-yr.	5.14	92.14	



**EXHIBIT A-9**  
**GLOBAL SUMMARY TABLES**

HEC-HMS Global Summary Table  
100-Year Corrected Effective Flows

Hydrologic Element	Drainage Area	Peak Discharge	Time of Peak	Volume
	Sq Mi	cfs		
HS-S	0.038	184.5	14Oct2021, 12:06	9.34
LJHS Pond	0.038	94.8	14Oct2021, 12:21	9.33
RR-OUT	0.0475	184.4	14Oct2021, 12:12	7.61
Reach-1-LJHS	0.038	94.7	14Oct2021, 12:24	9.32
JCT-2	0.0855	262	14Oct2021, 12:12	8.37
Rimrock Pond	0.0855	211.2	14Oct2021, 12:24	8.36
Orchard S West	0.0855	211.2	14Oct2021, 12:27	8.36
LTOS-South	0.0224	71.7	14Oct2021, 12:21	7.82
LTOS-North	0.0024	12.4	14Oct2021, 12:03	7.68
JCT-Orch-S	0.1103	281.6	14Oct2021, 12:24	8.23
Orchard S East	0.1103	280.8	14Oct2021, 12:27	8.23
LTW-1	0.0586	177	14Oct2021, 12:24	7.82
JCT-Orch-N	0.0586	177	14Oct2021, 12:24	7.82
Orchard N East	0.0586	177	14Oct2021, 12:27	7.82
G1-3	0.0042	16.7	14Oct2021, 12:09	7.14
LTOSE	0.0039	15.4	14Oct2021, 12:12	7.73
JCT-LT-South	0.177	474.7	14Oct2021, 12:24	8.06
DS-1	0.177	474.6	14Oct2021, 12:27	8.05
OS-2	0.0294	88.4	14Oct2021, 12:21	7.17
JCT-Pond	0.2064	556.1	14Oct2021, 12:27	7.93
DS-2	0.2064	555	14Oct2021, 12:27	7.93
LTE-1	0.0373	53.9	14Oct2021, 12:27	7.53
LTO-1	0.00468	17.6	14Oct2021, 12:12	7.83
JCT-Citr-E	0.04198	68.5	14Oct2021, 12:18	7.57
To Kingswood	0.04198	68.4	14Oct2021, 12:18	7.56
LT-KW	0.035	108.2	14Oct2021, 12:21	7.43
DA-E	0.0029	13.5	14Oct2021, 12:06	7.74
JCT-Kings-1	0.07988	182.6	14Oct2021, 12:18	7.51
KW-SW-1	0.07988	182.5	14Oct2021, 12:21	7.51
LTS-1	0.01516	53.3	14Oct2021, 12:15	7.49
KW-S1	0.00314	13.6	14Oct2021, 12:06	7.5
JCT-Kings-2	0.09818	240.6	14Oct2021, 12:18	7.51
KW-SW-2	0.09818	239.4	14Oct2021, 12:21	7.51
OS-3	0.0187	56	14Oct2021, 12:21	7.13
JCT-Kings-3	0.32328	835.5	14Oct2021, 12:24	7.75
DS-3	0.32328	832.5	14Oct2021, 12:27	7.75
CS-1	0.08266	290.9	14Oct2021, 12:15	7.93
CS-2-South	0.08281	321.6	14Oct2021, 12:12	7.62
CS2-Pond	0.08281	307.7	14Oct2021, 12:15	7.58
Outside CS	0.11906	473.4	14Oct2021, 12:09	7.61
To CS-1	0.08281	307.7	14Oct2021, 12:24	7.57
JCT-CSOff	0.20187	644.1	14Oct2021, 12:15	7.59
CS1-Pond	0.08266	268.4	14Oct2021, 12:21	7.87
Estates-J1	0.28453	894.8	14Oct2021, 12:18	7.67
EP-R1	0.28453	894.8	14Oct2021, 12:18	7.67
EP	0.0042	18.4	14Oct2021, 12:09	8.62
Estates-J2	0.28873	908.1	14Oct2021, 12:18	7.69
RBT1-1	0.28873	905.1	14Oct2021, 12:27	7.68
KW-2	0.0221	77.9	14Oct2021, 12:15	7.55
JCT-LT-RBT1	0.63411	1793.8	14Oct2021, 12:27	7.71
RBT1-2	0.63411	1793.7	14Oct2021, 12:30	7.71
LLWS	0.0405	124	14Oct2021, 12:21	7.6
LLWN	0.0228	82.9	14Oct2021, 12:12	7.61
JCT-End	0.69741	1951.5	14Oct2021, 12:27	7.7
Out	0.69741	1951.5	14Oct2021, 12:30	7.69
LLEast	0.01709	51.6	14Oct2021, 12:21	7.17
JCT-DSLlimit	0.7145	1995.1	14Oct2021, 12:30	7.68

HEC-HMS Global Summary Table  
25-Year Corrected Effective Flows

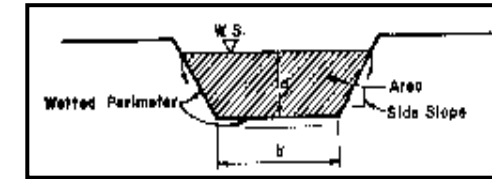
Hydrologic Element	Drainage Area	Peak Discharge	Time of Peak	Volume
HS-S	0.038	145.6	14Oct2021, 12:06	7.35
LJHS Pond	0.038	77.3	14Oct2021, 12:21	7.33
RR-OUT	0.0475	139.4	14Oct2021, 12:12	5.69
Reach-1-LJHS	0.038	77.3	14Oct2021, 12:24	7.33
JCT-2	0.0855	202.2	14Oct2021, 12:12	6.42
Rimrock Pond	0.0855	169.5	14Oct2021, 12:24	6.41
Orchard S West	0.0855	169.5	14Oct2021, 12:27	6.41
LTOS-South	0.0224	54.6	14Oct2021, 12:21	5.89
LTOS-North	0.0024	9.4	14Oct2021, 12:03	5.75
JCT-Orch-S	0.1103	224.2	14Oct2021, 12:24	6.29
Orchard S East	0.1103	223.4	14Oct2021, 12:24	6.28
LTW-1	0.0586	134.8	14Oct2021, 12:24	5.89
JCT-Orch-N	0.0586	134.8	14Oct2021, 12:24	5.89
Orchard N East	0.0586	134.8	14Oct2021, 12:27	5.88
G1-3	0.0042	12.4	14Oct2021, 12:09	5.25
LTOSE	0.0039	11.7	14Oct2021, 12:12	5.8
JCT-LT-South	0.177	372.2	14Oct2021, 12:24	6.12
DS-1	0.177	371.7	14Oct2021, 12:27	6.11
OS-2	0.0294	65.8	14Oct2021, 12:21	5.29
JCT-Pond	0.2064	432.7	14Oct2021, 12:27	6
DS-2	0.2064	431.9	14Oct2021, 12:27	6
LTE-1	0.0373	40.4	14Oct2021, 12:27	5.63
LTO-1	0.00468	13.4	14Oct2021, 12:12	5.9
JCT-Citr-E	0.04198	51.5	14Oct2021, 12:18	5.66
To Kingswood	0.04198	51.4	14Oct2021, 12:18	5.66
LT-KW	0.035	81.3	14Oct2021, 12:21	5.52
DA-E	0.0029	10.2	14Oct2021, 12:06	5.81
JCT-Kings-1	0.07988	137.3	14Oct2021, 12:21	5.6
KW-SW-1	0.07988	137.3	14Oct2021, 12:21	5.6
LTS-1	0.01516	40.2	14Oct2021, 12:15	5.58
KW-S1	0.00314	10.2	14Oct2021, 12:06	5.59
JCT-Kings-2	0.09818	181	14Oct2021, 12:18	5.6
KW-SW-2	0.09818	180.2	14Oct2021, 12:21	5.6
OS-3	0.0187	41.7	14Oct2021, 12:21	5.24
JCT-Kings-3	0.32328	642.3	14Oct2021, 12:24	5.83
DS-3	0.32328	640.7	14Oct2021, 12:27	5.83
CS-1	0.08266	221.9	14Oct2021, 12:15	5.99
CS-2-South	0.08281	243.3	14Oct2021, 12:12	5.7
CS2-Pond	0.08281	229.9	14Oct2021, 12:15	5.67
Outside CS	0.11906	357.3	14Oct2021, 12:09	5.69
To CS-1	0.08281	229.9	14Oct2021, 12:24	5.66
JCT-CSOff	0.20187	482.5	14Oct2021, 12:15	5.68
CS1-Pond	0.08266	199.8	14Oct2021, 12:21	5.94
Estates-J1	0.28453	667	14Oct2021, 12:18	5.75
EP-R1	0.28453	667	14Oct2021, 12:18	5.75
EP	0.0042	14.3	14Oct2021, 12:09	6.65
Estates-J2	0.28873	677.4	14Oct2021, 12:18	5.77
RBT1-1	0.28873	676.1	14Oct2021, 12:27	5.76
KW-2	0.0221	58.8	14Oct2021, 12:15	5.64
JCT-LT-RBT1	0.63411	1359.5	14Oct2021, 12:27	5.79
RBT1-2	0.63411	1358.5	14Oct2021, 12:30	5.79
LLWS	0.0405	93.6	14Oct2021, 12:21	5.68
LLWN	0.0228	62.6	14Oct2021, 12:15	5.69
JCT-End	0.69741	1478.3	14Oct2021, 12:30	5.78
Out	0.69741	1478.3	14Oct2021, 12:33	5.78
LLEast	0.01709	38.4	14Oct2021, 12:21	5.29
JCT-DSLlimit	0.7145	1508.1	14Oct2021, 12:33	5.76

***APPENDIX B***

***HYDRAULIC DESIGN***

## EXHIBIT B-1a

### OPEN CHANNEL CALCULATIONS DITCHES A1 & A2

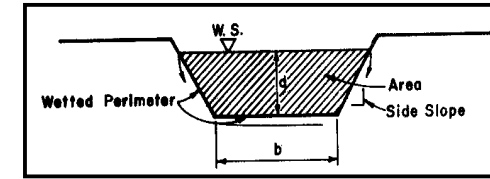


CHANNEL STATION		Channel Type	Flow "Q" (c.f.s.)	Roughness Coeff. "n"	Slope "S" (ft./ft.)	"S" <sup>1/2</sup>	$\frac{Q \times n}{1.486 \times S^{1/2}}$	Width "b" (feet)	Depth "d" (feet)	Side Slope	Area "A" (sq. ft.)	Wetted Perimeter "WP" (feet)	Hydraulic Radius "R" = $\frac{A}{WP}$ (feet)	R <sup>2/3</sup>	A x R <sup>2/3</sup>	Velocity V = $\frac{Q}{A}$ (f.p.s.)	Velocity Head $\frac{V^2}{2g}$ (ft.)	REMARKS
From	To																	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
		Trapezoid	3.93	0.030	0.0050	0.0707	1.12	1	0.63	4	2.218	6.04	0.367	0.513	1.14	1.77		Ditch A-1
		Trapezoid	3.93	0.030	0.0040	0.0632	1.25	1	0.66	4	2.402	6.28	0.383	0.527	1.27	1.64		
		Trapezoid	7.39	0.030	0.0050	0.0707	2.11	1	0.82	4	3.510	7.56	0.464	0.599	2.10	2.11		
		Trapezoid	7.39	0.030	0.0040	0.0632	2.36	1	0.86	4	3.818	7.88	0.485	0.617	2.36	1.94		
		Trapezoid	15.37	0.030	0.0050	0.0707	4.39	1	1.12	4	6.138	9.96	0.616	0.724	4.44	2.50		
		Trapezoid	15.37	0.030	0.0040	0.0632	4.91	1	1.17	4	6.646	10.36	0.641	0.744	4.94	2.31		
		Trapezoid	29.91	0.030	0.0050	0.0707	8.54	1	1.46	4	9.986	12.68	0.788	0.853	8.52	2.99		
		Trapezoid	29.91	0.030	0.0040	0.0632	9.55	1	1.53	4	10.894	13.24	0.823	0.878	9.56	2.75		
		Trapezoid	30.10	0.030	0.0050	0.0707	8.59	1	1.47	4	10.114	12.76	0.793	0.856	8.66	2.98		
		Trapezoid	30.10	0.030	0.0040	0.0632	9.61	1	1.54	4	11.026	13.32	0.828	0.882	9.72	2.73		
		Trapezoid	51.77	0.030	0.0050	0.0707	14.78	1	1.82	4	15.070	15.56	0.968	0.979	14.75	3.44		
		Trapezoid	51.77	0.030	0.0040	0.0632	16.52	1	1.91	4	16.502	16.28	1.014	1.009	16.65	3.14		
		Trapezoid	65.26	0.030	0.0050	0.0707	18.63	1	2.00	4	18.000	17.00	1.059	1.039	18.70	3.63		
		Trapezoid	65.26	0.030	0.0040	0.0632	20.83	1	2.09	4	19.562	17.72	1.104	1.068	20.90	3.34		
		Trapezoid	68.23	0.030	0.0050	0.0707	19.48	1	2.03	4	18.514	17.24	1.074	1.049	19.41	3.69		
		Trapezoid	68.23	0.030	0.0040	0.0632	21.78	1	2.13	4	20.278	18.04	1.124	1.081	21.92	3.36		
		Trapezoid	77.92	0.030	0.0050	0.0707	22.25	1	2.14	4	20.458	18.12	1.129	1.084	22.18	3.81		
		Trapezoid	77.92	0.030	0.0040	0.0632	24.87	1	2.24	4	22.310	18.92	1.179	1.116	24.90	3.49		
		Trapezoid	78.30	0.030	0.0050	0.0707	22.35	1	2.15	4	20.640	18.20	1.134	1.088	22.45	3.79		
		Trapezoid	78.30	0.030	0.0040	0.0632	24.99	1	2.24	4	22.310	18.92	1.179	1.116	24.90	3.51		
		Trapezoid	77.31	0.030	0.0050	0.0707	22.07	1	2.14	4	20.458	18.12	1.129	1.084	22.18	3.78		
		Trapezoid	77.31	0.030	0.0040	0.0632	24.68	1	2.23	4	22.122	18.84	1.174	1.113	24.62	3.49		
		Trapezoid	77.23	0.030	0.0050	0.0707	22.05	1	2.14	4	20.458	18.12	1.129	1.084	22.18	3.77		
		Trapezoid	77.23	0.030	0.0040	0.0632	24.65	1	2.23	4	22.122	18.84	1.174	1.113	24.62	3.49		
		Trapezoid	76.86	0.030	0.0050	0.0707	21.94	1	2.13	4	20.278	18.04	1.124	1.081	21.92	3.79		
		Trapezoid	76.86	0.030	0.0040	0.0632	24.53	1	2.23	4	22.122	18.84	1.174	1.113	24.62	3.47		
		Trapezoid	76.85	0.030	0.0050	0.0707	21.94	1	2.13	4	20.278	18.04	1.124	1.081	21.92	3.79		
		Trapezoid	76.85	0.030	0.0040	0.0632	24.53	1	2.23	4	22.122	18.84	1.174	1.113	24.62	3.47		
		Trapezoid	34.36	0.030	0.0050	0.0707	9.81	1	1.55	4	11.160	13.40	0.833	0.885	9.88	3.08		Ditch A-2
		Trapezoid	40.29	0.030	0.0050	0.0707	11.50	1	1.65	4	12.540	14.20	0.883	0.920	11.54	3.21		
		Trapezoid	114.54	0.030	0.0050	0.0707	32.70	4	2.18	4	27.730	21.44	1.293	1.187	32.92	4.13		Ditch G
		Trapezoid	115.88	0.030	0.0050	0.0707	33.09	4	2.19	4	27.944	21.52	1.299	1.190	33.26	4.15		



## EXHIBIT B-1b

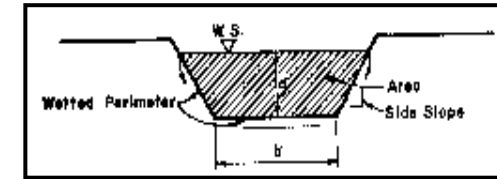
### OPEN CHANNEL CALCULATIONS DITCHES B1, C1, D, BCEF & L-K



CHANNEL STATION		Channel Type	Flow "Q" (c.f.s.)	Roughness Coeff. "n"	Slope "S" (ft./ft.)	"S" <sup>1/2</sup>	$\frac{Q \times n}{1.486 \times S^{1/2}}$	Width "b" (feet)	Depth "d" (feet)	Side Slope	Area "A" (sq. ft.)	Wetted Perimeter "WP" (feet)	Hydraulic Radius "R" = $\frac{A}{WP}$ (feet)	R <sup>2/3</sup>	A x R <sup>2/3</sup>	Velocity V = $\frac{Q}{A}$ (f.p.s.)	Velocity Head $\frac{v^2}{2g}$ (ft.)	REMARKS
From	To																	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
B1		Trapezoid	7.61	0.030	0.0050	0.0707	2.17	1	0.83	4	3.586	7.64	0.469	0.604	2.16	2.12		
B2		Trapezoid	18.97	0.030	0.0050	0.0707	5.41	1	1.22	4	7.174	10.76	0.667	0.763	5.47	2.64		
B3		Trapezoid	20.70	0.030	0.0050	0.0707	5.91	1	1.26	4	7.610	11.08	0.687	0.778	5.92	2.72		
B4		Trapezoid	31.46	0.030	0.0050	0.0707	8.98	1	1.49	4	10.370	12.92	0.803	0.864	8.96	3.03		
B5		Trapezoid	36.69	0.030	0.0050	0.0707	10.47	1	1.59	4	11.702	13.72	0.853	0.899	10.52	3.14		
B6		Trapezoid	41.91	0.030	0.0050	0.0707	11.96	1	1.68	4	12.970	14.44	0.898	0.931	12.07	3.23		
B7		Trapezoid	47.33	0.030	0.0050	0.0707	13.51	1	1.76	4	14.150	15.08	0.938	0.958	13.56	3.34		
B8		Trapezoid	52.24	0.030	0.0050	0.0707	14.91	1	1.83	4	15.226	15.64	0.974	0.982	14.96	3.43		
B9		Trapezoid	52.56	0.030	0.0050	0.0707	15.01	1	1.84	4	15.382	15.72	0.979	0.986	15.16	3.42		
B10		Trapezoid	68.00	0.030	0.0050	0.0707	19.41	1	2.03	4	18.514	17.24	1.074	1.049	19.41	3.67		
C1		Trapezoid	2.98	0.030	0.0050	0.0707	0.85	1	0.55	4	1.760	5.40	0.326	0.473	0.83	1.69		
C2		Trapezoid	7.81	0.030	0.0050	0.0707	2.23	1	0.84	4	3.662	7.72	0.474	0.608	2.23	2.13		
C3		Trapezoid	9.32	0.030	0.0050	0.0707	2.66	1	0.91	4	4.222	8.28	0.510	0.638	2.69	2.21		
D1		Trapezoid	1.67	0.030	0.0050	0.0707	0.48	1	0.43	4	1.170	4.44	0.263	0.411	0.48	1.43		
D2		Trapezoid	7.51	0.030	0.0050	0.0707	2.14	1	0.83	4	3.586	7.64	0.469	0.604	2.16	2.09		
D3		Trapezoid	9.40	0.030	0.0050	0.0707	2.69	1	0.91	4	4.222	8.28	0.510	0.638	2.69	2.23		
D4		Trapezoid	10.31	0.030	0.0050	0.0707	2.94	1	0.94	4	4.474	8.52	0.525	0.651	2.91	2.30		
D5		Trapezoid	14.03	0.030	0.0050	0.0707	4.00	1	1.07	4	5.650	9.56	0.591	0.704	3.98	2.48		
D6		Trapezoid	23.52	0.030	0.0050	0.0707	6.71	1	1.33	4	8.406	11.64	0.722	0.805	6.76	2.80		
D7		Trapezoid	27.18	0.030	0.0050	0.0707	7.76	1	1.41	4	9.362	12.28	0.762	0.834	7.81	2.90		
D8		Berm	41.26	0.035	0.0050	0.0707	13.74	0	1.53	7	16.386	21.42	0.765	0.836	13.71	2.52		Ave. SS 4:1 & 10:1
D9		Berm	52.61	0.035	0.0050	0.0707	17.53	0	1.68	7	19.757	23.52	0.840	0.890	17.59	2.66		Ave. SS 4:1 & 10:1
D10		Berm	62.25	0.035	0.0050	0.0707	20.74	0	1.79	7	22.429	25.06	0.895	0.929	20.83	2.78		Ave. SS 4:1 & 10:1
BCEF		Trapezoid	86.22	0.030	0.0050	0.0707	24.62	2	2.12	4	22.218	18.96	1.172	1.112	24.70	3.88		
L-K1		Trapezoid	144.56	0.030	0.0050	0.0707	41.27	4	2.41	4	32.872	23.28	1.412	1.259	41.38	4.40		
L-K2		Trapezoid	156.09	0.030	0.0050	0.0707	44.56	4	2.49	4	34.760	23.92	1.453	1.283	44.60	4.49		
KWE		Trapezoid	54.79	0.030	0.0050	0.0707	15.64	2	1.76	4	15.910	16.08	0.989	0.993	15.80	3.44		

# EXHIBIT B-1c

## OPEN CHANNEL CALCULATIONS DITCHES OSW1, ONW1 & OSE1



CHANNEL STATION		Channel Type	Flow "Q" (c.f.s.)	Roughness Coeff. "n"	Slope "S" (ft./ft.)	"S" <sup>1/2</sup> "	$\frac{Q \times n}{1.486 \times S^{1/2}}$	Width "b" (feet)	Depth "d" (feet)	Side Slope	Area "A" (sq. ft.)	Wetted Perimeter "WP" (feet)	Hydraulic Radius "R" = $\frac{A}{WP}$ (feet)	R <sup>2/3</sup>	A x R <sup>2/3</sup>	Velocity $V = \frac{Q}{A}$ (f.p.s.)	Velocity Head $\frac{V^2}{2g}$ (ft.)	REMARKS
From	To																	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
OSW1		Trapezoid	9.68	0.030	0.0050	0.0707	2.76	1	0.92	4	4.306	8.36	0.515	0.642	2.77	2.25		
		Trapezoid	24.20	0.030	0.0050	0.0707	6.91	1	1.35	4	8.640	11.80	0.732	0.812	7.02	2.80		
		Trapezoid	38.59	0.030	0.0050	0.0707	11.02	1	1.62	4	12.118	13.96	0.868	0.910	11.03	3.18		
		Trapezoid	43.58	0.030	0.0050	0.0707	12.44	1	1.70	4	13.260	14.60	0.908	0.938	12.44	3.29		
		Trapezoid	46.21	0.030	0.0050	0.0707	13.19	1	1.74	4	13.850	14.92	0.928	0.952	13.18	3.34		
		Trapezoid	48.78	0.030	0.0050	0.0707	13.93	1	1.78	4	14.454	15.24	0.948	0.965	13.95	3.37		
OSE1		Trapezoid	1.77	0.030	0.0050	0.0707	0.51	1	0.44	4	1.214	4.52	0.269	0.416	0.51	1.46		
		Trapezoid	4.50	0.030	0.0050	0.0707	1.28	1	0.66	4	2.402	6.28	0.383	0.527	1.27	1.87		
		Trapezoid	7.42	0.030	0.0050	0.0707	2.12	1	0.82	4	3.510	7.56	0.464	0.599	2.10	2.11		
		Trapezoid	8.45	0.030	0.0050	0.0707	2.41	1	0.87	4	3.898	7.96	0.490	0.621	2.42	2.17		
		Trapezoid	8.85	0.030	0.0050	0.0707	2.53	1	0.89	4	4.058	8.12	0.500	0.630	2.56	2.18		
ONW1		Trapezoid	0.91	0.030	0.0050	0.0707	0.26	1	0.33	4	0.766	3.64	0.210	0.353	0.27	1.19		
		Trapezoid	6.00	0.030	0.0050	0.0707	1.71	1	0.75	4	3.000	7.00	0.429	0.568	1.70	2.00		
Orchard West		Trapezoid	211.20	0.030	0.0088	0.0938	45.45	6	1.95	8	42.120	37.20	1.132	1.086	45.76	5.01		South Crossing
Orchard East		Trapezoid	280.80	0.030	0.0080	0.0894	63.38	6	2.24	8	53.581	41.84	1.281	1.179	63.19	5.24		South Crossing

**EXHIBIT B-2**

**Lemontree Culvert Design Table**

All designs based on culverts and ditches constructed with 0.50% slope, 1-ft. bottom width and 4:1 side slopes, maintained ditch with Manning's "n" value = 0.030

Ditch Name	Driveway or Street Name	Culvert Size	No. of Culverts	Pipe or Box	Upstream F.L.	100-Yr Flow (cfs)	100-Yr HW Depth (ft.)	100-Yr Velocity (fps)	25-Yr Flow (cfs)	25-Yr HW Depth (ft.)	25-Yr Velocity (fps)
		Span x Rise									
A1	Citrus A1-1	15"	1	Pipe		3.93	1.31	4.73	3.23	1.17	4.38
A1	Citrus A1-2	18"	1	Pipe		7.39	1.76	5.58	6.01	1.55	5.11
A1	Citrus A1-3	24"	1	Pipe		15.37	2.44	6.61	12.35	1.55	5.99
A1	Citrus A1-4	3' x 2'	1	Box		29.91	2.00	7.07	23.66	1.61	5.89
A1	Citrus A1-5	3' x 2'	1	Box		30.10	2.01	7.08	23.73	1.62	5.90
A1	Citrus A1-6	4' x 2'	1	Box		51.77	2.80	7.98	40.60	2.20	6.10
A1	Citrus A1-7a	3' x 2'	2	Box		68.23	2.77	5.69	53.39	2.33	4.79
A1	Citrus A1-8	4' x 2'	2	Box		77.92	2.64	4.87	62.16	2.24	3.94
A1	Citrus A1-9	4' x 2'	2	Box		78.30	2.65	4.89	62.21	2.24	3.94
A1	Citrus A1-10	4' x 2'	2	Box		77.31	2.62	4.83	62.01	2.24	3.93
A1	Citrus A1-11	4' x 2'	2	Box		77.23	2.62	4.83	60.31	2.20	3.87
A1	Citrus A1-12	4' x 2'	2	Box		76.86	2.61	4.80	59.92	2.20	3.85
A1	Citrus A1-13	4' x 2'	2	Box		76.85	2.61	4.80	59.87	2.20	3.51
North	Orchard Road	5' x 2'	2	Box		113.05	2.84	5.65	88.07	2.60	4.40
B	Citrus B1	18"	1	Pipe		7.61	1.79	5.65	6.25	1.58	5.19
B	Citrus B2	24"	1	Pipe		18.97	2.74	7.18	15.43	2.38	6.49
B	Citrus B3	24"	1	Pipe		20.70	2.93	7.55	16.82	2.51	6.76
B	Citrus B4	24"	2	Pipe		31.46	2.40	6.21	25.44	1.99	6.04
B	Citrus B5	24"	2	Pipe		36.69	2.69	6.81	29.59	2.31	5.99
B	Citrus B6	4' x 2'	1	Box		41.91	2.65	6.21	33.78	2.23	5.46
B	Citrus B7	4' x 2'	1	Box		47.33	2.96	6.68	38.13	2.45	5.87
B	Citrus B8	3' x 2'	2	Box		52.24	2.31	4.73	42.02	2.02	4.15
B	Citrus B9	3' x 2'	2	Box		52.56	2.32	4.74	42.24	2.03	4.16
B	Citrus B10	4' x 2'	2	Box		68.00	2.38	4.25	54.55	2.08	3.64
C	Citrus C1	15"	1	Pipe		2.98	1.11	4.26	2.48	0.92	4.03
C	Citrus C2	18"	1	Pipe		7.81	1.82	5.72	6.29	1.59	5.21
C	Citrus C3	18"	1	Pipe		9.32	2.10	6.25	7.48	1.77	5.61
B-C	Culvert BC	4' x 2'	2	Box		76.53	2.47	4.78	61.38	2.15	4.14
D	Citrus D1	12"	1	Pipe		1.67	0.88	3.78	1.38	0.79	3.54
D	Citrus D2	18"	1	Pipe		7.51	1.77	5.62	6.45	1.61	5.26
D	Citrus D3	18"	1	Pipe		9.40	2.12	6.28	8.05	1.86	5.80
D	Lemon D4	18"	1	Pipe		10.31	2.35	6.62	8.78	1.98	6.06
D	Lemon D5	24"	1	Pipe		14.03	2.25	6.22	11.90	1.90	5.95
D	Lemon D6	21"	2	Pipe		23.52	2.16	5.97	19.95	1.95	5.43
D	Lemon D7	24"	2	Pipe		27.18	2.20	5.71	22.99	1.86	5.21

**EXHIBIT B-2**

**Lemontree Culvert Design Table**

All designs based on culverts and ditches constructed with 0.50% slope, 1-ft. bottom width and 4:1 side slopes, maintained ditch with Manning's "n" value = 0.030

Ditch Name	Driveway or Street Name	Culvert Size	No. of Culverts	Pipe or Box	Upstream F.L.	100-Yr Flow (cfs)	100-Yr HW Depth (ft.)	100-Yr Velocity (fps)	25-Yr Flow (cfs)	25-Yr HW Depth (ft.)	25-Yr Velocity (fps)
		Span x Rise									
E	Citrus E1	15"	1	Pipe		4.50	1.42	5.00	3.72	1.27	4.62
E	Citrus E2	18"	1	Pipe		5.69	1.50	5.01	4.69	1.25	4.73
E	Citrus E3	18"	1	Pipe		7.95	1.84	5.77	6.54	1.63	5.29
F	Citrus F1	12"	1	Pipe		0.96	0.58	3.18	0.79	0.52	3.01
F	Citrus F2	12"	1	Pipe		1.51	0.83	3.65	1.24	0.74	3.42
F	Citrus F3	12"	1	Pipe		2.09	1.00	4.11	1.72	0.89	3.82
OSW	Orchard W1	18"	1	Pipe		9.68	2.19	6.38	7.95	1.84	5.77
OSW	Orchard W2	18"	2	Pipe		24.20	2.85	7.21	19.67	2.23	6.29
OSW	Orchard W3	24"	2	Pipe		38.59	2.83	7.03	31.29	2.40	6.19
OSW	Orchard W4	4' x 2'	1	Box		43.58	2.74	6.36	35.23	2.30	5.60
OSW	Orchard W5	4' x 2'	1	Box		46.21	2.90	6.59	37.28	2.40	5.79
OSW	Orchard W6	4' x 2'	1	Box		48.78	3.05	7.85	39.29	2.51	5.98
South	Orchard Road	5' x 3'	3	Box		280.80	3.88	10.05	223.40	3.24	9.45
OSE	Orchard E1	12"	1	Pipe		1.77	0.91	3.86	1.46	0.81	3.61
OSE	Orchard E2	15"	1	Pipe		4.50	1.42	5.00	3.66	1.25	4.60
OSE	Orchard E3	18"	1	Pipe		7.42	1.76	5.59	6.01	1.55	5.11
OSE	Orchard E4	18"	1	Pipe		8.45	1.92	5.94	6.81	1.67	5.38
OSE	Orchard E5	18"	1	Pipe		8.85	2.00	6.08	7.10	1.71	5.48

***APPENDIX C***

***LYNN LANE FLOOD STUDY***





**CITY OF LUCAS, TEXAS**

**LEMONTREE & KINGSWOOD DRAINAGE DESIGN  
EXHIBIT C-1 HEC-RAS WORK MAP**

**BIRKHOFF, HENDRICKS & CARTER, L.L.P.**  
 PROFESSIONAL ENGINEERS  
 TBPELS PE Firm 526; Survey Firm 10031800  
 11910 Greenville Ave., Suite 600 Dallas, Texas 75243 (214) 361-7900

January  
2022



HEC-RAS HEC-RAS 5.0.3 September 2016  
 U.S. Army Corps of Engineers  
 Hydrologic Engineering Center  
 609 Second Street  
 Davis, California

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X   X XXXXXX   XXXX   XXXX   XX   XXXX
X   X X       X   X   X   X   X   X   X
X   X X       X       X   X   X   X   X
XXXXXXXX XXXX   X       XXX XXXX   XXXXXX   XXXX
X   X X       X       X   X   X   X       X
X   X X       X   X   X   X   X   X   X
X   X XXXXXX   XXXX   X   X   X   X   XXXXX
    
```

PROJECT DATA

Project Title: Reid Br Trib 1-Ex Lynn  
 Project File : ExLynn1.prj  
 Run Date and Time: 12/2/2021 12:40:00 PM

Project in English units

PLAN DATA

Plan Title: Plan 02  
 Plan File : h:\Projects\Lucas\2021136 Lemontree-Kingswood Drainage\Engineering\HEC-RAS\ExLynn1.p02

Geometry Title: ExGeo-Lynn  
 Geometry File : h:\Projects\Lucas\2021136 Lemontree-Kingswood Drainage\Engineering\HEC-RAS\ExLynn1.g01

Flow Title : EX-Multi  
 Flow File : h:\Projects\Lucas\2021136 Lemontree-Kingswood Drainage\Engineering\HEC-RAS\ExLynn1.f02

Plan Description:  
 Existing Conditions

Plan Summary Information:

Number of:	Cross Sections =	7	Multiple Openings =	0
	Culverts =	1	Inline Structures =	0
	Bridges =	0	Lateral Structures =	0

Computational Information

Water surface calculation tolerance =	0.01
Critical depth calculation tolerance =	0.01
Maximum number of iterations =	20
Maximum difference tolerance =	0.3
Flow tolerance factor =	0.001

Computation Options

Critical depth computed only where necessary  
 Conveyance Calculation Method: At breaks in n values only  
 Friction Slope Method: Average Conveyance

Computational Flow Regime: Subcritical Flow

FLOW DATA

Flow Title: EX-Multi

Flow File : h:\Projects\Lucas\2021136 Lemontree-Kingswood Drainage\Engineering\HEC-RAS\ExLynn1.f02

Flow Data (cfs)

River	Reach	RS	100-Yr	25-Yr	10-Yr	5-Yr	2-Yr
Reid Branch Trib	Reid Branch Trib	843.95	1951.5	1478.3	1168.6	953.6	622
Reid Branch Trib	Reid Branch Trib	485.57	1951.5	1478.3	1168.6	953.6	622
Reid Branch Trib	Reid Branch Trib	331.24	1975	1493	1180	963	629
Reid Branch Trib	Reid Branch Trib	31.74	1995.1	1508.1	1192	972.6	634.2

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Reid Branch Trib	Reid Branch Trib	100-Yr		Normal S = 0.01
Reid Branch Trib	Reid Branch Trib	25-Yr		Normal S = 0.01

GEOMETRY DATA

Geometry Title: ExGeo-Lynn

Geometry File : h:\Projects\Lucas\2021136 Lemontree-Kingswood Drainage\Engineering\HEC-RAS\ExLynn1.g01

CROSS SECTION

RIVER: Reid Branch Trib

REACH: Reid Branch Trib RS: 843.95

INPUT

Description: Upstream Limit of Study

Station Elevation Data num= 40

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	603	99	600.72	121.78	600	134.34	599.32	142.3	598.85
152.45	598.55	172.79	599.45	176.26	599.42	197.23	599.74	202.77	599.26
206.42	598.91	231.36	599.84	241.73	597.33	243.88	597.18	252.04	597.05
258.43	596.56	259.9	595.85	262.02	595.49	263.11	595.66	263.66	595.74
265.11	595.96	270.07	596.94	276.54	598.29	286.57	599.67	287.67	599.62
297.49	601.03	303.84	601.52	304.99	601.55	323.66	601.9	325.42	601.99
343.85	602.13	346.49	602.18	363.24	602.32	377.81	602.16	390.86	602.98
397.79	603.17	403.39	603.17	410.77	603.38	411.36	603.42	411.63	603.41

Manning's n Values

num= 3

Sta	n Val	Sta	n Val
0	.045	231.36	.045
		286.57	.04

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	231.36	286.57		50 187.47	230	.1	.3



CROSS SECTION

RIVER: Reid Branch Trib  
 REACH: Reid Branch Trib RS: 656.48

INPUT

Description:

Station Elevation Data		num= 21	
Sta	Elev	Sta	Elev
0	604	82.36	601.33
137.73	598.44	146.65	597.74
198.91	595.09	200.6	594.56
207.95	594.92	214.5	596.67
267.36	601.5		

Manning's n Values		num= 3	
Sta	n Val	Sta	n Val
0	.045	162.65	.04
		214.5	.04

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	162.65	214.5		150	89.97		.1	.3

CROSS SECTION

RIVER: Reid Branch Trib  
 REACH: Reid Branch Trib RS: 566.51

INPUT

Description: Just US of Lynn Lane

Station Elevation Data		num= 36	
Sta	Elev	Sta	Elev
0	603.35	4.47	603.26
52.41	602.85	58.12	602.73
78.82	601.95	79.33	601.85
110.37	595.31	113.31	595.07
149.87	593.87	151.82	593.93
173.42	597.38	187.76	598.38
232.44	600.43	233.08	600.39
374	603		

Manning's n Values		num= 3	
Sta	n Val	Sta	n Val
0	.045	103.55	.04
		202.27	.045

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	103.55	202.27		47.85	47.85		.3	.5

Ineffective Flow		num= 2	
Sta L	Sta R	Elev	Permanent
0	109	600.5	F
158.22	374	600.5	F

CULVERT

RIVER: Reid Branch Trib  
 REACH: Reid Branch Trib RS: 533.93

INPUT

Description: Lynn Lane Crossing Existing

Distance from Upstream XS = 8

Deck/Roadway Width = 30.5

Weir Coefficient = 2.6

Upstream Deck/Roadway Coordinates

num=	13													
Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
0	603.58	0	59.43	603.14	0	109	601.75	0						
109.1	604.25	0	126.36	603.48	0	156.72	602.91	0						
157	600.5	0	199.51	601.17	0	213.84	601.44	0						
248.06	602	0	274	602.5	0	324	603.5	0						
374	604	0												

Upstream Bridge Cross Section Data

Station Elevation Data												num=	36
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	603.35	4.47	603.26	14.9	603.38	15.9	603.38	28.94	603.43				
52.41	602.85	58.12	602.73	75.17	602.07	78.38	602	78.59	601.98				
78.82	601.95	79.33	601.85	92.01	600.48	103.55	600.29	105.83	596.39				
110.37	595.31	113.31	595.07	116.05	595.07	123.38	594.73	131.25	593.79				
149.87	593.87	151.82	593.93	158.22	596.48	172.35	597.31	172.74	597.31				
173.42	597.38	187.76	598.38	198.64	599.17	202.27	599.33	216.75	600.22				
232.44	600.43	233.08	600.39	247.73	600.47	274	601	324	602				
374	603												

Manning's n Values

num=	3				
Sta	n Val	Sta	n Val	Sta	n Val
0	.045	103.55	.04	202.27	.045

Bank Sta: Left Right Coeff Contr. Expan.

103.55	202.27	.3	.5
--------	--------	----	----

Ineffective Flow

num=				2
Sta L	Sta R	Elev	Permanent	
0	109	600.5	F	
158.22	374	600.5	F	

Downstream Deck/Roadway Coordinates

num=	12													
Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
0	603.73	0	69.47	603.14	0	124.49	601.6	0						
124.77	604.18	0	136.85	603.48	0	166.69	602.91	0						
166.97	600.5	0	209.48	601.17	0	223.81	601.44	0						
257.79	602.08	0	280	602.5	0	330	603	0						

Downstream Bridge Cross Section Data

Station Elevation Data												num=	31
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	602.64	5.44	602.34	7.86	602.31	31.36	601.87	31.46	601.87				
34.06	601.83	57.36	601.47	57.47	601.47	84.25	601.08	85.04	600.98				
85.47	600.93	108.66	599.48	109.59	599.31	121.55	594.58	125.68	593.94				
134.39	593.22	142.41	593.23	142.43	593.23	156.03	593.26	161.44	593.77				
174.28	597.4	176.72	597.7	194.32	598.67	195.45	598.8	221.27	599.47				
223.41	599.69	223.91	599.7	251.78	599.89	257.79	600.08	280	601				
330	602												

Manning's n Values

num=	3				
Sta	n Val	Sta	n Val	Sta	n Val

0 .055 109.59 .04 194.32 .055

Bank Sta: Left Right Coeff Contr. Expan.  
 109.59 194.32 .3 .5

Ineffective Flow num= 2  
 Sta L Sta R Elev Permanent  
 0 119.5 600.5 F  
 165 330 600.5 F

Upstream Embankment side slope = 0 horiz. to 1.0 vertical  
 Downstream Embankment side slope = 0 horiz. to 1.0 vertical  
 Maximum allowable submergence for weir flow = .98  
 Elevation at which weir flow begins = 600.41  
 Energy head used in spillway design =  
 Spillway height used in design =  
 Weir crest shape = Broad Crested

Number of Culverts = 1

Culvert Name Shape Rise Span  
 8-48" RCP Circular 4

FHWA Chart # 1 - Concrete Pipe Culvert  
 FHWA Scale # 1 - Square edge entrance with headwall

Solution Criteria = Highest U.S. EG

Culvert Upstrm Dist	Length	Top n	Bottom n	Depth Blocked	Entrance Loss Coef	Exit Loss Coef
9	30.24	.012	.012	0	.3	1

Number of Barrels = 8

Upstream Elevation = 593.57

Centerline Stations

Sta.	Sta.	Sta.	Sta.	Sta.	Sta.	Sta.	Sta.
111.7	117.24	123.12	128.76	134.3	139.92	145.75	151.21

Downstream Elevation = 593.23

Centerline Stations

Sta.	Sta.	Sta.	Sta.	Sta.	Sta.	Sta.	Sta.
121.74	127.41	132.97	139.05	144.94	150.61	156.32	162.43

CULVERT OUTPUT Profile #100-Yr Culv Group: 8-48" RCP

Q Culv Group (cfs)	1199.11	Culv Full Len (ft)	30.24
# Barrels	8	Culv Vel US (ft/s)	11.93
Q Barrel (cfs)	149.89	Culv Vel DS (ft/s)	11.93
E.G. US. (ft)	603.11	Culv Inv El Up (ft)	593.57
W.S. US. (ft)	603.03	Culv Inv El Dn (ft)	593.23
E.G. DS (ft)	600.66	Culv Frctn Ls (ft)	0.28
W.S. DS (ft)	599.95	Culv Exit Loss (ft)	1.50
Delta EG (ft)	2.45	Culv Entr Loss (ft)	0.66
Delta WS (ft)	3.07	Q Weir (cfs)	752.39
E.G. IC (ft)	602.96	Weir Sta Lft (ft)	60.64
E.G. OC (ft)	603.11	Weir Sta Rgt (ft)	304.30
Culvert Control	Outlet	Weir Submerg	0.00
Culv WS Inlet (ft)	597.57	Weir Max Depth (ft)	2.61
Culv WS Outlet (ft)	597.23	Weir Avg Depth (ft)	1.14
Culv Nml Depth (ft)		Weir Flow Area (sq ft)	235.41
Culv Crt Depth (ft)	3.59	Min El Weir Flow (ft)	600.51

CULVERT OUTPUT Profile #25-Yr Culv Group: 8-48" RCP

Q Culv Group (cfs)	1169.33	Culv Full Len (ft)	30.24
--------------------	---------	--------------------	-------

# Barrels	8	Culv Vel US (ft/s)	11.63
Q Barrel (cfs)	146.17	Culv Vel DS (ft/s)	11.63
E.G. US. (ft)	602.35	Culv Inv El Up (ft)	593.57
W.S. US. (ft)	602.28	Culv Inv El Dn (ft)	593.23
E.G. DS (ft)	599.85	Culv Frctn Ls (ft)	0.27
W.S. DS (ft)	599.35	Culv Exit Loss (ft)	1.61
Delta EG (ft)	2.51	Culv Entr Loss (ft)	0.63
Delta WS (ft)	2.93	Q Weir (cfs)	308.97
E.G. IC (ft)	602.21	Weir Sta Lft (ft)	87.15
E.G. OC (ft)	602.35	Weir Sta Rgt (ft)	266.87
Culvert Control	Outlet	Weir Submerg	0.00
Culv WS Inlet (ft)	597.57	Weir Max Depth (ft)	1.86
Culv WS Outlet (ft)	597.23	Weir Avg Depth (ft)	0.85
Culv Nml Depth (ft)		Weir Flow Area (sq ft)	112.40
Culv Crt Depth (ft)	3.56	Min El Weir Flow (ft)	600.51

## CULVERT OUTPUT Profile #10-Yr Culv Group: 8-48" RCP

Q Culv Group (cfs)	1103.01	Culv Full Len (ft)	30.24
# Barrels	8	Culv Vel US (ft/s)	10.97
Q Barrel (cfs)	137.88	Culv Vel DS (ft/s)	10.97
E.G. US. (ft)	601.51	Culv Inv El Up (ft)	593.57
W.S. US. (ft)	601.45	Culv Inv El Dn (ft)	593.23
E.G. DS (ft)	599.22	Culv Frctn Ls (ft)	0.24
W.S. DS (ft)	598.85	Culv Exit Loss (ft)	1.50
Delta EG (ft)	2.30	Culv Entr Loss (ft)	0.56
Delta WS (ft)	2.60	Q Weir (cfs)	65.59
E.G. IC (ft)	601.29	Weir Sta Lft (ft)	156.88
E.G. OC (ft)	601.51	Weir Sta Rgt (ft)	218.36
Culvert Control	Outlet	Weir Submerg	0.00
Culv WS Inlet (ft)	597.57	Weir Max Depth (ft)	1.01
Culv WS Outlet (ft)	597.23	Weir Avg Depth (ft)	0.52
Culv Nml Depth (ft)		Weir Flow Area (sq ft)	32.08
Culv Crt Depth (ft)	3.49	Min El Weir Flow (ft)	600.51

## CULVERT OUTPUT Profile #5-Yr Culv Group: 8-48" RCP

Q Culv Group (cfs)	953.60	Culv Full Len (ft)	30.24
# Barrels	8	Culv Vel US (ft/s)	9.49
Q Barrel (cfs)	119.20	Culv Vel DS (ft/s)	9.49
E.G. US. (ft)	600.41	Culv Inv El Up (ft)	593.57
W.S. US. (ft)	600.23	Culv Inv El Dn (ft)	593.23
E.G. DS (ft)	598.71	Culv Frctn Ls (ft)	0.18
W.S. DS (ft)	598.41	Culv Exit Loss (ft)	1.10
Delta EG (ft)	1.70	Culv Entr Loss (ft)	0.42
Delta WS (ft)	1.82	Q Weir (cfs)	
E.G. IC (ft)	599.81	Weir Sta Lft (ft)	
E.G. OC (ft)	600.41	Weir Sta Rgt (ft)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (ft)	597.57	Weir Max Depth (ft)	
Culv WS Outlet (ft)	597.23	Weir Avg Depth (ft)	
Culv Nml Depth (ft)		Weir Flow Area (sq ft)	
Culv Crt Depth (ft)	3.29	Min El Weir Flow (ft)	600.51

## CULVERT OUTPUT Profile #2-Yr Culv Group: 8-48" RCP

Q Culv Group (cfs)	622.00	Culv Full Len (ft)	30.24
# Barrels	8	Culv Vel US (ft/s)	6.19
Q Barrel (cfs)	77.75	Culv Vel DS (ft/s)	6.19
E.G. US. (ft)	598.45	Culv Inv El Up (ft)	593.57
W.S. US. (ft)	598.28	Culv Inv El Dn (ft)	593.23
E.G. DS (ft)	597.79	Culv Frctn Ls (ft)	0.08
W.S. DS (ft)	597.61	Culv Exit Loss (ft)	0.41
Delta EG (ft)	0.67	Culv Entr Loss (ft)	0.18
Delta WS (ft)	0.68	Q Weir (cfs)	
E.G. IC (ft)	597.78	Weir Sta Lft (ft)	
E.G. OC (ft)	598.45	Weir Sta Rgt (ft)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (ft)	597.57	Weir Max Depth (ft)	
Culv WS Outlet (ft)	597.23	Weir Avg Depth (ft)	
Culv Nml Depth (ft)		Weir Flow Area (sq ft)	
Culv Crt Depth (ft)	2.67	Min El Weir Flow (ft)	600.51

CROSS SECTION

RIVER: Reid Branch Trib  
 REACH: Reid Branch Trib RS: 518.66

INPUT  
 Description: Just DS of Lynn Lane

Station Elevation Data	num=	31
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev		
0 602.64 5.44 602.34 7.86 602.31 31.36 601.87 31.46 601.87		
34.06 601.83 57.36 601.47 57.47 601.47 84.25 601.08 85.04 600.98		
85.47 600.93 108.66 599.48 109.59 599.31 121.55 594.58 125.68 593.94		
134.39 593.22 142.41 593.23 142.43 593.23 156.03 593.26 161.44 593.77		
174.28 597.4 176.72 597.7 194.32 598.67 195.45 598.8 221.27 599.47		
223.41 599.69 223.91 599.7 251.78 599.89 257.79 600.08 280 601		
330 602		

Manning's n Values	num=	3
Sta n Val Sta n Val Sta n Val		
0 .055 109.59 .04 194.32 .055		

Bank Sta: Left Right Lengths: Left Channel Right	Coeff Contr.	Expan.
109.59 194.32 33.09 33.09 33.09	.3	.5

Ineffective Flow	num=	2
Sta L Sta R Elev Permanent		
0 119.5 600.5 F		
165 330 600.5 F		

CROSS SECTION

RIVER: Reid Branch Trib  
 REACH: Reid Branch Trib RS: 485.57

INPUT  
 Description:

Station Elevation Data	num=	16
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev		
0 600.78 2.92 600.74 34.54 597 52.76 594.82 58.27 594.46		
65.81 593.04 73.58 594.01 77.34 594.21 90.64 595.73 103.1 596.03		

137.06 599.61 145.16 599.65 166.24 599.8 167.19 599.8 175.28 600.07  
 197.5 601

Manning's n Values num= 3  
 Sta n Val Sta n Val Sta n Val  
 0 .05 34.54 .05 103.1 .05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
 34.54 103.1 154.33 154.33 154.33 .1 .3

CROSS SECTION

RIVER: Reid Branch Trib  
 REACH: Reid Branch Trib RS: 331.24

INPUT

Description:

Station Elevation Data num= 11  
 Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev  
 0 600.75 1.11 600.69 21.43 599.08 22.16 598.88 28.12 597.79  
 61.38 591.43 64.13 591.78 119.4 598.49 138.98 598.72 143.46 598.92  
 206.82 602

Manning's n Values num= 3  
 Sta n Val Sta n Val Sta n Val  
 0 .06 21.43 .06 119.4 .05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
 21.43 119.4 250 299.5 350 .1 .3

CROSS SECTION

RIVER: Reid Branch Trib  
 REACH: Reid Branch Trib RS: 31.74

INPUT

Description:

Station Elevation Data num= 17  
 Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev  
 0 600 49.28 597.56 50.49 597.46 51.43 597.36 54.85 596.99  
 113.19 594.39 113.96 594.13 130.65 593.21 142.56 587.99 143.55 588.38  
 158.06 593.61 159.02 593.84 164.97 593.94 169.11 595.89 194.43 597.9  
 196.37 598.28 231.01 599.83

Manning's n Values num= 3  
 Sta n Val Sta n Val Sta n Val  
 0 .06 113.96 .065 158.06 .06

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
 113.96 158.06 0 0 0 .1 .3

SUMMARY OF MANNING'S N VALUES

River:Reid Branch Trib

Reach	River Sta.	n1	n2	n3
Reid Branch Trib	843.95	.045	.045	.04
Reid Branch Trib	656.48	.045	.04	.04
Reid Branch Trib	566.51	.045	.04	.045
Reid Branch Trib	533.93	Culvert		
Reid Branch Trib	518.66	.055	.04	.055
Reid Branch Trib	485.57	.05	.05	.05
Reid Branch Trib	331.24	.06	.06	.05
Reid Branch Trib	31.74	.06	.065	.06

SUMMARY OF REACH LENGTHS

River: Reid Branch Trib

Reach	River Sta.	Left	Channel	Right
Reid Branch Trib	843.95	50	187.47	230
Reid Branch Trib	656.48	150	89.97	50
Reid Branch Trib	566.51	47.85	47.85	47.85
Reid Branch Trib	533.93	Culvert		
Reid Branch Trib	518.66	33.09	33.09	33.09
Reid Branch Trib	485.57	154.33	154.33	154.33
Reid Branch Trib	331.24	250	299.5	350
Reid Branch Trib	31.74	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS

River: Reid Branch Trib

Reach	River Sta.	Contr.	Expan.
Reid Branch Trib	843.95	.1	.3
Reid Branch Trib	656.48	.1	.3
Reid Branch Trib	566.51	.3	.5
Reid Branch Trib	533.93	Culvert	
Reid Branch Trib	518.66	.3	.5
Reid Branch Trib	485.57	.1	.3
Reid Branch Trib	331.24	.1	.3
Reid Branch Trib	31.74	.1	.3

Profile Output Table - Standard Table 1

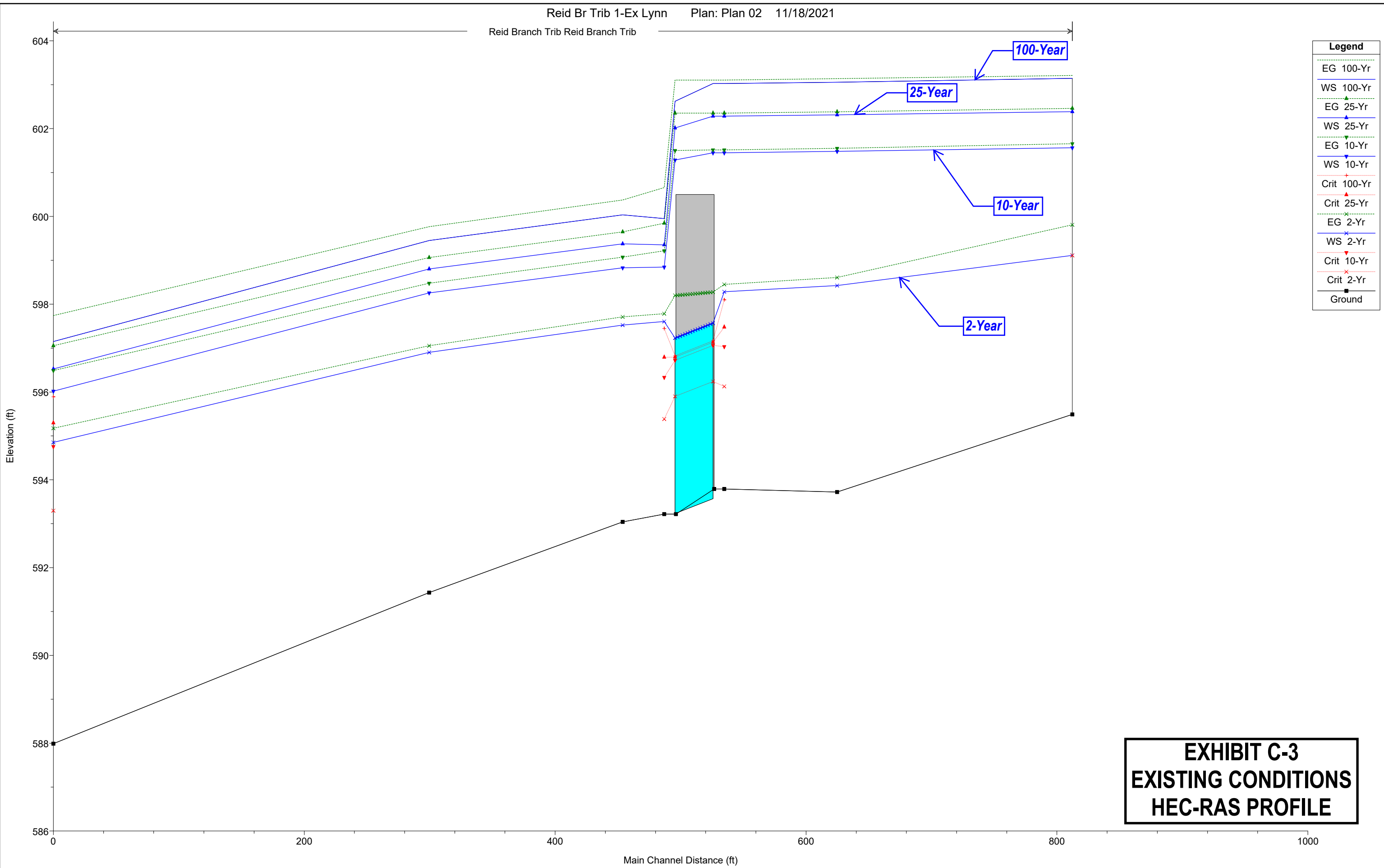
Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Ch1
Reid Branch Trib	843.95	100-Yr	1951.50	595.49	603.14		603.21	0.000657	2.64	1054.74	396.86	0.20
Reid Branch Trib	843.95	25-Yr	1478.30	595.49	602.39		602.46	0.000835	2.70	768.75	354.75	0.22
Reid Branch Trib	843.95	10-Yr	1168.60	595.49	601.56		601.66	0.001275	2.95	529.82	243.28	0.26
Reid Branch Trib	843.95	5-Yr	953.60	595.49	600.51		600.71	0.003541	4.02	305.98	188.39	0.41
Reid Branch Trib	843.95	2-Yr	622.00	595.49	599.11	599.11	599.81	0.019010	6.79	98.13	83.03	0.88

ExLynn1.rep

Reid Branch Trib	656.48	100-Yr	1951.50	593.72	603.06		603.14	0.000386	2.78	972.00	238.21	0.18
Reid Branch Trib	656.48	25-Yr	1478.30	593.72	602.31		602.38	0.000359	2.51	803.74	215.33	0.17
Reid Branch Trib	656.48	10-Yr	1168.60	593.72	601.48		601.55	0.000409	2.45	635.16	189.18	0.18
Reid Branch Trib	656.48	5-Yr	953.60	593.72	600.39		600.48	0.000622	2.64	453.93	151.57	0.21
Reid Branch Trib	656.48	2-Yr	622.00	593.72	598.43		598.61	0.002317	3.62	199.36	107.61	0.37
Reid Branch Trib	566.51	100-Yr	1951.50	593.79	603.03	598.10	603.11	0.000336	2.42	1045.21	328.73	0.16
Reid Branch Trib	566.51	25-Yr	1478.30	593.79	602.28	597.48	602.35	0.000318	2.18	824.25	268.60	0.15
Reid Branch Trib	566.51	10-Yr	1168.60	593.79	601.45	597.03	601.51	0.000362	2.12	624.12	213.33	0.16
Reid Branch Trib	566.51	5-Yr	953.60	593.79	600.23	596.70	600.41	0.000791	3.34	285.27	114.02	0.24
Reid Branch Trib	566.51	2-Yr	622.00	593.79	598.28	596.13	598.45	0.001319	3.29	189.34	81.64	0.30
Reid Branch Trib	533.93			Culvert								
Reid Branch Trib	518.66	100-Yr	1951.50	593.22	599.95	597.45	600.66	0.002825	6.74	289.51	152.61	0.47
Reid Branch Trib	518.66	25-Yr	1478.30	593.22	599.35	596.79	599.85	0.002254	5.64	262.25	107.38	0.41
Reid Branch Trib	518.66	10-Yr	1168.60	593.22	598.85	596.33	599.22	0.001915	4.89	239.17	86.43	0.38
Reid Branch Trib	518.66	5-Yr	953.60	593.22	598.41	595.98	598.71	0.001698	4.34	219.48	77.79	0.35
Reid Branch Trib	518.66	2-Yr	622.00	593.22	597.61	595.38	597.79	0.001330	3.40	182.77	62.05	0.30
Reid Branch Trib	485.57	100-Yr	1951.50	593.04	600.04		600.37	0.003236	4.94	469.40	165.38	0.39
Reid Branch Trib	485.57	25-Yr	1478.30	593.04	599.38		599.65	0.003080	4.38	376.04	120.39	0.37
Reid Branch Trib	485.57	10-Yr	1168.60	593.04	598.83		599.07	0.003195	4.08	312.89	110.58	0.37
Reid Branch Trib	485.57	5-Yr	953.60	593.04	598.37		598.59	0.003420	3.88	264.07	102.35	0.37
Reid Branch Trib	485.57	2-Yr	622.00	593.04	597.52		597.71	0.004125	3.51	183.90	87.17	0.39
Reid Branch Trib	331.24	100-Yr	1975.00	591.43	599.45		599.76	0.004766	4.53	451.20	137.61	0.38
Reid Branch Trib	331.24	25-Yr	1493.00	591.43	598.80		599.06	0.004716	4.09	368.68	118.24	0.37
Reid Branch Trib	331.24	10-Yr	1180.00	591.43	598.26		598.48	0.004594	3.77	312.98	91.92	0.36
Reid Branch Trib	331.24	5-Yr	963.00	591.43	597.79		597.98	0.004469	3.55	271.38	85.49	0.35
Reid Branch Trib	331.24	2-Yr	629.00	591.43	596.90		597.06	0.004245	3.13	201.00	73.57	0.33
Reid Branch Trib	31.74	100-Yr	1995.10	587.99	597.15	595.89	597.74	0.010011	6.75	363.58	131.59	0.52
Reid Branch Trib	31.74	25-Yr	1508.10	587.99	596.52	595.30	597.05	0.010016	6.21	287.12	111.81	0.51
Reid Branch Trib	31.74	10-Yr	1192.00	587.99	596.02	594.76	596.49	0.010007	5.75	235.03	94.08	0.50
Reid Branch Trib	31.74	5-Yr	972.60	587.99	595.61	594.34	596.03	0.010002	5.37	199.23	82.74	0.49
Reid Branch Trib	31.74	2-Yr	634.20	587.99	594.85	593.30	595.17	0.010000	4.62	143.41	64.06	0.47



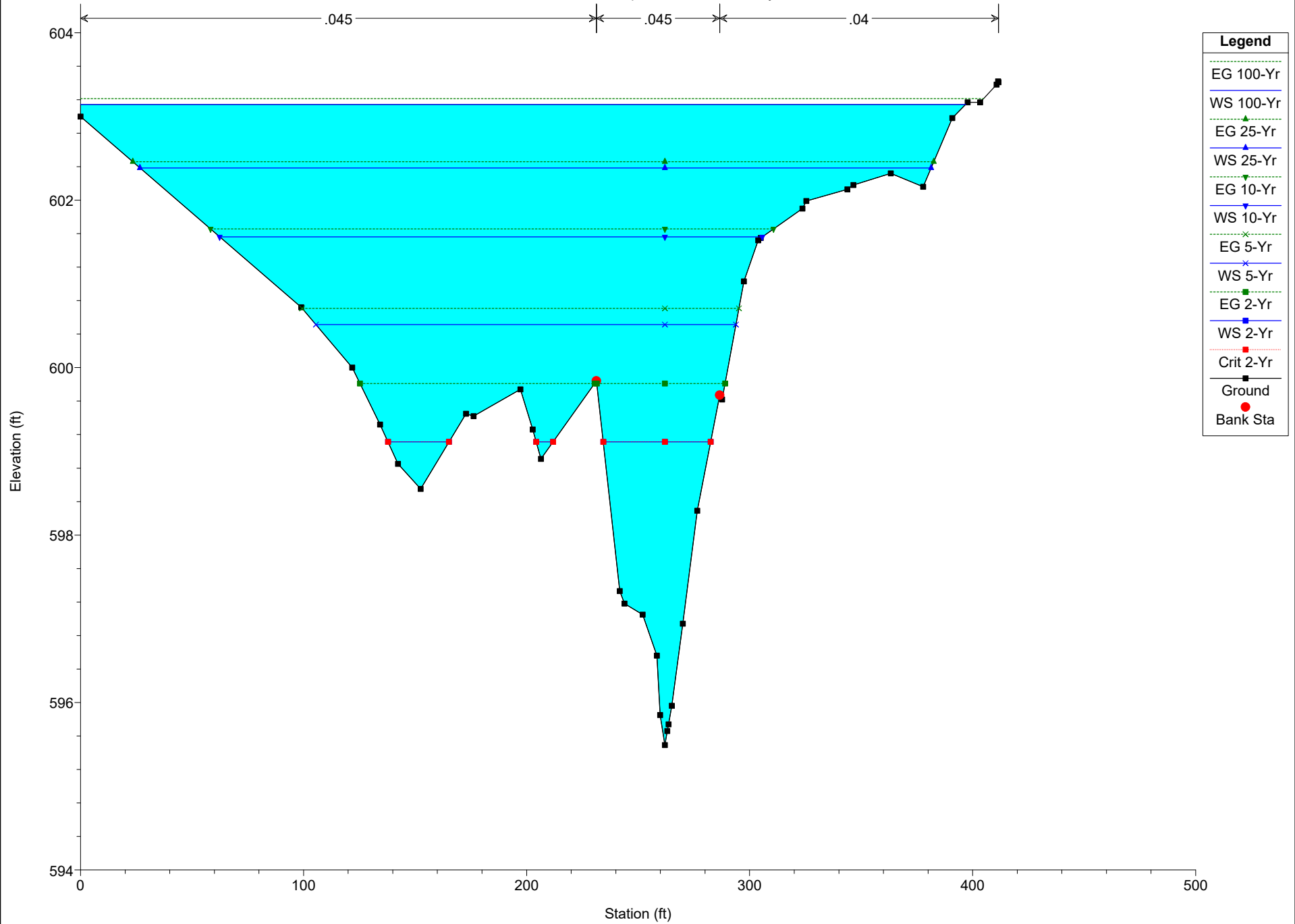
Reid Branch Trib Reid Branch Trib



**EXHIBIT C-3  
EXISTING CONDITIONS  
HEC-RAS PROFILE**

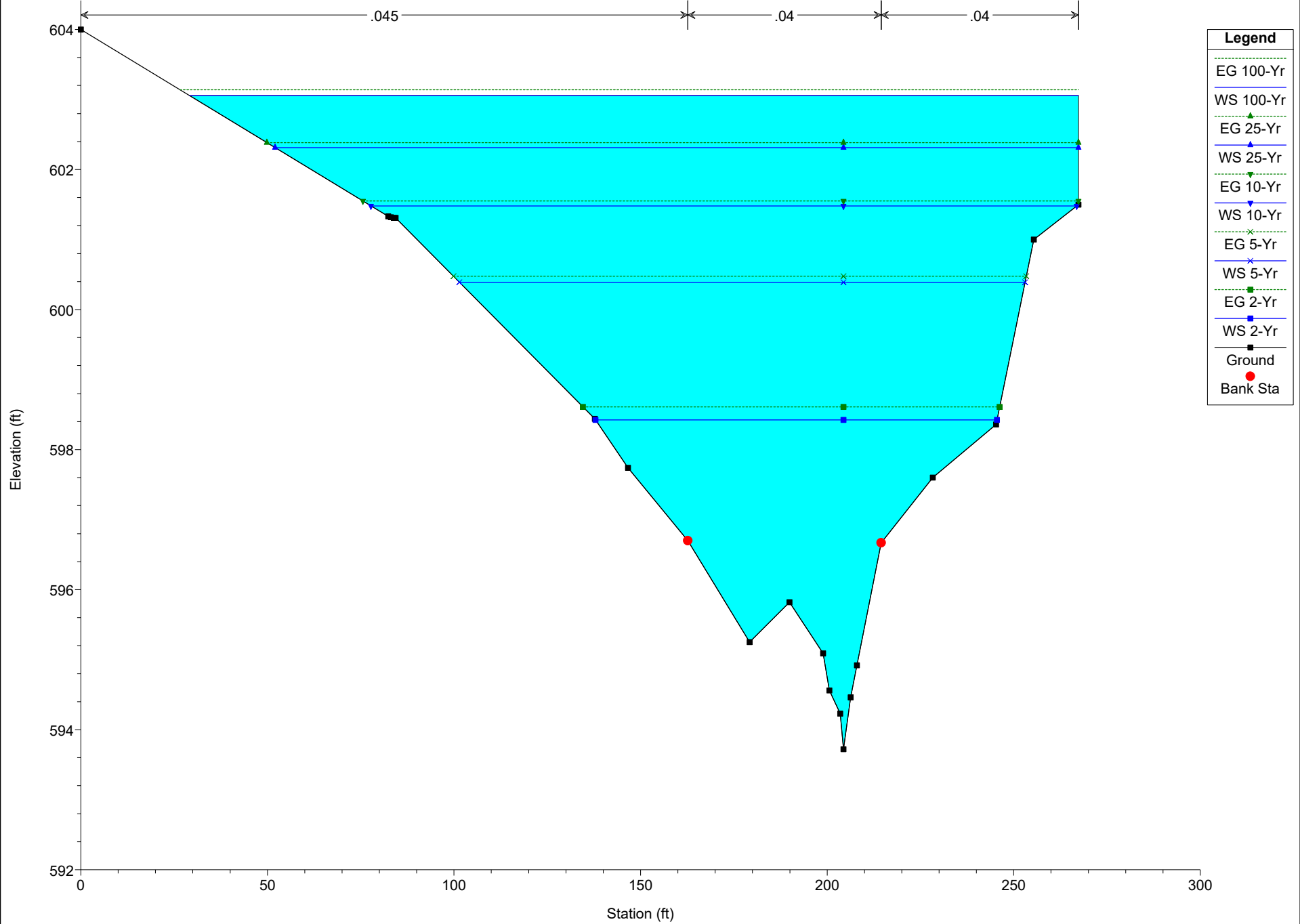
Reid Br Trib 1-Ex Lynn Plan: Plan 02 12/2/2021

RS = 843.95 Upstream Limit of Study



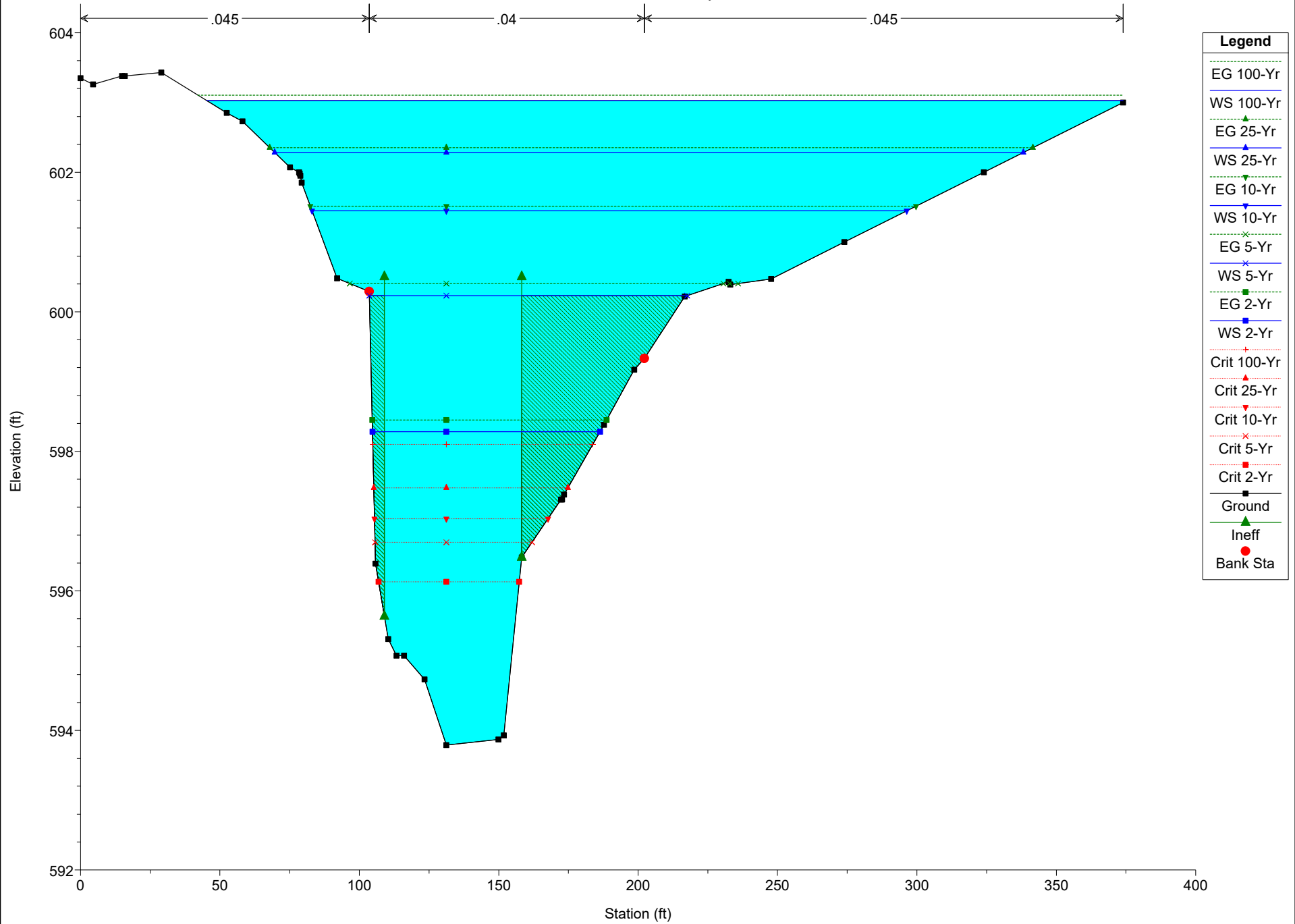
Reid Br Trib 1-Ex Lynn Plan: Plan 02 12/2/2021

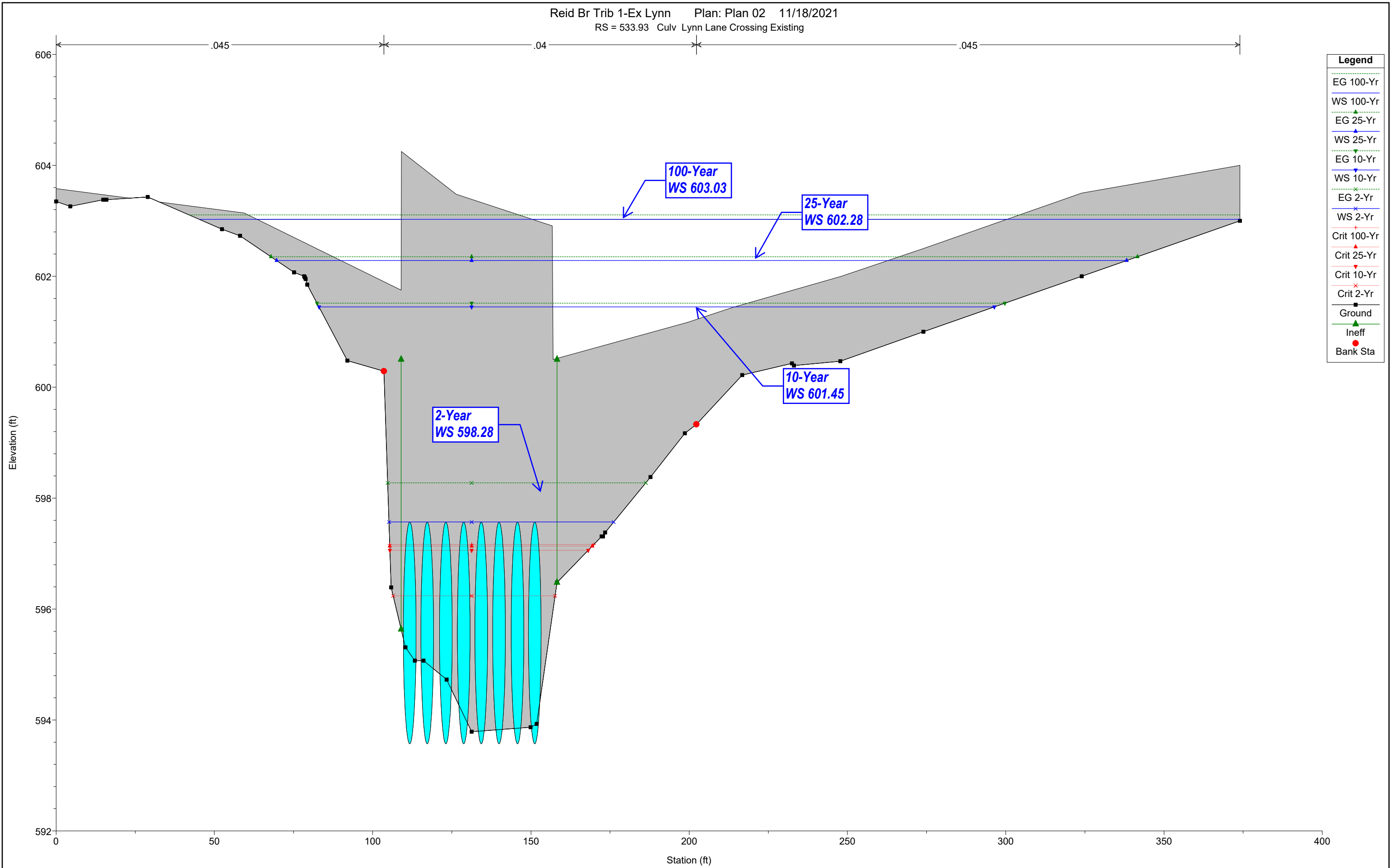
RS = 656.48



Reid Br Trib 1-Ex Lynn Plan: Plan 02 12/2/2021

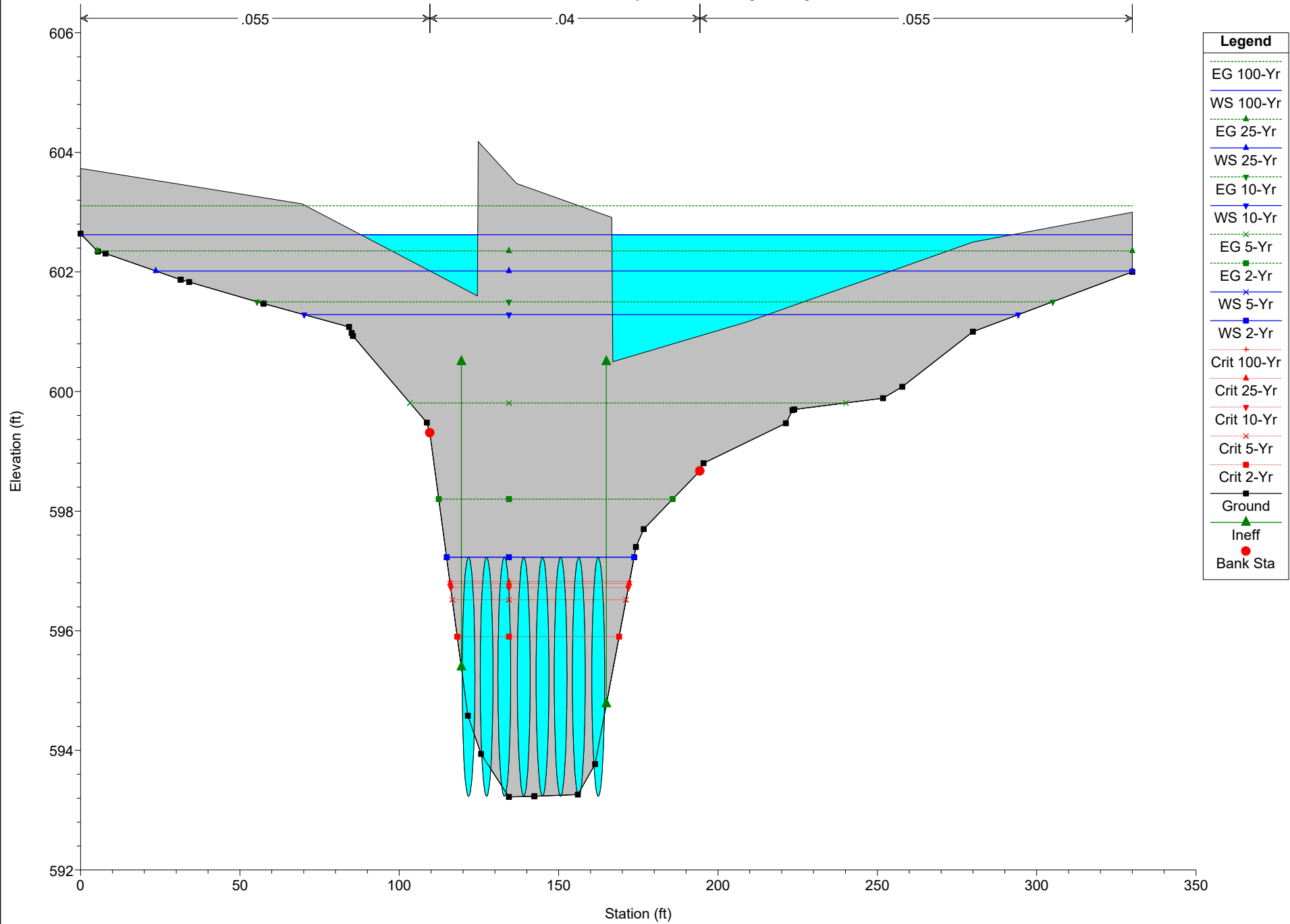
RS = 566.51 Just US of Lynn Lane





Reid Br Trib 1-Ex Lynn Plan: Plan 02 12/2/2021

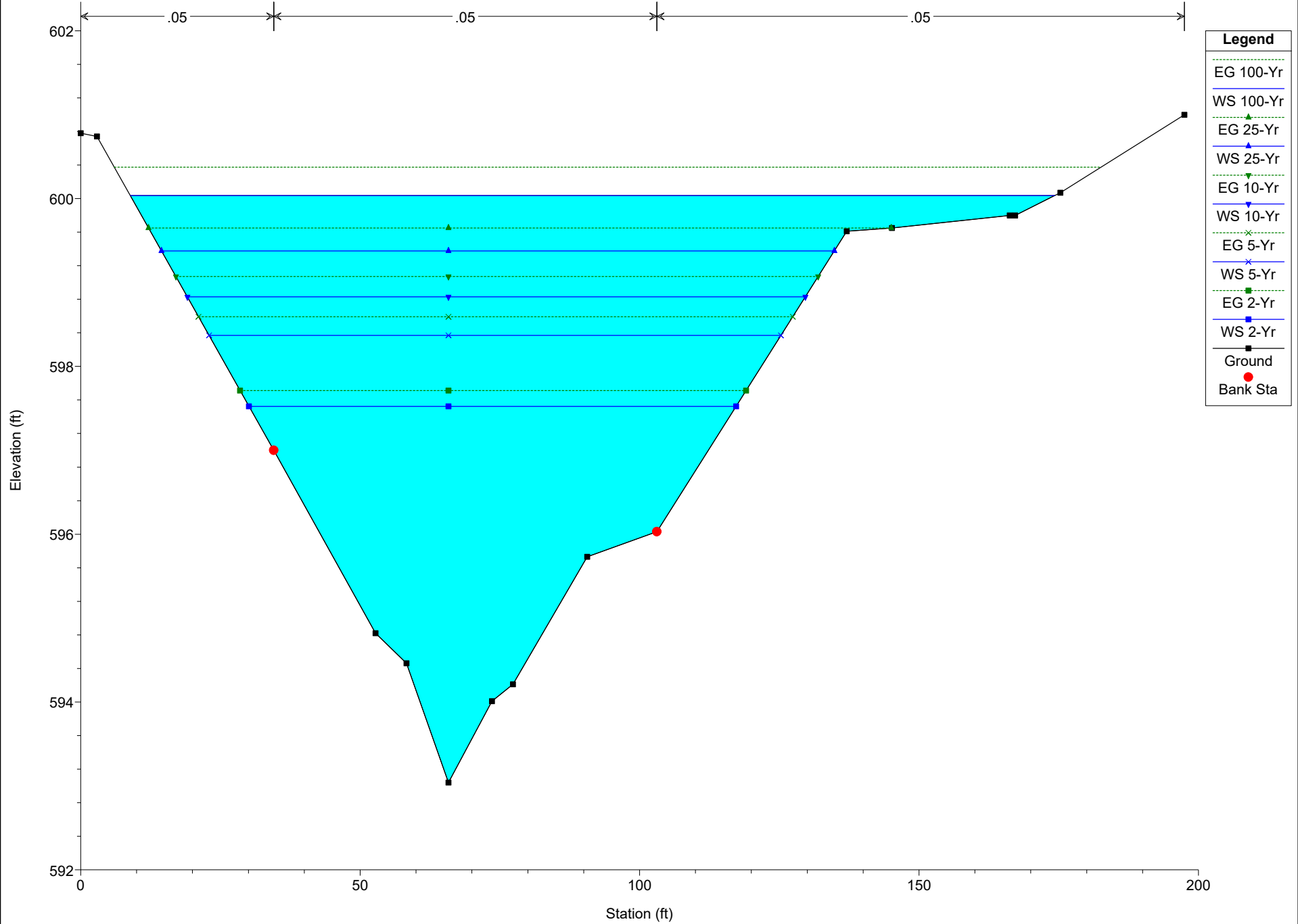
RS = 533.93 Culv Lynn Lane Crossing Existing





Reid Br Trib 1-Ex Lynn Plan: Plan 02 12/2/2021

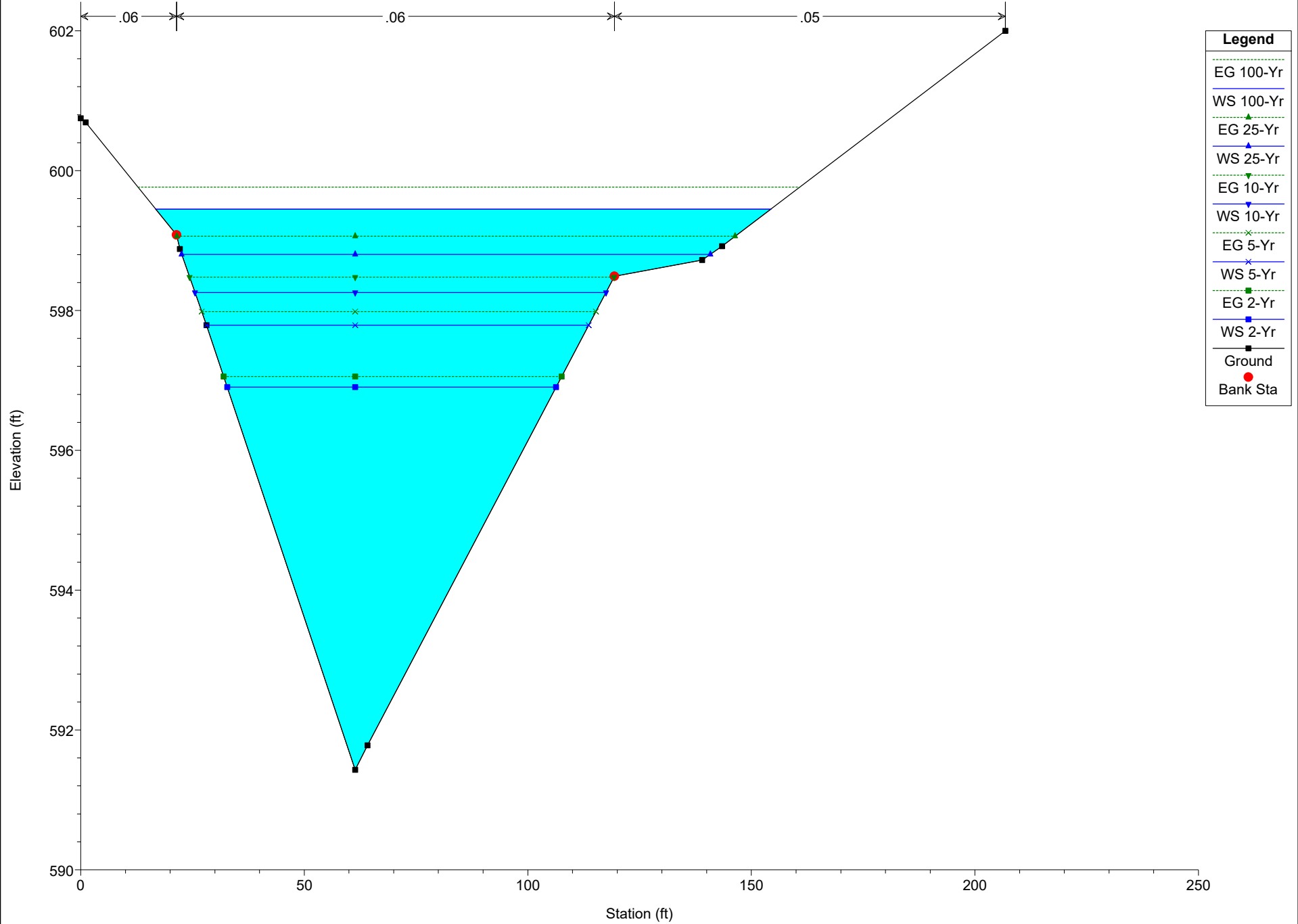
RS = 485.57





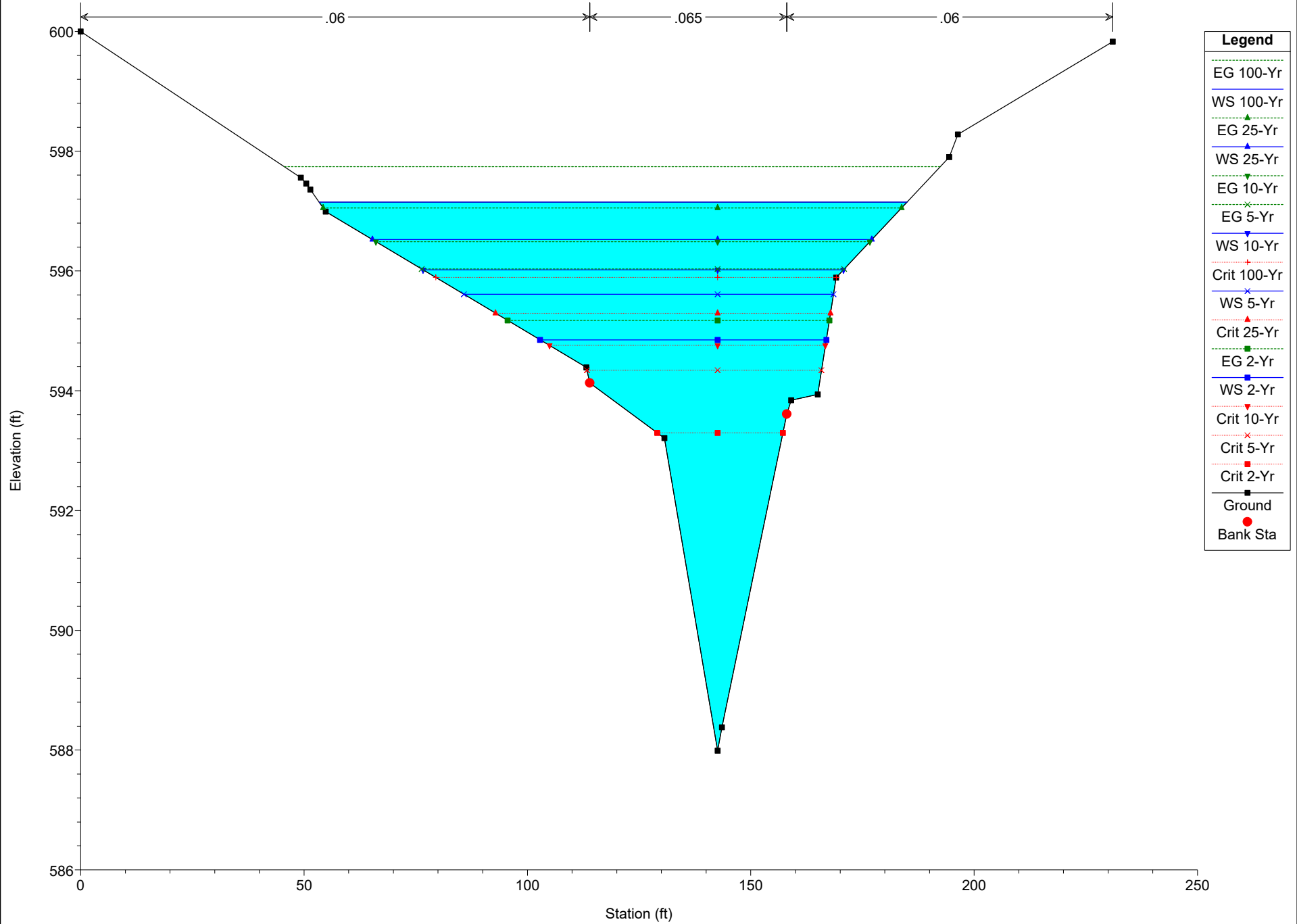
Reid Br Trib 1-Ex Lynn Plan: Plan 02 12/2/2021

RS = 331.24



Reid Br Trib 1-Ex Lynn Plan: Plan 02 12/2/2021

RS = 31.74



HEC-RAS HEC-RAS 5.0.3 September 2016  
 U.S. Army Corps of Engineers  
 Hydrologic Engineering Center  
 609 Second Street  
 Davis, California

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X   X XXXXXX   XXXX   XXXX   XX   XXXX
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## PROJECT DATA

Project Title: Reid Br Trib 1-Pr Lynn  
 Project File : PrLynn1.prj  
 Run Date and Time: 11/18/2021 11:45:24 AM

Project in English units

## PLAN DATA

Plan Title: PrBox-1  
 Plan File : h:\Projects\Lucas\2021136 Lemontree-Kingswood Drainage\Engineering\HEC-RAS\PrLynn1.p03

Geometry Title: PrGeo-Lynn  
 Geometry File : h:\Projects\Lucas\2021136 Lemontree-Kingswood Drainage\Engineering\HEC-RAS\PrLynn1.g02

Flow Title : EX-Multi  
 Flow File : h:\Projects\Lucas\2021136 Lemontree-Kingswood Drainage\Engineering\HEC-RAS\PrLynn1.f02

## Plan Description:

Preliminary Proposed Box Culverts

## Plan Summary Information:

Number of:	Cross Sections =	7	Multiple Openings =	0
	Culverts =	1	Inline Structures =	0
	Bridges =	0	Lateral Structures =	0

## Computational Information

Water surface calculation tolerance =	0.01
Critical depth calculation tolerance =	0.01
Maximum number of iterations =	20
Maximum difference tolerance =	0.3
Flow tolerance factor =	0.001

## Computation Options

Critical depth computed only where necessary  
 Conveyance Calculation Method: At breaks in n values only  
 Friction Slope Method: Average Conveyance

Computational Flow Regime: Subcritical Flow

FLOW DATA

Flow Title: EX-Multi  
 Flow File : h:\Projects\Lucas\2021136 Lemontree-Kingswood Drainage\Engineering\HEC-RAS\PrLynn1.f02

Flow Data (cfs)

River	Reach	RS	100-Yr	25-Yr	10-Yr	2-Yr
Reid Branch Trib	Reid Branch Trib	843.95	1951.5	1478.3	1168.6	622
Reid Branch Trib	Reid Branch Trib	485.57	1951.5	1478.3	1168.6	622
Reid Branch Trib	Reid Branch Trib	331.24	1975	1493	1180	629
Reid Branch Trib	Reid Branch Trib	31.74	1995.1	1508.1	1192	634.2

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Reid Branch Trib	Reid Branch Trib	100-Yr		Normal S = 0.01
Reid Branch Trib	Reid Branch Trib	25-Yr		Normal S = 0.01

GEOMETRY DATA

Geometry Title: PrGeo-Lynn  
 Geometry File : h:\Projects\Lucas\2021136 Lemontree-Kingswood Drainage\Engineering\HEC-RAS\PrLynn1.g02

CROSS SECTION

RIVER: Reid Branch Trib  
 REACH: Reid Branch Trib RS: 843.95

INPUT

Description: Upstream Limit of Study

Station Elevation Data num= 40

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	603	99	600.72	121.78	600	134.34	599.32	142.3	598.85
152.45	598.55	172.79	599.45	176.26	599.42	197.23	599.74	202.77	599.26
206.42	598.91	231.36	599.84	241.73	597.33	243.88	597.18	252.04	597.05
258.43	596.56	259.9	595.85	262.02	595.49	263.11	595.66	263.66	595.74
265.11	595.96	270.07	596.94	276.54	598.29	286.57	599.67	287.67	599.62
297.49	601.03	303.84	601.52	304.99	601.55	323.66	601.9	325.42	601.99
343.85	602.13	346.49	602.18	363.24	602.32	377.81	602.16	390.86	602.98
397.79	603.17	403.39	603.17	410.77	603.38	411.36	603.42	411.63	603.41

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	231.36	.045	286.57	.04

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

231.36	286.57	50	187.47	230	.1	.3
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## CROSS SECTION

RIVER: Reid Branch Trib  
 REACH: Reid Branch Trib RS: 656.48

## INPUT

Description:

Station Elevation Data		num=		21	
Sta	Elev	Sta	Elev	Sta	Elev
0	604	82.36	601.33	83.09	601.32
137.73	598.44	146.65	597.74	162.65	596.7
198.91	595.09	200.6	594.56	203.5	594.23
207.95	594.92	214.5	596.67	228.33	597.6
267.36	601.5				

Manning's n Values		num=		3	
Sta	n Val	Sta	n Val	Sta	n Val
0	.045	162.65	.04	214.5	.04

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	162.65	214.5		150	89.97		.1	.3

## CROSS SECTION

RIVER: Reid Branch Trib  
 REACH: Reid Branch Trib RS: 566.51

## INPUT

Description: Just US of Lynn Lane

Station Elevation Data		num=		34	
Sta	Elev	Sta	Elev	Sta	Elev
0	603.35	4.47	603.26	14.9	603.38
52.41	602.85	58.12	602.73	75.17	602.07
78.82	601.95	79.33	601.85	92.01	600.48
110.37	595.31	114.76	593.79	131.53	593.79
158.22	596.48	172.35	597.31	172.74	597.31
198.64	599.17	202.27	599.33	216.75	600.22
247.73	600.47	274	601	324	602

Manning's n Values		num=		3	
Sta	n Val	Sta	n Val	Sta	n Val
0	.045	103.55	.04	202.27	.045

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	103.55	202.27		47.85	47.85		.3	.5

Ineffective Flow		num=		2	
Sta L	Sta R	Elev	Permanent		
0	109	600.5	F		
158.22	374	600.5	F		

## CULVERT

RIVER: Reid Branch Trib  
 REACH: Reid Branch Trib RS: 533.93

## INPUT

Description: Lynn Lane Crossing Existing

Distance from Upstream XS = 8

Deck/Roadway Width = 30.5

Weir Coefficient = 2.6

Upstream Deck/Roadway Coordinates

num= 13											
Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
0	603.58	0	59.43	603.14	0	109	601.75	0			
109.1	604.25	0	126.36	603.48	0	156.72	602.91	0			
157	600.5	0	199.51	601.17	0	213.84	601.44	0			
248.06	602	0	274	602.5	0	324	603.5	0			
374	604	0									

Upstream Bridge Cross Section Data

Station Elevation Data num= 34									
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	603.35	4.47	603.26	14.9	603.38	15.9	603.38	28.94	603.43
52.41	602.85	58.12	602.73	75.17	602.07	78.38	602	78.59	601.98
78.82	601.95	79.33	601.85	92.01	600.48	103.55	600.29	105.83	596.39
110.37	595.31	114.76	593.79	131.53	593.79	148.3	593.79	151.82	593.93
158.22	596.48	172.35	597.31	172.74	597.31	173.42	597.38	187.76	598.38
198.64	599.17	202.27	599.33	216.75	600.22	232.44	600.43	233.08	600.39
247.73	600.47	274	601	324	602	374	603		

Manning's n Values

num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	103.55	.04	202.27	.045

Bank Sta: Left Right Coeff Contr. Expan.

103.55	202.27	.3	.5
--------	--------	----	----

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	109	600.5	F
158.22	374	600.5	F

Downstream Deck/Roadway Coordinates

num= 12											
Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
0	603.73	0	69.47	603.14	0	124.49	601.6	0			
124.77	604.18	0	136.85	603.48	0	166.69	602.91	0			
166.97	600.5	0	209.48	601.17	0	223.81	601.44	0			
257.79	602.08	0	280	602.5	0	330	603	0			

Downstream Bridge Cross Section Data

Station Elevation Data num= 29									
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	602.64	5.44	602.34	7.86	602.31	31.36	601.87	31.46	601.87
34.06	601.83	57.36	601.47	57.47	601.47	84.25	601.08	85.04	600.98
85.47	600.93	108.66	599.48	109.59	599.31	121.55	594.58	125.23	593.22
142	593.22	158.77	593.22	161.44	593.77	174.28	597.4	176.72	597.7
194.32	598.67	195.45	598.8	221.27	599.47	223.41	599.69	223.91	599.7
251.78	599.89	257.79	600.08	280	601	330	602		

Manning's n Values

num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.055	109.59	.04	194.32	.055

Bank Sta: Left Right Coeff Contr. Expan.

109.59	194.32	.3	.5
Ineffective Flow	num=	2	
Sta L	Sta R	Elev	Permanent
0	119.5	600.5	F
165	330	600.5	F

Upstream Embankment side slope = 0 horiz. to 1.0 vertical  
Downstream Embankment side slope = 0 horiz. to 1.0 vertical  
Maximum allowable submergence for weir flow = .98  
Elevation at which weir flow begins = 600.41  
Energy head used in spillway design =  
Spillway height used in design =  
Weir crest shape = Broad Crested

Number of Culverts = 1

Culvert Name	Shape	Rise	Span
Prop Boxes	Box	5	10

FHWA Chart # 8 - flared wingwalls  
FHWA Scale # 2 - Wingwall flared 90 or 15 deg.  
Solution Criteria = Highest U.S. EG  
Culvert Upstrm Dist Length Top n Bottom n Depth Blocked Entrance Loss Coef Exit Loss Coef

4	40	.012	.012	0	.5	1
---	----	------	------	---	----	---

Number of Barrels = 3

Upstream Elevation = 593.75

Centerline Stations

Sta.	Sta.	Sta.
120.35	131.53	142.71

Downstream Elevation = 593.26

Centerline Stations

Sta.	Sta.	Sta.
130.82	142	153.18

CULVERT OUTPUT Profile #100-Yr Culv Group: Prop Boxes

Q Culv Group (cfs)	1543.13	Culv Full Len (ft)	40.00
# Barrels	3	Culv Vel US (ft/s)	10.29
Q Barrel (cfs)	514.38	Culv Vel DS (ft/s)	10.29
E.G. US. (ft)	602.57	Culv Inv El Up (ft)	593.75
W.S. US. (ft)	602.47	Culv Inv El Dn (ft)	593.26
E.G. DS (ft)	600.64	Culv Frctn Ls (ft)	0.14
W.S. DS (ft)	599.96	Culv Exit Loss (ft)	0.97
Delta EG (ft)	1.93	Culv Entr Loss (ft)	0.82
Delta WS (ft)	2.50	Q Weir (cfs)	408.37
E.G. IC (ft)	602.41	Weir Sta Lft (ft)	79.75
E.G. OC (ft)	602.57	Weir Sta Rgt (ft)	277.51
Culvert Control	Outlet	Weir Submerg	0.00
Culv WS Inlet (ft)	598.75	Weir Max Depth (ft)	2.07
Culv WS Outlet (ft)	598.26	Weir Avg Depth (ft)	0.94
Culv Nml Depth (ft)		Weir Flow Area (sq ft)	141.68
Culv Crt Depth (ft)	4.35	Min El Weir Flow (ft)	600.51

CULVERT OUTPUT Profile #25-Yr Culv Group: Prop Boxes

Q Culv Group (cfs)	1409.68	Culv Full Len (ft)	40.00
# Barrels	3	Culv Vel US (ft/s)	9.40
Q Barrel (cfs)	469.89	Culv Vel DS (ft/s)	9.40
E.G. US. (ft)	601.54	Culv Inv El Up (ft)	593.75

W.S. US. (ft)	601.43	Culv Inv El Dn (ft)	593.26
E.G. DS (ft)	599.83	Culv Frctn Ls (ft)	0.12
W.S. DS (ft)	599.36	Culv Exit Loss (ft)	0.90
Delta EG (ft)	1.71	Culv Entr Loss (ft)	0.69
Delta WS (ft)	2.07	Q Weir (cfs)	68.62
E.G. IC (ft)	601.37	Weir Sta Lft (ft)	156.88
E.G. OC (ft)	601.54	Weir Sta Rgt (ft)	219.46
Culvert Control	Outlet	Weir Submerg	0.00
Culv WS Inlet (ft)	598.75	Weir Max Depth (ft)	1.03
Culv WS Outlet (ft)	598.26	Weir Avg Depth (ft)	0.53
Culv Nml Depth (ft)		Weir Flow Area (sq ft)	33.21
Culv Crt Depth (ft)	4.09	Min El Weir Flow (ft)	600.51

## CULVERT OUTPUT Profile #10-Yr Culv Group: Prop Boxes

Q Culv Group (cfs)	1168.60	Culv Full Len (ft)	40.00
# Barrels	3	Culv Vel US (ft/s)	7.79
Q Barrel (cfs)	389.53	Culv Vel DS (ft/s)	7.79
E.G. US. (ft)	600.35	Culv Inv El Up (ft)	593.75
W.S. US. (ft)	600.10	Culv Inv El Dn (ft)	593.26
E.G. DS (ft)	599.20	Culv Frctn Ls (ft)	0.08
W.S. DS (ft)	598.85	Culv Exit Loss (ft)	0.59
Delta EG (ft)	1.14	Culv Entr Loss (ft)	0.47
Delta WS (ft)	1.25	Q Weir (cfs)	
E.G. IC (ft)	599.92	Weir Sta Lft (ft)	
E.G. OC (ft)	600.35	Weir Sta Rgt (ft)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (ft)	598.75	Weir Max Depth (ft)	
Culv WS Outlet (ft)	598.26	Weir Avg Depth (ft)	
Culv Nml Depth (ft)		Weir Flow Area (sq ft)	
Culv Crt Depth (ft)	3.61	Min El Weir Flow (ft)	600.51

## CULVERT OUTPUT Profile #2-Yr Culv Group: Prop Boxes

Q Culv Group (cfs)	622.00	Culv Full Len (ft)	
# Barrels	3	Culv Vel US (ft/s)	5.50
Q Barrel (cfs)	207.33	Culv Vel DS (ft/s)	4.76
E.G. US. (ft)	598.23	Culv Inv El Up (ft)	593.75
W.S. US. (ft)	598.07	Culv Inv El Dn (ft)	593.26
E.G. DS (ft)	597.78	Culv Frctn Ls (ft)	0.08
W.S. DS (ft)	597.62	Culv Exit Loss (ft)	0.18
Delta EG (ft)	0.44	Culv Entr Loss (ft)	0.23
Delta WS (ft)	0.45	Q Weir (cfs)	
E.G. IC (ft)	597.76	Weir Sta Lft (ft)	
E.G. OC (ft)	598.23	Weir Sta Rgt (ft)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (ft)	597.52	Weir Max Depth (ft)	
Culv WS Outlet (ft)	597.62	Weir Avg Depth (ft)	
Culv Nml Depth (ft)	1.42	Weir Flow Area (sq ft)	
Culv Crt Depth (ft)	2.37	Min El Weir Flow (ft)	600.51

## CROSS SECTION

RIVER: Reid Branch Trib  
 REACH: Reid Branch Trib RS: 518.66



## INPUT

Description: Just DS of Lynn Lane

Station Elevation Data num= 29									
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	602.64	5.44	602.34	7.86	602.31	31.36	601.87	31.46	601.87
34.06	601.83	57.36	601.47	57.47	601.47	84.25	601.08	85.04	600.98
85.47	600.93	108.66	599.48	109.59	599.31	121.55	594.58	125.23	593.22
142	593.22	158.77	593.22	161.44	593.77	174.28	597.4	176.72	597.7
194.32	598.67	195.45	598.8	221.27	599.47	223.41	599.69	223.91	599.7
251.78	599.89	257.79	600.08	280	601	330	602		

Manning's n Values num= 3					
Sta	n Val	Sta	n Val	Sta	n Val
0	.055	109.59	.04	194.32	.055

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	109.59	194.32		33.09	33.09		.3	.5

Ineffective Flow num= 2			
Sta L	Sta R	Elev	Permanent
0	119.5	600.5	F
165	330	600.5	F

## CROSS SECTION

RIVER: Reid Branch Trib

REACH: Reid Branch Trib RS: 485.57

## INPUT

Description:

Station Elevation Data num= 16									
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	600.78	2.92	600.74	34.54	597	52.76	594.82	58.27	594.46
65.81	593.04	73.58	594.01	77.34	594.21	90.64	595.73	103.1	596.03
137.06	599.61	145.16	599.65	166.24	599.8	167.19	599.8	175.28	600.07
197.5	601								

Manning's n Values num= 3					
Sta	n Val	Sta	n Val	Sta	n Val
0	.05	34.54	.05	103.1	.05

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	34.54	103.1		154.33	154.33		.1	.3

## CROSS SECTION

RIVER: Reid Branch Trib

REACH: Reid Branch Trib RS: 331.24

## INPUT

Description:

Station Elevation Data num= 11									
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	600.75	1.11	600.69	21.43	599.08	22.16	598.88	28.12	597.79
61.38	591.43	64.13	591.78	119.4	598.49	138.98	598.72	143.46	598.92
206.82	602								

Manning's n Values num= 3  
 Sta n Val Sta n Val Sta n Val  
 0 .06 21.43 .06 119.4 .05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
 21.43 119.4 250 299.5 350 .1 .3

CROSS SECTION

RIVER: Reid Branch Trib  
 REACH: Reid Branch Trib RS: 31.74

INPUT

Description:

Station Elevation Data num= 17  
 Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev  
 0 600 49.28 597.56 50.49 597.46 51.43 597.36 54.85 596.99  
 113.19 594.39 113.96 594.13 130.65 593.21 142.56 587.99 143.55 588.38  
 158.06 593.61 159.02 593.84 164.97 593.94 169.11 595.89 194.43 597.9  
 196.37 598.28 231.01 599.83

Manning's n Values num= 3  
 Sta n Val Sta n Val Sta n Val  
 0 .06 113.96 .065 158.06 .06

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
 113.96 158.06 0 0 0 .1 .3

SUMMARY OF MANNING'S N VALUES

River:Reid Branch Trib

Reach	River Sta.	n1	n2	n3
Reid Branch Trib	843.95	.045	.045	.04
Reid Branch Trib	656.48	.045	.04	.04
Reid Branch Trib	566.51	.045	.04	.045
Reid Branch Trib	533.93	Culvert		
Reid Branch Trib	518.66	.055	.04	.055
Reid Branch Trib	485.57	.05	.05	.05
Reid Branch Trib	331.24	.06	.06	.05
Reid Branch Trib	31.74	.06	.065	.06

SUMMARY OF REACH LENGTHS

River: Reid Branch Trib

Reach	River Sta.	Left	Channel	Right
Reid Branch Trib	843.95	50	187.47	230
Reid Branch Trib	656.48	150	89.97	50
Reid Branch Trib	566.51	47.85	47.85	47.85
Reid Branch Trib	533.93	Culvert		

Reid Branch Trib	518.66	33.09	33.09	33.09
Reid Branch Trib	485.57	154.33	154.33	154.33
Reid Branch Trib	331.24	250	299.5	350
Reid Branch Trib	31.74	0	0	0

## SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS

River: Reid Branch Trib

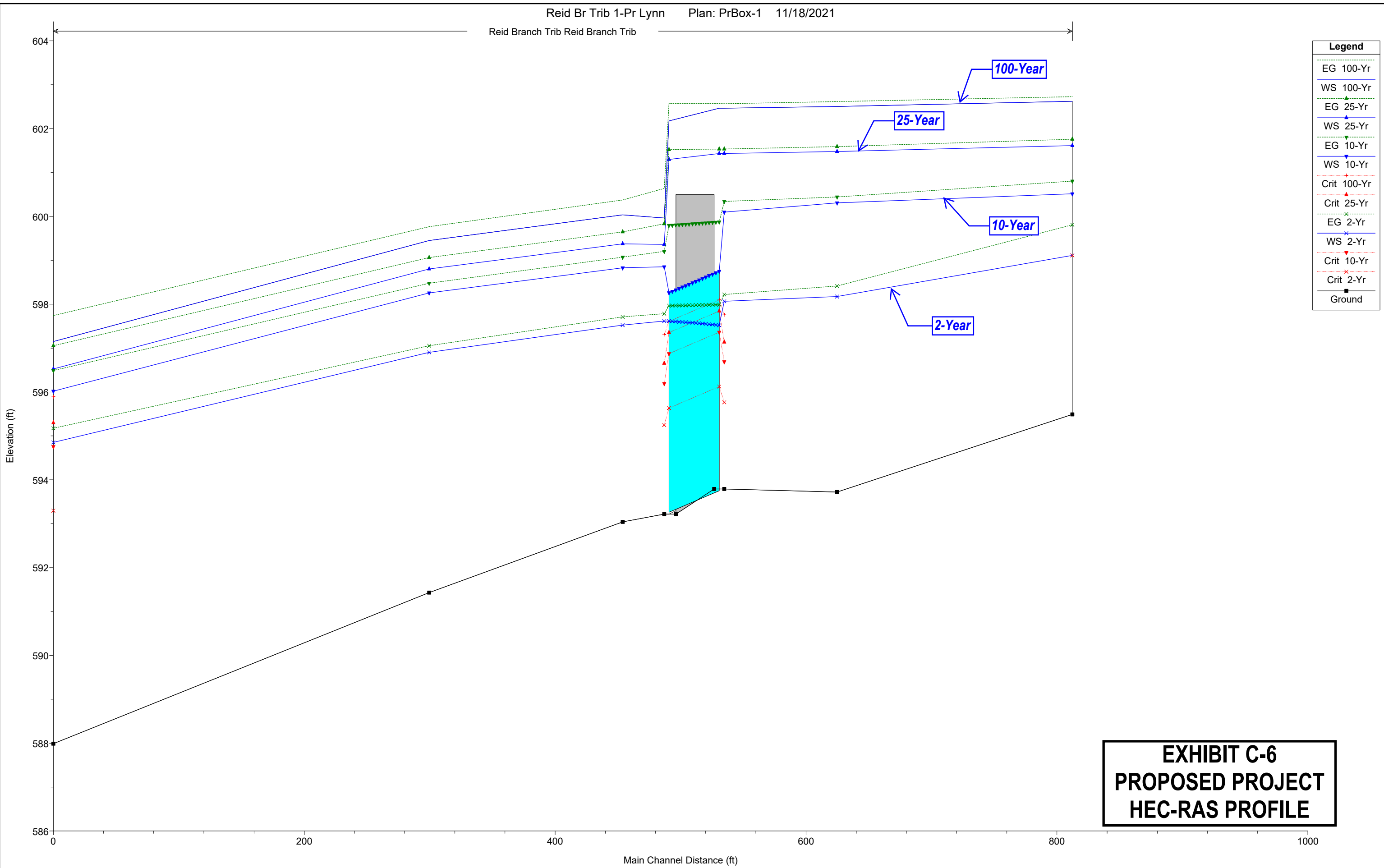
Reach	River Sta.	Contr.	Expan.
Reid Branch Trib	843.95	.1	.3
Reid Branch Trib	656.48	.1	.3
Reid Branch Trib	566.51	.3	.5
Reid Branch Trib	533.93	Culvert	
Reid Branch Trib	518.66	.3	.5
Reid Branch Trib	485.57	.1	.3
Reid Branch Trib	331.24	.1	.3
Reid Branch Trib	31.74	.1	.3

## Profile Output Table - Standard Table 1

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Reid Branch Trib	843.95	100-Yr	1951.50	595.49	602.62		602.73	0.001130	3.25	853.89	368.71	0.25
Reid Branch Trib	843.95	25-Yr	1478.30	595.49	601.61		601.76	0.001928	3.66	541.98	248.07	0.32
Reid Branch Trib	843.95	10-Yr	1168.60	595.49	600.51		600.81	0.005314	4.93	306.05	188.40	0.50
Reid Branch Trib	843.95	2-Yr	622.00	595.49	599.11	599.11	599.81	0.019010	6.79	98.13	83.03	0.88
Reid Branch Trib	656.48	100-Yr	1951.50	593.72	602.51		602.62	0.000550	3.16	845.65	221.25	0.21
Reid Branch Trib	656.48	25-Yr	1478.30	593.72	601.48		601.59	0.000654	3.10	634.96	189.12	0.22
Reid Branch Trib	656.48	10-Yr	1168.60	593.72	600.31		600.44	0.001006	3.32	441.43	149.71	0.27
Reid Branch Trib	656.48	2-Yr	622.00	593.72	598.18		598.42	0.003310	4.08	173.38	100.09	0.44
Reid Branch Trib	566.51	100-Yr	1951.50	593.79	602.47	597.76	602.57	0.000453	2.70	891.04	282.35	0.19
Reid Branch Trib	566.51	25-Yr	1478.30	593.79	601.43	597.14	601.53	0.000531	2.61	637.82	212.45	0.20
Reid Branch Trib	566.51	10-Yr	1168.60	593.79	600.10	596.69	600.34	0.001061	3.95	295.52	111.10	0.28
Reid Branch Trib	566.51	2-Yr	622.00	593.79	598.07	595.77	598.22	0.001191	3.18	195.50	78.40	0.28
Reid Branch Trib	533.93											
Reid Branch Trib	518.66	100-Yr	1951.50	593.22	599.96	597.31	600.64	0.002632	6.59	296.24	153.19	0.46
Reid Branch Trib	518.66	25-Yr	1478.30	593.22	599.36	596.65	599.83	0.002088	5.50	268.80	107.75	0.40
Reid Branch Trib	518.66	10-Yr	1168.60	593.22	598.85	596.19	599.20	0.001763	4.76	245.61	86.67	0.36
Reid Branch Trib	518.66	2-Yr	622.00	593.22	597.62	595.25	597.78	0.001187	3.28	189.44	62.17	0.28
Reid Branch Trib	485.57	100-Yr	1951.50	593.04	600.04		600.37	0.003236	4.94	469.40	165.38	0.39
Reid Branch Trib	485.57	25-Yr	1478.30	593.04	599.38		599.65	0.003080	4.38	376.04	120.39	0.37
Reid Branch Trib	485.57	10-Yr	1168.60	593.04	598.83		599.07	0.003195	4.08	312.89	110.58	0.37
Reid Branch Trib	485.57	2-Yr	622.00	593.04	597.52		597.71	0.004125	3.51	183.90	87.17	0.39
Reid Branch Trib	331.24	100-Yr	1975.00	591.43	599.45		599.76	0.004766	4.53	451.20	137.61	0.38
Reid Branch Trib	331.24	25-Yr	1493.00	591.43	598.80		599.06	0.004716	4.09	368.68	118.24	0.37
Reid Branch Trib	331.24	10-Yr	1180.00	591.43	598.26		598.48	0.004594	3.77	312.98	91.92	0.36

PrLynn1.rep												
Reid Branch Trib	331.24	2-Yr	629.00	591.43	596.90		597.06	0.004245	3.13	201.00	73.57	0.33
Reid Branch Trib	31.74	100-Yr	1995.10	587.99	597.15	595.89	597.74	0.010011	6.75	363.58	131.59	0.52
Reid Branch Trib	31.74	25-Yr	1508.10	587.99	596.52	595.30	597.05	0.010016	6.21	287.12	111.81	0.51
Reid Branch Trib	31.74	10-Yr	1192.00	587.99	596.02	594.76	596.49	0.010007	5.75	235.03	94.08	0.50
Reid Branch Trib	31.74	2-Yr	634.20	587.99	594.85	593.30	595.17	0.010000	4.62	143.41	64.06	0.47

Reid Branch Trib Reid Branch Trib

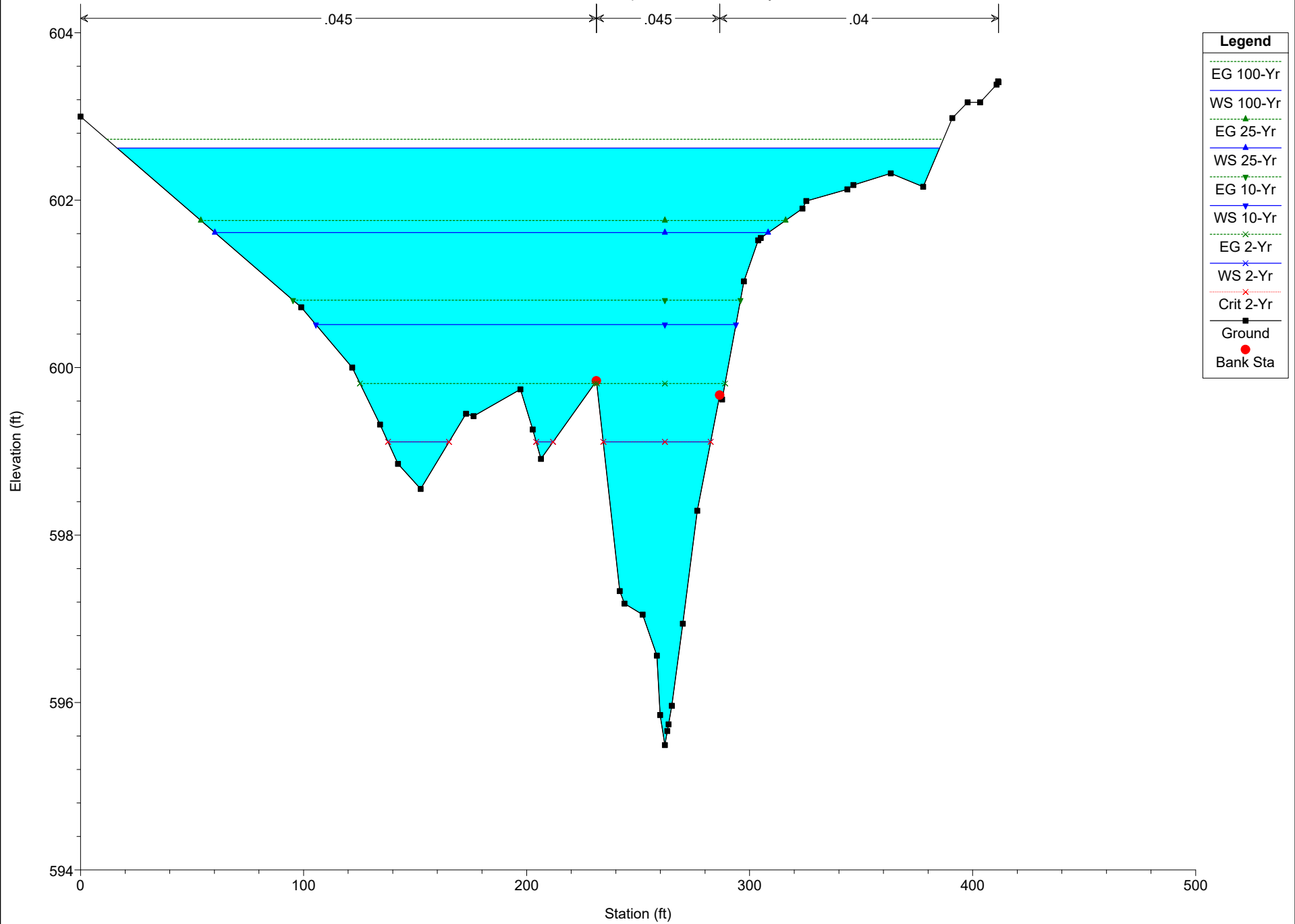


Legend	
EG 100-Yr	(Dotted Green Line)
WS 100-Yr	(Solid Blue Line)
EG 25-Yr	(Dotted Green Line)
WS 25-Yr	(Solid Blue Line)
EG 10-Yr	(Dotted Green Line)
WS 10-Yr	(Solid Blue Line)
Crit 100-Yr	(Red Line with Triangle)
Crit 25-Yr	(Red Line with Triangle)
EG 2-Yr	(Dotted Green Line)
WS 2-Yr	(Solid Blue Line)
Crit 10-Yr	(Red Line with Triangle)
Crit 2-Yr	(Red Line with Cross)
Ground	(Solid Black Line)

**EXHIBIT C-6  
PROPOSED PROJECT  
HEC-RAS PROFILE**

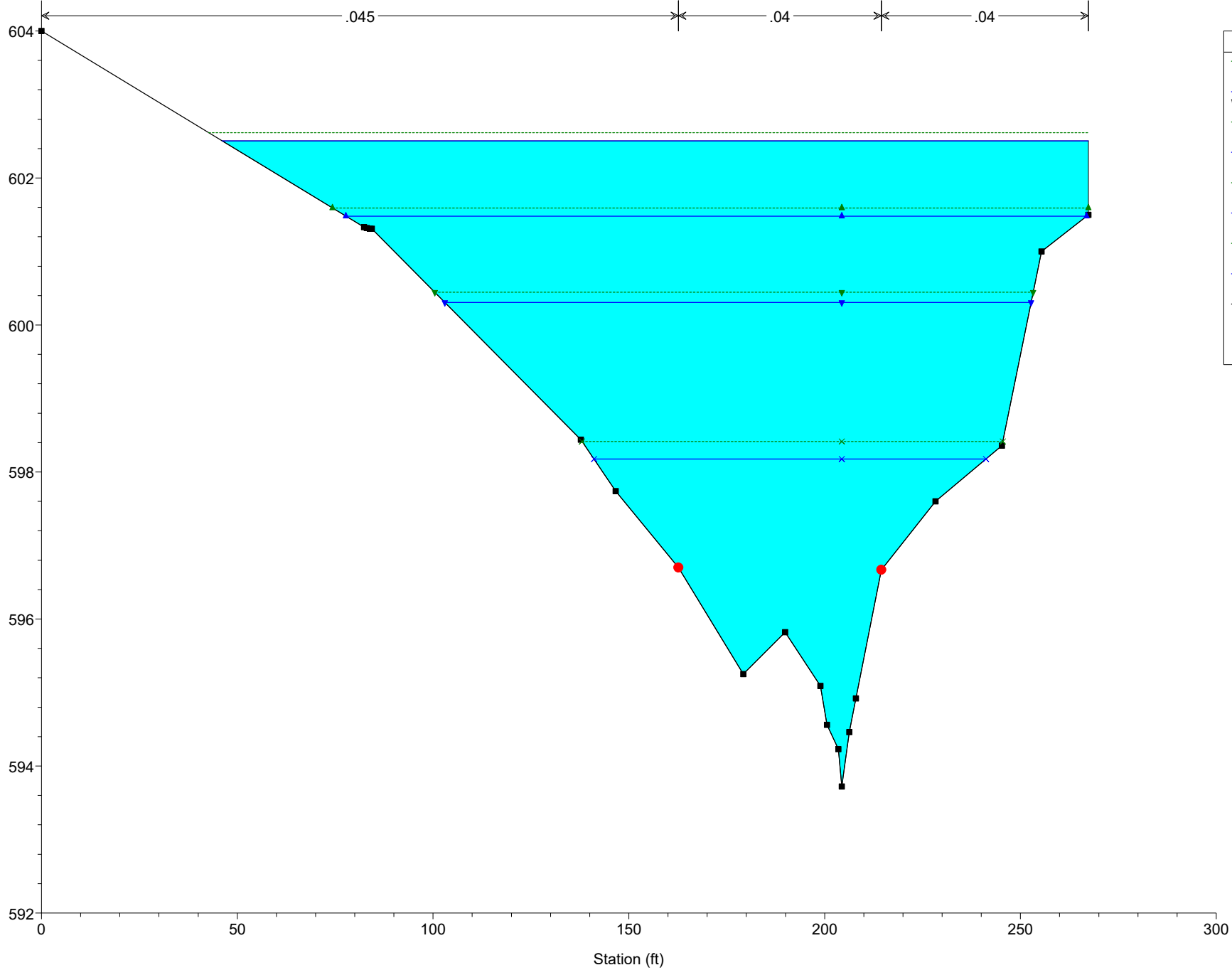
Reid Br Trib 1-Pr Lynn Plan: PrBox-1 11/18/2021

RS = 843.95 Upstream Limit of Study



Reid Br Trib 1-Pr Lynn Plan: PrBox-1 11/18/2021

RS = 656.48

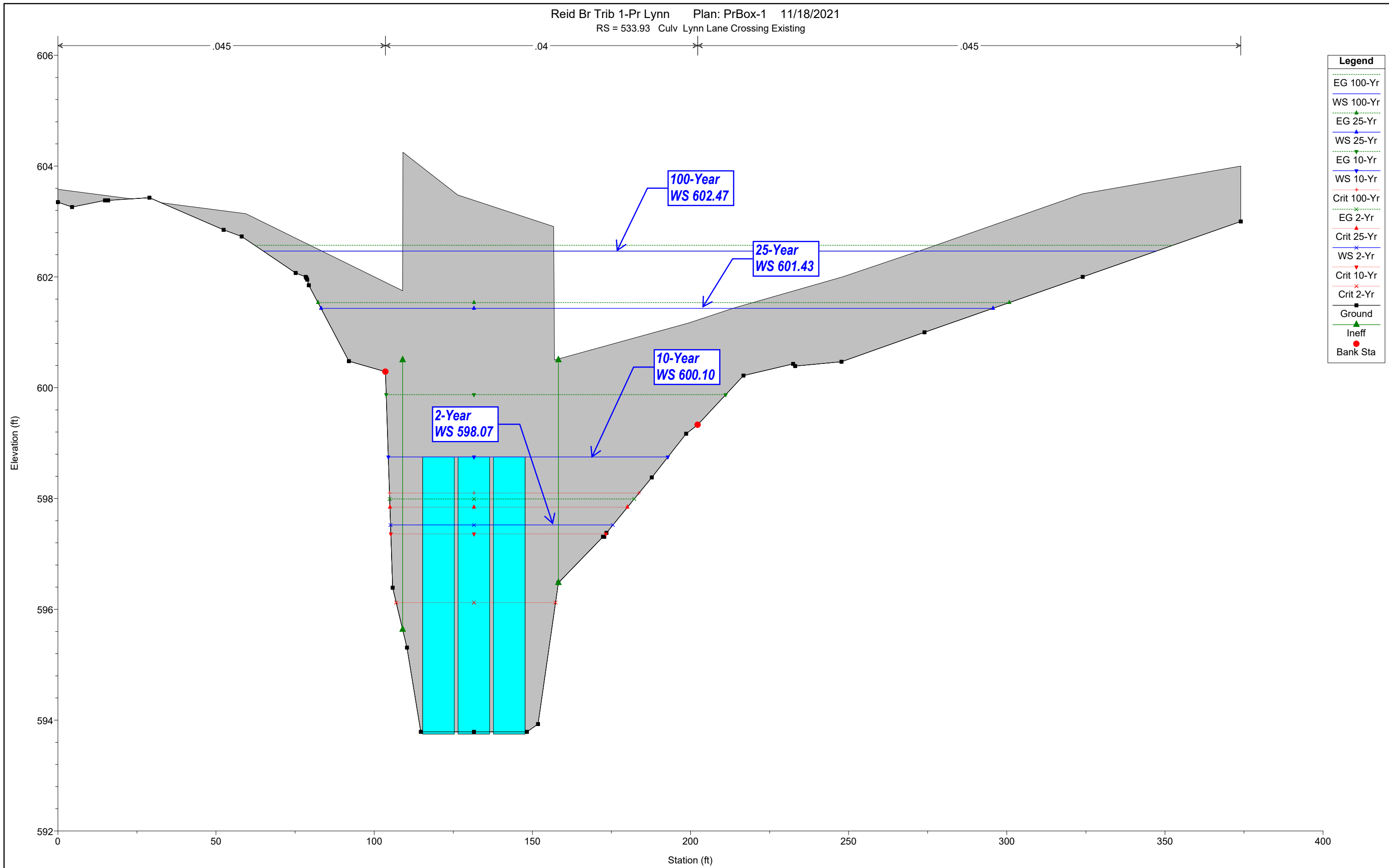


**Legend**

- EG 100-Yr
- WS 100-Yr
- EG 25-Yr
- WS 25-Yr
- EG 10-Yr
- WS 10-Yr
- EG 2-Yr
- WS 2-Yr
- Ground
- Bank Sta

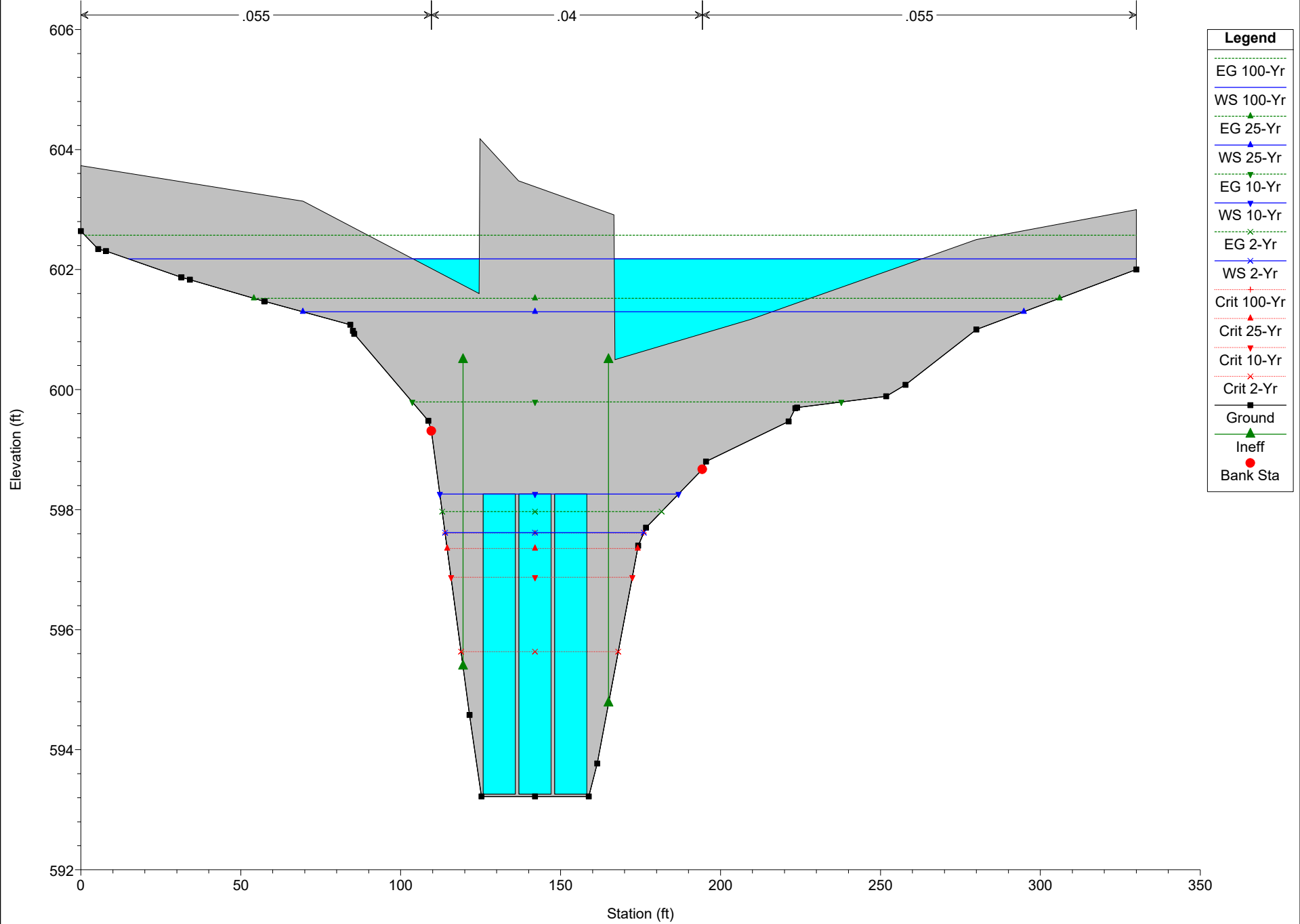




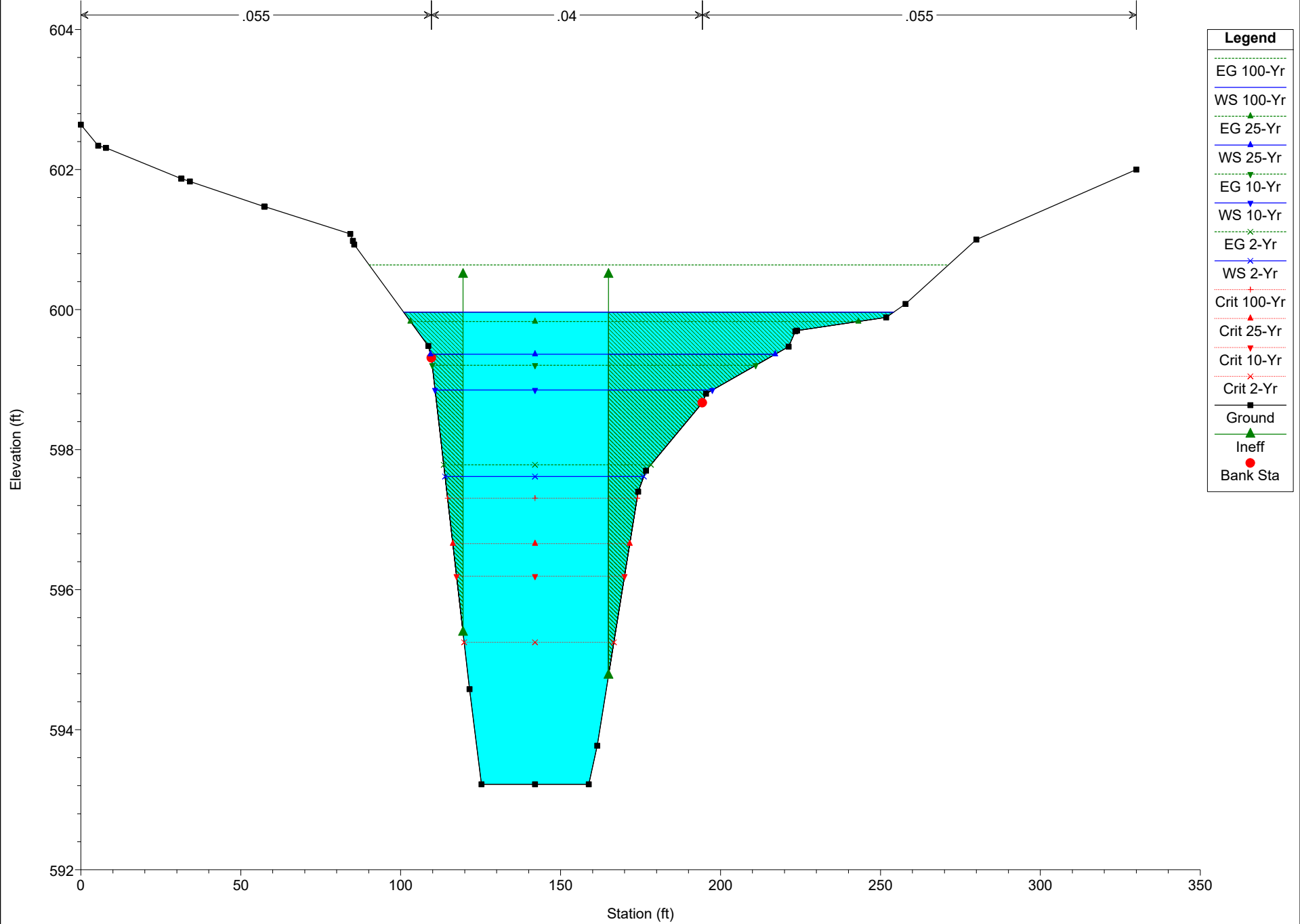


Reid Br Trib 1-Pr Lynn Plan: PrBox-1 11/18/2021

RS = 533.93 Culv Lynn Lane Crossing Existing

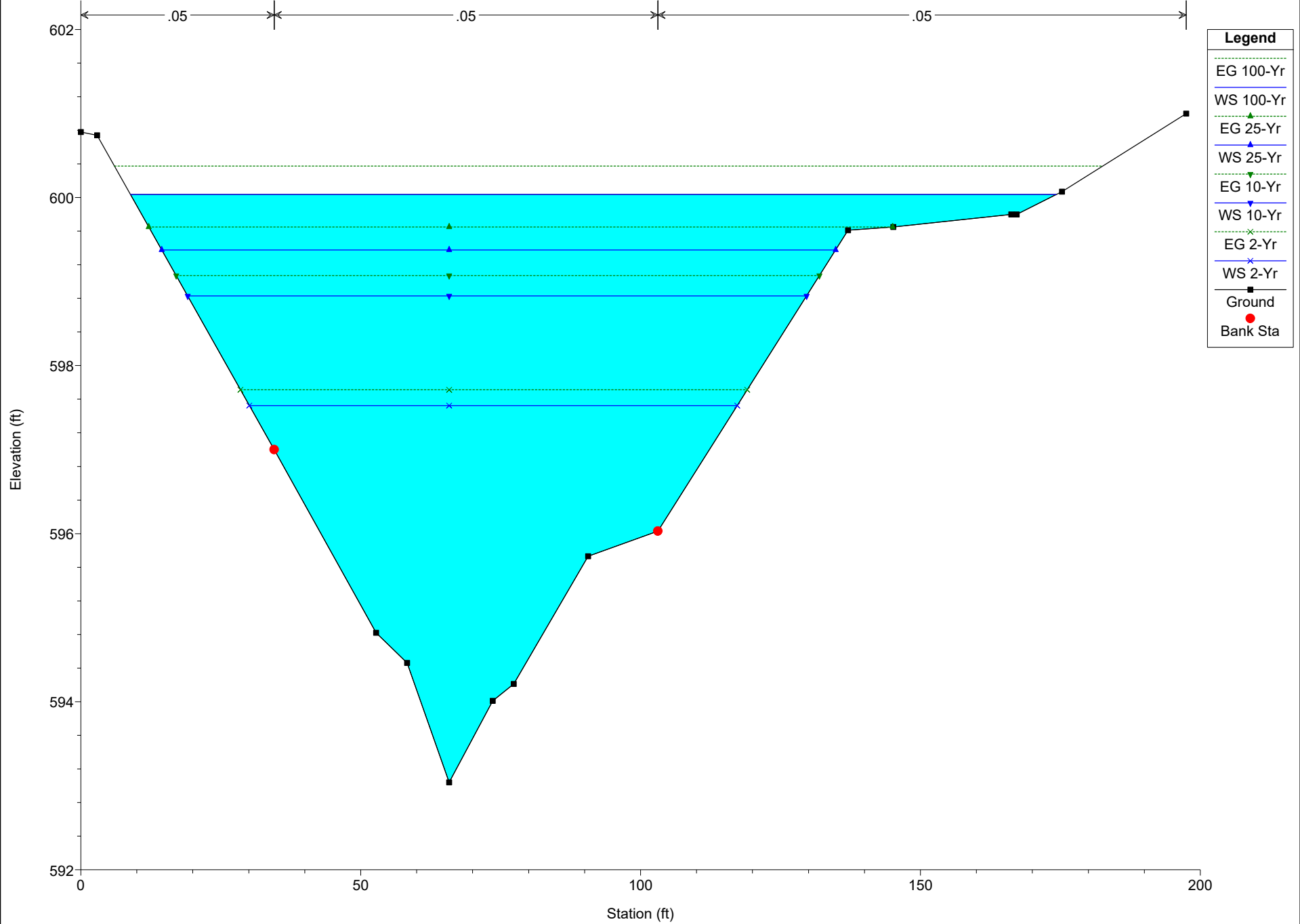


Reid Br Trib 1-Pr Lynn Plan: PrBox-1 11/18/2021  
 RS = 518.66 Just DS of Lynn Lane



Reid Br Trib 1-Pr Lynn Plan: PrBox-1 11/18/2021

RS = 485.57



- Legend**
- EG 100-Yr
  - WS 100-Yr
  - EG 25-Yr
  - WS 25-Yr
  - EG 10-Yr
  - WS 10-Yr
  - EG 2-Yr
  - WS 2-Yr
  - Ground
  - Bank Sta





City of Lucas

Lynn Lane Crossing Reid Branch Tributary 1

Existing Conditions

<h1 style="margin: 0;">EXHIBIT C-8</h1> <h2 style="margin: 0;">STANDARD TABLE 1 COMPARISON</h2>
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Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude #	
												Chl	
Reid Branch Trib	843.95	100-Yr	1951.50	595.49	603.14		603.21	0.000657	2.64	1054.74	396.86	0.20	
Reid Branch Trib	843.95	25-Yr	1478.30	595.49	602.39		602.46	0.000835	2.70	768.75	354.75	0.22	
Reid Branch Trib	843.95	10-Yr	1168.60	595.49	601.56		601.66	0.001275	2.95	529.82	243.28	0.26	
Reid Branch Trib	843.95	2-Yr	622.00	595.49	599.11	599.11	599.81	0.01901	6.79	98.13	83.03	0.88	
Reid Branch Trib	656.48	100-Yr	1951.50	593.72	603.06		603.14	0.000386	2.78	972.00	238.21	0.18	
Reid Branch Trib	656.48	25-Yr	1478.30	593.72	602.31		602.38	0.000359	2.51	803.74	215.33	0.17	
Reid Branch Trib	656.48	10-Yr	1168.60	593.72	601.48		601.55	0.000409	2.45	635.16	189.18	0.18	
Reid Branch Trib	656.48	2-Yr	622.00	593.72	598.43		598.61	0.002317	3.62	199.36	107.61	0.37	
Reid Branch Trib	566.51	100-Yr	1951.50	593.79	603.03	598.10	603.11	0.000336	2.42	1045.21	328.73	0.16	
Reid Branch Trib	566.51	25-Yr	1478.30	593.79	602.28	597.48	602.35	0.000318	2.18	824.25	268.60	0.15	
Reid Branch Trib	566.51	10-Yr	1168.60	593.79	601.45	597.03	601.51	0.000362	2.12	624.12	213.33	0.16	
Reid Branch Trib	566.51	2-Yr	622.00	593.79	598.28	596.13	598.45	0.001319	3.29	189.34	81.64	0.30	
Reid Branch Trib	533.93	Culvert										100-Year Depth Over Top Road 600.50	Road 2.53
Reid Branch Trib	518.66	100-Yr	1951.50	593.22	599.95	597.45	600.66	0.002825	6.74	289.51	152.61	0.47	
Reid Branch Trib	518.66	25-Yr	1478.30	593.22	599.35	596.79	599.85	0.002254	5.64	262.25	107.38	0.41	
Reid Branch Trib	518.66	10-Yr	1168.60	593.22	598.85	596.33	599.22	0.001915	4.89	239.17	86.43	0.38	
Reid Branch Trib	518.66	2-Yr	622.00	593.22	597.61	595.38	597.79	0.00133	3.40	182.77	62.05	0.30	
Reid Branch Trib	485.57	100-Yr	1951.50	593.04	600.04		600.37	0.003236	4.94	469.40	165.38	0.39	
Reid Branch Trib	485.57	25-Yr	1478.30	593.04	599.38		599.65	0.00308	4.38	376.04	120.39	0.37	
Reid Branch Trib	485.57	10-Yr	1168.60	593.04	598.83		599.07	0.003195	4.08	312.89	110.58	0.37	
Reid Branch Trib	485.57	2-Yr	622.00	593.04	597.52		597.71	0.004125	3.51	183.90	87.17	0.39	
Reid Branch Trib	331.24	100-Yr	1975.00	591.43	599.45		599.76	0.004766	4.53	451.20	137.61	0.38	
Reid Branch Trib	331.24	25-Yr	1493.00	591.43	598.80		599.06	0.004716	4.09	368.68	118.24	0.37	
Reid Branch Trib	331.24	10-Yr	1180.00	591.43	598.26		598.48	0.004594	3.77	312.98	91.92	0.36	
Reid Branch Trib	331.24	2-Yr	629.00	591.43	596.90		597.06	0.004245	3.13	201.00	73.57	0.33	
Reid Branch Trib	31.74	100-Yr	1995.10	587.99	597.15	595.89	597.74	0.010011	6.75	363.58	131.59	0.52	
Reid Branch Trib	31.74	25-Yr	1508.10	587.99	596.52	595.30	597.05	0.010016	6.21	287.12	111.81	0.51	
Reid Branch Trib	31.74	10-Yr	1192.00	587.99	596.02	594.76	596.49	0.010007	5.75	235.03	94.08	0.50	
Reid Branch Trib	31.74	2-Yr	634.2	587.99	594.85	593.30	595.17	0.01	4.62	143.41	64.06	0.47	



City of Lucas

Lynn Lane Crossing Reid Branch Tributary 1

Proposed (3) 10' x 5' Boxes

**EXHIBIT C-8**  
**STANDARD TABLE 1 COMPARISON**

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl	Prop - Existing (ft)
Reid Branch Trib	843.95	100-Yr	1951.50	595.49	602.62		602.73	0.00113	3.25	853.89	368.71	0.25	-0.52
Reid Branch Trib	843.95	25-Yr	1478.30	595.49	601.61		601.76	0.001928	3.66	541.98	248.07	0.32	-0.78
Reid Branch Trib	843.95	10-Yr	1168.60	595.49	600.51		600.81	0.005314	4.93	306.05	188.40	0.50	-1.05
Reid Branch Trib	843.95	2-Yr	622.00	595.49	599.11	599.11	599.81	0.01901	6.79	98.13	83.03	0.88	0.00
Reid Branch Trib	656.48	100-Yr	1951.50	593.72	602.51		602.62	0.00055	3.16	845.65	221.25	0.21	-0.55
Reid Branch Trib	656.48	25-Yr	1478.30	593.72	601.48		601.59	0.000654	3.10	634.96	189.12	0.22	-0.83
Reid Branch Trib	656.48	10-Yr	1168.60	593.72	600.31		600.44	0.001006	3.32	441.43	149.71	0.27	-1.17
Reid Branch Trib	656.48	2-Yr	622.00	593.72	598.18		598.42	0.00331	4.08	173.38	100.09	0.44	-0.25
Reid Branch Trib	566.51	100-Yr	1951.50	593.79	602.47	597.76	602.57	0.000453	2.70	891.04	282.35	0.19	-0.56
Reid Branch Trib	566.51	25-Yr	1478.30	593.79	601.43	597.14	601.53	0.000531	2.61	637.82	212.45	0.20	-0.85
Reid Branch Trib	566.51	10-Yr	1168.60	593.79	600.10	596.69	600.34	0.001061	3.95	295.52	111.10	0.28	-1.35
Reid Branch Trib	566.51	2-Yr	622.00	593.79	598.07	595.77	598.22	0.001191	3.18	195.50	78.40	0.28	-0.21
Reid Branch Trib	533.93	Culvert										Top Road 600.50	Road 1.97
Reid Branch Trib	518.66	100-Yr	1951.50	593.22	599.96	597.31	600.64	0.002632	6.59	296.24	153.19	0.46	0.01
Reid Branch Trib	518.66	25-Yr	1478.30	593.22	599.36	596.65	599.83	0.002088	5.50	268.80	107.75	0.40	0.01
Reid Branch Trib	518.66	10-Yr	1168.60	593.22	598.85	596.19	599.20	0.001763	4.76	245.61	86.67	0.36	0.00
Reid Branch Trib	518.66	2-Yr	622.00	593.22	597.62	595.25	597.78	0.001187	3.28	189.44	62.17	0.28	0.01
Reid Branch Trib	485.57	100-Yr	1951.50	593.04	600.04		600.37	0.003236	4.94	469.40	165.38	0.39	0.00
Reid Branch Trib	485.57	25-Yr	1478.30	593.04	599.38		599.65	0.00308	4.38	376.04	120.39	0.37	0.00
Reid Branch Trib	485.57	10-Yr	1168.60	593.04	598.83		599.07	0.003195	4.08	312.89	110.58	0.37	0.00
Reid Branch Trib	485.57	2-Yr	622.00	593.04	597.52		597.71	0.004125	3.51	183.90	87.17	0.39	0.00
Reid Branch Trib	331.24	100-Yr	1975.00	591.43	599.45		599.76	0.004766	4.53	451.20	137.61	0.38	0.00
Reid Branch Trib	331.24	25-Yr	1493.00	591.43	598.80		599.06	0.004716	4.09	368.68	118.24	0.37	0.00
Reid Branch Trib	331.24	10-Yr	1180.00	591.43	598.26		598.48	0.004594	3.77	312.98	91.92	0.36	0.00
Reid Branch Trib	331.24	2-Yr	629.00	591.43	596.90		597.06	0.004245	3.13	201.00	73.57	0.33	0.00
Reid Branch Trib	31.74	100-Yr	1995.10	587.99	597.15	595.89	597.74	0.010011	6.75	363.58	131.59	0.52	0.00
Reid Branch Trib	31.74	25-Yr	1508.10	587.99	596.52	595.30	597.05	0.010016	6.21	287.12	111.81	0.51	0.00
Reid Branch Trib	31.74	10-Yr	1192.00	587.99	596.02	594.76	596.49	0.010007	5.75	235.03	94.08	0.50	0.00
Reid Branch Trib	31.74	2-Yr	634.20	587.99	594.85	593.30	595.17	0.01	4.62	143.41	64.06	0.47	0.00



# City of Lucas

## City Council Agenda Request

### January 20, 2022

Item No. 07

Requester: Public Works Director Scott Holden  
Development Services Director Joe Hilbourn

#### **Agenda Item Request**

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Receive the Limited Bridge Evaluation Report for the Winningkoff Bridge from BCC Engineering, LLC dated December 2021 and provide direction to the City Manager.

#### **Background Information**

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In July 2019, BCC Engineering completed a structural inspection bridge report of the Winningkoff bridge. The report was a complete overview of the condition of the bridge that included structural elements. During that inspection, BCC Engineering noted that the approach slabs were undermined and needed emergency repairs to secure them. The emergency repair secured the approach slabs and made them safe. BCC Engineering also recommended revetment (protection with riprap) to reduce chances for future erosion (same thing happening again). No action has been taken to protect the emergency repair and the recommendation will remain to protect the approaches.

August 5, 2021, the City Council authorized BCC Engineering to conduct a bridge survey and create a report covering bridge safety and ride quality. The resulting bridge survey and report from BCC recommended analyzed the following alternatives:

- Alternative 1: Maintain existing condition - \$0.00
- Alternative 2: Long-Term Scour Protection - \$32,000.00 - 1 month to complete project
- Alternative 3: Bridge and Roadway Repairs - \$400,000.00 - 8 months to complete project
- Alternative 4: Bridge Replacement - \$4,300,000.00 - 24 months to complete project

BCC is recommending Alternative 3 which can be undertaken at a future time, if desired.

While BCC was completing the Winningkoff Bridge Limited Bridge Evaluation Report, City Staff was evaluating how to protect the emergency foam repair. City staff consulted with Four Star Excavation, Inc. and determined that a concrete footing (shield) could be installed to protect the existing structural foam repair and received a quote from Four Star Excavation, Inc. in the amount of \$10,300.

#### **Attachments/Supporting Documentation**

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1. Limited Bridge Evaluation Report dated December 2021
2. Estimate from Four Star Excavation, Inc. dated December 31, 2021



# City of Lucas

## City Council Agenda Request

### January 20, 2022

#### **Budget/Financial Impact**

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Since the report shows the bridge is structurally sound, Staff is planning to proceed with authorizing Four Star Excavation, Inc. to construct a concrete footing (shield) to protect the existing structural foam repair in the amount of \$10,300 to be expensed to line item 11-8209-301 (Improvement Roads with an unencumbered balance of \$246,000) for the purpose of protecting the existing structural repair on the Winningkoff Bridge.

#### **Recommendation**

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Staff has no additional recommendations.  
BCC is recommending Alternative 3 which can be undertaken at a future time, if desired.

#### **Motion**

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NA

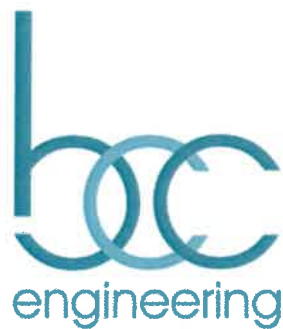
# LIMITED BRIDGE EVALUATION REPORT

## Winningkoff Bridge over White Rock Creek City of Lucas

Prepared for:  
City of Lucas



Prepared by:  
BCC Engineering, LLC



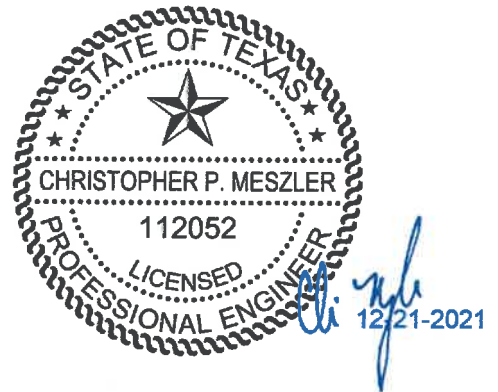
December 2021

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**APPENDICES**

- APPENDIX A: Alternatives Comparison Matrix
- APPENDIX B: Existing Bridge Inspection Report (2019)
- APPENDIX C: References
- APPENDIX D: As-Built Plans
- APPENDIX E: Field Inspection Photos



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**1. EXECUTIVE SUMMARY**

BCC Engineering, LLC has prepared this Limited Bridge Evaluation report for Winningkoff Bridge over White Rock Creek. The purpose of this Limited Bridge Evaluation Report is to provide an evaluation of the current Winningkoff Bridge condition over White Rock Creek regarding the ride quality, approach slab protection, and long-term scour protection. It is not the intent for this report to define the precise geometry of all structural elements, but rather to provide information in sufficient detail to fairly assess the current conditions stated and provide various alternatives and recommendations.

Winningkoff Road crosses White Rock Creek approximately 0.10 mile south of Blondy Jhune Road within the City of Lucas located in Collin County, Texas.

In July of 2019, a bridge inspection report was performed and advised immediate repairs to the severely undermined approach slabs which has settled and rotated.

In August of 2020, an emergency repair was performed to fill the voids under the approach slab. Structural foam was injected to secure the approaches. Roadway pavement planing was performed to slightly improve the ride quality at the discontinuous joint between the concrete roadway pavement and concrete approach slab. The joint material was also replaced at both approaches.

Vehicles traveling across the Winningkoff Bridge are experiencing a bumpy ride and a hard dip at the end of the approach slabs both north and south of the bridge. The dips at the end of both approach slabs transitioning into the roadway concrete pavement were caused by two factors. The first contributing factor is suspected to be the poor soil and high plasticity clays under the roadway concrete pavement that caused the pavement adjacent to the north approach slab to heave. The second contributing factor was the erosion under both approach slabs that allowed them to settle and rotate. These two contributing factors, combined, create an uneven riding surface, hence the dips.

This limited report provides the needs, evaluation criteria, alternatives, cost, duration and recommendation. A summary of the alternatives is shown in table below:

<b>Alternatives</b>	<b>Estimated Construction Cost</b>	<b>Estimated Construction Duration</b>
Alternative 1: Do-Nothing	\$0.00	0 months
Alternative 2: Long-Term Scour Protection	\$32,000.00	1 months
Alternative 3: Bridge and Roadway Repairs	\$400,000.00	8 months
Alternative 4: Bridge Replacement	\$4,300,000.00	24 months

Note: Estimated construction cost as of 2021. Cost may differ in future years.

Our recommendation is Alternative 3. However, if Alternative 3 is not feasible, Alternative 2 is the absolute minimum.

## **2. INTRODUCTION**

The purpose of this Limited Bridge Evaluation Report is to provide an evaluation of the current Winningkoff Bridge condition over White Rock Creek regarding the ride quality, approach slabs protection, and long-term scour protection. It is not the intent for this report to define the precise geometry of all structural elements, but rather to provide information in sufficient detail to fairly assess the current conditions stated and provide various alternatives and recommendations.

### **2.1. Project Location**

The project involves the evaluation of the current bridge at Winningkoff Road over White Rock Creek located in the City of Lucas, Collin County, Texas. See Figure 1 – Project Location Map.



**Figure 1 – Project Location Map**



## **2.2. Project Background**

Winningkoff Road crosses White Rock Creek approximately 0.10 mile south of Blondy Jhune Road and approximately 1 mile west of Lavon Lake within the City of Lucas located in Collin County, Texas. The existing bridge is comprised of a three-span concrete bridge and 120 feet long. The bridge was constructed in 2000. The bridge has a roadway width of 28-feet and carries two lanes of traffic with no shoulder width on either side and a 7.75-foot bridal path on the east side of the bridge. The approach roadway is comprised of concrete pavement of 28-feet at both the north and south approaches.

Based on an inspection report performed on July 11, 2019 (refer to Appendix B), the inspection rating for concrete pan girders and substructure are 7 and 6, respectively, with a sufficiency rating of 90 (rated by NBIS procedure). The field inspection found the following major deficiencies 2019:

- Approach slabs have been undermined severely causing settling and rotation
- Expansion joint seal material is worn
- Bank erosion and scour have exposed top of east drilled shaft at north interior bent
- No thrie beam or blockout

In August of 2020, an emergency repair was performed to fill the voids under the approach slab. Structural foam was injected to secure the approaches. The roadway pavement planning was performed to slightly improve the ride quality at the discontinuous joint between the concrete roadway pavement and concrete approach slab. The joint material was also replaced at both approaches.

A topographic survey of the bridge was conducted in August of 2020 to facilitate further evaluation of the ride quality.

Existing condition photos taken in September of 2021, are shown below.



**S. Approach - Looking North**



**N. Approach - Looking South**



**Winningkoff Bridge over White Rock Creek  
Limited Bridge Evaluation Report**

---



**SW Corner / S. Approach Slab**



**SE Corner / S. Approach Slab**



**NW Corner / N. Approach Slab**



**NE Corner / N. Approach Slab**



**Joint - S. Approach Slab**



**Joint - N. Approach Slab**

### 3. EVALUATION CRITERIA

#### Ride Quality

Vehicles traveling across the Winningkoff Bridge are experiencing a bumpy ride and a hard dip at the end of the approach slabs both north and south of the bridge. The dips at the end of both approach slabs transitioning into the roadway concrete pavement were caused by two factors. The first contributing factor is suspected to be the poor soil and high plasticity clays under the roadway concrete pavement that caused the pavement adjacent to the north approach slab to heave. The second contributing factor was the erosion under both approach slabs that allowed them to settle and rotate. These two contributing factors, combined, create an uneven riding surface, hence the dips. See Figure 2 below for the existing vertical profile and where the dips are located.

Existing Vertical Profile of Winningkoff Road is shown in Figure 2 – Existing Vertical Profile below.

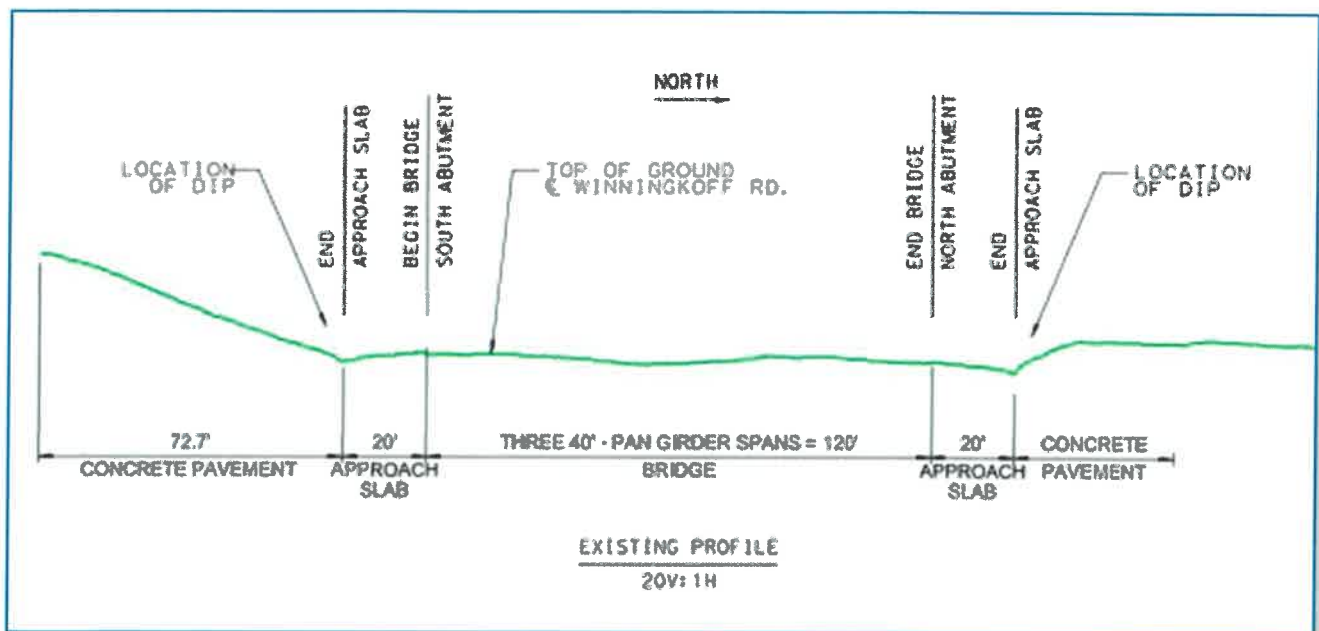


Figure 2 – Existing Vertical Profile

Ride quality for pavement surfaces were measured and evaluated using “Surface Test Type A” method in accordance with the Texas Department of Transportation (TxDOT) Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges (November 2014). This method tested the surfaces with a 10-foot straightedge and a measuring tape to measure the depth between two points. The allowable depth is 1/8-inch. A total of twelve measurements were performed with 4 at the south of the bridge where the asphalt pavement transition to concrete pavement, 4 at the end of the south Approach Slab and 4 at the end of the north Approach Slab (refer to Appendix E for photos). Based on the field measurements, all twelve measurements exceeded the 1/8-inch allowable limit. See table below for summary of measurements.

**Winningkoff Bridge over White Rock Creek  
Limited Bridge Evaluation Report**

Field measurements summary is shown in **Table 1 – Field Measurements Summary** below.

Photo #	Location Description	Field Measurement
	<b>Allowable Limit (Surface Test Type A)</b>	<b>1/8"</b>
1	Center of SB Lane/ Asphalt to Concrete Pavement Transition at South of Bridge	1"
2	Left Wheel Line of SB Lane/ Asphalt to Concrete Pavement Transition at South of Bridge	1/2"
3	Center of NB Lane/ Asphalt to Concrete Pavement Transition at South of Bridge	1 1/4"
4	Left Wheel Line of NB Lane/ Asphalt to Concrete Pavement Transition at South of Bridge	1 1/8"
5	Center of SB Lane / End of South Approach Slab	1 7/8"
6	Left Wheel Line of SB Lane / End of South Approach Slab	1 1/2"
7	Center of NB Lane / End of South Approach Slab	1"
8	Left Wheel Line of NB Lane / End of South Approach Slab	1"
9	Center of SB Lane / End of North Approach Slab	1 3/4"
10	Left Wheel Line of SB Lane / End of North Approach Slab	1 7/8"
11	Center of NB Lane / End of North Approach Slab	1 3/4"
12	Left Wheel Line of NB Lane / End of North Approach Slab	1 3/4"

**Table 1 – Field Measurements Summary**

The existing vertical profile has changed since construction in 2000. The original vertical profile (refer to Appendix D for As-Built) was compared with the current vertical profile for additional reference. See figure 3 below for the comparison of the original vertical profile and current vertical profile.



Comparison of the original as-built vertical profile to current vertical profile is shown in Figure 3 – As-Built and Current Vertical Profile Comparison.

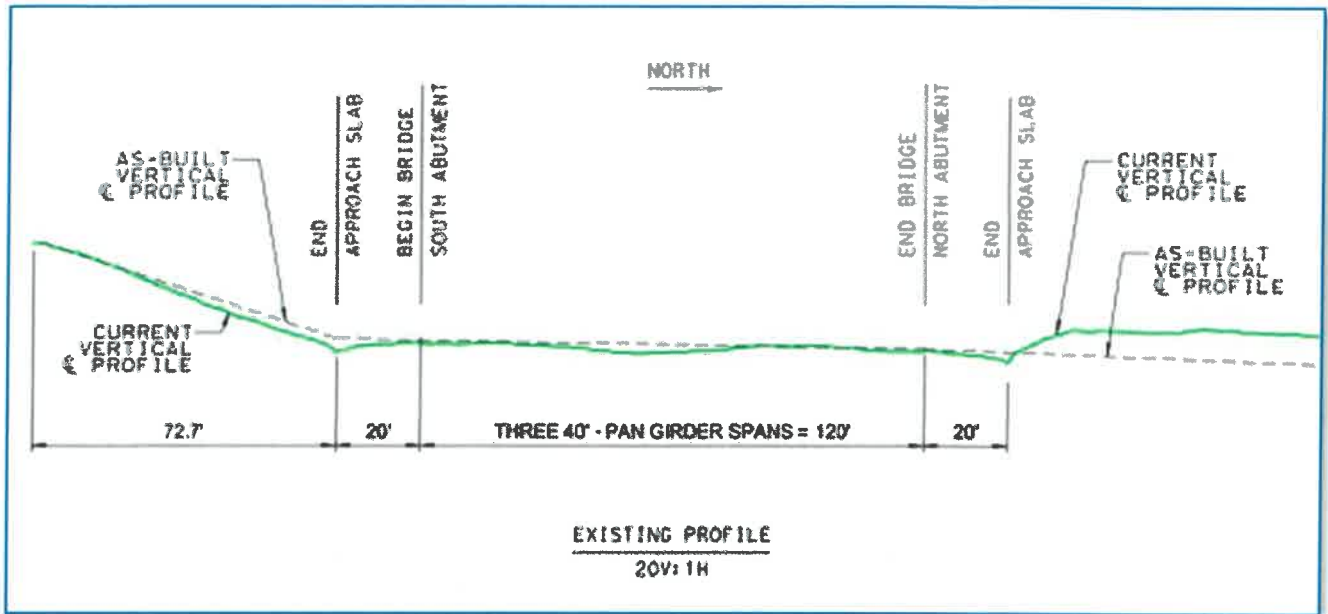


Figure 3 – As-Built and Current Vertical Profile Comparison

#### Approach Slabs Protection

Approach slabs were visually inspected. The end of both approach slabs where they jointed with the adjacent concrete pavement, have been grinded down to provide a better transition during an emergency repair. In addition, expansion joint sealant installed just over 1-year ago has failed or is failing.

#### Long-Term Scour Protection

At the time of this report, the erosion protection recommended by the 2019 inspection report has not been placed. All four sides of the slabs were exposed and not protected. The scour at the intermediate bent, exposing the drilled shafts, has increased.

#### Bridge Evaluation

At the time of this report, the bridge did not show any major changes since the 2019 inspection report. However, minor deteriorates such as crack or spalls are common as the bridge approaches its design life span. Based on our limited field observations, the bridge appears to be structurally sound. However, a full in-depth bridge inspection should be performed for a more accurate evaluation of the bridge. A updated bridge inspection report may be available to the City from TxDOT as it is likely inspected by them biannually.

#### 4. ALTERNATIVES ANALYSIS

##### *Alternative 1 – Do Nothing*

A do-nothing alternative was investigated. This alternative does not address the riding quality, approach slab protection, or long-term scour protection. Instead, it may allow further deterioration of the bridge and approaches from heavy vehicle impacts from the uneven approach slab and bridge and will likely allow further erosion.

##### *Alternative 2 – Long-term Scour Protection*

Long-Term Scour Protection was recommended in 2019 following the bridge inspection by placing riprap at all four corners of the bridge and at the intermediate bent. This alternative does not address the riding quality but does address the approach slab protection and long-term scour protection.

##### *Alternative 3 – Bridge and Roadway Repairs*

Bridge repairs will include reconstruction of both approach slabs, joints, riprap at all four corners of the bridge, and at the intermediate bents. Roadway repair will include reconstruction the concrete pavement at both south and north of the approaches, which includes removal and/or treatment of poor roadbed soils. This alternative addresses the ride quality, approach slab protection, and long-term scour protection.

##### *Alternative 4 – Bridge Replacement and Roadway improvements from Snider Lane to Orr Road*

A bridge replacement and roadway improvements from Snider Lane to Orr Road alternative was investigated. The limits of the roadway improvements from Snider Lane to Orr Road was set because it is a potential future phase of reconstructing the Winningkoff road corridor.

The advantages of a bridge replacement will improve the flat profile on the bridge by raising it higher. With the replacement of Blondy Jhune Bridge over White Rock Creek few years ago, a restriction upstream of Winningkoff was removed and the water discharging into Winningkoff Bridge appeared to be increased. This will make a great opportunity to improve the hydraulic opening to prevent future flooding within the vicinity of Winningkoff Bridge. In addition, substandard guardrail attachments and missing blockouts can be eliminated by providing the proper bridge railing end treatments. An opportunity to reduce the guardrail length and improve drainage is also presented with roadway and roadside improvements.

See Appendix A for an alternative comparison matrix.

## 5. ESTIMATED CONSTRUCTION COST & DURATION COMPARISON

The following table below summarizes the alternatives by the overall estimated construction cost for each alternative.

Alternatives	Estimated Construction Cost	Estimated Construction Duration
<b>Alternative 1: Do-Nothing</b>	\$0.00	0 months
<b>Alternative 2: Long-Term Scour Protection</b>	\$32,000.00	1 months
<b>Alternative 3: Bridge and Roadway Repairs</b>	\$400,000.00	8 months
<b>Alternative 4: Bridge Replacement and Roadway Improvements</b>	\$4,300,000.00	24 months

Note: Estimated construction cost as of 2021. Cost may differ in future years.

## 6. RECOMMENDATION

Alternative 1 is strongly not recommended as it does not protect the asset and may reduce the useful life of the bridge.

Alternative 2 is considered a minimum for deferred maintenance to the near future. This alternative does provide approach slabs protection and long-term scour protection. This alternative does not improve ride quality and it does not limit the potential for further degradation of the roadway approaches.

Alternative 3 is the most suitable and recommended as it is second most economical and second shortest construction duration. Alternative 3 provides solutions to current deficiencies, protects the asset from future accelerated deterioration, and will improve the ride quality, in the area of the bridge, to current standards. This solution limits the potential of future roadway/bridge approach degradation by removing and/or treating poor soils under the existing roadway. Regardless of alternative exercised, the addition of scour protection and maintenance repairs to deficient or deteriorating items found in the bridge inspection report are highly recommended to preserve the asset.

Alternative 4 would be the ideal solution providing the smoothest ride quality for the entire corridor, maximize the service life of the bridge, and provide better flood resilience. This option produces a long-term solution and vastly improves and completes the recent reconstruction of the corridor. This option is only considered if it were incorporated into the City's Capital Improvement Program at a time where the would be at the end of its useful design life. Alternative 4 is not recommended for immediate implementation due to the substantial cost and time savings provided by alternative 3.

# **APPENDIX A: Alternative Comparison Matrix**

**Winningkoff Bridge over White Rock Creek  
Alternatives Comparison Matrix**

<b>Categories</b>	<b>Alternative 1 Do-Nothing</b>	<b>Alternative 2 Long-Term Scour Protection</b>	<b>Alternative 3 Bridge and Roadway Repairs</b>	<b>Alternative 4 Bridge Replacement</b>
Improved Ride Quality	No	No	Yes	Yes
Protect Approach Slabs	No	Partially	Yes	Yes
Long-Term Scour Protection	No	Partially	Yes	Yes
Limit Future Deterioration	No	Partially	Yes	Yes
<b>Risk Rating if Selected</b>	<b>High Risk</b>	<b>Moderate Risk</b>	<b>Low Risk</b>	<b>Low Risk</b>
	<i>Poor Ride Quality Remains</i>	<i>Poor Ride Quality Remains</i>		
	<i>High Potential for Approach Slabs Deterioration</i>	<i>Low Potential for Approach Slabs Deterioration</i>		
	<i>High Potential for Additional Erosion</i>	<i>Future Erosion Minimized</i>		
	<i>Vehicle Impact Loading on Bridge Deck</i>	<i>Vehicle Impact Loading on Bridge Deck</i>		
Estimated Construction Cost	\$0	\$32,000	\$400,000	\$4,300,000
Estimated Construction Duration	0 month	1 month	8 month	24 month
Recommendation Ranking	4	2	1	3



# **APPENDIX B: Existing Bridge Inspection Report (2019)**



# BRIDGE SUMMARY SHEET

City: Lucas County: Collin Name: Winningkoff Bridge Structure #: \_\_\_\_\_ Route: Winningkoff Road

Description: 3-Span Concrete Bridge

Feature Crossed: White Rock Creek Inspector's Signature: \_\_\_\_\_ Date: 7/11/19

Company Name and Company Number: \_\_\_\_\_ Lakes Engineering, Inc. F-15243

Selected Component Description and Rating:	Inspection Rating (1085)	Inventory Rating		Operating Rating	
		H	HS	H	HS
Concrete Pan Girder (HS20 Design Load)	7	-	20.0	-	27.0
Concrete Substructure (HS20 Design Load)	6	-	20.0	-	27.0

**Comments and/or Upgrade Recommendations (if applicable):**  
 Approach slabs have been undermined severely causing settling and rotation.  
 Immediate repair action is advised.  
 Sufficiency Rating = 90

**Load Posting Limits for Present Condition (if applicable):**

Inventory	Operating	1	2	3	4	5	6
_____ lbs Gross	_____ lbs Gross	OTHER	R12-2bT	R12-2cT	R12-4Tb	R12-4Tc	W12-5T
_____ lbs Tandem Axle	_____ lbs Tandem Axle		WEIGHT LIMIT AXLE OR TANDEM LBS	WEIGHT LIMIT TANDEM AXLE LBS	WEIGHT LIMITS GROSS LBS AXLE OR TANDEM LBS	WEIGHT LIMITS GROSS LBS TANDEM AXLE LBS	
_____ lbs Axle or Tandem	_____ lbs Axle or Tandem						
_____ Sign Code	_____ Sign Code						

**Posting Recommendation:** \_\_\_\_\_

**Previous Load Posting Recommendations:**

_____ R12-2bT	X	None
_____ R12-2cT		lbs Gross
_____ R12-4Tb		lbs Tandem Axle
_____ R12-4Tc		lbs Axle or Tandem

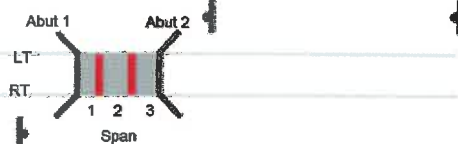
**Observed Load Posting at Bridge:**

_____ R12-2bT	X	None
_____ R12-2cT		lbs Gross
_____ R12-4Tb		lbs Tandem Axle
_____ R12-4Tc		lbs Axle or Tandem

Other (desc): \_\_\_\_\_

**Material Needed**

- \_\_\_\_\_ - R12-2bT
- \_\_\_\_\_ - R12-2cT
- \_\_\_\_\_ - R12-4Tb
- \_\_\_\_\_ - R12-4Tc
- \_\_\_\_\_ - W12-5
- \_\_\_\_\_ - Posts
- \_\_\_\_\_ - Hardware Sets
- \_\_\_\_\_ - Decals



Advanced Warning  
*(optional)*

Bridge Approach

Bridge Approach

Advanced Warning  
*(optional)*

Sign Code				
Condition Code				
Maintenance Need				




- |                           |                          |                        |                           |                        |
|---------------------------|--------------------------|------------------------|---------------------------|------------------------|
| A. Visible & Legible      | D. Improper Position     | G. Sign Missing        | K. Clean Sign             | N. None                |
| B. Obscured by Vegetation | E. Damaged Beyond Repair | H. Sign & Post Missing | L. Reposition Sign        | P. Replace Sign        |
| C. Sign Needs Cleaning    | F. Sign Down             | J. Clear Vegetation    | M. Reposition Sign & Post | S. Replace Sign & Post |

# BRIDGE INSPECTION RECORD

City: Lucas County: Collin Name: Winningkoff Road Bridge Structure #: \_\_\_\_\_ Route: Winningkoff Road

Description: \_\_\_\_\_

Feature Crossed: \_\_\_\_\_ Inspector's Signature: \_\_\_\_\_ Date: 7/18/2019

Company Name and Company Number: Lakes Engineering, Inc. F-15243 Inspector: Christopher Meszler, P.E.

**Ratings Defined:**

- 0 = Failed condition - bridge closed and beyond repair
- 1 = Failing condition - bridge closed but repairable
- 2 = Critical condition - bridge should be closed until repaired
- 3 = Serious condition - deterioration seriously affects structural capacity
- 4 = Poor condition - deterioration significantly affects structural capacity
- 5 = Fair condition - minor deterioration of structural elements (extensive)
- 6 = Satisfactory condition - minor deterioration of structural elements (limited)
- 7 = Good condition - some minor problems
- 8 = Very good condition - no problems noted
- 9 = Excellent condition
- = Not applicable

Enter a rating for each element of each component. Component ratings should equal the lowest rating of any element of the component, except for Deck. The Deck component is independent of its' associated element ratings. Fully supportive comments are to be made hereon or on attachments for all ratings of 7 or below.

General Comment:

**DECK (Item 58)**

Minimum	Description	Rating	Comments
1	Deck - Rating	6	Elements are referred to as follows: numbered south to north, west to east  Previously Noted: (1) Minor longitudinal hairline cracks in bottom of deck (top of pans). - NO CHG. (2) Expansion joint seal material is worn - INCR. (3) Minor spall on north end of west railing - NO CHG.  See additional comments
6	Wearing Surface	-	
6	Joints, Expansion, Open	-	
6	Joints, Expansion, Sealed	5	
6	Joints, Other	-	
6	Drainage System	7	
6	Curbs, Sidewalks & Parapets	7	
6	Median Barrier	-	
6	Railings	7	
7	Railing Protective Coating	8	
7	Delineation (curve Markers)	-	
	Other	-	

**SUPERSTRUCTURE (Item 59)**

Minimum	Description	Rating	Comments
0	Main Members - Steel	-	Previously Noted: (1) See Note (I) in "Deck (item 58)". Minor flexure hairline cracks in pan girders at mid-span. Minor spalls at several girder ends & on bottom of east outside girder at middle span. - NO CHG. (2) Minor hairline cracks in several concrete diaphragms. - NO CHG.  Photo 17: Hairline crack on beams 3, 6, 8, 9, 12 and bent 2 of span 1 (typ.)  See additional comments
0	Main Members - Concrete	7	
0	Main Members - Timber	-	
0	Main Members - Connections	-	
1	Floor System Members	-	
1	Floor System Connections	-	
5	Secondary Members	7	
5	Secondary Members Connections	-	
6	Expansion Bearings	8	
6	Fixed Bearings	8	
6	Steel Protective Coating	-	
	Other	-	
	Component Rating	7	

## BRIDGE INSPECTION RECORD

City: Lucas County: Collin Name: Winningkoff Road Bridge Structure #: \_\_\_\_\_ Route: Winningkoff Road

### SUBSTRUCTURE (Item 60)

Minimum	Description	Rating	Comments
0	Abutment Caps	7	Previously Noted: (1) Minor vertical cracks in north abutment cap. - NO CHG. (2) Top of east drilled shaft at north interior bent is exposed due to erosion & scour. - INCR.  Photo 22-23: Bent 2 (looking north) - evidence of flooding; exposed drill shaft from scour 13" (Typ.)  Photo 25-27: Abutment 2 - 7' x 1" crack along slope pavement (recommend seal); Slope Pavement setting away from abutment about 7/8" (recommend Seal)
0	Above Ground	-	
0	Below Ground or Foundation	8	
0	Backwalls and Wingwalls	8	
0	Intermediate Supports		
	Caps - Concrete	8	
	Caps - Steel	-	
	Caps - Timber	-	
	Above Ground - Concrete	8	
	Above Ground - Steel	-	
	Above Ground - Timber	-	
	Above Ground - Masonry	-	
	Below Ground or Foundation	6	
5	Collision Protection System	-	
6	Steel Protective Coating	-	
	Component Rating	6	

### CHANNEL (Item 61)

Minimum	Description	Rating	Comments
0	Channel Banks	7	Previously Noted: (1) Minor bank erosion & scour have exposed top of east drilled shaft at north interior bent. - INCR.
0	Channel Bed	7	
5	Rip Rap, Toe Walls and Aprons	6	
5	Dikes	-	
5	Jetties	-	
	Other	-	
	Component Rating	6	

### CULVERTS (Item 62)

Minimum	Description	Rating	Comments
0	Top Slabs	-	
0	Bottom Slab or Footing	-	
0	Abutments & Intermediate Supports	-	
5	Headwalls and Wingwalls	-	
	Other	-	
	Component Rating	N	

## BRIDGE INSPECTION RECORD

City: Lucas County: Collin Name: Winningkoff Road Bridge Structure #: \_\_\_\_\_ Route: Winningkoff Road

### APPROACHES (Item 65)

Minimum	Description	Rating	Comments
0	Embankments	7	Previously Noted: (1) Minor erosion at bridge corners has slightly undermined edge of approach slabs. - INCR. (2) Relief joints seal material is worn. -INCR (3) Horizontal curves at approaches limit sight distance. - NO CHG.
4	Embankment Retaining Walls	-	
5	Slope Protection	4	
5	Roadway	6	
6	Relief Joints	6	
6	Drainage	7	
6	Guardfence	7	
7	Delineation	-	
7	Sight Distance	7	
	Other	-	
	Component Rating	4	

### MISCELLANEOUS

Minimum	Description	Rating	Comments
7	Signs	-	
7	Illumination	-	
7	Warning Devices	-	
7	Utility Lines	-	
	Other	-	

### TRAFFIC SAFETY (Item 36)

Description	Rating	Comments
Bridge Railing (036.1)	1	Previously Noted: (1) No thrie beam. No blockouts - NO CHG. (2) Turndowns - NO CHG.
Transitions (036.2)	0	
Approach Guardrail (036.3)	1	
Approach Guardrail Ends (036.4)	0	
		General condition: substandard guardrail end treatment (both approaches)

### APPRAISAL RATINGS

Description	Rating	Comments
Waterway Adequacy (071)	6	
Approach Roadway Alignment (072)	6	

## BRIDGE INSPECTION RECORD ADDITIONAL COMMENTS

City: Lucas County: Collin Name: Winningkoff Road Bridge Structure #: \_\_\_\_\_ Route: Winningkoff Road

Description: Double Barrel Steel Pipe Culvert

Feature Crossed: Muddy Creek Inspector's Signature: \_\_\_\_\_ Date: 7/11/2019

Company Name and Company Number: Lakes Engineering, Inc. F-15243 Inspector: Christopher Meszler, P.E.

### DECK (Item 58)

Photo Num.	Comments
4	Southwest corner approach slab settled 1" (likely resulting from the slab rotating at the expansion joint)
5	Southeast approach slab settled ½"
6	3'-6' Transverse cracking caused by approach slab settling
7	Approach slab settled 1" at roadway
8	Approach slab settled 1-1/2" at northwest corner of approach roadway
-	Approach Slab 2 - 2 1/2" settling of southeast corner
9	Approach Slab 2 - Approach slab 1 rotated up ½" at end bridge southeast corner
10	Left Railing (Span 1) - 0.035" + 27" crack left railing span 1 at 12'
11	Deck (right side) - Shrinkage cracking along deck (Typ.)
12	Deck (Span 1) - Scupper clogged mid span
13-14	Approach Slab 2 (Northwest Corner) - Scour and undermining both sides; At least 8' of undermining at the approach slab
15-16	Approach Slab 2 (Northeast Corner) - Northeast corner approach undermined (Typical both approach slabs, both sides); At least 13' of undermining under approach slab of northeast corner

### SUPERSTRUCTURE (Item 59)

Photo Num.	Comments
18	Longitudinal crack under deck between beams 8 and
19	Span 2 (looking north) - Small spall mid span of beam 10
20	6" X 3" X 1" spall at 7' from span 2
21	Span 3 (looking north) - longitudinal cracking under deck span 3 (typ.)



01: Elevation – West View





02: Approach – Southbound



**03: Approach – Northbound**





**04: Approach Slab 1 – Southwest Corner**



**Southwest corner approach slab settled 1"**

**05: Approach Slab 1 – Southwest Corner**



**Southeast approach slab settled 1/2"**

**06: Approach Slab 2 – Northwest Corner**



**3'-6' Transverse cracking caused by approach slab settling on roadway**

**07: Approach Slab 2 – Northeast Corner**



**Approach slab settled 1" at roadway**

08: Approach Slab 2 – Northwest Corner



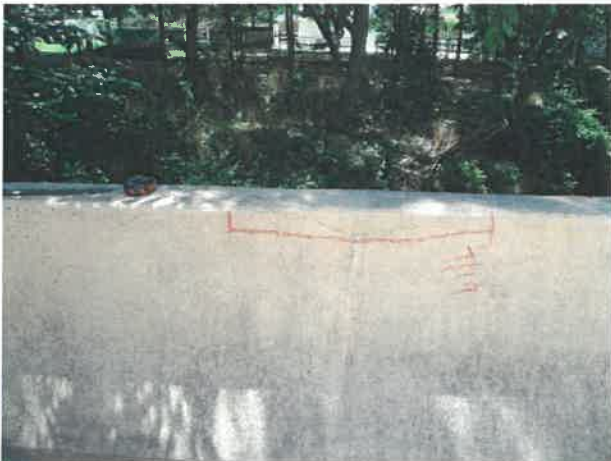
Approach slab settled 1-1/2" at northwest corner of approach roadway

09: Approach Slab 2 – Northeast Corner



Approach slab 1 rotated up 1/2" at end bridge southeast corner

10: Left Railing – Span 1



0.035" + 27" crack left railing span 1 at 12'

11: Deck – Right Side



Shrinkage cracking along deck (Typ.)

12: Deck Span 1 – Midspan



Scupper clogged mid span of span 1

13: Approach Slab 2 – Northwest Corner



Scour and undermining both sides

14: Approach Slab 2 – Northwest Corner



At least 8' of undermining at the approach slab

15: Approach Slab 2 – Northeast Corner



Northeast corner approach undermined (Typical both approach slabs, both sides)



16: Approach Slab 2 – Northeast Corner



At least 13' of undermining under approach slab of northeast corner

17: Span 1



Hairline vertical cracks on beams 3, 6, 8, 9, 12 of span 1 (typ.)

18: Span 1 – Deck between beams 8 and 9



Longitudinal crack bottom of deck between beams 8 and 9

19: Span 2 – Under View – Looking North



**20: Span 2**



**6" X 3" X 1" Spall at beam 10 7' from bent 2**

**21: Span 3 – Under View – Looking North**



**Longitudinal cracking under deck span 3 (Typ.)**

**22: Bent 2 – Looking North**



**Evidence of flooding**

**23: Span 2 – Drilled Shaft**



**Exposed drill shaft from scour 13" (Typ.)**



**24: Abutment 1 – Slope Protection**



Typical – no deficiencies noted

**25: Abutment 2 – Looking Northwest**



**26: Abutment 2 – Northeast Corner**



7' x 1" crack along concrete riprap & starting at abutment

**27: Abutment 2 – Northeast Corner**



Concrete riprap settling away from abutment 7/8"  
(recommend Seal)

28: Channel – Looking West Upstream



Typical – no deficiencies noted

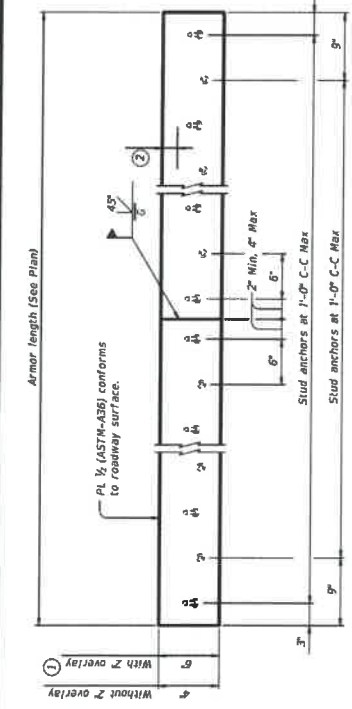
29: East Channel – Looking East Downstream



Typical – Slight bank erosion

# **APPENDIX C: References**

- Adjust 6" splice height for overlay thicknesses other than the 2" shown. Adjust weight by 1.7D pif for each 1/2" variation in thickness.
- Do not paint top 1/2" of plate if using sealed armor joint.
- Set top of backer rod 7" below top of armor plate. Backer rod must be compatible with sealant. Sealant and backer rod cross section is not permitted. Top of backer rod must be convex as shown.
- Black clean entire contact area between sealant and plate (SPFC-SP10) before installing sealant. Remove all oil, dirt, and debris from concrete surfaces in contact with joint sealant before application of silicone seal.
- Use Class 7 joint sealant that conforms to DMS-6310.
- Place sealant while ambient temperature is between 55°F and 80°F and is rising.
- Armor joint does not include joint sealant or backer rod.
- Armor joint (sealed) includes Class 7 joint sealant and backer rod.
- Form vertical top of seal as per the Manufacturer's recommendations. Use Class 4 joint sealant if Class 7 cannot be installed correctly. Install according to Manufacturer's recommendations.
- Unless shown otherwise, terminate armor plate at slab break point if break is more than 2'-0" from slab edge.
- See "Plans of Armor Plates".
- At Fabricator's option, armor plate may extend up to 6" beyond this point for stews through 15°.
- Align shipping angle perpendicular to joint.



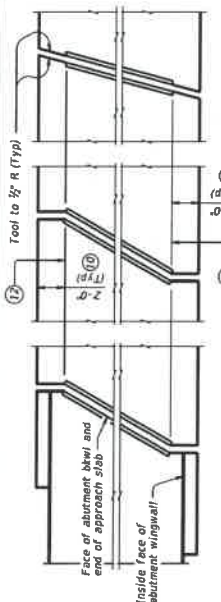
**ELEVATION OF BASIC ARMOR PLATE**

**FABRICATION NOTES:**  
 Match corresponding plate sections and secure together for shipment with shipping angle. Do not use erection bolts. Permitted in each shipping length, provided no plate is less than 2'-0" long and sufficient studs are added to limit the stud to snap splice in the shop.  
 Weld studs in accordance with AWS D1.1.  
 Weld studs for all shop and field butt splices. Grind smooth areas in contact with seal. Make all necessary field splice joint preparations in the shop.  
 Paint the entire steel section, except as stated in Note 2, with System II or IV primer in accordance with Item 446-Field Cleaning and Painting Steel.  
 Provide paints in accordance with Item 446.2. Prepare steel and apply paint in accordance with Items 446.4.2.3 and 446.4.2.4.  
 These joint details accommodate a joint movement range of 1 1/2" opening movement and 1/2" closure movement.

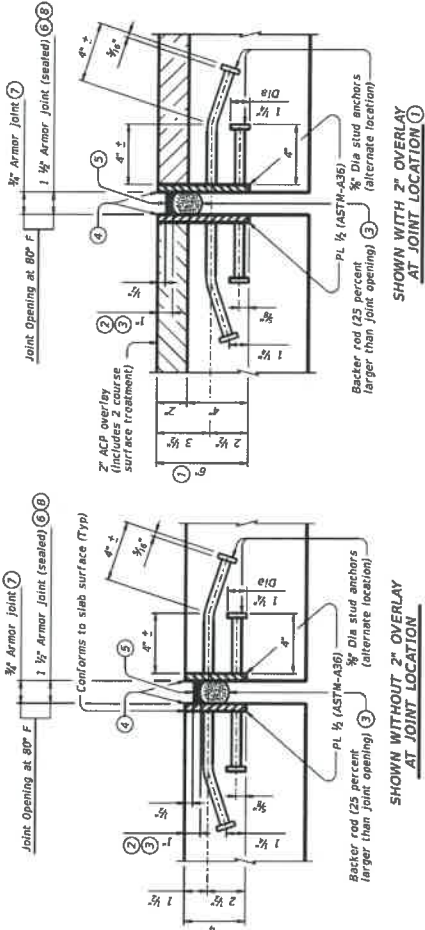
**CONSTRUCTION NOTES:**  
 Position and align by welding braces to adjacent reinforcing steel, to prestressed beam stirrups, or to anchors cast into the concrete. The brace for Armor Joint.  
 Remove shipping angle immediately after each joint half is secured in place. Grind smooth, and touch up with organic zinc-rich paint.  
**GENERAL NOTES:**  
 Provide armor joints at locations shown on the plans. Provide the seal when "Armor Joint (Sealed)" is noted on the plans. Payment for armor joint, with or without seal, is based on length of armor plate.

WEIGHTS FOR ONE ARMOR JOINT (2 PLATES)	
WITHOUT OVERLAY	16.10 pif
WITH 2" OVERLAY	22.90 pif

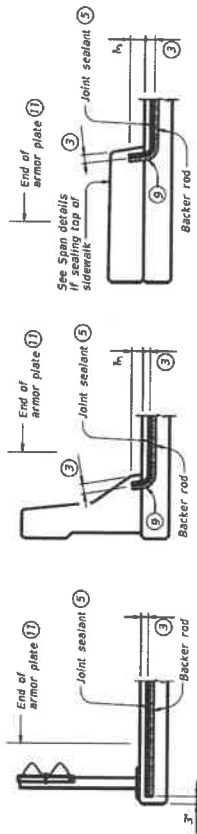
Bridge Division Standard  
 Texas Department of Transportation  
**ARMOR JOINT DETAILS**  
 A J  
 Date: 11/10/09  
 Job No: 2009-010000  
 Revision: 01  
 Scale: 1/4" = 1'-0"  
 Sheet No. 1 of 1



**JOINTS AT ABUTMENTS**  
**SKWEWS OVER 15°**  
**SKWEWS THRU 15°**  
**PLANS OF ARMOR PLATES**



**ARMOR JOINT SECTIONS**  
 Showing Armor Joint (Sealed)



**ARMOR JOINT SECTIONS**  
 Showing Armor Joint (Sealed)

**JOINT SEALANT TERMINATION DETAILS**  
 Armor joint (sealed) only. Armor plate is not shown for clarity.

**SHIPPING ANGLE**  
 An alternate method of securing joint sections may be used if approved by the Bridge Division. Erection bolts are not allowed.

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### APPROXIMATE QUANTITIES (6)

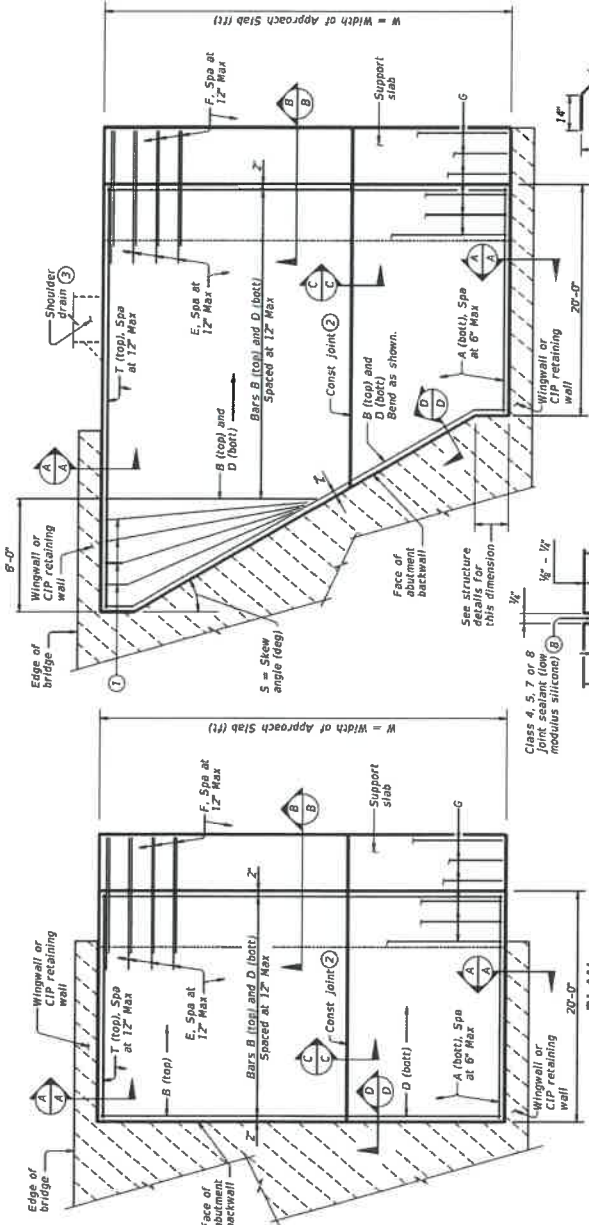
Reinf steel weight = 18.5 Lbs/SF of Approach Slab  
 = 18.4 Lbs/LF of Support Slab  
 Vol of Appr Slab Conc (CY) =  $1.027W \times T + 0.028W \times T \times S$   
 (Includes Support Slab)  
 W = Width of Approach Slab (ft)  
 T = Conc Pavement Thickness (in)  
 S = Stew Angle (deg)

### BAR TABLE

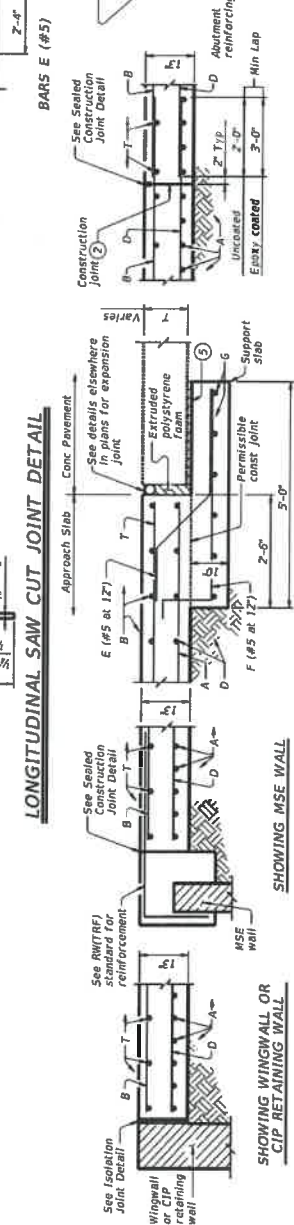
BAR	SIZE
A	#8
B	#5
D	#5
E	#5
F	#5
G	#5
T	#5

- Flare Bars B and D in this region (1'-6" Max Spa, 3" Min Spa). Minimum flare bar length = Z-6". Bend bars as necessary.
- Provide longitudinal construction joints that align with longitudinal construction joints in the bridge slab with bridges built in stages. Other longitudinal construction joints must receive approval of the Engineer.
- See details elsewhere in plans for shoulder drain location and details.
- On portion of support slab that supports the concrete pavement, adjust top surface elevation, if required, to provide a minimum 1% slope. On top of support slab with 60 grade oil and apply heavy coat of powdered graphite. Press down one layer of 20# roofing felt.
- Multiple piece tie bars are acceptable at longitudinal construction joints provided minimum tags shown are achieved.
- See details elsewhere in plans for required cross-slope.
- Place in accordance with Item 438.
- Provide batter rod that is 25% larger than joint opening and compatible with the sealant.
- If bridge rail is present at the wingwall or CIP retaining wall, place by rebounded recycled tire rubber between concrete railing and top of approach slab as shown when concrete railing projects over the approach slab.

**GENERAL NOTES:**  
 Construct approach slab in accordance with Item 422.  
 Provide Class "S" concrete with a minimum compressive strength of Provide Grade 60 reinforcing steel.  
 Provide longitudinal joints as shown on the Longitudinal Saw Cut Joint Detail at lane lines and shoulders when width between 16 feet. Saw cut joints within 24 inches of edges of approach slab exceeds a depth of 1 1/2" and seal in accordance with Item 438. Alternately, provide a controlled joint consisting of 1 1/2" vinyl or plastic joint former (Stress Cap, Zip Strip, Stress Lock, or equal as approved by the Engineer).  
 Provide recycled tire rubber joint filler that meets the requirements of DMS-6310, "Joint Sealants and Fillers".  
 Construct the subgrade or subbase away from the bridge for a minimum distance of 100 feet prior to the approach slab, unless otherwise noted.  
 Compact and finish the subgrade or foundation for the approach slab to the typical cross-section and to the lines end grades shown on the plans, days using wheel or membrane curing per Item 422.  
 All details shown herein are subsidiary to bridge construction.  
 Cover dimensions are clear dimensions unless otherwise noted.  
 Reinforcing bar dimensions shown are out-to-out of bar.



### LONGITUDINAL SAW CUT JOINT DETAIL

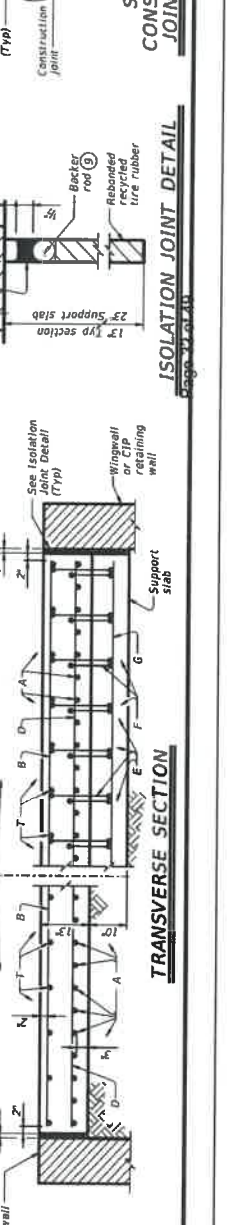


### SECTION A-A

### SECTION B-B

### SECTION C-C

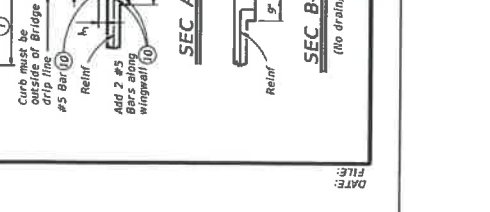
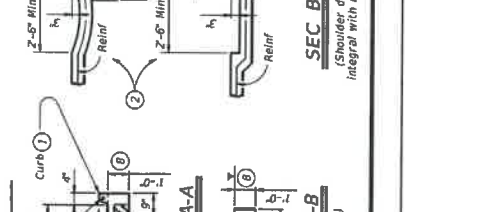
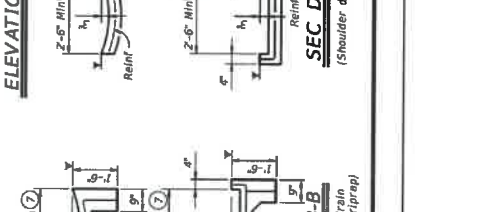
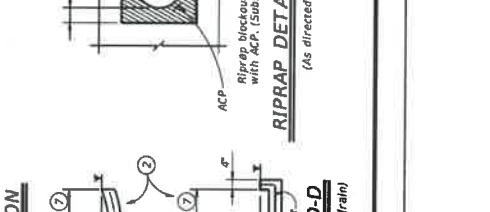
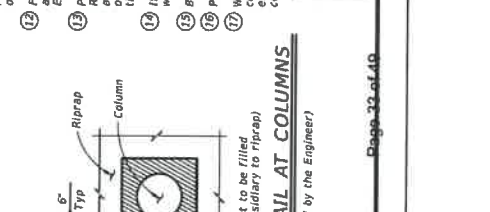
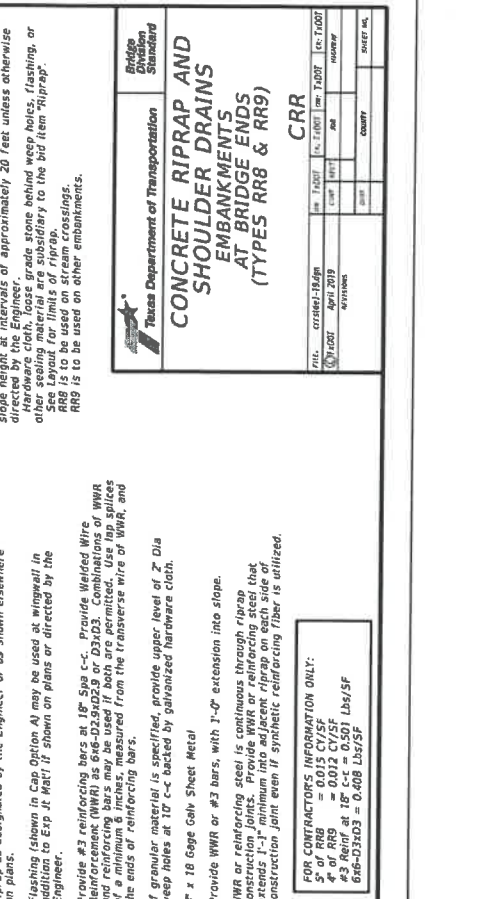
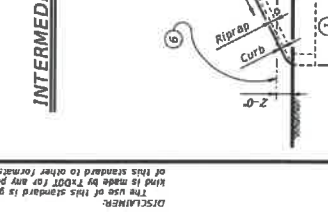
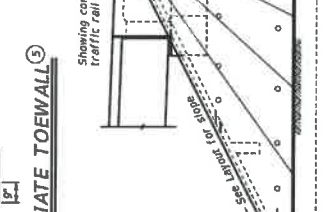
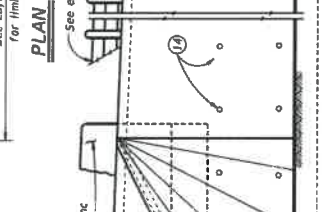
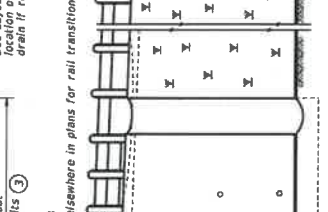
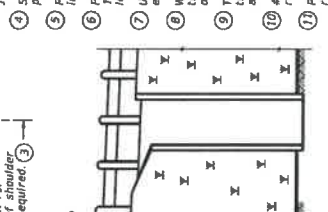
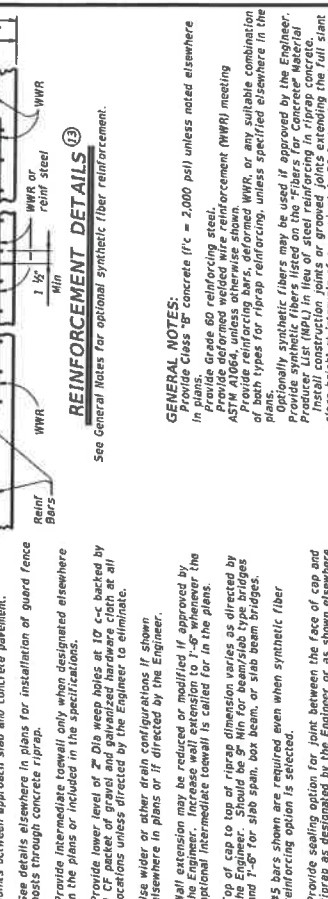
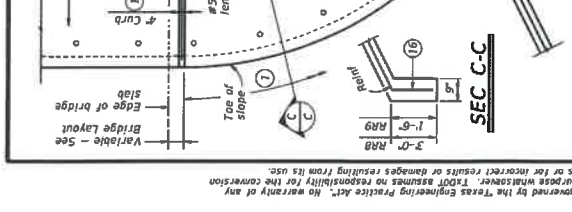
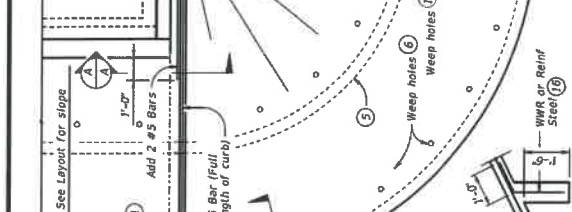
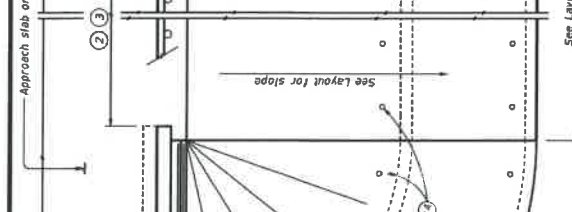
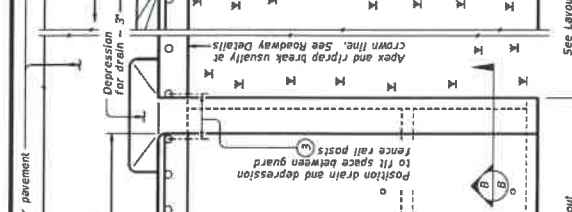
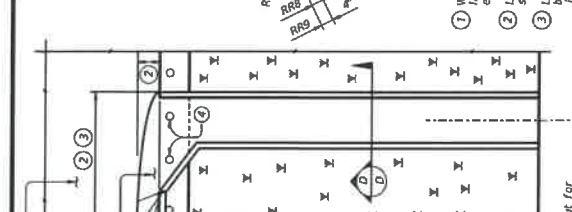
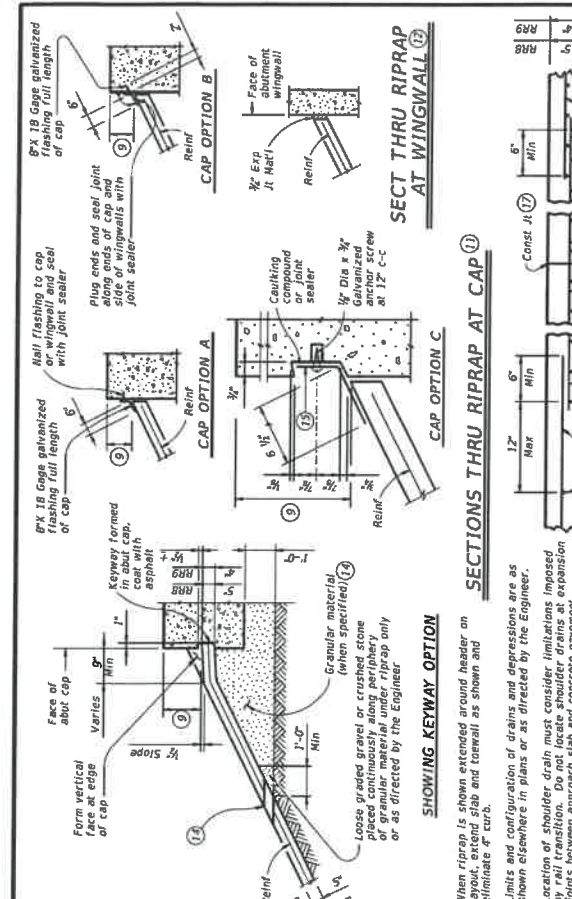
### SECTION D-D



**DISCLAIMER:**  
 The use of this standard is governed by the Texas Engineering Practice Act. No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.

**DATE:**  
 10/07/2019  
 4:00 PM  
 200  
 10/07/2019  
 4:00 PM  
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**BRIDGE APPROACH SLAB**  
**CONCRETE PAVEMENT**  
**BAS-C**  
 Project: 1007  
 Revision: 001  
 Date: 10/07/2019  
 Time: 4:00 PM  
 User: j...  
 Scale: 200  
 Sheet No. 2417 of 24



DATE: \_\_\_\_\_  
 FILE: \_\_\_\_\_  
 DRAWN: \_\_\_\_\_  
 CHECKED: \_\_\_\_\_  
 APPROVED: \_\_\_\_\_

DR'S/LM'S: \_\_\_\_\_

The use of this standard is governed by the Texas Engineering Practice Act. No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.

Variable - See Bridge Layout

Edge of bridge Slab

See Layout for slope

Toe of slope

#3 Bar (Full length of curb)

Add 2 #5 Bars

1'-0" Min

Position drain and depression

to fit space between guard

and riprap

Apex and riprap break usually at

Crown line. See Roadway Details

Depression for drain - 3"

See Layout for limits

See elsewhere in plans for rail transition

Showing curb

and riprap

See Layout for location of shoulder

drain if required

See Layout for slope

See Layout for slope

See Layout for slope

See Layout for slope

See Layout for slope

See Layout for slope

See Layout for slope

See Layout for slope

See Layout for slope

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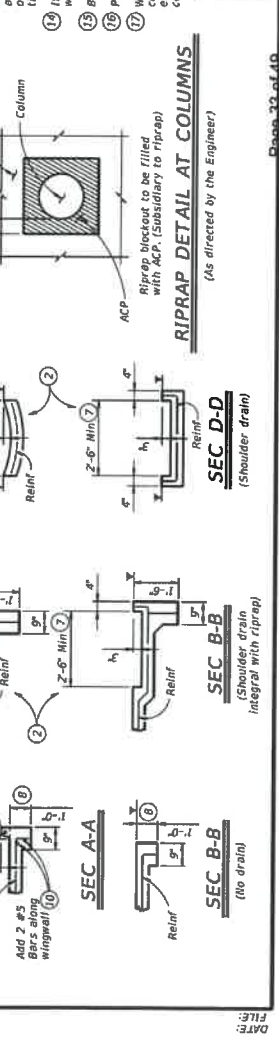
**Texas Department of Transportation**

**CONCRETE RIPRAP AND SHOULDER DRAINS AT BRIDGE ENDS (TYPES RR8 & RR9)**

**CRR**

DATE: \_\_\_\_\_  
 FILE: \_\_\_\_\_  
 DRAWN: \_\_\_\_\_  
 CHECKED: \_\_\_\_\_  
 APPROVED: \_\_\_\_\_

FOR CONTRACTORS INFORMATION ONLY:  
 #3 of RR8 = 0.015 CY/SF  
 #3 of RR9 = 0.015 CY/SF  
 #3 Rein at 18" C-C = 0.501 Lbs/SF  
 #3 Rein at 12" C-C = 0.408 Lbs/SF



Page 32 of 40

# **APPENDIX D: As-Built**





# LUCAS WINNINGKOFF BRIDGE



## CITY OF LUCAS, TEXAS COLLIN COUNTY, TEXAS



### CITY OF LUCAS OFFICIALS

- ANDREA CALVE MAYOR
- BOB BARBER MAYOR PRO-TEM
- TOMMY MCDANIEL PUBLIC WORKS MANAGER
- BEVERLY COVINGTON CITY SECRETARY
- LINDA SHoup ADMINISTRATOR
- CITY COUNCIL OF LUCAS
  - CHARLE GANES
  - PHILIP ROQUIERE

### COUNTY OF COLLIN OFFICIALS

- RON HARRIS COUNTY JUDGE
- PHYLLIS COLE COMMISSIONER, PCT. 1
- JERRY HOAGLAND COMMISSIONER, PCT. 2
- JOE JAYNES COMMISSIONER, PCT. 3
- JACK HATCHELL COMMISSIONER, PCT. 4
- RUBEN DELGADO, P.E. DIRECTOR OF ENGINEERING

### 1999 COLLIN COUNTY BOND PROGRAM

#### DECEMBER, 1999

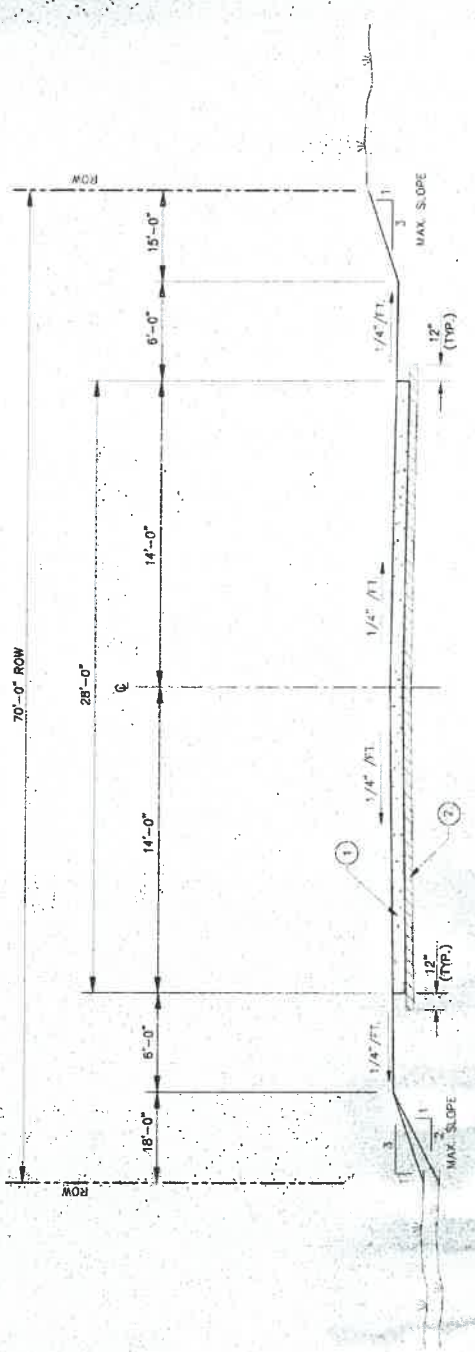
#### INDEX OF SHEETS

NO.	TITLE
1	INDEX OF SHEETS
2	GENERAL NOTES
3	PROPOSED BRIDGE
4	PROPOSED BRIDGE
5	PROPOSED BRIDGE
6	PROPOSED BRIDGE
7	PROPOSED BRIDGE
8	PROPOSED BRIDGE
9	PROPOSED BRIDGE
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99	PROPOSED BRIDGE
100	PROPOSED BRIDGE

APPROVED FOR CONSTRUCTION

LUCAS 12/99  
WINNINGKOFF BRIDGE 7B





**TYPICAL PAVEMENT SECTION**  
NOT TO SCALE

**CONTRACTOR NOTES:**

- IT IS THE CONTRACTOR'S RESPONSIBILITY TO COORDINATE ALL UTILITY ADJUSTMENTS ON THIS PROJECT, AND TO SECURE ALL CONSTRUCTION ACTIVITIES TO CLEAR THE VARIOUS LINES.
- THE CONTRACTOR SHALL BE FURNISHED A CONTROL LINE AND BENCHMARK ELEVATION DATA FOR THIS PROJECT. ALL CONSTRUCTION STAKING SHALL BE COMPLETED BY THE CONTRACTOR ON THIS JOB. THE CITY ENGINEER WILL ASSIST IN DETERMINATION WHERE CONFLICTS ARE FOUND IN UNDERGROUND UTILITIES. THE CONTRACTOR HAS IDENTIFIED THE PROBLEM AND NEEDS HELP. THERE IS NO DIRECT STAKING, CONSTRUCTION LAYOUT, OR OTHER RELATED ITEMS.
- PROJECT IS PROVIDED BY THE CITY FROM THE ISSUANCE OF BONDS. THERE ARE NO FUNDS INVOLVED IN THE PAYMENT TO THE CONTRACTOR.
- ALL MATERIALS FOR THIS PROJECT FOR THE DURATION OF CONSTRUCTION SHALL BE PROVIDED BY THE CITY.
- THE PROJECT WILL BE AVAILABLE FROM THE CITY FOR THE DURATION OF THE JOB.
- INCLUDE ALL MATERIALS AND LABOR FOR THIS PROJECT.

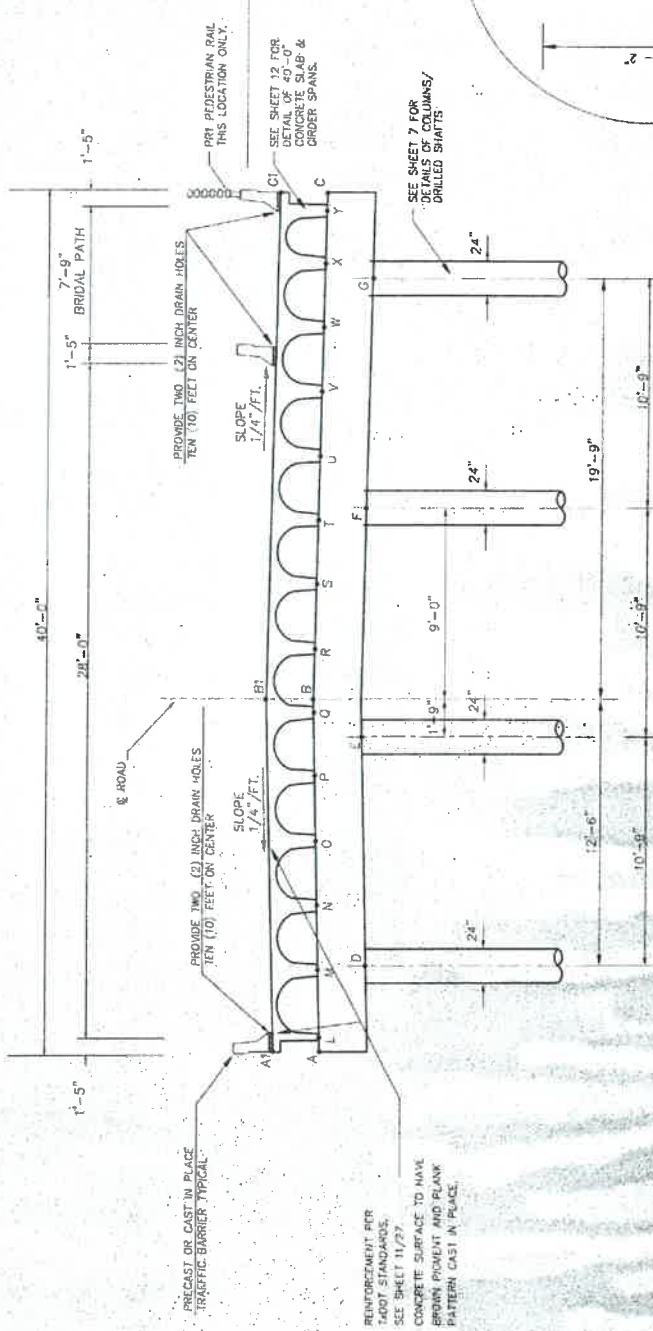


**TYPICAL PAVEMENT HEADER DETAIL**

**NOTES ON CONCRETE PAVEMENT:**

- 8" THICK, 3,500 P.S.I. REINFORCED PAVEMENTS NO. 3 BARS @ 24 IN O.C. EACH WAY.
- LINE STABILIZED SUBGRADE COMPACTED TO 95% TEX 113. THE AMOUNT OF HYDRATED LIME SLURRY SHALL BE THAT WHICH REDUCES THE PLASTICITY INDEX OF THE TREATED SOIL TO BELOW 15. FOR BIDDING PURPOSES, ASSUME THAT THE AMOUNT OF LIME REQUIRED IS 12 LBS PER SQUARE YARD.
- DEPTH OF LIME IS 12 IN.





**BRIDGE SECTION**  
SCALE N.T.S.

- GENERAL NOTES:
1. BRIDGE DESIGNED FOR HS-20-44 LIVE LOAD IN ACCORDANCE WITH 1983 AASHTO SPECIFICATIONS.
  2. THE ENGINEER SHALL INSPECT THE DRILLING AND PLACING OF REINFORCING STEEL AND CONDUIT IN ALL DRILLED SHAFTS.
  3. TEXAS DEPARTMENT OF TRANSPORTATION 1993 STANDARD SPECIFICATIONS FOR CONSTRUCTION OF HIGHWAYS, BRIDGES AND STRUCTURES SHALL GOVERN FOR THE CONSTRUCTION OF THIS BRIDGE EXCEPT AS NOTED.
  4. ALL REINFORCING STEEL FOR THIS BRIDGE, INCLUDING DRILLED SHAFTS AND IRILING SHALL BE IN CONFORMANCE WITH ASTM A615, GRADE 60 EXCEPT STRIPES AND SPIRAL REINFORCEMENT SHALL BE ASTM A615, GRADE 40.

SEE SHEET 12 FOR DETAIL OF 40'-0" SPAN BRIDGES & OTHER SPANS.

SEE SHEET 7 FOR DETAILS OF COSSWAYS/DRILLED SHAFTS.

PROVIDE TWO (2) INCH DRAIN HOLES TEN (10) FEET ON CENTER.

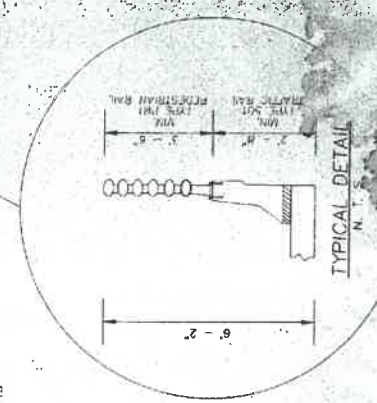
PROVIDE TWO (2) INCH DRAIN HOLES TEN (10) FEET ON CENTER.

PRECAST OR CAST IN PLACE TRAFFIC BARRIER, TYPICAL.

REINFORCEMENT PER TxDOT STANDARDS. SEE SHEET 11/277.

CONCRETE SURFACE TO HAVE BROWN POINT AND PLANK PATTERN CAST IN PLACE.

PRY PEDESTRIAN RAIL THIS LOCATION ONLY.













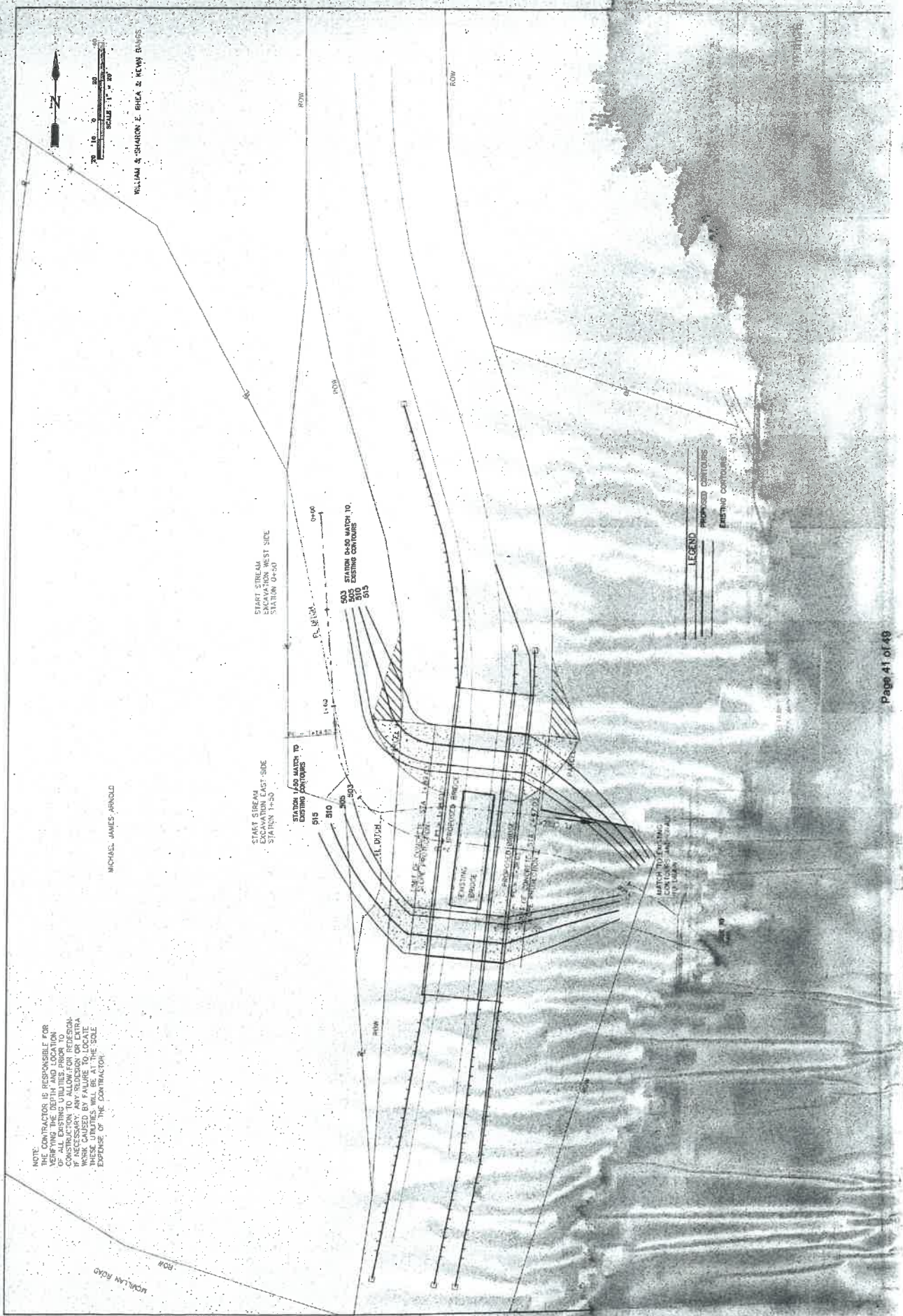
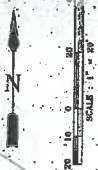




NOTE:  
 THE CONTRACTOR IS RESPONSIBLE FOR  
 VERIFYING THE DEPTH AND LOCATION  
 OF ALL UTILITIES PRIOR TO  
 CONSTRUCTION TO ALLOW FOR REVISION  
 IF NECESSARY. ANY REVISION OR EXTRA  
 WORK CAUSED BY FAILURE TO LOCATE  
 UTILITIES SHALL BE AT THE SOLE  
 EXPENSE OF THE CONTRACTOR.

MICHAEL JAMES ARNOLD

WILLIAM & SHARON E. BRICK & HEATH BRIDGES



LEGEND

---	PROPOSED CONTOURS
---	EXISTING CONTOURS

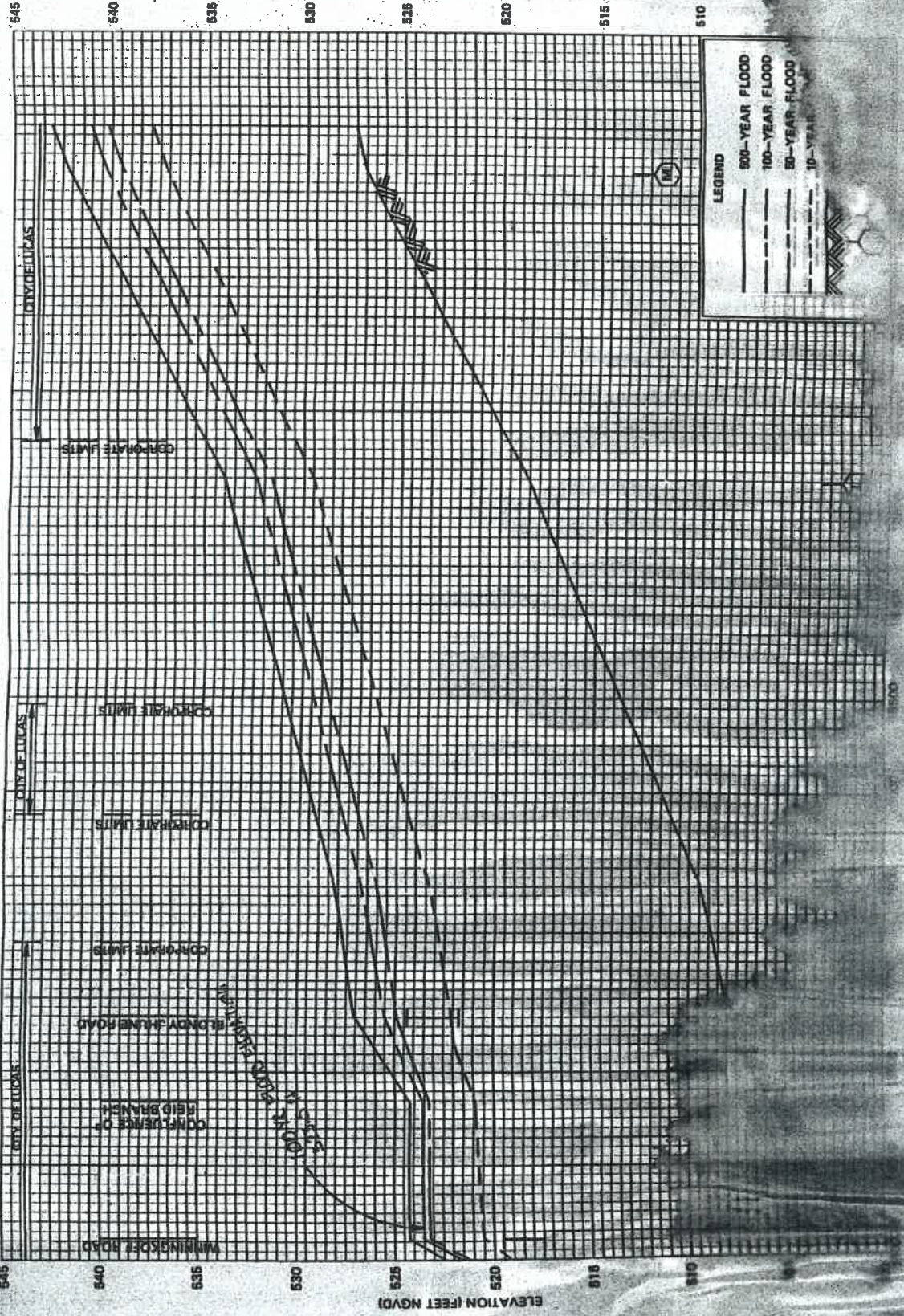


CITY OF LUCAS

FLOOD PROFILES

COUNTY, TX  
INTEGRATED AREAS

MANAGEMENT AGENCY



**LEGEND**

- 500-YEAR FLOOD
- - - 100-YEAR FLOOD
- · - · 50-YEAR FLOOD
- · · · 10-YEAR FLOOD



# APPENDIX E: Field Inspection Photos



Photo 1



Photo 2



**Winningkoff Bridge over White Rock Creek  
Limited Bridge Evaluation Report**

---



**Photo 3**



**Photo 4**





Photo 5



Photo 6





**Photo 7**



**Photo 8**





Photo 9



Photo 10





Photo 11



Photo 12

## Four Star Excavating, Co.

6825 Levelland Rd., Suite 2B

Dallas, Texas 75252

Office: (972)-330-6767 \* Fax: (972) 421-1597

Project: MISCELLANEOUS WORK

Location: LUCAS

Date: 12/31/2021

We propose to provide equipment, labor and material to perform the following operations.

Our proposal is to include these items as specifically listed, all other work items or materials are excluded.

This quote is void after thirty days from proposal date.

Item No.	Item Description	Qty	U/M	Unit Price	Extension
1	REPAIR BRIDGE AT WINNINGKOFF AT FOUR LOCATIONS	1	LS	\$ 10,300.00	\$ 10,300.00

TOTAL AMOUNT BID: \$ 10,300.00

Exclusions:

Sincerely,

Antonio Evangelista

Four Star Excavating Co.



# City of Lucas

## Council Agenda Request

### January 20, 2022

Item No. 08

Requester: City Manager Joni Clarke  
Development Services Director Joe Hilbourn

#### **Agenda Item Request**

---

Consider receiving a donation of a house located at 525 Stinson Road and relocating to city-owned property for a future public use.

#### **Background Information**

---

The City of Lucas was contacted by Lucas resident Judge C. Ruckel (Retired) regarding a house that is owned by Mr. and Ms. Ruckel located at 525 Stinson Road. This house was once owned and occupied by the Stinson Family. There are very few historically significant structures that remain in the City of Lucas, and this provides the City with the opportunity to protect and restore a home that reflects the rich history of Lucas. Mr. Ruckel provided the City with documentation reflecting the ownership of this home and property over the years.

The City received information on the anticipated cost to relocate the home from McMillan Movers located in Lancaster, Texas.

Due to the height of this house, the roof will have to be removed and reconstructed at the new site due to the height of all the utility wires along the route.

If raising all utilities lines along the route is feasible AND the City is willing to pay the utility companies to raise all utility wires along the route, the cost to relocate this house with the attic/roof attached, the estimated cost is between \$45,000 to \$55,000.

The foundation will be at an additional cost and will be determined upon the provision of engineered drawings. Instead of a pier foundation, McMillan Movers recommends that a slab foundation with concrete blocks on top be considered. The cost would be approximately \$350 per pier, and this would allow for a clean crawl space and an adequate working space for plumbers and any duct work if ducts are not in attic. The approximate cost of the slab with concrete blocks could be \$18,000 to \$22,000 depending on engineering expectations.

All utilities leading to the house are to be disconnected by the City or an additional contractor and all utility reconnections are to be done by the City or an additional contractor as well.

#### **Attachments/Supporting Documentation**

---

NA



# City of Lucas Council Agenda Request January 20, 2022

## **Budget/Financial Impact**

---

- The approximate cost to relocate the 525 Stinson House to the Community Park next to City Hall is anticipated to be approximately \$100,000.
- The City of Lucas would need funding to renovate the house with renovation cost anticipated to be approximately \$200 per square foot.
- Mr. and Ms. Ruckel have generously offered a donation of \$5,000 towards the relocation and renovation of the Stinson House.

## **Recommendation**

---

NA

## **Motion**

---

NA





# City of Lucas

## City Council Agenda Request

### January 20, 2022

Item No. 09

Requester: City Secretary Stacy Henderson

#### **Agenda Item Request**

---

Consider authorizing the City Manager to enter into a contract with Records Consultants, Inc. (RCI) in the amount of \$26,606.50 for scanning the City's permanent records appropriating funds from Unrestricted General Fund Reserves to account 11-6110-239 Records Management.

#### **Background Information**

---

Staff has been inventorying records contained in the City's records room and determined that some of the files require permanent retention and are currently only in a paper format. City Staff has identified and begun scanning some of the paper files that can be completed in-house to assist in reducing the cost of the scanning contract. However, permanent records related to subdivision plans, architectural plans, and plats will require outsourcing due to the vast number of records and the various sizes of the documents that need to be scanned. Staff will also be reviewing the subdivision files and removing any documents that have passed their retention period before leaving City Hall to be scanned to not have documents scanned unnecessarily.

City Staff has obtained a proposal from Records Consultants, Inc. (RCI), which the City has worked with previously for records organization projects. RCI has presented a proposal to complete the scanning process that is expected to take between 8-10 weeks. During this time, should access to the files be needed, RCI will send the needed information within 24-48 hours.

The scope of services from RCI includes:

1. Box, label, and inventory records from file cabinets (estimated 63 boxes)
2. Prep and scan oversized architectural plans/maps
3. Index each document with fields identified by the City
4. Provide scanned files on secure media or FTP (File Transfer Protocol) site
5. Secure document destruction of scanned records (if needed) within 60 days after completion and verification of data delivery

The cost of scanning 63 boxes and up to 6,000 plat sheets is \$26,606.50.

#### **Attachments/Supporting Documentation**

---

1. Document Imaging Proposal
2. General Fund Reserves Schedule



# City of Lucas

## City Council Agenda Request

### January 20, 2022

#### **Budget/Financial Impact**

---

Contract cost is \$26,606.50 appropriating funds from Unrestricted General Fund Reserves to account 11-6110-239 Records Management.

RCI is proposing the following payment schedule:

15% due upon contract acceptance (estimated \$3,990.98)

35% due upon initiation of project (estimated \$9,312.28)

50% due upon completion of project, net 10 days (estimated \$13,303.25)

#### **Recommendation**

---

City Staff recommends authorizing the City Manager to enter into a contract with Records Consultants, Inc. (RCI).

#### **Motion**

---

I make a motion to approve/deny authorizing the City Manager to enter into a contract with Records Consultants, Inc. (RCI) in the amount of \$26,606.50 for scanning the City's permanent records appropriating funds from Unrestricted General Fund Reserves to account 11-6110-239 Records Management.



---

**DOCUMENT IMAGING PROPOSAL**

January 10, 2022

City of Lucas  
Stacy Henderson, City Secretary  
665 Country Club Rd.  
Lucas, TX 75002

Dear Ms. Henderson,

Records Consultants, Inc. (RCI) is pleased to submit this proposal to the City of Lucas for scanning and converting the City's Permanent Records. RCI offers a highly efficient, multi-level quality check imaging process to ensure 100% capture of your documents.

The attached proposal will cover the following information:

- RCI 7-Step Process
- Work Schedule
- Delivery of Image Database/Software
- Post-Project Disposition of Records
- Project Scope & Fees
- Payment Terms & Conditions
- RCI Document Imaging Process (Workflow)
- Acceptance Page

If you should have any questions pertaining to this proposal, please do not hesitate to call me at (877) 363-4127. We greatly appreciate your continued interest in our services and look forward to assisting you with this project.

Sincerely,

A handwritten signature in black ink that reads "Linda LaField". The signature is written in a cursive, flowing style.

Linda LaField  
Account Manager

## RCI 7-Step Process

---

The imaging process for your permanent records consists of preparing, scanning, and indexing the document with quality checks throughout each phase of production. We have included an attachment that displays the workflow of this project.

- 1. Packaging, Boxing, and Transporting Records:** RCI will retrieve the documents and transport them to RCI in San Antonio, Texas for purging (upon request), preparing, scanning and indexing. RCI will process and image records by completing the following functions listed below. RCI offers optional services for boxing records that are filed in cabinets or shelving units. Additional fees apply.
- 2. Document Preparation:** RCI will prepare all documents for the scanning function. We will remove staples and paper clips, mount or copy any under-sized documents and tape any torn pages, if necessary. These documents will then be staged for the scanning process.
- 3. Document Scanning:** RCI will scan all selected documents found in the files. We will perform a scan quality check by visually inspecting each image and perform enhancements when necessary. Please note that scanning is only offered for standard office paper sizes (letter, legal, file folders, 11”x 17” paper, and smaller) and images will be in 200 dpi (dots per inch). Scanning at 300 dpi or greater can be supported upon request but increases data size. Oversized document exceeding 17” dimension incur additional fees. Optical Character Recognition (OCR) enabling full-text searchable images is offered for an additional fee.
- 4. Document Indexing:** RCI will index each record with up to 3 index fields. Index fields for the various type of records will be coordinated prior to beginning the scanning process. RCI will also coordinate the masking, formatting and delimiters to be used for the index values. Additional index fields can be supported, and additional fees would apply.
- 5. Final Audit and Quality Control:** RCI will conduct a final audit of the document image database to ensure that 100% of all documents have been captured, the images are sufficient to reproduce the record, and the images are appropriately indexed and accessible.
- 6. Delivery of Image Database and File Access Software:** Electronic file images will be created at completion of the scanning process. The scanned images will be provided electronically via FTP or on an external storage media, such as DVD, USB flash drive, or USB hard drive only if the client requests the scanned images in PDF format. Images can also be viewed with the purchase of the PaperVision® Enterprise (PVE) software or the ImageSilo® hosted document management service.
- 7. Post-Project Records Disposition:** After the project is completed, there are two options for disposition of the physical documents. RCI can return the documents to the client or request RCI to complete document destruction services for these records.

## Work Schedule

---

RCI anticipates the following schedule to complete the entire project:

Activity	Duration of Time
Packaging, Boxing and Transporting Records	1 day
Prep and Scan Required Documents	4-5 weeks
Index, Quality Control, and Prepare Final Packaging of Scanned Images	4-5 weeks
Installation and Training of Final Database	1 day

Also, if you require access to a particular document during the imaging process, RCI will scan the requested document and electronically transmit the image to the designated point of contact. Document requests will be fulfilled within one to two business days.

## Delivery of Image Database/Software

---

There are several options in which to provide the scanned images. RCI can deliver the final project through the ImageSilo® in a cloud hosted document management service, PaperVision® Enterprise (PVE) software, in individual PDF files, or in other formats that may be imported into your existing application(s). RCI provides installation, training, and support and can provide Professional Services to support integration. ImageSilo® installation and training can be provided remotely or onsite, while PVE software installation and training requires on-site services.

**Option #1:** RCI recommends **ImageSilo®**. **ImageSilo®** is a secure, online, cloud hosted document management service offering robust Enterprise Content Management (ECM) features at a low monthly fee. Fees are based only on data storage utilized with allotments starting out at 5 GB per month, and additional increments are available to handle all size projects.

- Supports unlimited users with no additional software license fees
- No up-front costs for hardware or software license
- No annual maintenance fees for software support
- Always running the current and latest version without incurring version upgrade headaches
- Eliminates headaches associated with infrastructure development and data management

**Option #2: PaperVision® Enterprise (PVE)** is a powerful ECM software application provided under an end-user licensure fee. PVE allows multiple licenses to be connected to a centralized data/image repository. The content management features include customized security for users and groups, file modification, image redaction, interface with Microsoft applications, usage audit trail, and other valuable features and functions. Should you choose to purchase the PaperVision® Enterprise software, RCI will install this software on the hardware you desire. Installation will be accomplished at the Professional Services Rates. Annual Maintenance fees will apply for ongoing license renewals and support.

**Option #3: Custom Image and Data Output:** RCI can provide other tailored formats to match your unique situation.



## **Post-Project Disposition of Records**

---

After the project is completed, there are two options for disposition of the physical documents:

**Option #1: Secure Document Destruction** – RCI can destroy the documents in our secure document destruction facility. A document destruction fee will apply. RCI will store the physical documents for 60 days at our secure facility prior to destruction. Records held for more than 60 days at RCI's facilities will incur additional storage fees at a rate of \$ 1.05 per box per month. The boxes and contents will be shredded and recycled. After the documents have been destroyed, we will provide a Certificate of Destruction to complete your audit trail.

**Option #2: Return of Documents** – Transportation fees apply. If the returned boxes are to be removed from pallets and shelved by RCI staff, additional fees will be included. Records in returned boxes are not in the original format or folder. During the image processing, contents are separated into groups of purged or scanned items. Scanned materials are bundled together in their same box with break sheets between each record. Purged contents are usually within the folder of which they were originally included. Additional fees apply to reconstruct the folder (excluding binding, staples, paperclips, etc.) to its original contents. Records for projects that did not include the purge function will also be bundled and outside of their original folder or binding. Returned records will be in boxes and palletized. Removing boxes from pallets and stacking on shelves may incur additional fees.

## **Project Scope & Fees**

---

Based on the information gathered and previous project information, we estimate the following quantities of records:

- **An estimated 30 boxes containing an estimated 66,000 images (requiring an estimated 30 boxes)**
- **6,000 Plat/Sheets (requiring an estimated 33 boxes)**

### Project scope on services included in this proposal:

- ✓ Box, Label, and Inventory an estimated 63 boxes for transportation
- ✓ Transportation of records to RCI secure facilities in San Antonio, Texas
- ✓ Prep & scan oversized Architectural Plans/Maps at 300 dpi bitonal (sized up to 48"x56")
- ✓ Index each document with 3 index fields –
  - City Records – *DOCUMENT TYPE, DOCUMENT TITLE and DATE (or Year)*
  - *Note: OCR is not available for oversized images*
- ✓ Provide named multi-page PDF file for each plan set on external USB media or via secure FTP site
- ✓ Secure Document Destruction of scanned records within 60 days after completion and verification of data delivery.

Our calculations are based on estimates and information provided by the point of contact. It is estimated that that the total number of images will likely range from 65,000 to 85,000 images. Disk storage space for the file images and database will is estimated to be approximately 25 GB (gigabytes).

QUANTITY	DESCRIPTION	UNIT PRICE	LINE TOTAL
	<b>PACKAGING, TRANSPORTATION &amp; DISPOSITION</b>		
63	Box, Label & Inventory Records for Transportation (Per Box)	\$ 7.00	\$ 441.00
1	Pick Up Transportation or Records (Per Round Trip)	\$ 620.00	\$ 620.00
63	Secure Document Destruction of Records (Per Box)	\$ 3.50	\$ 220.50
	<b>IMAGING PERMANENT RECORDS</b>		
6,000	Prep/Scan/Index/Quality Control - Plats/Sheets (Per sheet)	\$ 2.00	\$ 12,000.00
66,000	Prep/Scan/Index/Quality Control - Plats/Sheets (Per sheet)	\$ 0.18	\$ 11,880.00
66,000	OCR - Full-text Searchable Images (Per Image)	\$ 0.02	\$ 1,320.00
	<b>IMAGE DATA &amp; DELIVERY</b>		
1	Data Delivery of PDF Files Via or USB Media	Flat Fee	\$ 125.00
		<b>Total</b>	<b>\$ 26,606.50</b>

## Payment Terms & Conditions

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The following payment terms apply:

15% due upon contract acceptance

35% due upon contract initiation

50% (balance) due upon delivery

The ImageSilo® web hosted document management service will be billed on a monthly basis to begin on the first day of the month following completion of the project. If storage capacity is increased, additional fees will be reflected in the following month's invoice.


It is important to note that during each phase of the project we will continually monitor the number of files and images that are being processed. The pricing in this proposal is based on the estimated quantities and the final bill will be adjusted to reflect the actual count of files or images worked in the project. If there is an indication that the number of files or images may vary significantly from the estimates provided, we will immediately notify the designated point of contact of the variation.

## Authorization

---

When you approve this proposal, sign the acceptance page and fax it to Records Consultants, Inc. at (877) 366-0776.

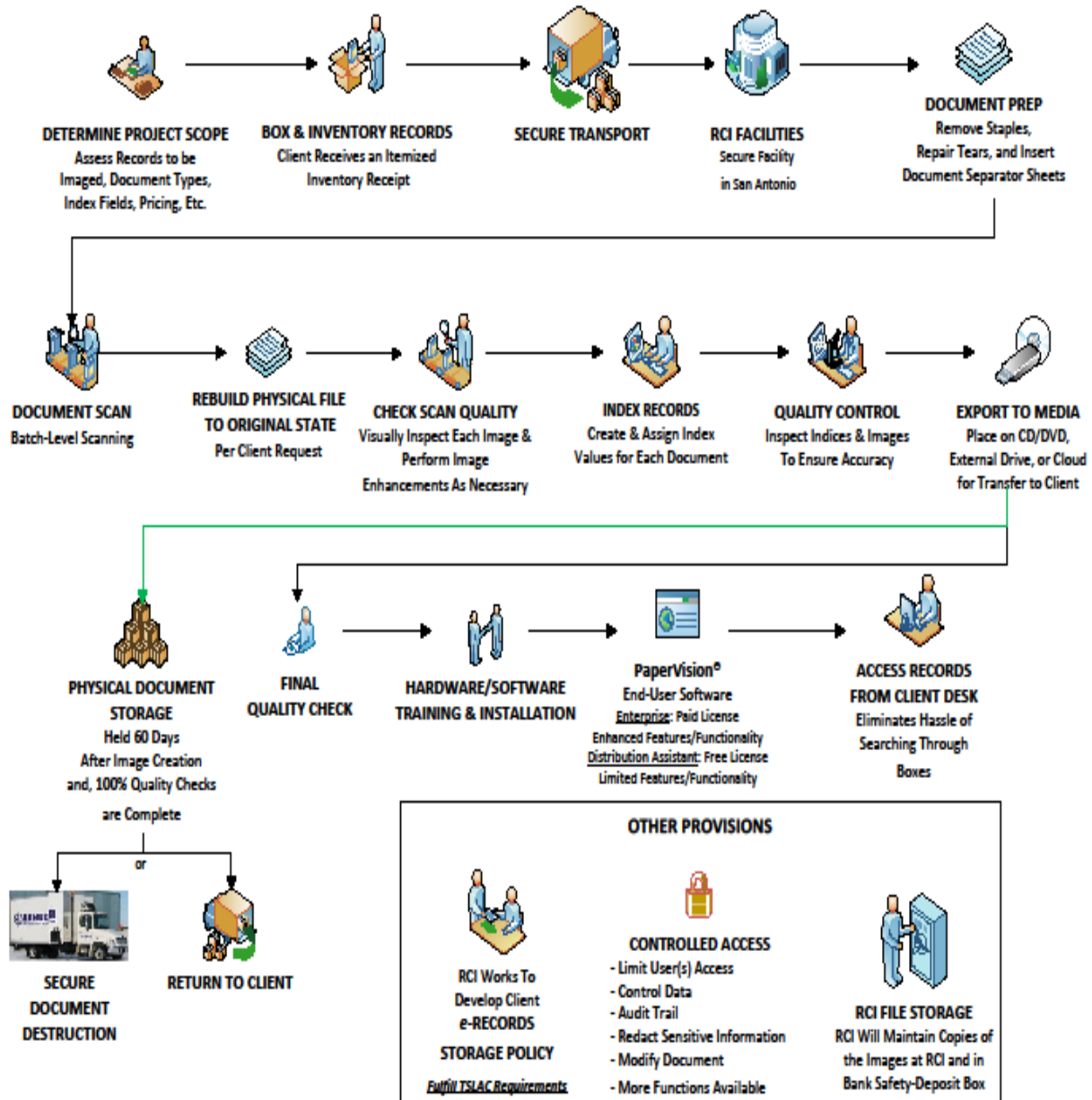
Sincerely,



Linda LaField  
Account Manager



## RCI DOCUMENT IMAGING WORKFLOW





# Document Imaging Acceptance

## Records Consultants, Inc.

12829 Wetmore Road  
 San Antonio, TX 78247  
 Office: (877) 363-4127  
 Fax: (877) 366-0776

Quotation Date: January 10, 2022  
 Salesperson: Linda LaField  
 Email: [llafield@rcitech.com](mailto:llafield@rcitech.com)  
 Website: [www.rcitech.com](http://www.rcitech.com)

TO: Ms. Stacy Henderson  
 City of Lucas  
 665 Country Club Rd.  
 Lucas, TX 75002

Payment Terms  
 15% due upon contract acceptance  
 35% due upon initiation of project  
 50% due upon completion of project, net 10 days

QUANTITY	DESCRIPTION	UNIT PRICE	LINE TOTAL
<b>PACKAGING, TRANSPORTATION &amp; DISPOSITION</b>			
63	Box, Label & Inventory Records for Transportation (Per Box)	\$ 7.00	\$ 441.00
1	Pick Up Transportation or Records (Per Round Trip)	\$ 620.00	\$ 620.00
63	Secure Document Destruction of Records (Per Box)	\$ 3.50	\$ 220.50
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<b>IMAGE DATA &amp; DELIVERY</b>			
1	Data Delivery of PDF Files Via or USB Media	Flat Fee	\$ 125.00
<b>Total</b>			<b>\$ 26,606.50</b>

Name: \_\_\_\_\_

Title: \_\_\_\_\_

Signature: \_\_\_\_\_

Date: \_\_\_\_\_

Email Address: \_\_\_\_\_

Purchase Order #: \_\_\_\_\_

PLEASE FAX SIGNED ACCEPTANCE TO (877) 366-0776 OR EMAIL TO:

[llafield@rcitech.com](mailto:llafield@rcitech.com)

**THANK YOU FOR YOUR BUSINESS!**

City of Lucas  
 General Fund Reserves by Fiscal Year (Unaudited)

	Actual 2013-2014	Actual 2014-2015	Actual 2015-2016	Actual 2016-2017	Actual 2017-2018	Actual 2018-2019	Actual 2019-2020	Projected 2020-2021	Projected 2021-2022
<b>Unassigned Fund Balance per Audit Report</b>	<b>\$ 5,867,875</b>	<b>\$ 6,203,973</b>	<b>\$ 7,545,674</b>	<b>\$ 8,774,909</b>	<b>\$ 7,380,496</b>	<b>\$ 7,442,323</b>	<b>\$ 8,524,465</b>	<b>\$ 8,524,465</b>	<b>\$ 8,524,465</b>
Adjusted For:									
Projected Excess Fund Balance FY 20-21 (Revenue vs. Expense)								\$ 1,438,228	\$ 1,438,228
Projected Excess Fund Balance FY 21-22 (Revenue vs. Expense)								\$	\$ 24,659
Additional Restrictions:									
Capital Project funding approved at (3-2-17) City Council Meeting				\$ (1,385,000)					
FY 20-21 Brockdale Roadway Improvements carry-over	\$ (47,935)	\$ (102,935)	\$ (140,335)	\$ (199,570)			\$ -	\$ (41,349)	\$ (41,349)
Water Rescue Boat								\$ (120,000)	\$ (120,000)
FY 20-21 FD Equipment/bunker gear carry-over								\$ (21,379)	\$ (21,379)
FY 20-21 Energov Software/Hardware carry-over								\$ (34,843)	\$ (34,843)
FY 20-21 -CC 7-1-21 Lemontree drainage carry-over								\$ (67,813)	\$ (67,813)
Reserve for Capital Outlay FY 20-21			\$ (50,000)	\$ (100,000)				\$ (50,000)	\$ (50,000)
Reserve for Capital Outlay FY 21-22								\$	\$ -
CC 11-4-21 Reserves for Claremont Springs Drainage (FY 21-22)									\$ (192,025)
CC 11-4-21 Reserves for Brookhaven Culvert (FY 21-22)									\$ (110,758)
CC 12-16-21 Reserves for Water Master Plan (FY 21-22)									\$ (30,000)
<b>Reserve Balance Prior to GASB 54 Requirement</b>	<b>\$ 5,819,940</b>	<b>\$ 6,101,038</b>	<b>\$ 7,355,339</b>	<b>\$ 7,090,339</b>	<b>\$ 7,380,496</b>	<b>\$ 7,442,323</b>	<b>\$ 8,524,465</b>	<b>\$ 9,627,309</b>	<b>\$ 9,319,185</b>
<b>Reserve Balance in Operating Months</b>	<b>16.7</b>	<b>17.1</b>	<b>19.3</b>	<b>16.5</b>	<b>16.9</b>	<b>14.9</b>	<b>17.9</b>	<b>17.8</b>	<b>16</b>
50% Current Year General Fund Expenditures (6 months)	\$ (2,089,807)	\$ (2,143,890)	\$ (2,286,670)	\$ (2,583,535)	\$ (2,624,410)	\$ (3,009,319)	\$ (2,861,041)	\$ (3,245,588)	\$ (3,463,246)
<b>Reserve Balance After GASB 54 Requirement</b>	<b>\$ 3,730,133</b>	<b>\$ 3,957,148</b>	<b>\$ 5,068,669</b>	<b>\$ 4,506,804</b>	<b>\$ 4,756,086</b>	<b>\$ 4,433,005</b>	<b>\$ 5,663,424</b>	<b>\$ 6,381,721</b>	<b>\$ 5,855,939</b>
<b>Reserve Balance in Operating Months</b>	<b>10.7</b>	<b>11.1</b>	<b>13.3</b>	<b>10.5</b>	<b>10.9</b>	<b>8.9</b>	<b>11.9</b>	<b>11.8</b>	<b>10</b>
<b>Restricted during Fiscal Year Audit:</b>									
Ambulance Donation					\$ 100,000	\$ -	\$ -	\$ -	\$ -
Capital Project Funding approved (3105)					\$ 1,385,000	\$ 1,385,000	\$ 613,590	\$ -	\$ -
Restricted Court/Misc (3105.10)(3105.35)	\$ 35,473	\$ 45,612	\$ 51,004	\$ 56,820	\$ 64,031	\$ 77,266	\$ 78,726	\$ 76,647	\$ 76,647
Restricted Cable Fees (3105.20)	\$ 8,256	\$ 12,773	\$ 17,670	\$ 21,843	\$ 25,318	\$ 28,582	\$ 31,834	\$ 34,707	\$ 34,707
Brockdale Roadway Improvements (3105.25)					\$ 245,054	\$ 285,878	\$ 385,528	\$ -	\$ -
Restricted Impact Fees (3105.30)	\$ 770,508	\$ 867,279	\$ 1,116,079	\$ 1,254,213	\$ 1,572,405	\$ 1,785,286	\$ 2,115,802	\$ 1,417,318	\$ 1,417,318
Restricted Water Rescue (3105-32)								\$ 120,000	\$ 120,000
Restricted FD Equipment (3105-34)								\$ 16,379	\$ 16,379
Restricted Cares Funding (3105.40)							\$ 89,755		
Restricted Mass Mutual LOSAP (3105.45)				\$ 216,615	\$ 233,592	\$ 252,407	\$ 265,669	\$ 279,043	\$ 279,043
Capital Outlay ( \$50K per year) (3106)					\$ 150,000	\$ 200,000	\$ 250,000	\$ 300,000	\$ 250,000
Project Mgmt (3107)						\$ 358,290	\$ 70,853	\$ -	\$ -
<b>Reserve Restricted per Audit Report</b>	<b>\$ 814,237</b>	<b>\$ 925,664</b>	<b>\$ 1,184,753</b>	<b>\$ 1,549,491</b>	<b>\$ 3,775,400</b>	<b>\$ 4,372,709</b>	<b>\$ 3,901,757</b>	<b>\$ 2,244,094</b>	<b>\$ 2,194,094</b>





# City of Lucas Council Agenda Request January 20, 2022

Item No. 10

Requester: City Council

## **Agenda Item Request**

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Consider nominations for 2022 Service Tree Awards and appoint Councilmembers to serve on the Service Tree Subcommittee.

## **Background Information**

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The City accepted Service Tree nomination applications through December 31, 2021. Four nominations were received and forwarded to the City Council for review. The Service Tree Committee currently consists of Councilmember Fisher, and two additional Councilmembers will need to be appointed to comprise the Service Tree Committee. Service Tree nominations were received for the following individuals:

- Tammy Duke
- Bill and Kathryn Esposito
- Gary Johnson (located within City’s ETJ)
- Wayne Millsap

Past Service Tree Award recipients include:

<b>2015 Recipients</b>	<b>2016 Recipients</b>	<b>2017 Recipients</b>	<b>2018 Recipients</b>
First Lucas City Council	Don Kendall	Founders Day Cancelled	Tonda Frazier
Past Mayor Rebecca Mark	Lee Bauer		Tracy Matern
Charlie Gaines			
Suzanne Christian Calton Shirley Biggs Parker			
<b>2019 Recipients</b>	<b>2020 Recipients</b>	<b>2021 Recipients</b>	
Peggy Rusterholtz	David Rhoads	Larry Abston	
Mrs. Lee Ford	Craig Zale	Andre & Debra Guillemaud	
		Former Councilmember Steve Duke	

## **Attachments/Supporting Documentation**

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1. Service Tree Nominations (sent under separate attachment)

## **Budget/Financial Impact**

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The Service Tree Program account 6211-445 has \$7,000 budgeted in the 2021-22 budget.



**City of Lucas  
Council Agenda Request  
January 20, 2022**

**Recommendation**

---

NA

**Motion**

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I make a motion to award the following individuals as Service Tree recipients for 2022:



# City of Lucas City Council Agenda Request January 20, 2022

Requestor: Mayor Jim Olk

## **Agenda Item Request**

---

### **Executive Session.**

An Executive Session is not scheduled for this meeting.

As authorized by Section 551.071 of the Texas Government Code, the City Council may convene into closed Executive Session for the purpose of seeking confidential legal advice from the City Attorney regarding any item on the agenda at any time during the meeting. This meeting is closed to the public as provided in the Texas Government Code.

## **Background Information**

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NA

## **Attachments/Supporting Documentation**

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NA

## **Budget/Financial Impact**

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NA

## **Recommendation**

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NA

## **Motion**

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NA



# City of Lucas City Council Agenda Request January 20, 2022

Item No. 12

Requester: Mayor Jim Olk

## **Agenda Item Request**

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Reconvene from Executive Session and take any action necessary as a result of the Executive Session.

## **Background Information**

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NA

## **Attachments/Supporting Documentation**

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NA

## **Budget/Financial Impact**

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NA

## **Recommendation**

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NA

## **Motion**

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NA