Administrative Package Cover Page

This file contains the following documents:

1. Summary of application (in plain language)
   - English
   - Alternative Language (Spanish)
2. First Notice (NORI-Notice of Receipt of Application and Intent to Obtain a Permit)
   - English
   - Alternative Language (Spanish)
3. Application materials

Portada de Paquete Administrativo

Este archivo contiene los siguientes documentos:

1. Resumen en lenguaje sencillo (PLS, por sus siglas en inglés) de la actividad propuesta
   - Inglés
   - Idioma alternativo (español)
2. Primer aviso (NORI, por sus siglas en inglés)
   - Inglés
   - Idioma alternativo (español)
3. Solicitud original

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

PLAIN LANGUAGE SUMMARY FOR TPDES OR TLAP PERMIT APPLICATIONS

Plain Language Summary Template and Instructions for Texas Pollutant Discharge Elimination System (TPDES) and Texas Land Application (TLAP) Permit Applications

Applicants should use this template to develop a plain language summary as required by Title 30, Texas Administrative Code (30 TAC), Chapter 39, Subchapter H. Applicants may modify the template as necessary to accurately describe their facility as long as the summary includes the following information: (1) the function of the proposed plant or facility; (2) the expected output of the proposed plant or facility; (3) the expected pollutants that may be emitted or discharged by the proposed plant or facility; and (4) how the applicant will control those pollutants, so that the proposed plant will not have an adverse impact on human health or the environment.

Fill in the highlighted areas below to describe your facility and application in plain language. Instructions and examples are provided below. Make any other edits necessary to improve readability or grammar and to comply with the rule requirements.

If you are subject to the alternative language notice requirements in 30 TAC Section 39.426, **you must provide a translated copy of the completed plain language summary in the appropriate alternative language as part of your application package**. For your convenience, a Spanish template has been provided below.

ENGLISH TEMPLATE FOR TPDES or TLAP NEW/RENEWAL/AMENDMENT APPLICATIONS DOMESTIC WASTEWATER/STORMWATER

The following summary is provided for this pending water quality permit application being reviewed by the Texas Commission on Environmental Quality as required by 30 TAC Chapter 39. The information provided in this summary may change during the technical review of the application and is not a federal enforceable representation of the permit application.

The City of Leander (CN600646012) operates the Leander RM 2243 Wastewater Treatment Plant (RN101917722), a 2.25 MGD wastewater treatment plant. The facility is located at 10201 RM 2243, in Leander, Williamson County, Texas 78641. This treatment facility is projected to be expanded 3 MGD, for a 5.25 MGD final flow rate. This expansion will be conducted in two phases: Interim Phase II with a 2 MGD expansion and Ultimate Phase with a 1 MGD expansion.

Discharges from the facility are expected to contain five-day carbonaceous biochemical oxygen demand ($CBOD_5$), total suspended solids (TSS), ammonia nitrogen (NH_3-N), *Escherichia coli*, and additional potential pollutants, which are included in the Domestic Technical Report 1.0, Section 7. Pollutant Analysis of Treated Effluent and Domestic Worksheet 4.0 in the permit application package. Effluent pollutant concentrations are significantly decreased compared to influent levels, as the plant treats beyond required limits. Domestic wastewater is treated by anoxic rapid mixing (coagulation), aerobic and anaerobic digestors, clarifiers for settling, tertiary filtration, and disinfection via chlorine, which will eventually be replaced by ultraviolet light disinfection.

PLANTILLA EN ESPAÑOL PARA SOLICITUDES NUEVAS/RENOVACIONES/ENMIENDAS DE TPDES o TLAP

AGUAS RESIDUALES DOMÉSTICAS /AGUAS PLUVIALES

El siguiente resumen se proporciona para esta solicitud de permiso de calidad del agua pendiente que está siendo revisada por la Comisión de Calidad Ambiental de Texas según lo requerido por el Capítulo 39 del Código Administrativo de Texas 30. La información proporcionada en este resumen puede cambiar durante la revisión técnica de la solicitud y no es una representación ejecutiva fedérale de la solicitud de permiso.

La ciudad de Leander (CN600646012) opera la planta de tratamiento de aguas residuals Leander RM2243 (RN101917722), una planta de tratamiento de aguas residuals de 2.25 MGD. La instalación está ubicada en 10201 RM 2243, en Leander, Condado de Williamson, Texas 78641. Esta planta de tratamiento se ampliará en 3 MGD, para un caudal final de 5,25 MGD. Esta expansión se llevará a cabo en dos fases: Fase Interina II con una expansión de 2 MGD y Fase Final con una expansión de 1 MGD. Este permiso no autorizará una descarga de contaminantes en el agua en el estado.

Se espera que las descargas de la instalación contengan una demanda bioquímica carbonosa carbonoso (CBOD5) de cinco días, sólidos suspendidos totales (SST), nitrógeno amoniacal (NH3-N), *Escherichia coli* y contaminantes potenciales adicionales, que se incluyen en el Informe Técnico Nacional. 1.0, Sección 7. Análisis de contaminantes de efluentes tratados y domésticas hoja de trabajo 4.0 en el paquete de solicitud de permiso. Las concentraciones de contaminantes en los efluentes disminuyen significativamente en comparación con los niveles del afluente, ya que la planta trata más allá de los límites requeridos. Las aguas residuals domésticas. estará tratado por mezcla rápida anóxica (coagulación), digestores aeróbicos y anaeróbicos, clarificadores para decantación y desinfección mediante cloro, que eventualmente será reemplazada por desinfección con luz ultravioleta.

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

NOTICE OF RECEIPT OF APPLICATION AND INTENT TO OBTAIN WATER QUALITY PERMIT RENEWAL

PERMIT NO. WQ0012644001

APPLICATION. City of Leander, P.O. Box 319, Leander, Texas 78646, has applied to the Texas Commission on Environmental Quality (TCEQ) to renew Texas Pollutant Discharge Elimination System (TPDES) Permit No. WQ0012644001 (EPA I.D. No. TX0092151) to authorize the discharge of treated wastewater at a volume not to exceed an annual average flow of 5,250,000 gallons per day. The domestic wastewater treatment facility is located at 10201 Ranch-to-Market Road 2243, in the city of Leander, in Williamson County, Texas 78641. The discharge route is from the plant site to Brushy Creek (unclassified), thence to Brushy Creek. TCEQ received this application on August 1, 2024. The permit application will be available for viewing and copying at City of Leander City Hall, 105 North Brushy Street, Leander, in Williamson County, Texas prior to the date this notice is published in the newspaper. The application, including any updates, and associated notices are available electronically at the following webpage: https://www.tceq.texas.gov/permitting/wastewater/pending-permits/tpdes-applications. This link to an electronic map of the site or facility's general location is provided as a public courtesy and not part of the application or notice. For the exact location, refer to the application.
https://gisweb.tceq.texas.gov/LocationMapper/?marker=-97.84027,30.581388&level=18

ALTERNATIVE LANGUAGE NOTICE. Alternative language notice in Spanish is available at: https://www.tceq.texas.gov/permitting/wastewater/pending-permits/tpdes-applications.
El aviso de idioma alternativo en español está disponible en
https://www.tceq.texas.gov/permitting/wastewater/pending-permits/tpdes-applications.

ADDITIONAL NOTICE. TCEQ's Executive Director has determined the application is administratively complete and will conduct a technical review of the application. After technical review of the application is complete, the Executive Director may prepare a draft permit and will issue a preliminary decision on the application. **Notice of the Application and Preliminary Decision will be published and mailed to those who are on the county-wide mailing list and to those who are on the mailing list for this application. That notice will contain the deadline for submitting public comments.**

PUBLIC COMMENT / PUBLIC MEETING. You may submit public comments or request a public meeting on this application. The purpose of a public meeting is to provide the opportunity to submit comments or to ask questions about the application. TCEQ will hold a public meeting if the Executive Director determines that there is a significant degree of public interest in the application or if requested by a local legislator. A public meeting is not a contested case hearing.

OPPORTUNITY FOR A CONTESTED CASE HEARING. After the deadline for submitting public comments, the Executive Director will consider all timely comments and prepare a response to all relevant and material, or significant public comments. **Unless the application is directly referred for a contested case hearing, the response to comments, and the Executive Director's decision on the application, will be mailed to everyone who submitted public comments and to those persons who are on the mailing list for this application. If comments are received, the mailing will also provide instructions for requesting reconsideration of the Executive Director's decision and for requesting a contested case hearing.** A contested case hearing is a legal proceeding similar to a civil trial in state district court.

TO REQUEST A CONTESTED CASE HEARING, YOU MUST INCLUDE THE FOLLOWING ITEMS IN YOUR REQUEST: your name, address, phone number; applicant's name and proposed permit number; the location and distance of your property/activities relative to the proposed facility; a specific description of how you would be adversely affected by the facility in a way not common to the general public; a list of all disputed issues of fact that you submit during the comment period and, the statement "[I/we] request a contested case hearing." If the request for contested case hearing is filed on behalf of a group or association, the request must designate the group's representative for receiving future correspondence; identify by name and physical address an individual member of the group who would be adversely affected by the proposed facility or activity; provide the information discussed above regarding the affected member's location and distance from the facility or activity; explain how and why the member would be affected; and explain how the interests the group seeks to protect are relevant to the group's purpose.

Following the close of all applicable comment and request periods, the Executive Director will forward the application and any requests for reconsideration or for a contested case hearing to the TCEQ Commissioners for their consideration at a scheduled Commission meeting.

The Commission may only grant a request for a contested case hearing on issues the requestor submitted in their timely comments that were not subsequently withdrawn. **If a hearing is granted, the subject of a hearing will be limited to disputed issues of fact or mixed questions of fact and law relating to relevant and material water quality concerns submitted during the comment period. TCEQ may act on an application to renew a permit for discharge of wastewater without providing an opportunity for a contested case hearing if certain criteria are met.**

MAILING LIST. If you submit public comments, a request for a contested case hearing or a reconsideration of the Executive Director's decision, you will be added to the mailing list for this specific application to receive future public notices mailed by the Office of the Chief Clerk. In addition, you may request to be placed on: (1) the permanent mailing list for a specific applicant name and permit number; and/or (2) the mailing list for a specific county. If you wish to be placed on the permanent and/or the county mailing list, clearly specify which list(s) and send your request to TCEQ Office of the Chief Clerk at the address below.

INFORMATION AVAILABLE ONLINE. For details about the status of the application, visit the Commissioners' Integrated Database at www.tceq.texas.gov/goto/cid. Search the database using the permit number for this application, which is provided at the top of this notice.

AGENCY CONTACTS AND INFORMATION. All public comments and requests must be submitted either electronically at **https://www14.tceq.texas.gov/epic/eComment/**, or in writing to the Texas Commission on Environmental Quality, Office of the Chief Clerk, MC-105, P.O. Box 13087, Austin, Texas 78711-3087. Please be aware that any contact information you provide, including your name, phone number, email address and physical address will become part of the agency's public record. For more information about this permit application or the permitting process, please call the TCEQ Public Education Program, Toll Free, at 1-800-687-4040 or visit their website at www.tceq.texas.gov/goto/pep. Si desea información en Español, puede llamar al 1-800-687-4040.

Further information may also be obtained from City of Leander at the address stated above or by calling Ms. Dara Crabtree, City Secretary, at 512-528-2743.

Issuance Date: September 6, 2024

Comisión de Calidad Ambiental del Estado de Texas

**AVISO DE RECIBO DE LA SOLICITUD Y
EL INTENTO DE OBTENER PERMISO PARA LA CALIDAD DEL AGUA
RENOVACION**

PERMISO NO. WQ0012644001

SOLICITUD. City of Leander, P.O. Box 319, Leander, Texas 78646, ha solicitado a la Comisión de Calidad Ambiental del Estado de Texas (TCEQ) para renovar el Permiso No. WQ0012644001 (EPA I.D. No. TX 0092151) del Sistema de Eliminación de Descargas de Contaminantes de Texas (TPDES) para autorizar la descarga de aguas residuales tratadas en un volumen que no sobrepasa un flujo promedio anual de 5,250,000 galones por día. La planta está ubicada en 10201 Ranch-to-Market Road 2243, en la Ciudad de Leander en el Condado de Williamson, Texas 78641. La ruta de descarga es del sitio de la planta a una corriente no clasificada de Brushy Creek, y después a Brushy Creek. La TCEQ recibió esta solicitud el 1 de agosto de 2024. La solicitud para el permiso estará disponible para ver y copiar en el Ayuntamiento de la Ciudad de Leander, 105 North Brushy Street, Leander, en el Condado de Williamson, Texas antes de la fecha de publicación de este aviso en el periódico. La solicitud (cualquier actualización y aviso inclusive) está disponible electrónicamente en la siguiente página web: https://www.tceq.texas.gov/permitting/wastewater/pending-permits/tpdes-applications. Este enlace a un mapa electrónico de la ubicación general del sitio o de la instalación es proporcionado como una cortesía y no es parte de la solicitud o del aviso. Para la ubicación exacta, consulte la solicitud.
https://www.tceq.texas.gov/permitting/wastewater/pending-permits/tpdes-applications

AVISO DE IDIOMA ALTERNATIVO. El aviso de idioma alternativo en español está disponible en https://www.tceq.texas.gov/permitting/wastewater/pending-permits/tpdes-applications.

AVISO ADICIONAL. El Director Ejecutivo de la TCEQ ha determinado que la solicitud es administrativamente completa y conducirá una revisión técnica de la solicitud. Después de completar la revisión técnica, el Director Ejecutivo puede preparar un borrador del permiso y emitirá una Decisión Preliminar sobre la solicitud. **El aviso de la solicitud y la decisión preliminar serán publicados y enviado a los que están en la lista de correo de las personas a lo largo del condado que desean recibir los avisos y los que están en la lista de correo que desean recibir avisos de esta solicitud. El aviso dará la fecha límite para someter comentarios públicos.**

COMENTARIO PUBLICO / REUNION PUBLICA. Usted puede presentar comentarios públicos o pedir una reunión pública sobre esta solicitud. El propósito de una reunión pública es dar la oportunidad de presentar comentarios o hacer preguntas acerca de la solicitud. La TCEQ realiza una reunión pública si el Director Ejecutivo determina que hay un grado de interés público suficiente en la solicitud o si un legislador local lo pide. Una reunión pública no es una audiencia administrativa de lo contencioso.

OPORTUNIDAD DE UNA AUDIENCIA ADMINISTRATIVA DE LO CONTENCIOSO. Después del plazo para presentar comentarios públicos, el Director Ejecutivo considerará todos los comentarios apropiados y preparará una respuesta a todo los comentarios públicos esenciales, pertinentes, o significativos. **A menos que la solicitud haya sido referida directamente a una audiencia administrativa de lo contencioso, la respuesta a los comentarios y la decisión del Director Ejecutivo sobre la solicitud serán enviados por correo a todos los que presentaron un comentario público y a las personas que están en la lista para recibir avisos sobre esta solicitud. Si se reciben comentarios, el aviso también proveerá instrucciones para pedir una reconsideración de la decisión del Director Ejecutivo y para pedir una audiencia administrativa de lo contencioso.** Una audiencia administrativa de lo contencioso es un procedimiento legal similar a un procedimiento legal civil en un tribunal de distrito del estado.

PARA SOLICITAR UNA AUDIENCIA DE CASO IMPUGNADO, USTED DEBE INCLUIR EN SU SOLICITUD LOS SIGUIENTES DATOS: su nombre, dirección, y número de teléfono; el nombre del solicitante y número del permiso; la ubicación y distancia de su propiedad/actividad con respecto a la instalación; una descripción específica de la forma cómo usted sería afectado adversamente por el sitio de una manera no común al público en general; una lista de todas las cuestiones de hecho en disputa que usted presente durante el período de comentarios; y la declaración "[Yo/nosotros] solicito/solicitamos una audiencia de caso impugnado". Si presenta la petición para una audiencia de caso impugnado de parte de un grupo o asociación, debe identificar una persona que representa al grupo para recibir correspondencia en el futuro; identificar el nombre y la dirección de un miembro del grupo que sería afectado adversamente por la planta o la actividad propuesta; proveer la información indicada anteriormente con respecto a la ubicación del miembro afectado y su distancia de la planta o actividad propuesta; explicar cómo y porqué el miembro sería afectado; y explicar cómo los intereses que el grupo desea proteger son pertinentes al propósito del grupo.

Después del cierre de todos los períodos de comentarios y de petición que aplican, el Director Ejecutivo enviará la solicitud y cualquier petición para reconsideración o para una audiencia de caso impugnado a los Comisionados de la TCEQ para su consideración durante una reunión programada de la Comisión. La Comisión sólo puede conceder una solicitud de una audiencia de caso impugnado sobre los temas que el solicitante haya presentado en sus comentarios oportunos que no fueron retirados posteriormente. Si se concede una audiencia, el tema de la audiencia estará limitado a cuestiones de hecho en disputa o cuestiones mixtas de hecho y de derecho relacionadas a intereses pertinentes y materiales de calidad del agua que se hayan presentado durante el período de comentarios. Si ciertos criterios se cumplen, la TCEQ puede actuar sobre una solicitud para renovar un permiso sin proveer una oportunidad de una audiencia administrativa de lo contencioso.

LISTA DE CORREO. Si somete comentarios públicos, un pedido para una audiencia administrativa de lo contencioso o una reconsideración de la decisión del Director Ejecutivo, la Oficina del Secretario Principal enviará por correo los avisos públicos en relación con la solicitud. Además, puede pedir que la TCEQ ponga su nombre en una o más de las listas correos siguientes (1) la lista de correo permanente para recibir los avisos de el solicitante indicado por nombre y número del permiso específico y/o (2) la lista de correo de todas las solicitudes en un condado especifico. Si desea que se agrega su nombre en una de las listas designe cual lista(s) y envía por correo su pedido a la Oficina del Secretario Principal de la TCEQ.

INFORMACIÓN DISPONIBLE EN LÍNEA. Para detalles sobre el estado de la solicitud, favor de visitar la Base de Datos Integrada de los Comisionados en www.tceq.texas.gov/goto/cid. Para buscar en la base de datos, utilizar el número de permiso para esta solicitud que aparece en la parte superior de este aviso.

CONTACTOS E INFORMACIÓN A LA AGENCIA. Todos los comentarios públicos y solicitudes deben ser presentadas electrónicamente vía http://www14.tceq.texas.gov/epic/eComment/ o por escrito dirigidos a la Comisión de Texas de Calidad Ambiental, Oficial de la Secretaría (Office of Chief Clerk), MC-105, P.O. Box 13087, Austin, Texas 78711-3087. Tenga en cuenta que cualquier información personal que usted proporcione, incluyendo su nombre, número de teléfono, dirección de correo electrónico y dirección física pasarán a formar parte del registro público de la Agencia. Para obtener más información acerca de esta solicitud de permiso o el proceso de permisos, llame al programa de educación pública de la TCEQ, gratis, al 1-800-687-4040. Si desea información en Español, puede llamar al 1-800-687-4040.

También se puede obtener información adicional de la Ciudad de Leander a la dirección indicada arriba o llamando a Sra. Dara Crabtree, secretaria de la Ciudad, al 512-528-2743.

Fecha de emisión: el 6 de septiembre de 2024

Leah Whallon

From: Joshua Cashio <jcashio@gbateam.com>
Sent: Wednesday, August 28, 2024 12:47 PM
To: Leah Whallon
Subject: RE: Application to Amend/Renew Permit No. WQ0012644001; City of Leander; City of Leander WWTP
Attachments: Municipal Discharge Renewal Spanish NORI.docx

Follow Up Flag: Follow up
Flag Status: Flagged

Leah,

Attached is the Spanish NORI as a word document.

Thank you,

Josh

Joshua Cashio E.I.T Staff Engineer
d 737.247.7560

From: Joshua Cashio <jcashio@gbateam.com>
Sent: Wednesday, August 28, 2024 12:24 PM
To: Leah Whallon <Leah.Whallon@Tceq.Texas.Gov>; Frank Phelan <fphelan@gbateam.com>
Subject: RE: Application to Amend/Renew Permit No. WQ0012644001; City of Leander; City of Leander WWTP

Leah,

Please see the requested additional information attached. Please let me know if there are any issues.

Thank you,

Josh

Joshua Cashio E.I.T Staff Engineer
d 737.247.7560

From: Leah Whallon <Leah.Whallon@Tceq.Texas.Gov>
Sent: Wednesday, August 28, 2024 10:31 AM
To: Frank Phelan <fphelan@gbateam.com>
Cc: Joshua Cashio <jcashio@gbateam.com>
Subject: RE: Application to Amend/Renew Permit No. WQ0012644001; City of Leander; City of Leander WWTP

Good Morning,

I received a hard copy response for this application, but have not received the requested electronic copy of the response. Can you please send an electronic copy of the complete response, including the Spanish NORI in a Microsoft Word document?

Please let me know if you have any questions.

Thanks,

Leah Whallon
Texas Commission on Environmental Quality
Water Quality Division
512-239-0084
leah.whallon@tceq.texas.gov

How is our customer service? Fill out our online customer satisfaction survey at
www.tceq.texas.gov/customersurvey

From: Leah Whallon
Sent: Friday, August 16, 2024 4:04 PM
To: fphelan@gbateam.com
Cc: jcashio@gbateam.com
Subject: Application to Amend/Renew Permit No. WQ0012644001; City of Leander; City of Leander WWTP

Good Afternoon,

Please see the attached Notice of Deficiency letter dated August 16, 2024 requesting additional information needed to declare the application administratively complete. Please send the complete response by August 30, 2024.

Please let me know if you have any questions.

Thank you,

Leah Whallon
Texas Commission on Environmental Quality
Water Quality Division
512-239-0084
leah.whallon@tceq.texas.gov

How is our customer service? Fill out our online customer satisfaction survey at
www.tceq.texas.gov/customersurvey

9601 Amberglen Blvd. #109
Austin, TX 78729

August 23, 2024

Texas Commission on Environmental Quality
Water Quality Division
Applications Review and Processing Team (MC148)
P.O. Box 13087
Austin, Texas 78711-3087

VIA: USPS, Certified, Return Receipt Requested

Re: Permit Renewal/Amendment Application for the
Wastewater Treatment Plant Permit No. WQ0012644001
City of Leander, Texas

Dear Ms. Whallon,

This submittal is in response to your administrative review comments issued for the above-referenced application on August 16, 2024. The submittal includes responses to comments in the form of a narrative (with responses in bold font), addressing each enumerated item.

1. Administrative Report 1.0, Section 2.d, 2.e
   The application type is listed as Major Amendment with Renewal, but the proposed changes indicate only the addition of an interim phase and no change to the current approved final phase. Changes to an interim phase are considered a Minor Amendment with Renewal. Please confirm it there are any other changes proposed to the permit. Provide a revised page for Section 2 to update the appropriate application type.

   The application type has been corrected from Major Amendment with Renewal to Minor Amendment with Renewal. There will be no other change proposed to the permit besides the addition of an interim phase.

2. The following is a portion of the NORI which contains information relevant to your application. Please read it carefully and indicate if it contains any errors or omissions. The complete notice will be sent to you once the application is declared administratively complete.

   APPLICATION. City of Leander, P.O. Box 319, Leander, Texas 78646, has applied to the Texas Commission on Environmental Quality (TCEQ) to renew Texas Pollutant Discharge Elimination System (TPDES) Permit No. WQ0012644001 (EPA I.D. No. TX0092151) to authorize the discharge of treated wastewater at a volume not to exceed an annual average flow of 5,250,000 gallons per day. The domestic wastewater treatment facility is located at 10201 Ranch-to-Market Road 2243, in the city of Leander, in Williamson County, Texas 78641. The discharge route is from the plant site to Brushy Creek (unclassified), thence to Brushy Creek. TCEQ received this application on August 1, 2024. The permit application will be available for viewing and copying at City of Leander City Hall, 105 North Brushy Street, Leander, in Williamson County, Texas prior to the date this notice is published in the newspaper. The application, including any updates, and associated notices are available electronically at the following webpage: https://www.tceq.texas.gov/permitting/wastewater/pending-permits/tpdes-applications.

This link to an electronic map of the site or facility's general location is provided as a public courtesy and not part of the application or notice. For the exact location, refer to the application. https://gisweb.tceq.texas.gov/LocationMapper/?marker=-97.84027,30.581388&level=18

Further information may also be obtained from City of Leander at the address stated above or by calling Ms. Dara Crabtree, City Secretary, at 512-528-2743.

The updated text is provided below:

City of Leander, P.O. Box 319, Leander, Texas 78646, has applied to the Texas Commission on Environmental Quality (TCEQ) to renew Texas Pollutant Discharge Elimination System (TPDES) Permit No. WQ0012644001 (EPA I.D. No. TX0092151) to authorize the discharge of treated wastewater at a volume not to exceed an annual average flow of 5,250,000 gallons per day and add an Interim Phase 2 capacity of 4,250,000 gallons per day. The domestic wastewater treatment facility is located at 10201 Ranch-to-Market Road 2243, in the city of Leander, in Williamson County, Texas 78641. The discharge route is from the plant site to Brushy Creek (unclassified), thence to Brushy Creek. TCEQ received this application on August 1, 2024. The permit application will be available for viewing and copying at City of Leander City Hall, 105 North Brushy Street, Leander, in Williamson County, Texas prior to the date this notice is published in the newspaper. The application, including any updates, and associated notices are available electronically at the following webpage: https://www.tceq.texas.gov/permitting/wastewater/pending-permits/tpdes-applications.

This link to an electronic map of the site or facility's general location is provided as a public courtesy and not part of the application or notice. For the exact location, refer to the application. https://gisweb.tceq.texas.gov/LocationMapper/?marker=-97.84027,30.581388&level=18

Further information may also be obtained from City of Leander at the address stated above or by calling Ms. Dara Crabtree, City Secretary, at 512-528-2743.

A correction was made including the addition of Interim Phase 2 capacity of 4,250,000 gallons per day in the permit.

3. The application indicates that public notices in Spanish are required. After confirming the portion of the NORI above does not contain any errors or omissions, please use the attached template to translate the NORI into Spanish. Only the first and last paragraphs are unique to this application and require translation. Please provide the translated Spanish NORI in a Microsoft Word document.

   The updated translated Spanish Nori is attached as a separate Microsoft Word document.

Sincerely,

Frank T. Phelan

Frank T. Phelan, P.E.

FTP/s

Attachments

Cc: Gina Ellison, City of Leander

c. Check the box next to the appropriate permit type.

☒ TPDES Permit

☐ TLAP

☐ TPDES Permit with TLAP component

☐ Subsurface Area Drip Dispersal System (SADDS)

d. Check the box next to the appropriate application type

☐ New

☐ Major Amendment *with* Renewal ☒ Minor Amendment *with* Renewal

☐ Major Amendment *without* Renewal ☐ Minor Amendment *without* Renewal

☐ Renewal without changes ☐ Minor Modification of permit

e. For amendments or modifications, describe the proposed changes: The proposed permit includes addition of interim stage II flow of 4.25 MGD, between the initial 2.25 MGD and the final 5.25 MGD. Proposed effluent parameter set for Interim phase II is 5,5,2,0.5. Proposed effluent parameter set for final phase is 5,5,2,1.

f. For existing permits:

Permit Number: WQ00 12644001

EPA I.D. (TPDES only): TX 0092151

Expiration Date: 01-23-2025

Section 3. Facility Owner (Applicant) and Co-Applicant Information (Instructions Page 26)

A. The owner of the facility must apply for the permit.

What is the Legal Name of the entity (applicant) applying for this permit?

City of Leander

(The legal name must be spelled exactly as filed with the Texas Secretary of State, County, or in the legal documents forming the entity.)

If the applicant is currently a customer with the TCEQ, what is the Customer Number (CN)? You may search for your CN on the TCEQ website at http://www15.tceq.texas.gov/crpub/

CN: 600646012

What is the name and title of the person signing the application? The person must be an executive official meeting signatory requirements in *30 TAC § 305.44*.

Prefix: Mr. Last Name, First Name: Parton, Todd

Title: City Manager Credential: Click to enter text.

B. Co-applicant information. Complete this section only if another person or entity is required to apply as a co-permittee.

What is the Legal Name of the co-applicant applying for this permit?

Click to enter text.

Comisión de Calidad Ambiental del Estado de Texas

**AVISO DE RECIBO DE LA SOLICITUD Y
EL INTENTO DE OBTENER PERMISO PARA LA CALIDAD DEL AGUA
RENOVACION**

PERMISO NO. WQ0012644001

SOLICITUD. City of Leander, P.O. Box 319, Leander, Texas 78646 ha solicitado a la Comisión de Calidad Ambiental del Estado de Texas (TCEQ) para renovar el Permiso No. WQ0012644001 (EPA I.D. No. TX 0092151) del Sistema de Eliminación de Descargas de Contaminantes de Texas (TPDES) para autorizar la descarga de aguas residuales tratadas en un volumen que no sobrepasa un flujo promedio diario de 5,250,000 galones por día y agregar una capacidad provisional de la Fase 2 de 4,250,000 galones por día. La planta está ubicada en 10201 Ranch-to-Market Road 2243, en la Ciudad de Leander en el Condado de Williamson, Texas. La ruta de descarga es del sitio de la planta a una corriente no clasificada de Brushy Creek, y después a Brushy Creek. La TCEQ recibió esta solicitud el 1ro de Agosto del 2024. La solicitud para el permiso estará disponible para ver y copiar en el Ayuntamiento de la Ciudad de Leander, 105 North Brushy Street, Leander, en el Condado de Williamson, Texas antes de la fecha de publicación de este aviso en el periódico. Este enlace a un mapa electrónico de la ubicación general del sitio o de la instalación es proporcionado como una cortesía y no es parte de la solicitud o del aviso. Para la ubicación exacta, consulte la solicitud.
https://www.tceq.texas.gov/permitting/wastewater/pending-permits/tpdes-applications

AVISO ADICIONAL. El Director Ejecutivo de la TCEQ ha determinado que la solicitud es administrativamente completa y conducirá una revisión técnica de la solicitud. Después de completar la revisión técnica, el Director Ejecutivo puede preparar un borrador del permiso y emitirá una Decisión Preliminar sobre la solicitud. **El aviso de la solicitud y la decisión preliminar serán publicados y enviado a los que están en la lista de correo de las personas a lo largo del condado que desean recibir los avisos y los que están en la lista de correo que desean recibir avisos de esta solicitud. El aviso dará la fecha límite para someter comentarios públicos.**

COMENTARIO PUBLICO / REUNION PUBLICA. Usted puede presentar comentarios públicos o pedir una reunión pública sobre esta solicitud. El propósito de una reunión pública es dar la oportunidad de presentar comentarios o hacer preguntas acerca de la solicitud. La TCEQ realiza una reunión pública si el Director Ejecutivo determina que hay un grado de interés público suficiente en la solicitud o si un legislador local lo pide. Una reunión pública no es una audiencia administrativa de lo contencioso.

OPORTUNIDAD DE UNA AUDIENCIA ADMINISTRATIVA DE LO CONTENCIOSO. Después del plazo para presentar comentarios públicos, el Director Ejecutivo considerará todos los comentarios apropiados y preparará una respuesta a todo los comentarios públicos esenciales, pertinentes, o significativos. **A menos que la solicitud haya sido referida directamente a una audiencia administrativa de lo contencioso, la respuesta a los comentarios y la decisión del Director Ejecutivo sobre la solicitud serán enviados por correo a todos los que presentaron un comentario público y a las personas que están en la lista para recibir avisos sobre esta solicitud. Si se reciben comentarios, el aviso también proveerá instrucciones para pedir una reconsideración de la decisión del Director Ejecutivo y para pedir una audiencia administrativa de lo contencioso.** Una audiencia administrativa de lo contencioso es un procedimiento legal similar a un procedimiento legal civil en un tribunal de distrito del estado.

PARA SOLICITAR UNA AUDIENCIA DE CASO IMPUGNADO, USTED DEBE INCLUIR EN SU SOLICITUD LOS SIGUIENTES DATOS: su nombre, dirección, y número de teléfono; el nombre del solicitante y número del permiso; la ubicación y distancia de su propiedad/actividad con respecto a la instalación; una descripción específica de la forma cómo usted sería afectado adversamente por el sitio de una manera no común al público en general; una lista de todas las cuestiones de hecho en disputa que usted presente durante el período de comentarios; y la declaración "[Yo/nosotros] solicito/solicitamos una audiencia de caso impugnado". Si presenta la petición para una audiencia de caso impugnado de parte de un grupo o asociación, debe identificar una persona que representa al grupo para recibir correspondencia en el futuro; identificar el nombre y la dirección de un miembro del grupo que sería afectado adversamente por la planta o la actividad propuesta; proveer la información indicada anteriormente con respecto a la ubicación del miembro afectado y su distancia de la planta o actividad propuesta; explicar cómo y porqué el miembro sería afectado; y explicar cómo los intereses que el grupo desea proteger son pertinentes al propósito del grupo.

Después del cierre de todos los períodos de comentarios y de petición que aplican, el Director Ejecutivo enviará la solicitud y cualquier petición para reconsideración o para una audiencia de caso impugnado a los Comisionados de la TCEQ para su consideración durante una reunión programada de la Comisión. La Comisión sólo puede conceder una solicitud de una audiencia de caso impugnado sobre los temas que el solicitante haya presentado en sus comentarios oportunos que no fueron retirados posteriormente. Si se concede una audiencia, el tema de la audiencia estará limitado a cuestiones de hecho en disputa o cuestiones mixtas de hecho y de derecho relacionadas a intereses pertinentes y materiales de calidad del agua que se hayan presentado durante el período de comentarios. Si ciertos criterios se cumplen, la TCEQ puede actuar sobre una solicitud para renovar un permiso sin proveer una oportunidad de una audiencia administrativa de lo contencioso.

LISTA DE CORREO. Si somete comentarios públicos, un pedido para una audiencia administrativa de lo contencioso o una reconsideración de la decisión del Director Ejecutivo, la Oficina del Secretario Principal enviará por correo los avisos públicos en relación con la solicitud. Ademas, puede pedir que la TCEQ ponga su nombre en una or mas de las listas correos siguientes (1) la lista de correo permanente para recibir los avisos de el solicitante indicado por nombre y número del permiso específico y/o (2) la lista de correo de todas las solicitudes en un condado especifico. Si desea que se agrega su nombre en una de las listas designe cual lista(s) y envia por correo su pedido a la Oficina del Secretario Principal de la TCEQ.

CONTACTOS E INFORMACIÓN A LA AGENCIA. Todos los comentarios públicos y

solicitudes deben ser presentadas electrónicamente vía http://www14.tceq.texas.gov/epic/eComment/ o por escrito dirigidos a la Comisión de Texas de Calidad Ambiental, Oficial de la Secretaría (Office of Chief Clerk), MC-105, P.O. Box 13087, Austin, Texas 78711-3087. Tenga en cuenta que cualquier información personal que usted proporcione, incluyendo su nombre, número de teléfono, dirección de correo electrónico y dirección física pasarán a formar parte del registro público de la Agencia. Para obtener más información acerca de esta solicitud de permiso o el proceso de permisos, llame al programa de educación pública de la TCEQ, gratis, al 1-800-687-4040. Si desea información en Español, puede llamar al 1-800-687-4040.

También se puede obtener información adicional de la Ciudad de Leander a la dirección indicada arriba o llamando a Ms. Dara Crabtree, Secretaria de la Ciudad, al 512-528-2743.

Fecha de emisión:

9601 Amberglen Blvd. #109
Austin, TX 78729

GBA

LETTER OF TRANSMITTAL

Date: August 8, 2024

To: Texas Commission on Environmental Quality
Water Quality Division
Applications Review and Processing Team (MC148)
P.O. Box 13087
Austin, Texas 78711-3087

Attention: Applications Reivew and Processing Team

Project Number: 16532

Subject: Permit No. WQ0012644001 Amendment & Renewal

We are sending you: ☒ Attached ☐ Under separate cover via:__________

☐ Shop drawings ☐ Prints ☐ Plans ☐Specifications

☐ Copy of letter ☐ Change order ☐ Catalog

☒ Permit Applications ☐ Prints returned after loan to us_____________

COPIES	DATE	DESCRIPTION
1	08/09/24	Revised Original TDPES Permit Renewal/Amendment Application Technical Report Page 10 and Addition to Attachment M (Lab Results)
2	08/09/24	Copies of Revised TDPES Permit Renewal/Amendment Application Technical Report Page 10 and Addition to Attachment M (Lab Results)

These are transmitted as checked below:

☐For approval ☐Reviewed ☐Prints returned after loan to us

☐For your use ☐Furnish as corrected ☐Rejected

☐As requested ☒Review and Comment _____________copies

☐Submit ___________ copies for distribution ☐__________________________

☐For bids due ___________, 20_____

Remarks:

Copy to: Gina Ellison, City of Leander

Signed: Frank T. Phelan
Frank T. Phelan

Table1.0(2) – Pollutant Analysis for Wastewater Treatment Facilities

Pollutant	Average Conc.	Max Conc.	No. of Samples	Sample Type	Sample Date/Time
$CBOD_5$, mg/l	5	-	1	Grab	7/30/24 8:19
Total Suspended Solids, mg/l	3	-	1	Grab	7/30/24 8:19
Ammonia Nitrogen, mg/l	<0.10	-	1	Grab	7/30/24 8:19
Nitrate Nitrogen, mg/l	8.73	-	1	Grab	7/30/24 8:19
Total Kjeldahl Nitrogen, mg/l	1.92	-	1	Grab	7/30/24 8:19
Sulfate, mg/l	76.8	-	1	Grab	7/30/24 8:19
Chloride, mg/l	138	-	1	Grab	7/30/24 8:19
Total Phosphorus, mg/l	0.42	-	1	Grab	7/30/24 8:19
pH, standard units	7.5	-	1	Grab	7/30/24 8:19
Dissolved Oxygen*, mg/l	7.5	-	1	Grab	7/30/24 8:19
Chlorine Residual, mg/l	1.4	-	1	Grab	7/30/24 8:19
E.coli (CFU/100ml) freshwater	<1	-	1	Grab	7/30/24 8:19
Entercocci (CFU/100ml) saltwater	-	-	-	-	-
Total Dissolved Solids, mg/l	578	-	1	Grab	7/30/24 8:19
Electrical Conductivity, µmohs/cm, †	1040	-	1	Grab	7/30/24 8:19
Oil & Grease, mg/l	<7	-	1	Grab	7/30/24 8:19
Alkalinity ($CaCO_3$)*, mg/l	112	-	1	Grab	7/30/24 8:19

*TPDES permits only
†TLAP permits only

Table1.0(3) – Pollutant Analysis for Water Treatment Facilities

Pollutant	Average Conc.	Max Conc.	No. of Samples	Sample Type	Sample Date/Time
Total Suspended Solids, mg/l					
Total Dissolved Solids, mg/l					
pH, standard units					
Fluoride, mg/l					
Aluminum, mg/l					
Alkalinity ($CaCO_3$), mg/l					

Section 8. Facility Operator (Instructions Page 50)

Facility Operator Name: Juan Ramirez

Facility Operator's License Classification and Level: Wastewater Treatment Operator A

Facility Operator's License Number: WW0067965

ENVIRONMENTAL
MONITORING
LABORATORY , L.L.C

P.O. Box 477
6145 State Highway 171
Hillsboro, Texas 76645
Phone: 254-582-2622

BIOLOGICAL & CHEMICAL ANALYSIS / UTILITIES MANAGEMENT & OPERATION / WATERWELL DRILLING & SERVICE / GEOLOGICAL INVESTIGATION

ANALYTICAL REPORT 24073050

For:

City of Leander
PO BOX 318
Leander, Texas 78641

Sample Site: Renewal Analysis

Collected Date: 07/30/24

Certificate Number: T104704247
Lab Number: TX01547

Authorized for release by:
06-AUG-24

Lisa Soward, Data Manager

homeoffice@yourwaterlab.com

The test results in this report meet all 2009 NELAC and 2016 TNI requirements for accredited parameters, exceptions are noted in this report. This report may not be reproduced except in full, and with written approval from the laboratory. For questions please contact the Project Manager at the e-mail address or telephone number listed on this page.

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory

ENVIRONMENTAL MONITORING LABORATORY , L.L.C

P.O. Box 477
6145 State Highway 171
Hillsboro, Texas 76645
Phone: 254-582-2622

BIOLOGICAL & CHEMICAL ANALYSIS / UTILITIES MANAGEMENT & OPERATION / WATERWELL DRILLING & SERVICE / GEOLOGICAL INVESTIGATION

ANALYTICAL RESULTS

Analytical Report: 24073050

Lab ID:	24073050-001	Collected Date:	07/30/24 08:19	Matrix:	Waste Water
Client:	City of Leander	Received Date:	07/30/24 13:54	Temp at Receipt:	6.2 °C
Sample Site:	Renewal Analysis	Report Date:	08/06/24	Sample Collector:	JR

Analyte	Abbreviation	Method	TNI Cert	Date Analyzed	Result	Units
Ammonia Nitrogen	NH3N	SM 4500-NH3/D	NP	07/31/24 08:52	<0.100	mg/L
Carbonaceous BOD	CBOD	SM 5210/B	NP	07/31/24 09:11	5	mg/L
Total Suspended Solids	TSS	SM 2540/D	NP/P	07/31/24 10:29	3	mg/L
pH	SM4500-H	SM4500/H	N	07/30/24 08:19	7.5	SU
Nitrate as N	E300.0	E 300.0	NP/P	07/30/24 15:00	8.73	mg/L
Dissolved Oxygen	DO	SM 4500-O	N	07/30/24 08:19	7.5	mg/L
Total Phosphorus (as P)	T.PHOS.	SM 4500-P/E	NP	07/31/24 11:18	0.420	mg/L
Nitrogen, Total Kjeldahl	TKN	SM 4500-NH3/D	NP	07/31/24 13:43	1.92	mg/L
Total dissolved solids	SM2540C	SM 2540/C	N	07/31/24 15:15	578.0	mg/L
Sulfate	E300.0	E 300.0	NP/P	07/30/24 15:19	76.8	mg/L
Chloride	Cl-	SM 4500-Cl-/B	NP	08/01/24 14:12	138	mg/L
Chlorine	SM4500-CL	SM4500-CL	NP	07/30/24 08:19	1.4	mg/L
n-Hexane Extractable Material (HEM)	O&G	SM 5520/B	NP	08/05/24 11:41	<7.00	mg/L
Alkalinity, Total (CaCO3)	ALK	SM 2320/B	NP	08/02/24 09:07	112	mg/L
Conductivity @ 25C	Cond	SM 2510/B	NP	08/01/24 10:46	1040	umhos/cm
E. coli	*E. coli*	IDEXX Colilert	NP	07/30/24 14:47	<1.00	MPN/100 mL
Flow	MGD	Provisional Instantaneous	N	07/30/24 08:19	0.0020	MGD
Temperature	(water, on site)	(water, on site)	N	07/30/24 08:19	26.7	°C

ENVIRONMENTAL
MONITORING
LABORATORY , L.L.C

P.O. Box 477
6145 State Highway 171
Hillsboro, Texas 76645
Phone: 254-582-2622

P: Potable water NP: Non Potable water N: Not Certified

Control #: 24073050

QUALITY ASSURANCE & QUALITY CONTROL

ANALYTE	ABBR./ ALT.NAME	STANDARD METHOD	UNITS	Quality Control S.D.	CV%	REC.1%	REC.2%	MDL/PQL	Q
Nitrate as N	E300.0	E 300.0	mg/L					0.400 / 0.400	
Sulfate	E300.0	E 300.0	mg/L					1.00 / 1.80	
Alkalinity, Total (CaCO3)	ALK	SM 2320/B	mg/L					1.50 / 5.00	
Chloride	Cl-	SM 4500-Cl-/B	mg/L	1.41	0.28	102	100	1.00 / 3.00	
Ammonia Nitrogen	NH3N	SM 4500-NH3/D	mg/L	0.05	2.40	100.2	104.4	0.0300 / 0.100	
Nitrogen, Total Kjeldahl	TKN	SM 4500-NH3/D	mg/L	0.08	0.60	100.7	101.9	0.0200 / 0.120	
Total Phosphorus (as P)	T.PHOS.	SM 4500-P/E	mg/L	0.03	0.40	101.7	102.4	.02 / .05	
n-Hexane Extractable Material (HEM)	O&G	SM 5520/B	mg/L	.57	.57	100.0	100.2	7.00 / 7.00	
Chemical Oxygen Demand	COD	SM 5220/D	mg/L						
Turbidity	TURB.	SM 2130/B	NTUs						
Total Percent Solids	%d.w	SM 2540/G	%						N

Biochemical Oxygen Demand(BOD)
Carbonaceous Biochemical Oxygen Demand(CBOD)
Method: SM 5210/B

Results	Units	Description
0.12	mg/L	Blank 1 - CBOD
0.14	mg/L	Blank 2 - CBOD
0.12	mg/L	Blank 3 - CBOD
196	mg/L	G/GA Std 1 - CBOD
195	mg/L	G/GA Std 2 - CBOD
196	mg/L	G/GA Std 3 - CBOD
195	mg/L	**G/GA Average - CBOD**
0.72	mg/L	Seed Corr/mL - CBOD
0.72	mg/L	Seed Corr/mL - CBOD
0.73	mg/L	Seed Corr/mL - CBOD
0.72	mg/L	**Seed Corr Average - CBOD**

Dissolved Oxygen
Method: SM 4500-O*/G

Results	Units	Description
8.88	mg/L	Set Up Calibration
9.07	mg/L	Read Off Calibration
20	°C	Set Up Temperature
20	°C	Read Off Temperature
759	mm Hg	Set Up Barometer
762	mm Hg	Read Off Barometer

Fecal Coliform
Method: SM9222 /D MF

Results	Units	Description
	CFU/100ml	Pre Blank
	CFU/100ml	Post Blank

TDS by SM2540/C

Results	Units	Description
0	mg/L	Blank

E. coli By IDEXX Collilert (enumeration)

MPN/100 mL

Total Suspended Solids (TSS, MLSS)
Method: 2540/D

Results	Units	Description
0.4	mg/L	Blank 1
0.2	mg/L	Blank 2
0.3	mg/L	Blank 3
0.3	mg/L	Blank 4
2.75	%	Relative % Difference
0.62	%	Relative % Difference
3.52	%	Relative % Difference
2.95	%	Relative % Difference
2.76	%	Relative % Difference
3.17	%	Relative % Difference
3.88	%	Relative % Difference
0	%	Relative % Difference

Conductivity @ 25° C
Method: SM2510/B
Standards ran for each analytical batch.

Results	Units	Description
	umhos/cm	Conductivity Standard
	umhos/cm	Conductivity Standard
	umhos/cm	Conductivity Standard

Report Out Date: 08/06/2024

Lisa Soward

Lisa Soward
Data Manager

Final 1.000

QUALITY ASSURANCE & QUALITY CONTROL

Standard Method E 300.0

Matrix Waste Water

Batch Number 77221

Sample ID	Parameter	Result	Ref. Value	Spike Conc.	Per. Rec.	Rec. Limits	RPD	RPD Limits	Flags
77221-1-LCS	Nitrate as N	7.77 mg/L		8.00 mg/L	97%	90-110%		0-20%	
77221-1-LCSD	Nitrate as N	7.82 mg/L		8.00 mg/L	98%	90-110%	1%	0-20%	
77221-1-UNS	Nitrate as N	0.200 mg/L			0%	90-110%		0-20%	
24072915-001S	Nitrate as N	7.92 mg/L	0.200 mg/L	8.00 mg/L	97 %	80-120%		0-20%	
24072915-001SD	Nitrate as N	7.88 mg/L	0.200 mg/L	8.00 mg/L	96 %	80-120%	0.51%	0-20%	

Standard Method E 300.0

Matrix Waste Water

Batch Number 77222

Sample ID	Parameter	Result	Ref. Value	Spike Conc.	Per. Rec.	Rec. Limits	RPD	RPD Limits	Flags
77222-1-LCS	Sulfate	14.2 mg/L		15.0 mg/L	95%	90-110%		0-20%	
77222-1-LCSD	Sulfate	14.2 mg/L		15.0 mg/L	95%	90-110%	0%	0-20%	
77222-1-UNS	Sulfate	2.73 mg/L			0%	90-110%		0-20%	
24072909-001S	Sulfate	16.7 mg/L	2.73 mg/L	15.0 mg/L	93 %	80-120%		0-20%	
24072909-001SD	Sulfate	16.7 mg/L	2.73 mg/L	15.0 mg/L	93 %	80-120%	0.00%	0-20%	

Standard Method SM 2540/D

Matrix Waste Water

Batch Number 77229

Sample ID	Parameter	Result	Ref. Value	Spike Conc.	Per. Rec.	Rec. Limits	RPD	RPD Limits	Flags
77229-1-MB	Total Suspended Solids	0.4000 mg/L			0%	80-120%		0-10%	
77229-2-MB	Total Suspended Solids	0.2000 mg/L			0%	80-120%		0-10%	
77229-3-MB	Total Suspended Solids	0.3000 mg/L			0%	80-120%		0-10%	
77229-4-MB	Total Suspended Solids	0.3000 mg/L			0%	80-120%		0-10%	

QUALITY ASSURANCE & QUALITY CONTROL

Standard Method SM 5210/B
Matrix Waste Water
Batch Number 77231

Sample ID	Parameter	Result	Ref. Value	Spike Conc.	Per. Rec.	Rec. Limits	RPD	RPD Limits	Flags
77231-1-BKS01	Carbonaceous BOD	196 mg/L		198 mg/L	99%	85-115%		0-25%	
77231-2-BKS02	Carbonaceous BOD	195 mg/L		198 mg/L	98%	85-115%		0-25%	
77231-3-BKS03	Carbonaceous BOD	196 mg/L		198 mg/L	99%	85-115%		0-25%	
77231-4-BKS04	Carbonaceous BOD	195 mg/L		198 mg/L	98%	85-115%		0-25%	
77231-1-BLK01	Carbonaceous BOD	0.120 mg/L			0%	85-115%		0-25%	
77231-2-BLK02	Carbonaceous BOD	0.140 mg/L			0%	85-115%		0-25%	
77231-3-BLK03	Carbonaceous BOD	0.120 mg/L			0%	85-115%		0-25%	

Standard Method SM 2540/C
Matrix Waste Water
Batch Number 77235

Sample ID	Parameter	Result	Ref. Value	Spike Conc.	Per. Rec.	Rec. Limits	RPD	RPD Limits	Flags
77235-1-MB	Total dissolved solids	< mg/L			0%	80-120%		0-10%	

Environmental Monitoring Laboratory ◆ P.O. Box 477 / 6145 State Highway 171, Hillsboro, Texas 76645 ◆ Phone: (254) 582-2622

TCEQ Lab ID: T104704247 EPA Lab ID: TX01547

Purchase Order / Chain of Custody

Panhandle Division 13260 South US Hwy 287 Amarillo, Texas 79118 Office: 806-335-9393 Emergency: 806-786-0612

Southwest Division 811 E. Young Street Llano, Texas 78643 Office: 325-247-3295 Emergency: 254-582-2622

East Texas Division 14295 S.H. 155 North Winona, Texas 75792 Office: 903-877-9222 Emergency: 817-357-6535

Coastal Division 34 East Ave., Schulenburg, Texas 78956 Office: 979-743-7010 Emergency: 254-221-3201

CL2

4407/30/24
~~0.04 mg/L~~
1.34 mg/L

Report To: Kenley Crowder	Report To: (Buyer)
Company: City of Leander	Purchase Order #:
10201 Ranch Road 2243 Leander, TX 78641	Address:
Email: kcrowder@leandertx.gov	Phone: Fax:
Project Name:	Quote #:
Project Location: WWTP	City, State:
Date Due: Rush: 0% 25% 50% 100%	Sampler: (Please Print) Juan Ramirez

24073050

ANALYSES REQUESTED

Lab#	Client Sample ID	Matrix	Date	Time	*Pres. Code	† Bottle Code	CBOD / BOD	TSS, TDS	pH 7.5	DO 7.5 (Temp 26.7)	NH3N (pH<2.0, H_2SO_4) SM4500-NH3 D or G unless specified TKN, TOT PHOS	FECAL COLIFORM / E.COLI (Sterile)	MLSS	ALKALINITY, CHLORIDE, CONDUCT	OIL & GREASE	NITRATE, SULFATE		Sample Remarks
24073050	1. Renewal Analysis	WW	7-30-24	0815	1	1	X	X	X	X								0.0020mg/L
	2.		7-30-24	0815	2	1					X							
	3.		7-30-24	0800	6	1						X						
	4.		7-30-24	0817	1	1								X				
	5.		7-30-24	0818	2	2									X			
	6.		7-30-24	0819	1	1										X		
	7.																	
	8.																	
	9.																	
	10.																	

Relinquished By:	Date	Time	Received By:	Date	Time
1. [signature]	7-30-24	1150	1. [signature]	7/30/24	1150
2. [signature]	7/30/24	1354	2. Jordan [signature]	7/30/24	1354
3.			3.		
4.			4.		

COOLER ID: 2P4L7
Ice: YES NO
Temperature: 6.2

*Preservation Codes: 1. None 2. Sulfuric 3. Nitric 4. NaOH + ZnAc 5. NaOH 6. Sterile + Thiosulfate

† Bottle Codes: 1. Plastic 2. Glass + Tef. 3. 40 ml VOA

Complete sample information is vital for proper login and reporting. EML may need to subcontract some analyses due to equipment or procedural limitations.

Check us out on the web: http://www.yourwaterlab.com **Email us at: homeoffice@yourwaterlab.com**

Revised 06/2024

9601 Amberglen Blvd. #109
Austin, TX 78729

GBA

LETTER OF TRANSMITTAL

Date: July 26, 2024

To: Texas Commission on Environmental Quality
Water Quality Division
Applications Review and Processing Team (MC148)
P.O. Box 13087
Austin, Texas 78711-3087

Attention: Applications Reivew and Processing Team

Project Number: 16532

Subject: Permit No. WQ0012644001 Amendment & Renewal

We are sending you: ☒ Attached ☐ Under separate cover via:__________

☐ Shop drawings ☐ Prints ☐ Plans ☐Specifications

☐ Copy of letter ☐ Change order ☐ Catalog

☒ Permit Applications ☐ Prints returned after loan to us_____________

COPIES	DATE	DESCRIPTION
1	07/26/24	Original TDPES Permit Renewal/Amendment Application
2	07/26/24	Copies of TDPES Permit Renewal/Amendment Application
1	07/26/24	USB with Affected Landowner Mailing Labels
1	07/26/24	Cover Letter

These are transmitted as checked below:

☐For approval ☐Reviewed ☐Prints returned after loan to us

☐For your use ☐Furnish as corrected ☐Rejected

☐As requested ☒Review and Comment _____________copies

☐Submit ___________ copies for distribution ☐__________________________

☐For bids due ___________, 20_____

Remarks:

Copy to: Gina Ellison, City of Leander

Signed: Frank T. Phelan
Frank T. Phelan

9601 Amberglen Blvd. #109
Austin, TX 78729

July 26, 2024

Texas Commission on Environmental Quality
Water Quality Division
Applications Review and Processing Team (MC148)
P.O. Box 13087
Austin, Texas 78711-3087

VIA: USPS, Certified, Return Receipt Requested

Re: Permit Renewal/Amendment Application for the
Wastewater Treatment Plant Permit No. WQ0012644001
City of Leander, Texas

To Whom It May Concern,

Enclosed are one original and two copies of the above-mentioned permit application packages. These are submitted for your review and approval.

The City of Leander is requesting amendment of the current discharge permit to add an Interim Phase 2 capacity of 4.25 MGD to meet ongoing and planned growth within the City of Leander City Limits and Certificated Area of Convenience and Necessity. The current Interim Phase 1 and Ultimate capacities of 2.25 MGD and 5.25 MGD respectively, remain unchanged.

Payment of the TCEQ review fee has been made under separate cover. A copy of the check and transmittal documents is enclosed for reference.

We appreciate your assistance with the review and approval of the application. Please call if you have any questions or need any additional information.

Sincerely,

Frank T. Phelan

Frank T. Phelan, P.E.

FTP/s

Attachments

Cc: Gina Ellison, City of Leander

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

DOMESTIC WASTEWATER PERMIT APPLICATION CHECKLIST

Complete and submit this checklist with the application.

APPLICANT NAME: City of Leander

PERMIT NUMBER (If new, leave blank): WQ00 12644001

Indicate if each of the following items is included in your application.

	Y	N		Y	N
Administrative Report 1.0	☒	☐	Original USGS Map	☒	☐
Administrative Report 1.1	☒	☐	Affected Landowners Map	☒	☐
SPIF	☒	☐	Landowner Disk or Labels	☒	☐
Core Data Form	☒	☐	Buffer Zone Map	☒	☐
Public Involvement Plan Form	☐	☒	Flow Diagram	☒	☐
Technical Report 1.0	☒	☐	Site Drawing	☒	☐
Technical Report 1.1	☒	☐	Original Photographs	☒	☐
Worksheet 2.0	☒	☐	Design Calculations	☒	☐
Worksheet 2.1	☒	☐	Solids Management Plan	☒	☐
Worksheet 3.0	☐	☒	Water Balance	☐	☒
Worksheet 3.1	☐	☒			
Worksheet 3.2	☐	☒			
Worksheet 3.3	☐	☒			
Worksheet 4.0	☒	☐			
Worksheet 5.0	☒	☐			
Worksheet 6.0	☒	☐			
Worksheet 7.0	☐	☒			

For TCEQ Use Only

Segment Number ___________________________________County _____________________
Expiration Date _____________________________________Region_____________________
Permit Number ____

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

DOMESTIC WASTEWATER PERMIT APPLICATION ADMINISTRATIVE REPORT 1.0

For any questions about this form, please contact the Applications Review and Processing Team at 512-239-4671.

Section 1. Application Fees (Instructions Page 26)

Indicate the amount submitted for the application fee (check only one).

Flow	New/Major Amendment	Renewal
<0.05 MGD	$350.00 ☐	$315.00 ☐
≥0.05 but <0.10 MGD	$550.00 ☐	$515.00 ☐
≥0.10 but <0.25 MGD	$850.00 ☐	$815.00 ☐
≥0.25 but <0.50 MGD	$1,250.00 ☐	$1,215.00 ☐
≥0.50 but <1.0 MGD	$1,650.00 ☐	$1,615.00 ☐
≥1.0 MGD	$2,050.00 ☒	$2,015.00 ☐

Minor Amendment (for any flow) $150.00 ☐

Payment Information:

Mailed Check/Money Order Number: 090588

Check/Money Order Amount: 2050.00

Name Printed on Check: City of Leander

EPAY Voucher Number: Click to enter text.

Copy of Payment Voucher enclosed? Yes ☐

Section 2. Type of Application (Instructions Page 26)

a. Check the box next to the appropriate authorization type.

☒ Publicly-Owned Domestic Wastewater

☐ Privately-Owned Domestic Wastewater

☐ Conventional Wastewater Treatment

b. Check the box next to the appropriate facility status.

☒ Active ☐ Inactive

c. Check the box next to the appropriate permit type.

☒ TPDES Permit

☐ TLAP

☐ TPDES Permit with TLAP component

☐ Subsurface Area Drip Dispersal System (SADDS)

d. Check the box next to the appropriate application type

☐ New

☒ Major Amendment *with* Renewal

☐ Minor Amendment *with* Renewal

☐ Major Amendment *without* Renewal

☐ Minor Amendment *without* Renewal

☐ Renewal without changes

☐ Minor Modification of permit

e. For amendments or modifications, describe the proposed changes: The proposed permit includes addition of interim stage II flow of 4.25 MGD, between the initial 2.25 MGD and the final 5.25 MGD. Proposed effluent parameter set for Interim phase II is 5,5,2,0.5. Proposed effluent parameter set for final phase is 5,5,2,1.

f. **For existing permits**:

Permit Number: WQ00 12644001

EPA I.D. (TPDES only): TX 0092151

Expiration Date: 01-23-2025

Section 3. Facility Owner (Applicant) and Co-Applicant Information (Instructions Page 26)

A. The owner of the facility must apply for the permit.

What is the Legal Name of the entity (applicant) applying for this permit?

City of Leander

(The legal name must be spelled exactly as filed with the Texas Secretary of State, County, or in the legal documents forming the entity.)

If the applicant is currently a customer with the TCEQ, what is the Customer Number (CN)? You may search for your CN on the TCEQ website at http://www15.tceq.texas.gov/crpub/

CN: 600646012

What is the name and title of the person signing the application? The person must be an executive official meeting signatory requirements in *30 TAC § 305.44*.

Prefix: Mr.

Last Name, First Name: Parton, Todd

Title: City Manager

Credential: Click to enter text.

B. Co-applicant information. Complete this section only if another person or entity is required to apply as a co-permittee.

What is the Legal Name of the co-applicant applying for this permit?

Click to enter text.

(The legal name must be spelled exactly as filed with the TX SOS, with the County, or in the legal documents forming the entity.)

If the co-applicant is currently a customer with the TCEQ, what is the Customer Number (CN)? You may search for your CN on the TCEQ website at: http://www15.tceq.texas.gov/crpub/

CN: Click to enter text.

What is the name and title of the person signing the application? The person must be an executive official meeting signatory requirements in *30 TAC § 305.44*.

Prefix: Click to enter text. Last Name, First Name: Click to enter text.

Title: Click to enter text. Credential: Click to enter text.

Provide a brief description of the need for a co-permittee: Click to enter text.

C. Core Data Form

Complete the Core Data Form for each customer and include as an attachment. If the customer type selected on the Core Data Form is **Individual**, complete **Attachment 1** of Administrative Report 1.0. Attachment A

Section 4. Application Contact Information (Instructions Page 27)

This is the person(s) TCEQ will contact if additional information is needed about this application. Provide a contact for administrative questions and technical questions.

A. Prefix: Mr. Last Name, First Name: Phelan, Frank

Title: Principal Credential: P.E., Lic. No. 93874

Organization Name: George Butler Associates Inc.

Mailing Address: 9601 Amberglen Blvd. Suite 109 City, State, Zip Code: Austin, TX 78729

Phone No.: (737) 247-7558 E-mail Address: fphelan@gbateam.com

Check one or both: ☒ Administrative Contact ☒ Technical Contact

B. Prefix: Click to enter text. Last Name, First Name: Click to enter text.

Title: Click to enter text. Credential: Click to enter text.

Organization Name: Click to enter text.

Mailing Address: Click to enter text. City, State, Zip Code: Click to enter text.

Phone No.: Click to enter text. E-mail Address: Click to enter text.

Check one or both: ☐ Administrative Contact ☐ Technical Contact

Section 5. Permit Contact Information (Instructions Page 27)

Provide the names and contact information for two individuals that can be contacted throughout the permit term.

A. Prefix: Ms. Last Name, First Name: Truman, Emily

Title: City Engineer Credential: Click to enter text.

Organization Name: City of Leander

Mailing Address: P.O. Box 319 City, State, Zip Code: Leander, TX 78646

Phone No.: (512) 528-2797 E-mail Address: etruman@leandertx.gov

B. Prefix: Ms. Last Name, First Name: Ellison, Gina

Title: Director of Public Works Credential: Click to enter text.

Organization Name: City of Leander

Mailing Address: P.O. Box 319 City, State, Zip Code: Leander, TX 78646

Phone No.: (512) 259-2640 E-mail Address: gellison@leandertx.gov

Section 6. Billing Contact Information (Instructions Page 27)

The permittee is responsible for paying the annual fee. The annual fee will be assessed to permits ***in effect on September 1 of each year***. The TCEQ will send a bill to the address provided in this section. The permittee is responsible for terminating the permit when it is no longer needed (using form TCEQ-20029).

Prefix: Ms. Last Name, First Name: Crabtree, Dara

Title: City Secretary Credential: Click to enter text.

Organization Name: City of Leander

Mailing Address: P.O. Box 319 City, State, Zip Code: Leander, TX 78646

Phone No.: (512) 528-2743 E-mail Address: dcrabtree@leandertx.gov

Section 7. DMR/MER Contact Information (Instructions Page 27)

Provide the name and complete mailing address of the person delegated to receive and submit Discharge Monitoring Reports (DMR) (EPA 3320-1) or maintain Monthly Effluent Reports (MER).

Prefix: Mr. Last Name, First Name: Crowder, Kenley

Title: Assistant Director- Utilities Credential: Click to enter text.

Organization Name: City of Leander

Mailing Address: P.O. Box 319 City, State, Zip Code: Leander, TX 78646

Phone No.: (512) 259-2640 E-mail Address: kcrowder@leandertx.gov

Section 8. Public Notice Information (Instructions Page 27)

A. Individual Publishing the Notices

Prefix: Ms. Last Name, First Name: Crabtree, Dara

Title: City Secretary Credential: Click to enter text.

Organization Name: City of Leander

Mailing Address: P.O. Box 319 City, State, Zip Code: Leander, TX 78646

Phone No.: (512) 528-2743 E-mail Address: dcrabtree@leandertx.gov

B. Method for Receiving Notice of Receipt and Intent to Obtain a Water Quality Permit Package

Indicate by a check mark the preferred method for receiving the first notice and instructions:

☐ E-mail Address

☐ Fax

☒ Regular Mail

C. Contact permit to be listed in the Notices

Prefix: Ms. Last Name, First Name: Crabtree, Dara

Title: City Secretary Credential: Click to enter text.

Organization Name: City of Leander

Mailing Address: P.O. Box 319 City, State, Zip Code: Leander, TX 78646

Phone No.: (512) 528-2743 E-mail Address: dcrabtree@leandertx.gov

D. Public Viewing Information

If the facility or outfall is located in more than one county, a public viewing place for each county must be provided.

Public building name: City of Leander City Hall

Location within the building: Lobby

Physical Address of Building: 105 N. Brushy Street

City: Leander County: Williamson

Contact (Last Name, First Name): Dara Crabtree

Phone No.: (512) 528-2743 Ext.: Click to enter text.

E. Bilingual Notice Requirements

This information **is required** for **new, major amendment, minor amendment or minor modification, and renewal** applications.

This section of the application is only used to determine if alternative language notices will be needed. Complete instructions on publishing the alternative language notices will be in your public notice package.

Please call the bilingual/ESL coordinator at the nearest elementary and middle schools and obtain the following information to determine whether an alternative language notices are required.

1. Is a bilingual education program required by the Texas Education Code at the elementary or middle school nearest to the facility or proposed facility?

   ☒ Yes ☐ No

   If **no**, publication of an alternative language notice is not required; **skip to** Section 9 below.

2. Are the students who attend either the elementary school or the middle school enrolled in a bilingual education program at that school?

   ☐ Yes ☒ No

3. Do the students at these schools attend a bilingual education program at another location?

   ☒ Yes ☐ No

4. Would the school be required to provide a bilingual education program but the school has waived out of this requirement under 19 TAC §89.1205(g)?

   ☐ Yes ☒ No

5. If the answer is **yes** to **question 1, 2, 3, or 4**, public notices in an alternative language are required. Which language is required by the bilingual program? Spanish

F. Plain Language Summary Template

Complete the Plain Language Summary (TCEQ Form 20972) and include as an attachment.

Attachment: Attachment B

G. Public Involvement Plan Form

Complete the Public Involvement Plan Form (TCEQ Form 20960) for each application for a **new permit or major amendment to a permit** and include as an attachment.

Attachment:

Section 9. Regulated Entity and Permitted Site Information (Instructions Page 29)

A. If the site is currently regulated by TCEQ, provide the Regulated Entity Number (RN) issued to this site. **RN** 101917722

Search the TCEQ's Central Registry at http://www15.tceq.texas.gov/crpub/ to determine if the site is currently regulated by TCEQ.

B. Name of project or site (the name known by the community where located):

City of Leander Wastewater Treatment Plant

C. Owner of treatment facility: City of Leander

Ownership of Facility: ☒ Public ☐ Private ☐ Both ☐ Federal

D. Owner of land where treatment facility is or will be:

Prefix: Click to enter text. Last Name, First Name: City of Leander

Title: Click to enter text. Credential: Click to enter text.

Organization Name: City of Leander

Mailing Address: P.O. Box 319 City, State, Zip Code: Leander, TX 78646

Phone No.: (512) 528-2760 E-mail Address: etruman@leandertx.gov

If the landowner is not the same person as the facility owner or co-applicant, attach a lease agreement or deed recorded easement. See instructions.

Attachment: Click to enter text.

E. Owner of effluent disposal site:

Prefix: Click to enter text. Last Name, First Name: City of Leander

Title: Click to enter text. Credential: Click to enter text.

Organization Name: City of Leander

Mailing Address: P.O. Box 319 City, State, Zip Code: Leander, TX 78646

Phone No.: (512) 528-2760 E-mail Address: etruman@leandertx.gov

If the landowner is not the same person as the facility owner or co-applicant, attach a lease agreement or deed recorded easement. See instructions.

Attachment: Click to enter text.

F. Owner sewage sludge disposal site (if authorization is requested for sludge disposal on property owned or controlled by the applicant)::

Prefix: Click to enter text. Last Name, First Name: Click to enter text.

Title: Click to enter text. Credential: Click to enter text.

Organization Name: Click to enter text.

Mailing Address: Click to enter text. City, State, Zip Code: Click to enter text.

Phone No.: Click to enter text. E-mail Address: Click to enter text.

If the landowner is not the same person as the facility owner or co-applicant, attach a lease agreement or deed recorded easement. See instructions.

Attachment: Click to enter text.

Section 10. TPDES Discharge Information (Instructions Page 31)

A. Is the wastewater treatment facility location in the existing permit accurate?

☒ Yes ☐ No

If **no, or a new permit application**, please give an accurate description:

Click to enter text.

B. Are the point(s) of discharge and the discharge route(s) in the existing permit correct?

☒ Yes ☐ No

If **no, or a new or amendment permit application**, provide an accurate description of the point of discharge and the discharge route to the nearest classified segment as defined in 30 TAC Chapter 307:

The treated effluent is discharged into an unclassified segment of Brushy Creek, then into Segment No. 1244 of Brushy Creek of the Brazos River Basin.

City nearest the outfall(s): Leander

County in which the outfalls(s) is/are located: Williamson

C. Is or will the treated wastewater discharge to a city, county, or state highway right-of-way, or a flood control district drainage ditch?

☐ Yes ☒ No

If **yes**, indicate by a check mark if:

☐ Authorization granted ☐ Authorization pending

For **new and amendment** applications, provide copies of letters that show proof of contact and the approval letter upon receipt.

Attachment: Click to enter text.

D. For all applications involving an average daily discharge of 5 MGD or more, provide the names of all counties located within 100 statute miles downstream of the point(s) of discharge: Williamson County, Milam County

Section 11. TLAP Disposal Information (Instructions Page 32)

A. For TLAPs, is the location of the effluent disposal site in the existing permit accurate?

☐ Yes ☐ No

If **no, or a new or amendment permit application**, provide an accurate description of the disposal site location:

Click to enter text.

B. City nearest the disposal site: Click to enter text.

C. County in which the disposal site is located: Click to enter text.

D. For **TLAPs**, describe the routing of effluent from the treatment facility to the disposal site:

Click to enter text.

E. For **TLAPs**, please identify the nearest watercourse to the disposal site to which rainfall runoff might flow if not contained: Click to enter text.

Section 12. Miscellaneous Information (Instructions Page 32)

A. Is the facility located on or does the treated effluent cross American Indian Land?

☐ Yes ☒ No

B. If the existing permit contains an onsite sludge disposal authorization, is the location of the sewage sludge disposal site in the existing permit accurate?

☐ Yes ☐ No ☒ Not Applicable

If No, or if a new onsite sludge disposal authorization is being requested in this permit application, provide an accurate location description of the sewage sludge disposal site.

Click to enter text.

C. Did any person formerly employed by the TCEQ represent your company and get paid for service regarding this application?

☐ Yes ☒ No

If yes, list each person formerly employed by the TCEQ who represented your company and was paid for service regarding the application: Click to enter text.

D. Do you owe any fees to the TCEQ?

☐ Yes ☒ No

If **yes**, provide the following information:

Account number: Click to enter text.

Amount past due: Click to enter text.

E. Do you owe any penalties to the TCEQ?

☐ Yes ☒ No

If **yes**, please provide the following information:

Enforcement order number: Click to enter text.

Amount past due: Click to enter text.

Section 13. Attachments (Instructions Page 33)

Indicate which attachments are included with the Administrative Report. Check all that apply:

☐ Lease agreement or deed recorded easement, if the land where the treatment facility is located or the effluent disposal site are not owned by the applicant or co-applicant.

☒ Original full-size USGS Topographic Map with the following information:

- Applicant's property boundary
- Treatment facility boundary
- Labeled point of discharge for each discharge point (TPDES only)
- Highlighted discharge route for each discharge point (TPDES only)
- Onsite sewage sludge disposal site (if applicable)
- Effluent disposal site boundaries (TLAP only)
- New and future construction (if applicable)
- 1 mile radius information
- 3 miles downstream information (TPDES only)
- All ponds.

☐ Attachment 1 for Individuals as co-applicants

☐ Other Attachments. Please specify: Click to enter text.

Section 14. Signature Page (Instructions Page 34)

If co-applicants are necessary, each entity must submit an original, separate signature page.

Permit Number: WQ0012644001

Applicant: City of Leander

Certification:

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

I further certify that I am authorized under 30 Texas Administrative Code § 305.44 to sign and submit this document, and can provide documentation in proof of such authorization upon request.

Signatory name (typed or printed): Todd Parton

Signatory title: City Manager

Signature: ______________________ Date: 7/15/2024

(Use blue ink)

Subscribed and Sworn to before me by the said Todd Parton

on this 15th day of July, 2024.

My commission expires on the 30th day of May, 2028.

____

Notary Public

Williamson

County, Texas

[SEAL]

JACQUELINE WINKLER
NOTARY PUBLIC
STATE OF TEXAS
ID 134924803
EXP. 05-30-2028

DOMESTIC WASTEWATER PERMIT APPLICATION ADMINISTRATIVE REPORT 1.0

The following information is required for new and amendment applications.

Section 1. Affected Landowner Information (Instructions Page 36)

A. Indicate by a check mark that the landowners map or drawing, with scale, includes the following information, as applicable:

- ☒ The applicant's property boundaries
- ☒ The facility site boundaries within the applicant's property boundaries
- ☐ The distance the buffer zone falls into adjacent properties and the property boundaries of the landowners located within the buffer zone
- ☒ The property boundaries of all landowners surrounding the applicant's property (Note: if the application is a major amendment for a lignite mine, the map must include the property boundaries of all landowners adjacent to the new facility (ponds).)
- ☒ The point(s) of discharge and highlighted discharge route(s) clearly shown for one mile downstream
- ☒ The property boundaries of the landowners located on both sides of the discharge route for one full stream mile downstream of the point of discharge
- ☐ The property boundaries of the landowners along the watercourse for a one-half mile radius from the point of discharge if the point of discharge is into a lake, bay, estuary, or affected by tides
- ☐ The boundaries of the effluent disposal site (for example, irrigation area or subsurface drainfield site) and all evaporation/holding ponds within the applicant's property
- ☐ The property boundaries of all landowners surrounding the effluent disposal site
- ☐ The boundaries of the sludge land application site (for land application of sewage sludge for beneficial use) and the property boundaries of landowners surrounding the applicant's property boundaries where the sewage sludge land application site is located
- ☐ The property boundaries of landowners within one-half mile in all directions from the applicant's property boundaries where the sewage sludge disposal site (for example, sludge surface disposal site or sludge monofill) is located

B. ☒ Indicate by a check mark that a separate list with the landowners' names and mailing addresses cross-referenced to the landowner's map has been provided.

C. Indicate by a check mark in which format the landowners list is submitted:

☒ USB Drive ☐ Four sets of labels

D. Provide the source of the landowners' names and mailing addresses: Williamson County Tax Appraisal District Records

E. As required by *Texas Water Code § 5.115*, is any permanent school fund land affected by this application?

☐ Yes ☒ No

If **yes**, provide the location and foreseeable impacts and effects this application has on the land(s):

Click to enter text.

Section 2. Original Photographs (Instructions Page 38)

Provide original ground level photographs. Indicate with checkmarks that the following information is provided.

☒ At least one original photograph of the new or expanded treatment unit location

☒ At least two photographs of the existing/proposed point of discharge and as much area downstream (photo 1) and upstream (photo 2) as can be captured. If the discharge is to an open water body (e.g., lake, bay), the point of discharge should be in the right or left edge of each photograph showing the open water and with as much area on each respective side of the discharge as can be captured.

☐ At least one photograph of the existing/proposed effluent disposal site

☒ A plot plan or map showing the location and direction of each photograph

Section 3. Buffer Zone Map (Instructions Page 38)

A. Buffer zone map. Provide a buffer zone map on 8.5 x 11-inch paper with all of the following information. The applicant’s property line and the buffer zone line may be distinguished by using dashes or symbols and appropriate labels.

- The applicant's property boundary;
- The required buffer zone; and
- Each treatment unit; and
- The distance from each treatment unit to the property boundaries.

B. Buffer zone compliance method. Indicate how the buffer zone requirements will be met. Check all that apply.

☒ Ownership

☐ Restrictive easement

☐ Nuisance odor control

☐ Variance

C. Unsuitable site characteristics. Does the facility comply with the requirements regarding unsuitable site characteristic found in 30 TAC § 309.13(a) through (d)?

☒ Yes ☐ No

DOMESTIC WASTEWATER PERMIT APPLICATION

SUPPLEMENTAL PERMIT INFORMATION FORM (SPIF)

This form applies to TPDES permit applications only. Complete and attach the Supplemental Permit information Form (SPIF) (TCEQ Form 20971).

Attachment: Attachment G

WATER QUALITY PERMIT

PAYMENT SUBMITTAL FORM

Use this form to submit the Application Fee, if the mailing the payment.

- Complete items 1 through 5 below.
- Staple the check or money order in the space provided at the bottom of this document.
- **Do Not mail this form with the application form.**
- Do not mail this form to the same address as the application.
- Do not submit a copy of the application with this form as it could cause duplicate permit entries.

Mail this form and the check or money order to:

BY REGULAR U.S. MAIL	*BY OVERNIGHT/EXPRESS MAIL*
Texas Commission on Environmental Quality Financial Administration Division Cashier's Office, MC-214 P.O. Box 13088 Austin, Texas 78711-3088	Texas Commission on Environmental Quality Financial Administration Division Cashier's Office, MC-214 12100 Park 35 Circle Austin, Texas 78753

Fee Code: WQP **Waste Permit No:** WQ0012644001

1. Check or Money Order Number: 090588
2. Check or Money Order Amount: 2050.00
3. Date of Check or Money Order: 7/26/2024
4. Name on Check or Money Order: City of Leander
5. APPLICATION INFORMATION

   Name of Project or Site: City of Leander Wastewater Treatment Plant

   Physical Address of Project or Site: 10201 FM2243, Leander, TX 78641

   If the check is for more than one application, attach a list which includes the name of each Project or Site (RE) and Physical Address, exactly as provided on the application.

Staple Check or Money Order in This Space

ATTACHMENT 1

INDIVIDUAL INFORMATION

Section 1. Individual Information (Instructions Page 41)

Complete this attachment if the facility applicant or co-applicant is an individual. Make additional copies of this attachment if both are individuals.

Prefix (Mr., Ms., Miss): Click to enter text.

Full legal name (Last Name, First Name, Middle Initial): Click to enter text.

Driver's License or State Identification Number: Click to enter text.

Date of Birth: Click to enter text.

Mailing Address: Click to enter text.

City, State, and Zip Code: Click to enter text.

Phone Number: Click to enter text. Fax Number: Click to enter text.

E-mail Address: Click to enter text.

CN: Click to enter text.

For Commission Use Only:
Customer Number:
Regulated Entity Number:
Permit Number:

DOMESTIC WASTEWATER PERMIT APPLICATION CHECKLIST OF COMMON DEFICIENCIES

Below is a list of common deficiencies found during the administrative review of domestic wastewater permit applications. To ensure the timely processing of this application, please review the items below and indicate by checking Yes that each item is complete and in accordance applicable rules at 30 TAC Chapters 21, 281, and 305. If an item is not required this application, indicate by checking N/A where appropriate. Please do not submit the application until the items below have been addressed.

Core Data Form (TCEQ Form No. 10400) ☒ Yes
(Required for all application types. Must be completed in its entirety and signed. Note: Form may be signed by applicant representative.)

Correct and Current Industrial Wastewater Permit Application Forms ☒ Yes
(TCEQ Form Nos. 10053 and 10054. Version dated 6/25/2018 or later.)

Water Quality Permit Payment Submittal Form (Page 19) ☒ Yes
(Original payment sent to TCEQ Revenue Section. See instructions for mailing address.)

7.5 Minute USGS Quadrangle Topographic Map Attached ☒ Yes
*(Full-size map if seeking "New" permit.
8 ½ x 11 acceptable for Renewals and Amendments)*

Current/Non-Expired, Executed Lease Agreement or Easement ☒ N/A ☐ Yes

Landowners Map ☐ N/A ☒ Yes
(See instructions for landowner requirements)

Things to Know:

- All the items shown on the map must be labeled.
- The applicant's complete property boundaries must be delineated which includes boundaries of contiguous property owned by the applicant.
- The applicant cannot be its own adjacent landowner. You must identify the landowners immediately adjacent to their property, regardless of how far they are from the actual facility.
- If the applicant's property is adjacent to a road, creek, or stream, the landowners on the opposite side must be identified. Although the properties are not adjacent to applicant's property boundary, they are considered potentially affected landowners. If the adjacent road is a divided highway as identified on the USGS topographic map, the applicant does not have to identify the landowners on the opposite side of the highway.

Landowners Cross Reference List ☐ N/A ☒ Yes
(See instructions for landowner requirements)

Landowners Labels or USB Drive attached ☐ N/A ☒ Yes
(See instructions for landowner requirements)

Original signature per 30 TAC § 305.44 – Blue Ink Preferred ☒ Yes
(If signature page is not signed by an elected official or principle executive officer, a copy of signature authority/delegation letter must be attached)

Plain Language Summary ☒ Yes

ADMINISTRATIVE REPORT

ATTACHMENT LIST

- ATTACHMENT A: TCEQ CORE DATA FORM
- ATTACHMENT B: PLAIN LANGUAGE SUMMARY
- ATTACHMENT C: USGS TOPOGRAPHIC MAP
- ATTACHMENT D: AFFECTED LANDOWNER MAP & LIST
- ATTACHMENT E: ORIGINAL PHOTOGRAPHS & PHOTOGRAPH PLOT MAP
- ATTACHMENT F: BUFFER ZONE MAP
- ATTACHMENT G: USGS TOPOGRAPHIC MAP FOR SPIF

ATTACHMENT A

TCEQ Use Only

TCEQ Core Data Form

For detailed instructions on completing this form, please read the Core Data Form Instructions or call 512-239-5175.

SECTION I: General Information

1. Reason for Submission *(If other is checked please describe in space provided.)*

☐ New Permit, Registration or Authorization (*Core Data Form should be submitted with the program application.)*

☒ Renewal *(Core Data Form should be submitted with the renewal form)* | ☐ Other

2. Customer Reference Number *(if issued)*	Follow this link to search for CN or RN numbers in Central Registry**	**3. Regulated Entity Reference Number** *(if issued)*
CN 600646012		**RN 101917722**

SECTION II: Customer Information

4. General Customer Information	**5. Effective Date for Customer Information Updates** (mm/dd/yyyy)	

☐ New Customer ☐ Update to Customer Information ☐ Change in Regulated Entity Ownership
☐ Change in Legal Name (Verifiable with the Texas Secretary of State or Texas Comptroller of Public Accounts)

The Customer Name submitted here may be updated automatically based on what is current and active with the Texas Secretary of State (SOS) or Texas Comptroller of Public Accounts (CPA).

6. Customer Legal Name *(If an individual, print last name first: eg: Doe, John)*	*If new Customer, enter previous Customer below:*
City of Leander	

7. TX SOS/CPA Filing Number	**8. TX State Tax ID** (11 digits)	**9. Federal Tax ID** (9 digits)	**10. DUNS Number** *(if applicable)*
	30006111881		

11. Type of Customer: ☐ Corporation ☐ Individual Partnership: ☐ General ☐ Limited
Government: ☒ City ☐ County ☐ Federal ☐ Local ☐ State ☐ Other ☐ Sole Proprietorship ☐ Other:

12. Number of Employees
☐ 0-20 ☐ 21-100 ☐ 101-250 ☒ 251-500 ☐ 501 and higher

13. Independently Owned and Operated?
☐ **Yes** ☐ **No**

14. Customer Role (Proposed or Actual) – *as it relates to the Regulated Entity listed on this form. Please check one of the following*

☐ Owner ☐ Operator ☒ Owner & Operator ☐ Other:
☐ Occupational Licensee ☐ Responsible Party ☐ VCP/BSA Applicant

15. Mailing Address:	P.O. Box 319						
	City	Leander	**State**	TX	**ZIP**	78646	**ZIP + 4** 0319

16. Country Mailing Information *(if outside USA)*	**17. E-Mail Address** *(if applicable)*
	dcrabtree@leandertx.gov

18. Telephone Number	19. Extension or Code	20. Fax Number *(if applicable)*
(512) 528-2743		(512) 259-1605

SECTION III: Regulated Entity Information

21. General Regulated Entity Information *(If 'New Regulated Entity" is selected, a new permit application is also required.)*

☐ New Regulated Entity ☐ Update to Regulated Entity Name ☒ Update to Regulated Entity Information

The Regulated Entity Name submitted may be updated, in order to meet TCEQ Core Data Standards (removal of organizational endings such as Inc, LP, or LLC).

22. Regulated Entity Name *(Enter name of the site where the regulated action is taking place.)*

City of Leander Wastewater Treatment Facility

23. Street Address of the Regulated Entity: ***(No PO Boxes)***	10201 Ranch Road 2243						
	City	Leander	**State**	TX	**ZIP**	78641	**ZIP + 4** 1524
24. County	Williamson						

If no Street Address is provided, fields 25-28 are required.

25. Description to Physical Location:	Facility is located approximately 2,300 west of the intersection of US183A and Ranch Road 2243.

26. Nearest City	State	Nearest ZIP Code
Leander	TX	78641

Latitude/Longitude are required and may be added/updated to meet TCEQ Core Data Standards. (Geocoding of the Physical Address may be used to supply coordinates where none have been provided or to gain accuracy).

27. Latitude (N) In Decimal:			**28. Longitude (W) In Decimal:**		
Degrees	Minutes	Seconds	Degrees	Minutes	Seconds
30	34	52.97	-97	50	25.17

29. Primary SIC Code (4 digits)	30. Secondary SIC Code (4 digits)	31. Primary NAICS Code (5 or 6 digits)	32. Secondary NAICS Code (5 or 6 digits)
4950	4952	221320	221320

33. What is the Primary Business of this entity? *(Do not repeat the SIC or NAICS description.)*

Wastewater Treatment Facility

34. Mailing Address:	**P.O. Box 319**							
	City	**Leander**	**State**	**TX**	**ZIP**	**78646**	**ZIP + 4**	**319**
35. E-Mail Address:	**dcrabtree@leandertx.gov**							

36. Telephone Number	37. Extension or Code	38. Fax Number *(if applicable)*
(512) 528-2743		**(512) 259-1605**

39. TCEQ Programs and ID Numbers Check all Programs and write in the permits/registration numbers that will be affected by the updates submitted on this form. See the Core Data Form instructions for additional guidance.

☐ Dam Safety	☐ Districts	☐ Edwards Aquifer	☐ Emissions Inventory Air	☐ Industrial Hazardous Waste
☐ Municipal Solid Waste	☐ New Source Review Air	☐ OSSF	☐ Petroleum Storage Tank	☐ PWS
☐ Sludge	☐ Storm Water	☐ Title V Air	☐ Tires	☐ Used Oil
☐ Voluntary Cleanup	☒ Wastewater	☐ Wastewater Agriculture	☐ Water Rights	☐ Other:

SECTION IV: Preparer Information

40. Name:	Joshua T. Cashio	**41. Title:**	Staff Engineer

42. Telephone Number	**43. Ext./Code**	**44. Fax Number**	**45. E-Mail Address**
(737) 247-7560		( ) -	jcashio@gbateam.com

SECTION V: Authorized Signature

46. By my signature below, I certify, to the best of my knowledge, that the information provided in this form is true and complete, and that I have signature authority to submit this form on behalf of the entity specified in Section II, Field 6 and/or as required for the updates to the ID numbers identified in field 39.

Company:	George Butler Associates, Inc.	**Job Title:**	Lead AES
Name *(In Print):*	Kevin Taylor	**Phone:**	(737) 247- **7538**
Signature:	Kevin Taylor	**Date:**	7/22/2024

ATTACHMENT B

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

PLAIN LANGUAGE SUMMARY FOR TPDES OR TLAP PERMIT APPLICATIONS

Plain Language Summary Template and Instructions for Texas Pollutant Discharge Elimination System (TPDES) and Texas Land Application (TLAP) Permit Applications

Applicants should use this template to develop a plain language summary as required by Title 30, Texas Administrative Code (30 TAC), Chapter 39, Subchapter H. Applicants may modify the template as necessary to accurately describe their facility as long as the summary includes the following information: (1) the function of the proposed plant or facility; (2) the expected output of the proposed plant or facility; (3) the expected pollutants that may be emitted or discharged by the proposed plant or facility; and (4) how the applicant will control those pollutants, so that the proposed plant will not have an adverse impact on human health or the environment.

Fill in the highlighted areas below to describe your facility and application in plain language. Instructions and examples are provided below. Make any other edits necessary to improve readability or grammar and to comply with the rule requirements.

If you are subject to the alternative language notice requirements in 30 TAC Section 39.426, **you must provide a translated copy of the completed plain language summary in the appropriate alternative language as part of your application package**. For your convenience, a Spanish template has been provided below.

ENGLISH TEMPLATE FOR TPDES or TLAP NEW/RENEWAL/AMENDMENT APPLICATIONS DOMESTIC WASTEWATER/STORMWATER

The following summary is provided for this pending water quality permit application being reviewed by the Texas Commission on Environmental Quality as required by 30 TAC Chapter 39. The information provided in this summary may change during the technical review of the application and is not a federal enforceable representation of the permit application.

The City of Leander (CN600646012) operates the Leander RM 2243 Wastewater Treatment Plant (RN101917722), a 2.25 MGD wastewater treatment plant. The facility is located at 10201 RM 2243, in Leander, Williamson County, Texas 78641. This treatment facility is projected to be expanded 3 MGD, for a 5.25 MGD final flow rate. This expansion will be conducted in two phases: Interim Phase II with a 2 MGD expansion and Ultimate Phase with a 1 MGD expansion.

Discharges from the facility are expected to contain five-day carbonaceous biochemical oxygen demand ($CBOD_5$), total suspended solids (TSS), ammonia nitrogen (NH_3-N), *Escherichia coli*, and additional potential pollutants, which are included in the Domestic Technical Report 1.0, Section 7. Pollutant Analysis of Treated Effluent and Domestic Worksheet 4.0 in the permit application package. Effluent pollutant concentrations are significantly decreased compared to influent levels, as the plant treats beyond required limits. Domestic wastewater is treated by anoxic rapid mixing (coagulation), aerobic and anaerobic digestors, clarifiers for settling, tertiary filtration, and disinfection via chlorine, which will eventually be replaced by ultraviolet light disinfection.

PLANTILLA EN ESPAÑOL PARA SOLICITUDES NUEVAS/RENOVACIONES/ENMIENDAS DE TPDES o TLAP

AGUAS RESIDUALES DOMÉSTICAS /AGUAS PLUVIALES

El siguiente resumen se proporciona para esta solicitud de permiso de calidad del agua pendiente que está siendo revisada por la Comisión de Calidad Ambiental de Texas según lo requerido por el Capítulo 39 del Código Administrativo de Texas 30. La información proporcionada en este resumen puede cambiar durante la revisión técnica de la solicitud y no es una representación ejecutiva fedérale de la solicitud de permiso.

La ciudad de Leander (CN600646012) opera la planta de tratamiento de aguas residuals Leander RM2243 (RN101917722), una planta de tratamiento de aguas residuals de 2.25 MGD. La instalación está ubicada en 10201 RM 2243, en Leander, Condado de Williamson, Texas 78641. Esta planta de tratamiento se ampliará en 3 MGD, para un caudal final de 5,25 MGD. Esta expansión se llevará a cabo en dos fases: Fase Interina II con una expansión de 2 MGD y Fase Final con una expansión de 1 MGD. Este permiso no autorizará una descarga de contaminantes en el agua en el estado.

Se espera que las descargas de la instalación contengan una demanda bioquímica carbonosa carbonoso (CBOD5) de cinco días, sólidos suspendidos totales (SST), nitrógeno amoniacal (NH3-N), *Escherichia coli* y contaminantes potenciales adicionales, que se incluyen en el Informe Técnico Nacional. 1.0, Sección 7. Análisis de contaminantes de efluentes tratados y domésticas hoja de trabajo 4.0 en el paquete de solicitud de permiso. Las concentraciones de contaminantes en los efluentes disminuyen significativamente en comparación con los niveles del afluente, ya que la planta trata más allá de los límites requeridos. Las aguas residuals domésticas. estará tratado por mezcla rápida anóxica (coagulación), digestores aeróbicos y anaeróbicos, clarificadores para decantación y desinfección mediante cloro, que eventualmente será reemplazada por desinfección con luz ultravioleta.

INSTRUCTIONS

1. Enter the name of applicant in this section. The applicant name should match the name associated with the customer number.
2. Enter the Customer Number in this section. Each Individual or Organization is issued a unique 11-digit identification number called a CN (e.g. CN123456789).
3. Choose “operates” in this section for existing facility applications or choose “proposes to operate” for new facility applications.
4. Enter the name of the facility in this section. The facility name should match the name associated with the regulated entity number.
5. Enter the Regulated Entity number in this section. Each site location is issued a unique 11-digit identification number called an RN (e.g. RN123456789).
6. Choose the appropriate article (a or an) to complete the sentence.
7. Enter a description of the facility in this section. For example: steam electric generating facility, nitrogenous fertilizer manufacturing facility, etc.
8. Choose “is” for an existing facility or “will be” for a new facility.
9. Enter the location of the facility in this section.
10. Enter the City nearest the facility in this section.
11. Enter the County nearest the facility in this section.
12. Enter the zip code for the facility address in this section.
13. Enter a summary of the application request in this section. For example: renewal to discharge 25,000 gallons per day of treated domestic wastewater, new application to discharge process wastewater and stormwater on an intermittent and flow-variable basis, or major amendment to reduce monitoring frequency for pH, etc. If more than one outfall is included in the application, provide applicable information for each individual outfall.
14. List all pollutants expected in the discharge from this facility in this section. If applicable, refer to the pollutants from any federal numeric effluent limitations that apply to your facility.
15. Enter the discharge types from your facility in this section (e.g., stormwater, process wastewater, once through cooling water, etc.)
16. Choose the appropriate verb tense to complete the sentence.
17. Enter a description of the wastewater treatment used at your facility. Include a description of each process, starting with initial treatment and finishing with the outfall/point of disposal. Use additional lines for individual discharge types if necessary.

Questions or comments concerning this form may be directed to the Water Quality Division’s Application Review and Processing Team by email at WQ-ARPTeam@tceq.texas.gov or by phone at (512) 239-4671.

Example

Individual Industrial Wastewater Application

The following summary is provided for this pending water quality permit application being reviewed by the Texas Commission on Environmental Quality as required by 30 TAC Chapter 39. The information provided in this summary may change during the technical review of the application and are not federal enforceable representations of the permit application.

ABC Corporation (CN600000000) operates the Starr Power Station (RN10000000000), a two-unit gas-fired electric generating facility. Unit 1 has a generating capacity of 393 megawatts (MWs) and Unit 2 has a generating capacity of 528 MWs. The facility is located at 1356 Starr Street, near the City of Austin, Travis County, Texas 78753.

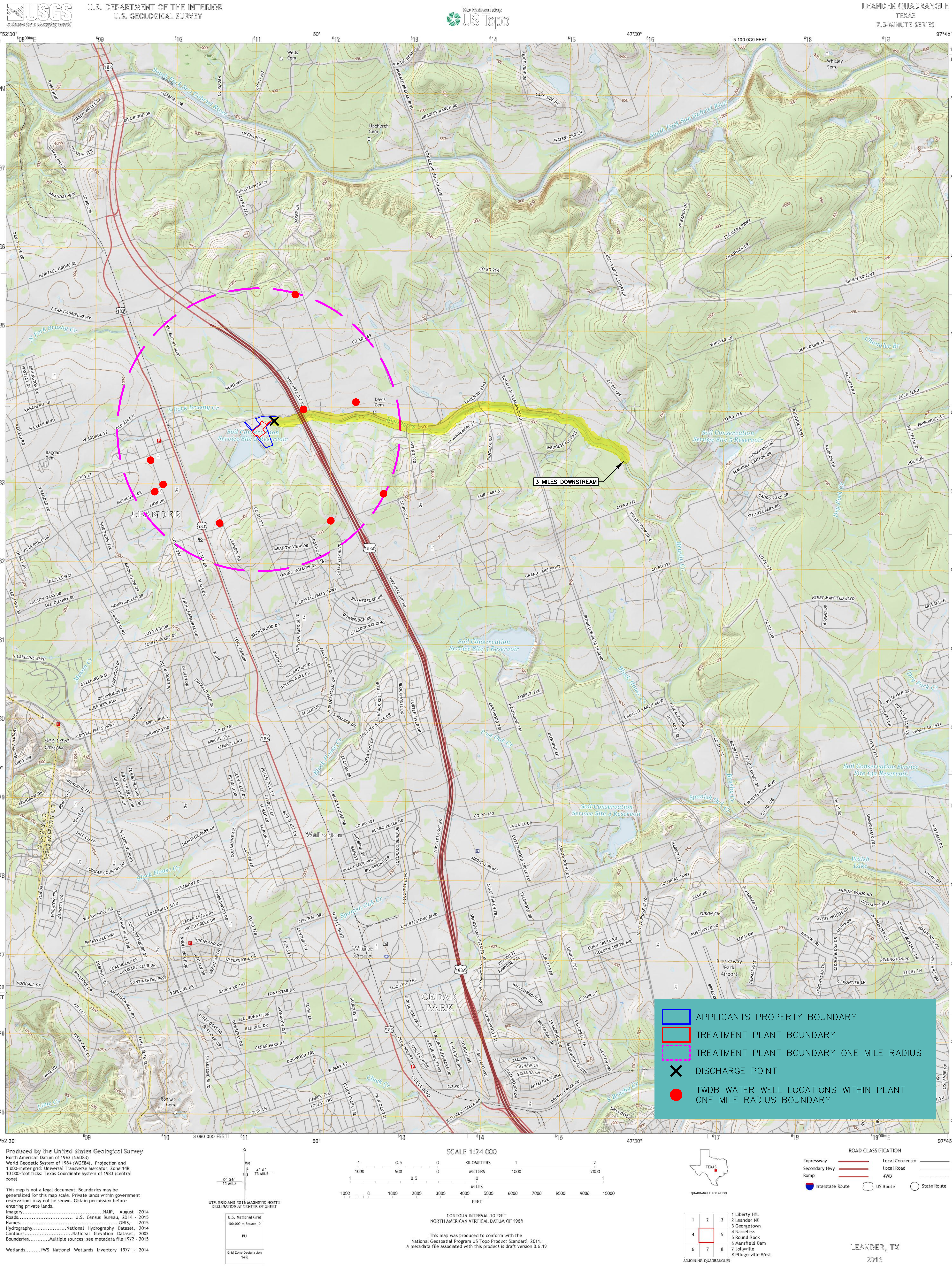
This application is for a renewal to discharge 870,000,000 gallons per day of once through cooling water, auxiliary cooling water, and also authorizes the following waste streams monitored inside the facility (internal outfalls) before it is mixed with the other wastewaters authorized for discharge via main Outfall 001, referred to as “previously monitored effluents” (low-volume wastewater, metal-cleaning waste, and stormwater (from diked oil storage area yards and storm drains)) via Outfall 001. Low-volume waste sources, metal-cleaning waste, and stormwater drains on a continuous and flow-variable basis via internal Outfall 101.

The discharge of once through cooling water via Outfall 001 and low-volume waste and metal-cleaning waste via Outfall 101 from this facility is subject to federal effluent limitation guidelines at 40 CFR Part 423. The pollutants expected from these discharges based on 40 CFR Part 423 are: free available chlorine, total residual chlorine, total suspended solids, oil and grease, total iron, total copper, and pH. Temperature is also expected from these discharges. Additional potential pollutants are included in the Industrial Wastewater Application Technical Report, Worksheet 2.0.

Cooling water and boiler make-up water are supplied by Lake Starr Reservoir. The City of Austin municipal water plant (CN600000000, PWS 00000) supplies the facility’s potable water and serves as an alternate source of boiler make-up water. Water from the Lake Starr Reservoir is withdrawn at the intake structure and treated with sodium hypochlorite to prevent biofouling and sodium bromide as a chlorine enhancer to improve efficacy and then passed through condensers and auxiliary equipment on a once-through basis to cool equipment and condense exhaust steam.

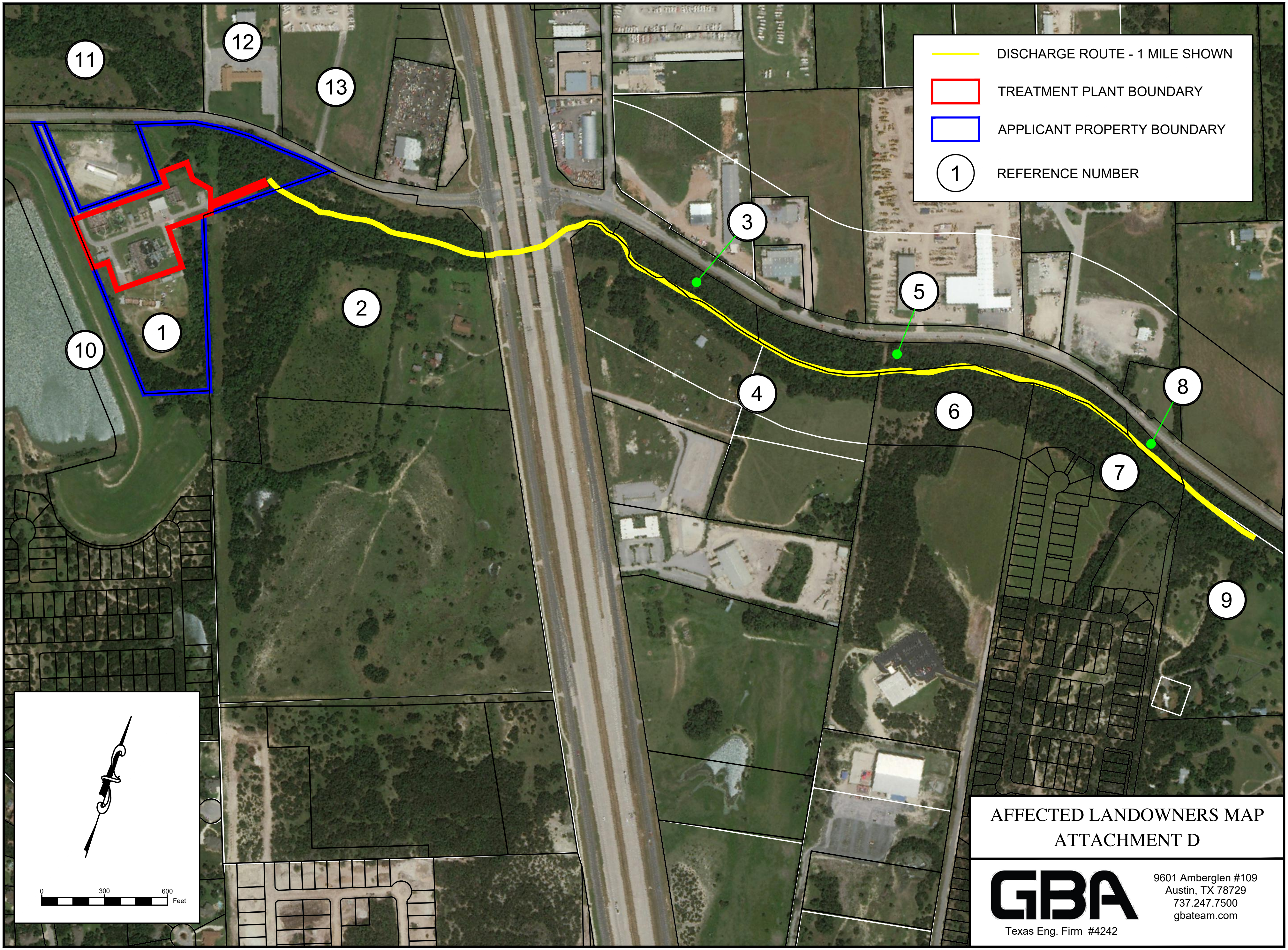
Low-volume wastewater from blowdown of boiler Units 1 and 2 and metal-cleaning wastes receive no treatment prior to discharge via Outfall 101. Plant floor and equipment drains and stormwater runoff from diked oil storage areas, yards, and storm drains are routed through an oil and water separator prior to discharge via Outfall 101. Domestic wastewater, blowdown, and backwash water from the service water filter, clarifier, and sand filter are routed to the Starr Creek Domestic Sewage Treatment Plant, TPDES Permit No. WQ0010000001, for treatment and disposal. Metal-cleaning waste from equipment cleaning is generally disposed of off-site.

ATTACHMENT C



U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY
The National Map
US Topo
LEANDER QUADRANGLE
TEXAS
7.5-MINUTE SERIES
3 MILES DOWNSTREAM
APPLICANTS PROPERTY BOUNDARY
TREATMENT PLANT BOUNDARY
TREATMENT PLANT BOUNDARY ONE MILE RADIUS
DISCHARGE POINT
TWDB WATER WELL LOCATIONS WITHIN PLANT ONE MILE RADIUS BOUNDARY
LEANDER
CEDAR PARK
Walkerton
Soil Conservation Service Site 7 Reservoir
S Fork Brushy Cr
South Fork San Gabriel River
Produced by the United States Geological Survey
North American Datum of 1983 (NAD83)
World Geodetic System of 1984 (WGS84). Projection and
1 000-meter grid: Universal Transverse Mercator, Zone 14R
10 000-foot ticks: Texas Coordinate System of 1983 (central zone)
This map is not a legal document. Boundaries may be generalized for this map scale. Private lands within government reservations may not be shown. Obtain permission before entering private lands.
Imagery..........NAIP, August 2014
Roads..........U.S. Census Bureau, 2014 - 2015
Names..........GNIS, 2015
Hydrography..........National Hydrography Dataset, 2014
Contours..........National Elevation Dataset, 2002
Boundaries..........Multiple sources; see metadata file 1972 - 2015
Wetlands..........FWS National Wetlands Inventory 1977 - 2014
UTM GRID AND 2016 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET
U.S. National Grid
100,000-m Square ID
PU
Grid Zone Designation
14R
SCALE 1:24 000
KILOMETERS
METERS
MILES
FEET
CONTOUR INTERVAL 10 FEET
NORTH AMERICAN VERTICAL DATUM OF 1988
This map was produced to conform with the National Geospatial Program US Topo Product Standard, 2011.
A metadata file associated with this product is draft version 0.6.19
TEXAS
QUADRANGLE LOCATION
1 Liberty Hill
2 Leander NE
3 Georgetown
4 Nameless
5 Round Rock
6 Mansfield Dam
7 Jollyville
8 Pflugerville West
ADJOINING QUADRANGLES
ROAD CLASSIFICATION
Expressway
Secondary Hwy
Ramp
Local Connector
Local Road
4WD
Interstate Route
US Route
State Route
LEANDER, TX
2016

ATTACHMENT D



AFFECTED LANDOWNERS MAP
ATTACHMENT D

GBA
Texas Eng. Firm #4242

9601 Amberglen #109
Austin, TX 78729
737.247.7500
gbateam.com

G:\16532\Analysis\Environ\Wastewater\TCEQ Documents\Admin Report Attachments\CAD Files\ATT C_AFFECTED-LANDOWNER-MAP.dwg

AFFECTED LANDOWNERS LIST

ATTACHMENT C

REF #	PARCEL NUMBER	NAME	ADDRESS	CITY	STATE	ZIP CODE
1	R108637	CITY OF LEANDER	PO BOX 319	LEANDER	TX	78646-0319
2	R051592	REIT GROUP LEANDER SPRINGS HOLDINGS LLC	301 SANTALUZ LN	AUSTIN	TX	78732-2467
3	R031287	CITY OF LEANDER	PO BOX 319	LEANDER	TX	78646-0319
4	R623019	PERDERNALES ELECTRIC COOPERATIVE INC.	PO BOX 1	JOHNSON CITY	TX	78636-0001
5	R031277	CITY OF LEANDER	PO BOX 319	LEANDER	TX	78646-0319
6	R433137	GENERATIONS MINISTRIES INC.	PO BOX 280	CEDAR PARK	TX	78630-0280
7	R547806	CITY OF LEANDER	PO BOX 319	LEANDER	TX	78646-0319
8	R382089	DAVIS CEMETARY	NO ADDRESS LISTED IN WCAD*			
9	R374610	RENAISSANCE EDUCATION FOUNDATION	14401 OWEN TECH BLVD	AUSTIN	TX	78728-7017
10	R620144	CITY OF LEANDER	PO BOX 319	LEANDER	TX	78646-0319
11	R031325	BRUSHY CREEK FORK LLC	1601 S MOPAC EXPY SITE 175	AUSTIN	TX	78746
12	R031254	FIRST BAPTIST CHURCH	PO BOX 187	LEANDER	TX	78646-0187
13	R031253	FAB-CON PRODUCTS INC.	PO BOX 249	LEANDER	TX	78646-0249

*No mailing address found. The physical address listed in WCAD is 109 U.S. Highway 183 Leander, TX 78646.

WCAD

Property	Owner	Property Address	Tax Year	2024 Market Value
R382089	DAVIS CEMETERY	FM 2243, LEANDER, TX 78641	2024	CERTIFIED $300

Page: Property Details

2024 GENERAL INFORMATION

Property Status	Active
Property Type	Land
Legal Description	AW0006 - Harmon, E. D. Sur., ACRES 0.52, (GREENBELT)
Neighborhood	L001LLLI - Leander Will Dedicated - Non-Res WMSN Dedicated
Account	R-17-W000-6000-0056-A004
Related Properties	R382088
Map Number	4-2828
Effective Acres	-

2024 OWNER INFORMATION

Owner Name	DAVIS CEMETERY
Owner ID	
Exemptions	Exempt Property (Active)
Percent Ownership	100%
Mailing Address	LEANDER, TX
Agent	-

2024 VALUE INFORMATION

MARKET VALUE

Improvement Homesite Value	$0
Improvement Non-Homesite Value	$0
Total Improvement Market Value	$0
Land Homesite Value	$0
Land Non-Homesite Value	$300
Land Agricultural Market Value	$0
Land Timber Market Value	$0
Total Land Market Value	$300
Total Market Value	$300

ASSESSED VALUE

Total Improvement Market Value	$0
Land Homesite Value	$0
Land Non-Homesite Value	$300
Agricultural Use	$0
Timber Use	$0
Total Appraised Value	$300
Homestead Cap Loss	-$0
Circuit Breaker Limit Cap Loss	-$0
Total Assessed Value	$300

2024 ENTITIES & EXEMPTIONS

Special Exemptions **EX - Exempt Property**

TAXING ENTITY	EXEMPTIONS	EXEMPTIONS AMOUNT	TAXABLE VALUE	TAX RATE PER 100	TAX CEILING
CAD- Williamson CAD		-	$0	0	0
CLE- City of Leander		-	$0	0.417282	0
GWI- Williamson CO		-	$0	0.333116	0
J01- Aus Comm Coll		-	$0	0.0986	0
RFM- Wmsn CO FM/RD		-	$0	0.044329	0
SLE- Leander ISD		-	$0	1.1087	0
W09- Upper Brushy Creek WCID		-	$0	0.017	0
TOTALS				**2.019027**	

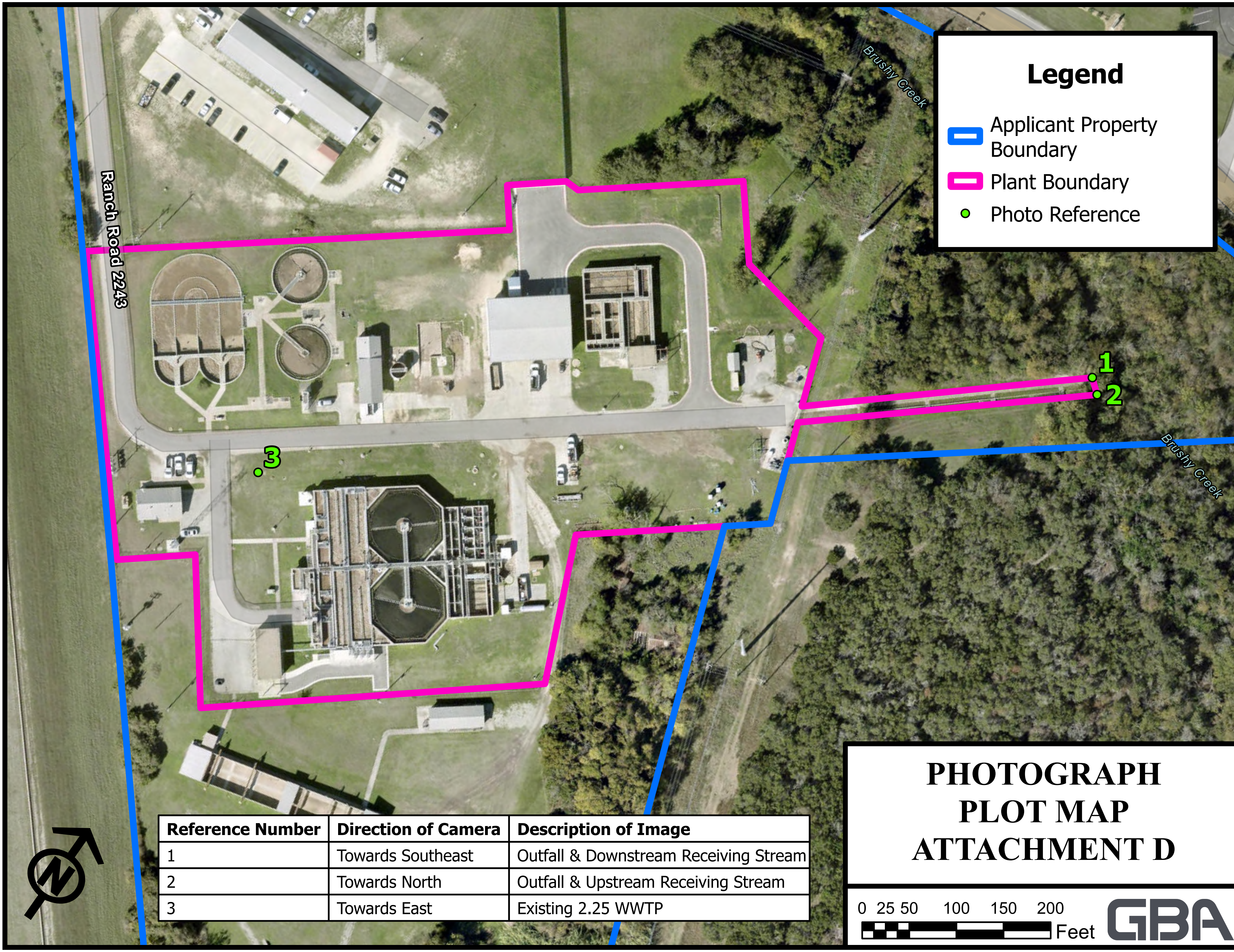
2024 LAND SEGMENTS

LAND SEGMENT TYPE	STATE CODE	HOMESITE	MARKET VALUE	AG USE	TIM USE	LAND SIZE
1 - Vacant Land	XV - Other Exemptions	No	$300	$0	$0	0.520000 acres
TOTALS						**22,651 Sq. ft / 0.520000 acres**

VALUE HISTORY

YEAR	IMPROVEMENT	LAND	MARKET	AG MARKET	AG USE	TIM MARKET	TIM USE	APPRAISED	HS CAP LOSS	CBL CAP LOSS	ASSESSED
2023	$0	$300	$300	$0	$0	$0	$0	$300	$0	$0	$300
2022	$0	$300	$300	$0	$0	$0	$0	$300	$0	$0	$300
2021	$0	$300	$300	$0	$0	$0	$0	$300	$0	$0	$300
2020	$0	$285	$285	$0	$0	$0	$0	$285	$0	$0	$285
2019	$0	$300	$300	$0	$0	$0	$0	$300	$0	$0	$300

ATTACHMENT E



Reference Number	Direction of Camera	Description of Image
1	Towards Southeast	Outfall & Downstream Receiving Stream
2	Towards North	Outfall & Upstream Receiving Stream
3	Towards East	Existing 2.25 WWTP

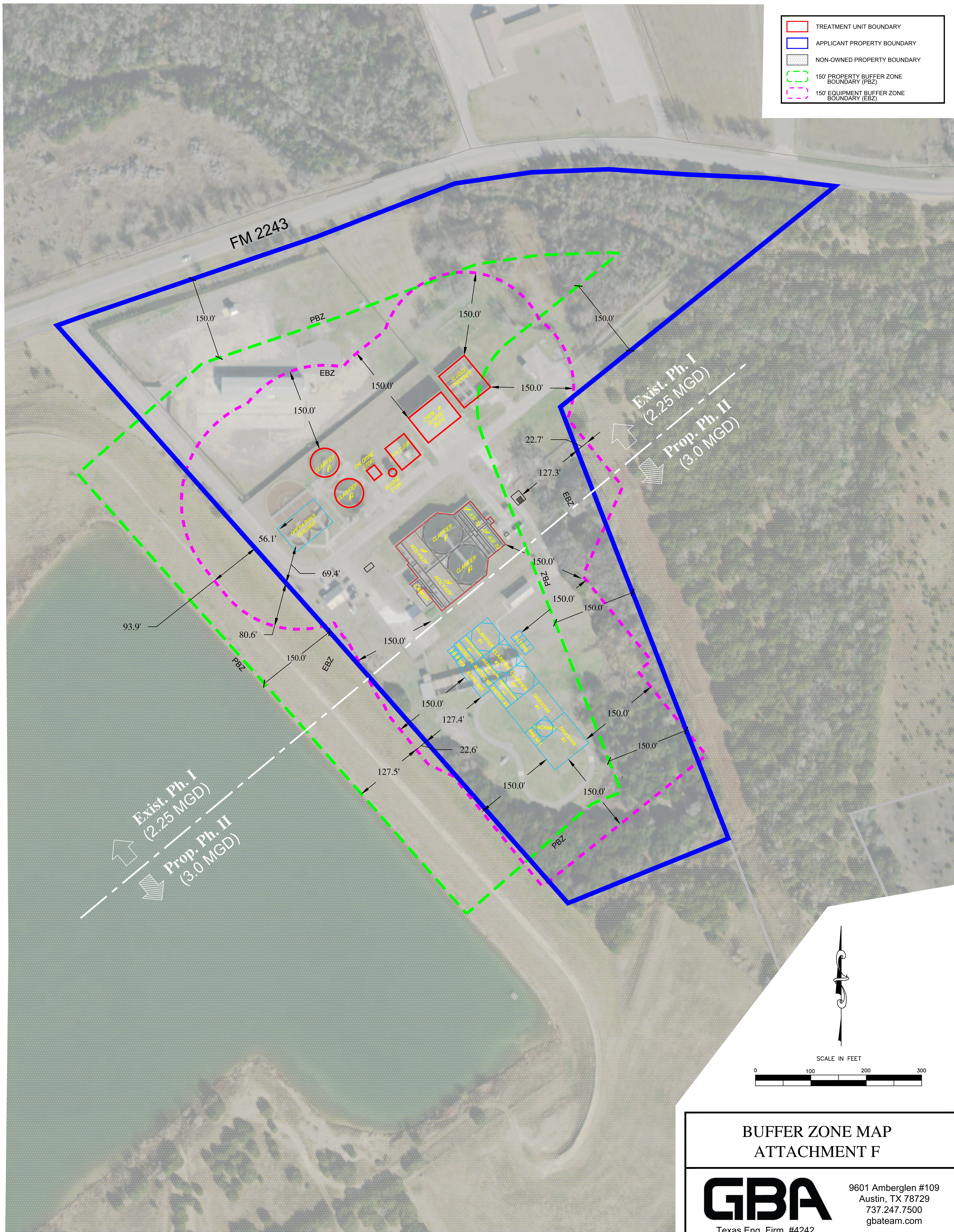
PHOTOGRAPH PLOT MAP ATTACHMENT D

1. Outfall and downstream receiving stream

2. Outfall and upstream receiving stream

3. Existing 2.25 MGD WWTP

ATTACHMENT F



BUFFER ZONE MAP
ATTACHMENT F

GBA
Texas Eng. Firm #4242
9601 Amberglen #109
Austin, TX 78729
737.247.7500
gbateam.com

ATTACHMENT G

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

SUPPLEMENTAL PERMIT INFORMATION FORM (SPIF)

FOR AGENCIES REVIEWING DOMESTIC OR INDUSTRIAL TPDES WASTEWATER PERMIT APPLICATIONS

TCEQ USE ONLY:

Application type: _____Renewal _____Major Amendment ____Minor Amendment _____New

County: ______________________________________ Segment Number: __________________

Admin Complete Date: _______________________

Agency Receiving SPIF:

______ Texas Historical Commission ______ U.S. Fish and Wildlife

______ Texas Parks and Wildlife Department ______ U.S. Army Corps of Engineers

This form applies to TPDES permit applications only. (Instructions, Page 53)

Complete this form as a separate document. TCEQ will mail a copy to each agency as required by our agreement with EPA. If any of the items are not completely addressed or further information is needed, we will contact you to provide the information before issuing the permit. Address each item completely.

Do not refer to your response to any item in the permit application form. Provide each attachment for this form separately from the Administrative Report of the application. The application will not be declared administratively complete without this SPIF form being completed in its entirety including all attachments. Questions or comments concerning this form may be directed to the Water Quality Division's Application Review and Processing Team by email at WQ-ARPTeam@tceq.texas.gov or by phone at (512) 239-4671.

The following applies to all applications:

1. Permittee: City of Leander

   Permit No. WQ00 12644001 EPA ID No. TX 0092151

   Address of the project (or a location description that includes street/highway, city/vicinity, and county):

   10201 RM 2243 Leander Texas, approximately 4,000ft east of the HWY-183 / Ranch Road 2243 intersection.

Provide the name, address, phone and fax number of an individual that can be contacted to answer specific questions about the property.

Prefix (Mr., Ms., Miss): Mr.

First and Last Name: Kenley Crowder

Credential (P.E, P.G., Ph.D., etc.): Click here to enter text.

Title: Assistant Director of Utilities

Mailing Address: P.O. Box 319

City, State, Zip Code: Leander, TX 78646

Phone No.: (512) 259-2640 Ext.: Click here to enter text. Fax No.: Click here to enter text.

E-mail Address: kcrowder@leandertx.gov

2. List the county in which the facility is located: Williamson
3. If the property is publicly owned and the owner is different than the permittee/applicant, please list the owner of the property.

Click here to enter text.

4. Provide a description of the effluent discharge route. The discharge route must follow the flow of effluent from the point of discharge to the nearest major watercourse (from the point of discharge to a classified segment as defined in 30 TAC Chapter 307). If known, please identify the classified segment number.

The treated effluent is discharged into an unclassified segment of Brushy Creek, then into Segment No. 1244 of Brushy Creek of the Brazos River Basin.

5. Please provide a separate 7.5-minute USGS quadrangle map with the project boundaries plotted and a general location map showing the project area. Please highlight the discharge route from the point of discharge for a distance of one mile downstream. (This map is required in addition to the map in the administrative report).

Provide original photographs of any structures 50 years or older on the property.

Does your project involve any of the following? Check all that apply.

- ☐ Proposed access roads, utility lines, construction easements
- ☐ Visual effects that could damage or detract from a historic property's integrity
- ☐ Vibration effects during construction or as a result of project design
- ☒ Additional phases of development that are planned for the future
- ☐ Sealing caves, fractures, sinkholes, other karst features

☐ Disturbance of vegetation or wetlands

1. List proposed construction impact (surface acres to be impacted, depth of excavation, sealing of caves, or other karst features):

   Surface area to be impacted by future expansion of the wastewater treatment plant is approximately 2.24 acres, depth of excavation to be less than 12 feet, no caves, karst features, fractures, or sink holes are anticipated at the site as three (3) previous plant projects on the site did not encounter any of these kinds of features.

2. Describe existing disturbances, vegetation, and land use:

   Existing site is a developed wastewater treatment plant. Areas of pervious cover on the site have carpet grass.

THE FOLLOWING ITEMS APPLY ONLY TO APPLICATIONS FOR NEW TPDES PERMITS AND MAJOR AMENDMENTS TO TPDES PERMITS

3. List construction dates of all buildings and structures on the property:

   The most recent plant expansion occurred in 2000 and included installation of new treatment trains to treat up to 2.25 MGD. Also included in the project was a sludge processing building, blower building, non-potable control building, and miscellaneous ancillary structures. The previous plant expansion included installation of a racetrack plant, two (2) clarifiers, and an office building. The original plant included a conventional activated sludge plant and drying beds.

4. Provide a brief history of the property, and name of the architect/builder, if known.

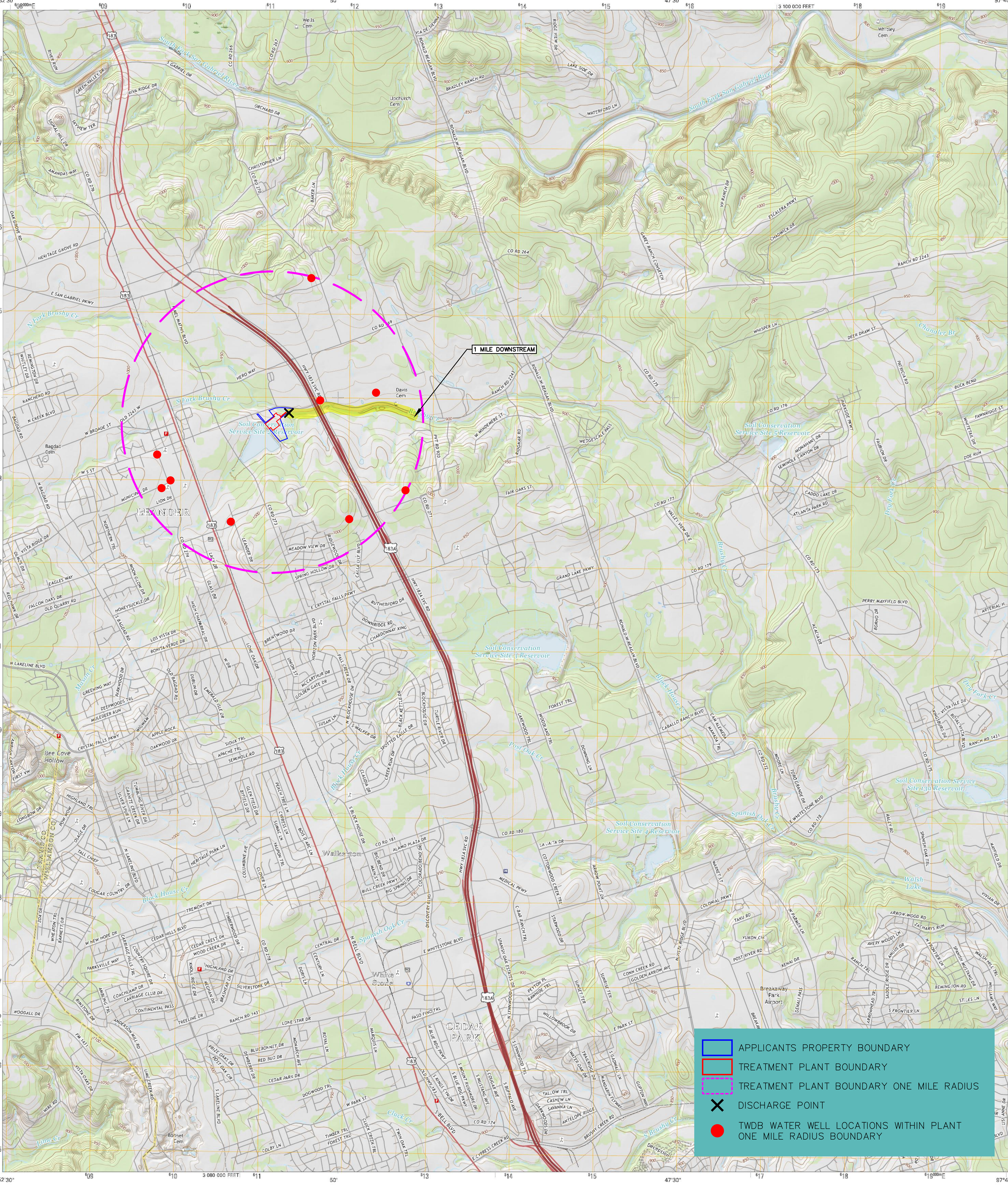
   The previous plant expansion built in 2000 was designed by Jay Engineering Company, Inc. and constructed by Cunningham Constructors Inc. Previous plant phase designers were Steger and Bizzell and constructors are unknown.

ATTACHMENT H

U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

The National Map
US Topo

LEANDER QUADRANGLE
TEXAS
7.5-MINUTE SERIES



Produced by the United States Geological Survey
North American Datum of 1983 (NAD83)
World Geodetic System of 1984 (WGS84). Projection and
1 000-meter grid: Universal Transverse Mercator, Zone 14R
10 000-foot ticks: Texas Coordinate System of 1983 (central zone)

This map is not a legal document. Boundaries may be generalized for this map scale. Private lands within government reservations may not be shown. Obtain permission before entering private lands.

Imagery..............NAIP, August 2014
Roads.............. U.S. Census Bureau, 2014 - 2015
Names..............GNIS, 2015
Hydrography..............National Hydrography Dataset, 2014
Contours..............National Elevation Dataset, 2002
Boundaries..............Multiple sources; see metadata file 1972 - 2015

Wetlands.........FWS National Wetlands Inventory 1977 - 2014

MN
GN
4° 6´
73 MILS
0° 36´
11 MILS

UTM GRID AND 2016 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

U.S. National Grid
100,000-m Square ID
PU
Grid Zone Designation 14R

SCALE 1:24 000

CONTOUR INTERVAL 10 FEET
NORTH AMERICAN VERTICAL DATUM OF 1988

This map was produced to conform with the National Geospatial Program US Topo Product Standard, 2011.
A metadata file associated with this product is draft version 0.6.19

TEXAS
QUADRANGLE LOCATION

1	2	3
4		5
6	7	8

1 Liberty Hill
2 Leander NE
3 Georgetown
4 Nameless
5 Round Rock
6 Mansfield Dam
7 Jollyville
8 Pflugerville West

ADJOINING QUADRANGLES

ROAD CLASSIFICATION
Expressway
Secondary Hwy
Ramp
Local Connector
Local Road
4WD
Interstate Route
US Route
State Route

LEANDER, TX
2016

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

DOMESTIC WASTEWATER PERMIT APPLICATION TECHNICAL REPORT 1.0

For any questions about this form, please contact the Domestic Wastewater Permitting Team at 512-239-4671.

The following information is required for all renewal, new, and amendment applications.

Section 1. Permitted or Proposed Flows (Instructions Page 43)

A. Existing/Interim I Phase

Design Flow (MGD): 2.25

2-Hr Peak Flow (MGD): 6.75

Estimated construction start date: June 2001

Estimated waste disposal start date: November 21, 2002

B. Interim II Phase

Design Flow (MGD): 4.25

2-Hr Peak Flow (MGD): 12.75

Estimated construction start date: January 2026

Estimated waste disposal start date: January 2028

C. Final Phase

Design Flow (MGD): 5.25

2-Hr Peak Flow (MGD): 15.75

Estimated construction start date: June 2032

Estimated waste disposal start date: June 2034

D. Current Operating Phase

Provide the startup date of the facility: November 21, 2002

Section 2. Treatment Process (Instructions Page 43)

A. Current Operating Phase

Provide a detailed description of the treatment process. **Include the type of treatment plant, mode of operation, and all treatment units.** Start with the plant's head works and finish with the point of discharge. Include all sludge processing and drying units. **If more than one phase exists or is proposed, a description of *each phase* must be provided.**

See Attachment A for description and sizing of current plant phase treatment units. Proposed plant improvements will include: drum screening, grit chamber, anoxic basin, anaerobic basins, aeration basins, clarifiers, tertiary filters, UV disinfection system, sludge digestion basins, and a gravity thickener. See Attachment B for Interim II proposed plant improvements detailed process description and design. See Attachment C for final phase proposed plant improvements detailed process description and design.

B. Treatment Units

In Table 1.0(1), provide the treatment unit type, the number of units, and dimensions (length, width, depth) **of each treatment unit, accounting for *all* phases of operation.**

Table 1.0(1) - Treatment Units

Treatment Unit Type	Number of Units	Dimensions (L x W x D)
		See Attachments A, B, & C

C. Process Flow Diagram

Provide flow diagrams for the existing facilities and **each** proposed phase of construction.

Attachment: See Attachment D for Flow Diagrams.

Section 3. Site Information and Drawing (Instructions Page 44)

Provide the TPDES discharge outfall latitude and longitude. Enter N/A if not applicable.

- Latitude: 97 deg 50 min 25 sec W
- Longitude: 30 deg 34 min 53 sec N

Provide the TLAP disposal site latitude and longitude. Enter N/A if not applicable.

- Latitude: N/A
- Longitude: N/A

Provide a site drawing for the facility that shows the following:

- The boundaries of the treatment facility;
- The boundaries of the area served by the treatment facility;
- If land disposal of effluent, the boundaries of the disposal site and all storage/holding ponds; and
- If sludge disposal is authorized in the permit, the boundaries of the land application or disposal site.

Attachment: See Attachment E for the Site Drawing.

Provide the name **and** a description of the area served by the treatment facility.

The area served by the facility is comprised of areas of the Colorado River Basin, North and South Brushy Creek Basin, South San Gabriel West Basin, Mason Creek Basin, and Bryson Basin within the north and west areas of the City of Leander Sewer CCN #20626.

Collection System Information **for wastewater TPDES permits only**: Provide information for each **uniquely owned** collection system, existing and new, served by this facility, including satellite collection systems**. Please see the instructions for a detailed explanation and examples.**

Collection System Information

Collection System Name	Owner Name	Owner Type	Population Served
Leander Collection System	City of Leander	Publicly Owned	38,000
		Choose an item.	
		Choose an item.	
		Choose an item.	

Section 4. Unbuilt Phases (Instructions Page 45)

Is the application for a renewal of a permit that contains an unbuilt phase or phases?

☒ Yes ☐ No

If yes, does the existing permit contain a phase that has not been constructed **within five years** of being authorized by the TCEQ?

☒ Yes ☐ No

If yes, provide a detailed discussion regarding the continued need for the unbuilt phase. **Failure to provide sufficient justification may result in the Executive Director recommending denial of the unbuilt phase or phases.**

A Collection System Master Plan for the City of Leander was completed, which included flow projections to the current 2.25 MGD plant. Growth projections for the entire city were developed using residential development and future land use maps created by the City of Leander. Flow projections were then developed using a collection system model in PCSWMM and historic flow data. The modeled projections and historic trends were used to anticipate future flow rates at the RM2243 WWTP. Based on this analysis, the plant is expected to reach its currently permitted capacity of 2.25 MGD by March 2025, its Interim II capacity by May 2030, and its ultimate capacity of 5.25 MGD by June 2034. These projections show the continued need for the unbuilt phases for the RM2243 WWTP.

Section 5. Closure Plans (Instructions Page 45)

Have any treatment units been taken out of service permanently, or will any units be taken out of service in the next five years?

☐ Yes ☒ No

If yes, was a closure plan submitted to the TCEQ?

☐ Yes ☒ No

If yes, provide a brief description of the closure and the date of plan approval.

Click to enter text.

Section 6. Permit Specific Requirements (Instructions Page 45)

For applicants with an existing permit, check the Other Requirements or Special Provisions of the permit.

A. Summary transmittal

Have plans and specifications been approved for the existing facilities and each proposed phase?

☐ Yes ☒ No

If yes, provide the date(s) of approval for each phase: The existing plant was approved by the Commission in 2000.

Provide information, including dates, on any actions taken to meet a *requirement or provision* pertaining to the submission of a summary transmittal letter. **Provide a copy of an approval letter from the TCEQ, if applicable**.

Summary transmittal letter was submitted November 9, 2000 – See Attachment F. TCEQ Approval letter was received November 28, 2000 – See Attachment G.

B. Buffer zones

Have the buffer zone requirements been met?

☒ Yes ☐ No

Provide information below, including dates, on any actions taken to meet the conditions of the buffer zone. If available, provide any new documentation relevant to maintaining the buffer zones.

Click to enter text.

C. Other actions required by the current permit

Does the *Other Requirements* or *Special Provisions* section in the existing permit require submission of any other information or other required actions? Examples include Notification of Completion, progress reports, soil monitoring data, etc.

☐ Yes ☒ No

If yes, provide information below on the status of any actions taken to meet the conditions of an *Other Requirement* or *Special Provision*.

Click to enter text.

D. Grit and grease treatment

1. *Acceptance of grit and grease waste*

Does the facility have a grit and/or grease processing facility onsite that treats and decants or accepts transported loads of grit and grease waste that are discharged directly to the wastewater treatment plant prior to any treatment?

☐ Yes ☒ No

If No, stop here and continue with Subsection E. Stormwater Management.

2. *Grit and grease processing*

Describe below how the grit and grease waste is treated at the facility. In your description, include how and where the grit and grease is introduced to the treatment works and how it is separated or processed. Provide a flow diagram showing how grit and grease is processed at the facility.

Click to enter text.

3. *Grit disposal*

Does the facility have a Municipal Solid Waste (MSW) registration or permit for grit disposal?

☐ Yes ☐ No

If No, contact the TCEQ Municipal Solid Waste team at 512-239-2335. Note: A registration or permit is required for grit disposal. Grit shall not be combined with treatment plant sludge. See the instruction booklet for additional information on grit disposal requirements and restrictions.

Describe the method of grit disposal.

Click to enter text.

4. ***Grease and decanted liquid disposal***

Note: A registration or permit is required for grease disposal. Grease shall not be combined with treatment plant sludge. For more information, contact the TCEQ Municipal Solid Waste team at 512-239-2335.

Describe how the decant and grease are treated and disposed of after grit separation.

Click to enter text.

E. Stormwater management

1. ***Applicability***

Does the facility have a design flow of 1.0 MGD or greater in any phase?

☒ Yes ☐ No

Does the facility have an approved pretreatment program, under 40 CFR Part 403?

☐ Yes ☒ No

If no to both of the above, then skip to Subsection F, Other Wastes Received.

2. ***MSGP coverage***

Is the stormwater runoff from the WWTP and dedicated lands for sewage disposal currently permitted under the TPDES Multi-Sector General Permit (MSGP), TXR050000?

☒ Yes ☐ No

If yes, please provide MSGP Authorization Number and skip to Subsection F, Other Wastes Received:

TXR05 AS75 or TXRNE Click to enter text.

If no, do you intend to seek coverage under TXR050000?

☐ Yes ☐ No

3. ***Conditional exclusion***

Alternatively, do you intend to apply for a conditional exclusion from permitting based TXR050000 (Multi Sector General Permit) Part II B.2 or TXR050000 (Multi Sector General Permit) Part V, Sector T 3(b)?

☒ Yes ☐ No

If yes, please explain below then proceed to Subsection F, Other Wastes Received:

Click to enter text.

4. ***Existing coverage in individual permit***

Is your stormwater discharge currently permitted through this individual TPDES or TLAP permit?

☐ Yes ☒ No

If yes, provide a description of stormwater runoff management practices at the site that are authorized in the wastewater permit then skip to Subsection F, Other Wastes Received.

Click to enter text.

5. ***Zero stormwater discharge***

Do you intend to have no discharge of stormwater via use of evaporation or other means?

☐ Yes ☒ No

If yes, explain below then skip to Subsection F. Other Wastes Received.

Click to enter text.

Note: If there is a potential to discharge any stormwater to surface water in the state as the result of any storm event, then permit coverage is required under the MSGP or an individual discharge permit. This requirement applies to all areas of facilities with treatment plants or systems that treat, store, recycle, or reclaim domestic sewage, wastewater or sewage sludge (including dedicated lands for sewage sludge disposal located within the onsite property boundaries) that meet the applicability criteria of above. You have the option of obtaining coverage under the MSGP for direct discharges, (recommended), or obtaining coverage under this individual permit.

6. ***Request for coverage in individual permit***

Are you requesting coverage of stormwater discharges associated with your treatment plant under this individual permit?

☐ Yes ☒ No

If yes, provide a description of stormwater runoff management practices at the site for which you are requesting authorization in this individual wastewater permit and describe whether you intend to comingle this discharge with your treated effluent or discharge it via a separate dedicated stormwater outfall. Please also indicate if you intend to divert stormwater to the treatment plant headworks and indirectly discharge it to water in the state.

Click to enter text.

Note: Direct stormwater discharges to waters in the state authorized through this individual permit will require the development and implementation of a stormwater pollution prevention plan (SWPPP) and will be subject to additional monitoring and reporting requirements. Indirect discharges of stormwater via headworks recycling will require compliance with all individual permit requirements including 2-hour peak flow limitations. All stormwater discharge authorization requests will require additional information during the technical review of your application.

F. Discharges to the Lake Houston Watershed

Does the facility discharge in the Lake Houston watershed?

☐ Yes ☒ No

If yes, attach a Sewage Sludge Solids Management Plan. See Example 5 in the instructions. Click to enter text.

G. Other wastes received including sludge from other WWTPs and septic waste

1. Acceptance of sludge from other WWTPs

Does or will the facility accept sludge from other treatment plants at the facility site?

☐ Yes ☒ No

If yes, attach sewage sludge solids management plan. See Example 5 of instructions.

In addition, provide the date the plant started or is anticipated to start accepting sludge, an estimate of monthly sludge acceptance (gallons or millions of gallons), an estimate of the BOD_5 concentration of the sludge, and the design BOD_5 concentration of the influent from the collection system. Also note if this information has or has not changed since the last permit action.

Click to enter text.

Note: Permits that accept sludge from other wastewater treatment plants may be required to have influent flow and organic loading monitoring.

2. Acceptance of septic waste

Is the facility accepting or will it accept septic waste?

☐ Yes ☒ No

If yes, does the facility have a Type V processing unit?

☐ Yes ☒ No

If yes, does the unit have a Municipal Solid Waste permit?

☐ Yes ☒ No

If yes to any of the above, provide the date the plant started or is anticipated to start accepting septic waste, an estimate of monthly septic waste acceptance (gallons or millions of gallons), an estimate of the BOD_5 concentration of the septic waste, and the design BOD_5 concentration of the influent from the collection system. Also note if this information has or has not changed since the last permit action.

Click to enter text.

Note: Permits that accept sludge from other wastewater treatment plants may be required to have influent flow and organic loading monitoring.

3. ***Acceptance of other wastes (not including septic, grease, grit, or RCRA, CERCLA or as discharged by IUs listed in Worksheet 6)***

Is or will the facility accept wastes that are not domestic in nature excluding the categories listed above?

☐ Yes ☒ No

If yes, provide the date that the plant started accepting the waste, an estimate how much waste is accepted on a monthly basis (gallons or millions of gallons), a description of the entities generating the waste, and any distinguishing chemical or other physical characteristic of the waste. Also note if this information has or has not changed since the last permit action.

Click to enter text.

Section 7. Pollutant Analysis of Treated Effluent (Instructions Page 50)

Is the facility in operation?

☒ Yes ☐ No

If no, this section is not applicable. Proceed to Section 8.

If yes, provide effluent analysis data for the listed pollutants. ***Wastewater treatment facilities*** complete Table 1.0(2). W***ater treatment facilities*** discharging filter backwash water, complete Table 1.0(3). Provide copies of the laboratory results sheets. **These tables are not applicable for a minor amendment without renewal.** See the instructions for guidance.

Note: The sample date must be within 1 year of application submission.

Table1.0(2) – Pollutant Analysis for Wastewater Treatment Facilities

Pollutant	Average Conc.	Max Conc.	No. of Samples	Sample Type	Sample Date/Time
$CBOD_5$, mg/l					
Total Suspended Solids, mg/l					
Ammonia Nitrogen, mg/l					
Nitrate Nitrogen, mg/l	13.3				
Total Kjeldahl Nitrogen, mg/l					
Sulfate, mg/l					
Chloride, mg/l					
Total Phosphorus, mg/l					
pH, standard units					
Dissolved Oxygen*, mg/l					
Chlorine Residual, mg/l					
E.coli (CFU/100ml) freshwater					
Entercocci (CFU/100ml) saltwater					
Total Dissolved Solids, mg/l					
Electrical Conductivity, µmohs/cm, †					
Oil & Grease, mg/l					
Alkalinity ($CaCO_3$)*, mg/l					

*TPDES permits only
†TLAP permits only

Table1.0(3) – Pollutant Analysis for Water Treatment Facilities

Pollutant	Average Conc.	Max Conc.	No. of Samples	Sample Type	Sample Date/Time
Total Suspended Solids, mg/l					
Total Dissolved Solids, mg/l					
pH, standard units					
Fluoride, mg/l					
Aluminum, mg/l					
Alkalinity ($CaCO_3$), mg/l					

Section 8. Facility Operator (Instructions Page 50)

Facility Operator Name: Juan Ramirez

Facility Operator's License Classification and Level: Wastewater Treatment Operator A

Facility Operator's License Number: WW0067965

Section 9. Sludge and Biosolids Management and Disposal (Instructions Page 51)

A. WWTP's Biosolids Management Facility Type

Check all that apply. See instructions for guidance

☒ Design flow>= 1 MGD

☒ Serves >= 10,000 people

☐ Class I Sludge Management Facility (per 40 CFR § 503.9)

☒ Biosolids generator

☐ Biosolids end user – land application (onsite)

☐ Biosolids end user – surface disposal (onsite)

☐ Biosolids end user – incinerator (onsite)

B. WWTP's Biosolids Treatment Process

Check all that apply. See instructions for guidance.

☒ Aerobic Digestion

☐ Air Drying (or sludge drying beds)

☐ Lower Temperature Composting

☐ Lime Stabilization

☐ Higher Temperature Composting

☐ Heat Drying

☐ Thermophilic Aerobic Digestion

☐ Beta Ray Irradiation

☐ Gamma Ray Irradiation

☐ Pasteurization

☐ Preliminary Operation (e.g. grinding, de-gritting, blending)

☒ Thickening (e.g. gravity thickening, centrifugation, filter press, vacuum filter)

☐ Sludge Lagoon

☐ Temporary Storage (< 2 years)

☐ Long Term Storage (>= 2 years)

☐ Methane or Biogas Recovery

☒ Other Treatment Process: Dewatering

C. Biosolids Management

Provide information on the *intended* biosolids management practice. Do not enter every management practice that you want authorized in the permit, as the permit will authorize all biosolids management practices listed in the instructions. Rather indicate the management practice the facility plans to use.

Biosolids Management

Management Practice	Handler or Preparer Type	Bulk or Bag Container	Amount (dry metric tons)	Pathogen Reduction Options	Vector Attraction Reduction Option
Disposal in Landfill	Off-site Third-Party Handler or Preparer	Bulk	1,000	Class B: PSRP Aerobic Digestion	Option 4: SOUR <=1.5 mg 02/hr/g total solids at 20C (<2% solids)
Choose an item.	Choose an item.	Choose an item.		Choose an item.	Choose an item.
Choose an item.	Choose an item.	Choose an item.		Choose an item.	Choose an item.

If "Other" is selected for Management Practice, please explain (e.g. monofill or transport to another WWTP): Click to enter text.

D. Disposal site

Disposal site name: Williamson County Landfill

TCEQ permit or registration number: 1405B

County where disposal site is located: Williamson

E. Transportation method

Method of transportation (truck, train, pipe, other): Dried sludge in a roll-off container

Name of the hauler: Al Clawson Disposal

Hauler registration number: 23754

Sludge is transported as a:

Liquid ☐ semi-liquid ☐ semi-solid ☐ solid ☒

Section 10. Permit Authorization for Sewage Sludge Disposal (Instructions Page 53)

A. Beneficial use authorization

Does the existing permit include authorization for land application of sewage sludge for beneficial use?

☐ Yes ☒ No

If yes, are you requesting to continue this authorization to land apply sewage sludge for beneficial use?

☐ Yes ☐ No

If yes, is the completed **Application for Permit for Beneficial Land Use of Sewage Sludge (TCEQ Form No. 10451)** attached to this permit application (see the instructions for details)?

☐ Yes ☐ No

B. Sludge processing authorization

Does the existing permit include authorization for any of the following sludge processing, storage or disposal options?

Sludge Composting	☐ Yes	☒ No
Marketing and Distribution of sludge	☐ Yes	☒ No
Sludge Surface Disposal or Sludge Monofill	☐ Yes	☒ No
Temporary storage in sludge lagoons	☐ Yes	☒ No

If yes to any of the above sludge options and the applicant is requesting to continue this authorization, is the completed **Domestic Wastewater Permit Application: Sewage Sludge Technical Report (TCEQ Form No. 10056)** attached to this permit application?

☐ Yes ☐ No

Section 11. Sewage Sludge Lagoons (Instructions Page 53)

Does this facility include sewage sludge lagoons?

☐ Yes ☒ No

If yes, complete the remainder of this section. If no, proceed to Section 12.

A. Location information

The following maps are required to be submitted as part of the application. For each map, provide the Attachment Number.

- Original General Highway (County) Map:

  Attachment: Click to enter text.
- USDA Natural Resources Conservation Service Soil Map:

  Attachment: Click to enter text.
- Federal Emergency Management Map:

  Attachment: Click to enter text.
- Site map:

  Attachment: Click to enter text.

Discuss in a description if any of the following exist within the lagoon area. Check all that apply.

☐ Overlap a designated 100-year frequency flood plain

☐ Soils with flooding classification

☐ Overlap an unstable area

☐ Wetlands

☐ Located less than 60 meters from a fault

☐ None of the above

Attachment: Click to enter text.

If a portion of the lagoon(s) is located within the 100-year frequency flood plain, provide the protective measures to be utilized including type and size of protective structures:

Click to enter text.

B. Temporary storage information

Provide the results for the pollutant screening of sludge lagoons. These results are in addition to pollutant results in *Section 7 of Technical Report 1.0.*

Nitrate Nitrogen, mg/kg: Click to enter text.

Total Kjeldahl Nitrogen, mg/kg: Click to enter text.

Total Nitrogen (=nitrate nitrogen + TKN), mg/kg: Click to enter text.

Phosphorus, mg/kg: Click to enter text.

Potassium, mg/kg: Click to enter text.

pH, standard units: Click to enter text.

Ammonia Nitrogen mg/kg: Click to enter text.

Arsenic: Click to enter text.

Cadmium: Click to enter text.

Chromium: Click to enter text.

Copper: Click to enter text.

Lead: Click to enter text.

Mercury: Click to enter text.

Molybdenum: Click to enter text.

Nickel: Click to enter text.

Selenium: Click to enter text.

Zinc: Click to enter text.

Total PCBs: Click to enter text.

Provide the following information:

Volume and frequency of sludge to the lagoon(s): Click to enter text.

Total dry tons stored in the lagoons(s) per 365-day period: Click to enter text.

Total dry tons stored in the lagoons(s) over the life of the unit: Click to enter text.

C. Liner information

Does the active/proposed sludge lagoon(s) have a liner with a maximum hydraulic conductivity of 1×10^{-7} cm/sec?

☐ Yes ☐ No

If yes, describe the liner below. Please note that a liner is required.

Click to enter text.

D. Site development plan

Provide a detailed description of the methods used to deposit sludge in the lagoon(s):

Click to enter text.

Attach the following documents to the application.

- Plan view and cross-section of the sludge lagoon(s)

  Attachment: Click to enter text.
- Copy of the closure plan

  Attachment: Click to enter text.
- Copy of deed recordation for the site

  Attachment: Click to enter text.
- Size of the sludge lagoon(s) in surface acres and capacity in cubic feet and gallons

  Attachment: Click to enter text.
- Description of the method of controlling infiltration of groundwater and surface water from entering the site

  Attachment: Click to enter text.
- Procedures to prevent the occurrence of nuisance conditions

  Attachment: Click to enter text.

E. Groundwater monitoring

Is groundwater monitoring currently conducted at this site, or are any wells available for groundwater monitoring, or are groundwater monitoring data otherwise available for the sludge lagoon(s)?

☐ Yes ☐ No

If groundwater monitoring data are available, provide a copy. Provide a profile of soil types encountered down to the groundwater table and the depth to the shallowest groundwater as a separate attachment.

Attachment: Click to enter text.

Section 12. Authorizations/Compliance/Enforcement (Instructions Page 55)

A. Additional authorizations

Does the permittee have additional authorizations for this facility, such as reuse authorization, sludge permit, etc?

☒ Yes ☐ No

If yes, provide the TCEQ authorization number and description of the authorization:

The City holds Reuse Authorization No. R1264001 that allows uses permitted for Type I wastewater effluent. See Attachment H.

B. Permittee enforcement status

Is the permittee currently under enforcement for this facility?

☐ Yes ☒ No

Is the permittee required to meet an implementation schedule for compliance or enforcement?

☐ Yes ☒ No

If yes to either question, provide a brief summary of the enforcement, the implementation schedule, and the current status:

Click to enter text.

Section 13. RCRA/CERCLA Wastes (Instructions Page 55)

A. RCRA hazardous wastes

Has the facility received in the past three years, does it currently receive, or will it receive RCRA hazardous waste?

☐ Yes ☒ No

B. Remediation activity wastewater

Has the facility received in the past three years, does it currently receive, or will it receive CERCLA wastewater, RCRA remediation/corrective action wastewater or other remediation activity wastewater?

☐ Yes ☒ No

C. Details about wastes received

If yes to either Subsection A or B above, provide detailed information concerning these wastes with the application.

Attachment: Click to enter text.

Section 14. Laboratory Accreditation (Instructions Page 56)

All laboratory tests performed must meet the requirements of *30 TAC Chapter 25, Environmental Testing Laboratory Accreditation and Certification*, which includes the following general exemptions from National Environmental Laboratory Accreditation Program (NELAP) certification requirements:

- The laboratory is an in-house laboratory and is:
  - periodically inspected by the TCEQ; or
  - located in another state and is accredited or inspected by that state; or
  - performing work for another company with a unit located in the same site; or
  - performing pro bono work for a governmental agency or charitable organization.
- The laboratory is accredited under federal law.
- The data are needed for emergency-response activities, and a laboratory accredited under the Texas Laboratory Accreditation Program is not available.
- The laboratory supplies data for which the TCEQ does not offer accreditation.

The applicant should review 30 TAC Chapter 25 for specific requirements.

The following certification statement shall be signed and submitted with every application. See the Signature Page section in the Instructions, for a list of designated representatives who may sign the certification.

CERTIFICATION:

I certify that all laboratory tests submitted with this application meet the requirements of *30 TAC Chapter 25, Environmental Testing Laboratory Accreditation and Certification.*

Printed Name: Todd Parton

Title: City Manager

Signature: ______________________

Date: 7/15/2024

DOMESTIC WASTEWATER PERMIT APPLICATION TECHNICAL REPORT 1.1

The following information is required for new and amendment major applications.

Section 1. Justification for Permit (Instructions Page 57)

A. Justification of permit need

Provide a detailed discussion regarding the need for any phase(s) not currently permitted. Failure to provide sufficient justification may result in the Executive Director recommending denial of the proposed phase(s) or permit.

The City of Leander is rapidly growing, with a service area covering over 33 square miles (CCN 20626). All growth in this area will be served by the plant. According to the City's Collection System Master Plan, the plant is projected to reach its current permitted capacity of 2.25 MGD by March 2025, its proposed Interim II capacity of 4.25 MGD by May 2030, and its Ultimate capacity of 5.25 MGD by June 2034. To ensure the City can meet the demands of projected population growth, it will be necessary to expand the plant by adding three additional treatment trains, each with a capacity of 1.0 MGD.

B. Regionalization of facilities

For additional guidance, please review TCEQ's Regionalization Policy for Wastewater Treatment[1].

Provide the following information concerning the potential for regionalization of domestic wastewater treatment facilities:

1. ***Municipally incorporated areas***

   If the applicant is a city, then Item 1 is not applicable. Proceed to Item 2 Utility CCN areas.

   Is any portion of the proposed service area located in an incorporated city?

   ☐ Yes ☐ No ☒ Not Applicable

   If yes, within the city limits of: Click to enter text.

   If yes, attach correspondence from the city.

   Attachment: Click to enter text.

   If consent to provide service is available from the city, attach a justification for the proposed facility and a cost analysis of expenditures that includes the cost of connecting to the city versus the cost of the proposed facility or expansion attached.

   Attachment: Click to enter text.

2. ***Utility CCN areas***

   Is any portion of the proposed service area located inside another utility's CCN area?

   ☒ Yes ☐ No

[1] https://www.tceq.texas.gov/permitting/wastewater/tceq-regionalization-for-wastewater

If yes, attach a justification for the proposed facility and a cost analysis of expenditures that includes the cost of connecting to the CCN facilities versus the cost of the proposed facility or expansion.

Attachment: I

3. ***Nearby WWTPs or collection systems***

Are there any domestic permitted wastewater treatment facilities or collection systems located within a three-mile radius of the proposed facility?

☐ Yes ☒ No

If yes, attach a list of these facilities and collection systems that includes each permittee's name and permit number, and an area map showing the location of these facilities and collection systems.

Attachment: Click to enter text.

If yes, attach proof of mailing a request for service to each facility and collection system, the letters requesting service, and correspondence from each facility and collection system.

Attachment: Click to enter text.

If the facility or collection system agrees to provide service, attach a justification for the proposed facility and a cost analysis of expenditures that includes the cost of connecting to the facility or collection system versus the cost of the proposed facility or expansion.

Attachment: Click to enter text.

Section 2. Proposed Organic Loading (Instructions Page 59)

Is this facility in operation?

☒ Yes ☐ No

If no, proceed to Item B, Proposed Organic Loading.

If yes, provide organic loading information in Item A, Current Organic Loading

A. Current organic loading

Facility Design Flow (flow being requested in application): 4.25 MGD/5.25 MGD

Average Influent Organic Strength or BOD_5 Concentration in mg/l: 280 mg/L

Average Influent Loading (lbs/day = total average flow X average BOD_5 conc. X 8.34): 9,925 lbs/day / 12260 lbs/day

Provide the source of the average organic strength or BOD_5 concentration.

Assumed organic loading used in design calculations.

B. Proposed organic loading

This table must be completed if this application is for a facility that is not in operation or if this application is to request an increased flow that will impact organic loading.

Table 1.1(1) – Design Organic Loading

Source	Total Average Flow (MGD)	Influent BOD5 Concentration (mg/l)
Municipality		
Subdivision		
Trailer park – transient		
Mobile home park		
School with cafeteria and showers		
School with cafeteria, no showers		
Recreational park, overnight use		
Recreational park, day use		
Office building or factory		
Motel		
Restaurant		
Hospital		
Nursing home		
Other		
TOTAL FLOW from all sources		
AVERAGE BOD_5 from all sources		

Section 3. Proposed Effluent Quality and Disinfection (Instructions Page 59)

A. Existing/Interim I Phase Design Effluent Quality

Biochemical Oxygen Demand (5-day), mg/l: 5

Total Suspended Solids, mg/l: 5

Ammonia Nitrogen, mg/l: 2

Total Phosphorus, mg/l: 1

Dissolved Oxygen, mg/l: 6

Other: *E. coli: 126 CFU*

B. Interim II Phase Design Effluent Quality

Biochemical Oxygen Demand (5-day), mg/l: 5

Total Suspended Solids, mg/l: 5

Ammonia Nitrogen, mg/l: 2

Total Phosphorus, mg/l: 1

Dissolved Oxygen, mg/l: 6

Other: *E. coli: 126 CFU*

C. Final Phase Design Effluent Quality

Biochemical Oxygen Demand (5-day), mg/l: 5

Total Suspended Solids, mg/l: 5

Ammonia Nitrogen, mg/l: 2

Total Phosphorus, mg/l: 0.5

Dissolved Oxygen, mg/l: 6

Other: *E. coli: 126 CFU*

D. Disinfection Method

Identify the proposed method of disinfection.

☐ Chlorine: Click to enter text. mg/l after Click to enter text. minutes detention time at peak flow

Dechlorination process: Click to enter text.

☒ Ultraviolet Light: 30 seconds contact time at peak flow

☐ Other: Click to enter text.

Section 4. Design Calculations (Instructions Page 59)

Attach design calculations and plant features for each proposed phase. Example 4 of the instructions includes sample design calculations and plant features.

Attachment: Attachments A, B, and C

Section 5. Facility Site (Instructions Page 60)

A. 100-year floodplain

Will the proposed facilities be located above the 100-year frequency flood level?

☒ Yes ☐ No

If no, describe measures used to protect the facility during a flood event. Include a site map showing the location of the treatment plant within the 100-year frequency flood level. If applicable, provide the size and types of protective structures.

Attachment J

Provide the source(s) used to determine 100-year frequency flood plain.

FEMA FIRM (Flood Insurance Rate Map) #48491C0455E. See Attachment J.

For a new or expansion of a facility, will a wetland or part of a wetland be filled?

☐ Yes ☒ No

If yes, has the applicant applied for a US Corps of Engineers 404 Dredge and Fill Permit?

☐ Yes ☐ No

If yes, provide the permit number: Click to enter text.

If no, provide the approximate date you anticipate submitting your application to the Corps: Click to enter text.

B. Wind rose

Attach a wind rose: Attachment K

Section 6. Permit Authorization for Sewage Sludge Disposal (Instructions Page 60)

A. Beneficial use authorization

Are you requesting to include authorization to land apply sewage sludge for beneficial use on property located adjacent to the wastewater treatment facility under the wastewater permit?

☐ Yes ☒ No

If yes, attach the completed **Application for Permit for Beneficial Land Use of Sewage Sludge (TCEQ Form No. 10451)**: Click to enter text.

B. Sludge processing authorization

Identify the sludge processing, storage or disposal options that will be conducted at the wastewater treatment facility:

☐ Sludge Composting

☐ Marketing and Distribution of sludge

☐ Sludge Surface Disposal or Sludge Monofill

If any of the above, sludge options are selected, attach the completed **Domestic Wastewater Permit Application: Sewage Sludge Technical Report (TCEQ Form No. 10056)**: Click to enter text.

Section 7. Sewage Sludge Solids Management Plan (Instructions Page 61)

Attach a solids management plan to the application.

Attachment: L

The sewage sludge solids management plan must contain the following information:

- Treatment units and processes dimensions and capacities

- Solids generated at 100, 75, 50, and 25 percent of design flow
- Mixed liquor suspended solids operating range at design and projected actual flow
- Quantity of solids to be removed and a schedule for solids removal
- Identification and ownership of the ultimate sludge disposal site
- For facultative lagoons, design life calculations, monitoring well locations and depths, and the ultimate disposal method for the sludge from the facultative lagoon

An example of a sewage sludge solids management plan has been included as Example 5 of the instructions.

DOMESTIC WASTEWATER PERMIT APPLICATION WORKSHEET 2.0: RECEIVING WATERS

The following information is required for all TPDES permit applications.

Section 1. Domestic Drinking Water Supply (Instructions Page 64)

Is there a surface water intake for domestic drinking water supply located within 5 miles downstream from the point or proposed point of discharge?

☐ Yes ☒ No

If **no**, proceed it Section 2. **If yes**, provide the following:

Owner of the drinking water supply: Click to enter text.

Distance and direction to the intake: Click to enter text.

Attach a USGS map that identifies the location of the intake.

Attachment: Click to enter text.

Section 2. Discharge into Tidally Affected Waters (Instructions Page 64)

Does the facility discharge into tidally affected waters?

☐ Yes ☒ No

If **no**, proceed to Section 3. **If yes**, complete the remainder of this section. If no, proceed to Section 3.

A. Receiving water outfall

Width of the receiving water at the outfall, in feet: Click to enter text.

B. Oyster waters

Are there oyster waters in the vicinity of the discharge?

☐ Yes ☐ No

If yes, provide the distance and direction from outfall(s).

Click to enter text.

C. Sea grasses

Are there any sea grasses within the vicinity of the point of discharge?

☐ Yes ☐ No

If yes, provide the distance and direction from the outfall(s).

Click to enter text.

Section 3. Classified Segments (Instructions Page 64)

Is the discharge directly into (or within 300 feet of) a classified segment?

☐ Yes ☒ No

If yes, this Worksheet is complete.

If no, complete Sections 4 and 5 of this Worksheet.

Section 4. Description of Immediate Receiving Waters (Instructions Page 65)

Name of the immediate receiving waters: Unnamed Tributary of Brushy Creek

A. Receiving water type

Identify the appropriate description of the receiving waters.

☒ Stream

☐ Freshwater Swamp or Marsh

☐ Lake or Pond

Surface area, in acres: Click to enter text.

Average depth of the entire water body, in feet: Click to enter text.

Average depth of water body within a 500-foot radius of discharge point, in feet: Click to enter text.

☐ Man-made Channel or Ditch

☐ Open Bay

☐ Tidal Stream, Bayou, or Marsh

☐ Other, specify: Click to enter text.

B. Flow characteristics

If a stream, man-made channel or ditch was checked above, provide the following. For existing discharges, check one of the following that best characterizes the area *upstream* of the discharge. For new discharges, characterize the area *downstream* of the discharge (check one).

☐ Intermittent - dry for at least one week during most years

☒ Intermittent with Perennial Pools - enduring pools with sufficient habitat to maintain significant aquatic life uses

☐ Perennial - normally flowing

Check the method used to characterize the area upstream (or downstream for new dischargers).

☐ USGS flow records

☐ Historical observation by adjacent landowners

☒ Personal observation

☐ Other, specify: Click to enter text.

C. Downstream perennial confluences

List the names of all perennial streams that join the receiving water within three miles downstream of the discharge point.

None, there are several unnamed intermittent streams within 3 miles downstream of discharge.

D. Downstream characteristics

Do the receiving water characteristics change within three miles downstream of the discharge (e.g., natural or man-made dams, ponds, reservoirs, etc.)?

☐ Yes ☒ No

If yes, discuss how.

Click to enter text.

E. Normal dry weather characteristics

Provide general observations of the water body during normal dry weather conditions.

Base flow in the receiving water body is primarily composed of effluent discharge from the WWTP. Before the effluent is introduced, the water body tends to have low flow. However, once the effluent is added, the flow becomes more dynamic. During dry weather conditions, the flow can vary significantly, largely depending on the volume of effluent being discharged.

Date and time of observation: June 27, 2024, at 9:00 am

Was the water body influenced by stormwater runoff during observations?

☐ Yes ☒ No

Section 5. General Characteristics of the Waterbody (Instructions Page 66)

A. Upstream influences

Is the immediate receiving water upstream of the discharge or proposed discharge site influenced by any of the following? Check all that apply.

☐ Oil field activities ☐ Urban runoff

☐ Upstream discharges ☐ Agricultural runoff

☐ Septic tanks ☐ Other(s), specify: Click to enter text.

B. Waterbody uses

Observed or evidences of the following uses. Check all that apply.

- ☐ Livestock watering
- ☐ Irrigation withdrawal
- ☐ Fishing
- ☐ Domestic water supply
- ☐ Park activities
- ☐ Contact recreation
- ☐ Non-contact recreation
- ☐ Navigation
- ☐ Industrial water supply
- ☐ Other(s), specify: Click to enter text.

C. Waterbody aesthetics

Check one of the following that best describes the aesthetics of the receiving water and the surrounding area.

- ☐ Wilderness: outstanding natural beauty; usually wooded or unpastured area; water clarity exceptional
- ☒ Natural Area: trees and/or native vegetation; some development evident (from fields, pastures, dwellings); water clarity discolored
- ☐ Common Setting: not offensive; developed but uncluttered; water may be colored or turbid
- ☐ Offensive: stream does not enhance aesthetics; cluttered; highly developed; dumping areas; water discolored

DOMESTIC WASTEWATER PERMIT APPLICATION
WORKSHEET 2.1: STREAM PHYSICAL CHARACTERISTICS

Required for new applications, major facilities, and applications adding an outfall.

Worksheet 2.1 is not required for discharges to intermittent streams or discharges directly to (or within 300 feet of) a classified segment.

Section 1. General Information (Instructions Page 66)

Date of study: 7/11/24 Time of study: 7:30 AM

Stream name: Unnamed Tributary of Brushy Creek

Location: Discharge is located south of RM 2243 approximately 1,200 feet east of the intersection with 183A Toll Road.

Type of stream upstream of existing discharge or downstream of proposed discharge (check one).

☐ Perennial ☒ Intermittent with perennial pools

Section 2. Data Collection (Instructions Page 66)

Number of stream bends that are well defined: 0

Number of stream bends that are moderately defined: 1

Number of stream bends that are poorly defined: 1

Number of riffles: 2

Evidence of flow fluctuations (check one):

☒ Minor ☐ moderate ☐ severe

Indicate the observed stream uses and if there is evidence of flow fluctuations or channel obstruction/modification.

The stream does not seem to have any human uses other than the outfall from the wastewater treatment plant (WWTP). It is used by wildlife. There was no evidence of debris in bank trees, indicating little sign of flow fluctuations. The only channel obstructions were the culverts from the 183A toll road, and the only channel modifications observed were the cleared and rock bed area under the toll road.

Stream transects

In the table below, provide the following information for each transect downstream of the existing or proposed discharges. Use a separate row for each transect.

Table 2.1(1) - Stream Transect Records

Stream type at transect Select riffle, run, glide, or pool. See Instructions, Definitions section.	**Transect location**	**Water surface width (ft)**	**Stream depths (ft)** at 4 to 10 points along each transect from the channel bed to the water surface. Separate the measurements with commas.
Riffle	0	18	9", 9", 9", 7", 7", 8"
Run	290	13.5	7", 8", 7.5", 7.5", 7", 6.5"
Run	590	27	1', 1' 4", 1' 4", 1' 4", 1', 1' 6"
Pool	880	35	1' 6", 1' 7", 1' 10", 1' 5", 1'10", 2' 2"
Riffle	1,182	13.5	4", 6", 6", 6", 6", 5"
Run	1,479	12	8", 11", 8", 7.5", 7", 6"
Run	1,772	19.5	1' 4", 1' 6", 1' 4", 1' 5", 1' 3", 1' 1"
Run	2,053	20	8", 11", 11", 11", 11", 11"
Pool	2,350	22.5	1' 3", 1' 4", 1' 6", 1' 8", 1' 8", 1' 6"
Pool	2,667	36	1' 6", 1' 8", 1' 7", 1' 10.5", 1' 11", 1' 8"

Section 3. Summarize Measurements (Instructions Page 66)

Streambed slope of entire reach, from USGS map in feet/feet: 0.02

Approximate drainage area above the most downstream transect (from USGS map or county highway map, in square miles): 0.42

Length of stream evaluated, in feet: 2667

Number of lateral transects made: 6

Average stream width, in feet: 21.7

Average stream depth, in feet: 1.08

Average stream velocity, in feet/second: 2.53

Instantaneous stream flow, in cubic feet/second: 59.09

Indicate flow measurement method (type of meter, floating chip timed over a fixed distance, etc.): Floating chip timed over a fixed distance

Size of pools (large, small, moderate, none): small

Maximum pool depth, in feet: 2' 2"

DOMESTIC WASTEWATER PERMIT APPLICATION WORKSHEET 3.0: LAND DISPOSAL OF EFFLUENT

The following is required for renewal, new, and amendment permit applications.

Section 1. Type of Disposal System (Instructions Page 68)

Identify the method of land disposal:

- ☐ Surface application
- ☐ Subsurface application
- ☐ Irrigation
- ☐ Subsurface soils absorption
- ☐ Drip irrigation system
- ☐ Subsurface area drip dispersal system
- ☐ Evaporation
- ☐ Evapotranspiration beds
- ☐ Other (describe in detail): Click to enter text.

NOTE: All applicants without authorization or proposing new/amended subsurface disposal MUST complete and submit Worksheet 7.0.

For existing authorizations, provide Registration Number: Click to enter text.

Section 2. Land Application Site(s) (Instructions Page 68)

In table 3.0(1), provide the requested information for the land application sites. Include the agricultural or cover crop type (wheat, cotton, alfalfa, bermuda grass, native grasses, etc.), land use (golf course, hayland, pastureland, park, row crop, etc.), irrigation area, amount of effluent applied, and whether or not the public has access to the area. Specify the amount of land area and the amount of effluent that will be allotted to each agricultural or cover crop, if more than one crop will be used.

Table 3.0(1) – Land Application Site Crops

Crop Type & Land Use	Irrigation Area (acres)	Effluent Application (GPD)	Public Access? Y/N

Section 3. Storage and Evaporation Lagoons/Ponds (Instructions Page 68)

Table 3.0(2) – Storage and Evaporation Ponds

Pond Number	Surface Area (acres)	Storage Volume (acre-feet)	Dimensions	Liner Type

Attach a copy of a liner certification that was prepared, signed, and sealed by a Texas licensed professional engineer for each pond.

Attachment: Click to enter text.

Section 4. Flood and Runoff Protection (Instructions Page 68)

Is the land application site within the 100-year frequency flood level?

☐ Yes ☐ No

If yes, describe how the site will be protected from inundation.

Click to enter text.

Provide the source used to determine the 100-year frequency flood level:

Click to enter text.

Provide a description of tailwater controls and rainfall run-on controls used for the land application site.

Click to enter text.

Section 5. Annual Cropping Plan (Instructions Page 68)

Attach an Annual Cropping Plan which includes a discussion of each of the following items. If not applicable, provide a detailed explanation indicating why. **Attachment**: Click to enter text.

- Soils map with crops
- Cool and warm season plant species
- Crop yield goals
- Crop growing season
- Crop nutrient requirements
- Additional fertilizer requirements
- Minimum/maximum harvest height (for grass crops)
- Supplemental watering requirements
- Crop salt tolerances
- Harvesting method/number of harvests
- Justification for not removing existing vegetation to be irrigated

Section 6. Well and Map Information (Instructions Page 69)

Attach a USGS map with the following information shown and labeled. If not applicable, provide a detailed explanation indicating why. **Attachment**: Click to enter text.

- The boundaries of the land application site(s)
- Waste disposal or treatment facility site(s)
- On-site buildings
- Buffer zones
- Effluent storage and tailwater control facilities
- All water wells within 1-mile radius of the disposal site or property boundaries
- All springs and seeps onsite and within 500 feet of the property boundaries
- All surface waters in the state onsite and within 500 feet of the property boundaries
- All faults and sinkholes onsite and within 500 feet of the property

List and cross reference all water wells located within a half-mile radius of the disposal site or property boundaries shown on the USGS map in the following table. Attach additional pages as necessary to include all of the wells.

Table 3.0(3) – Water Well Data

Well ID	Well Use	Producing? Y/N	Open, cased, capped, or plugged?	Proposed Best Management Practice
			Choose an item.	
			Choose an item.	
			Choose an item.	
			Choose an item.	
			Choose an item.	

If water quality data or well log information is available please include the information in an attachment listed by Well ID.

Attachment: Click to enter text.

Section 7. Groundwater Quality (Instructions Page 69)

Attach a Groundwater Quality Technical Report which assesses the impact of the wastewater disposal system on groundwater. This report shall include an evaluation of the water wells (including the information in the well table provided in Item 6. above), the wastewater application rate, and pond liners. Indicate by a check mark that this report is provided.

Attachment: Click to enter text.

Are groundwater monitoring wells available onsite? ☐ Yes ☐ No

Do you plan to install ground water monitoring wells or lysimeters around the land application site? ☐ Yes ☐ No

If yes, provide the proposed location of the monitoring wells or lysimeters on a site map.

Attachment: Click to enter text.

Section 8. Soil Map and Soil Analyses (Instructions Page 70)

A. Soil map

Attach a USDA Soil Survey map that shows the area to be used for effluent disposal.

Attachment: Click to enter text.

B. Soil analyses

Attach the laboratory results sheets from the soil analyses. **Note**: for renewal applications, the current annual soil analyses required by the permit are acceptable as long as the test date is less than one year prior to the submission of the application.

Attachment: Click to enter text.

List all USDA designated soil series on the proposed land application site. Attach additional pages as necessary.

Table 3.0(4) – Soil Data

Soil Series	Depth from Surface	Permeability	Available Water Capacity	Curve Number

Section 9. Effluent Monitoring Data (Instructions Page 71)

Is the facility in operation?

☒ Yes ☐ No

If no, this section is not applicable and the worksheet is complete.

If yes, provide the effluent monitoring data for the parameters regulated in the existing permit. If a parameter is not regulated in the existing permit, enter N/A.

Table 3.0(5) – Effluent Monitoring Data

Date	30 Day Avg Flow MGD	BOD5 mg/l	TSS mg/l	pH	Chlorine Residual mg/l	Acres irrigated

Provide a discussion of all persistent excursions above the permitted limits and any corrective actions taken.

Click to enter text.

DOMESTIC WASTEWATER PERMIT APPLICATION WORKSHEET 3.1: SURFACE LAND DISPOSAL OF EFFLUENT

The following is required for new and major amendment permit applications. Renewal and minor amendment permit applications may be asked for this worksheet on a case by case basis.

Section 1. Surface Disposal (Instructions Page 72)

Complete the item that applies for the method of disposal being used.

A. Irrigation

Area under irrigation, in acres: Click to enter text.

Design application frequency:

hours/day Click to enter text. **And** days/week Click to enter text.

Land grade (slope):

average percent (%): Click to enter text.

maximum percent (%): Click to enter text.

Design application rate in acre-feet/acre/year: Click to enter text.

Design total nitrogen loading rate, in lbs N/acre/year: Click to enter text.

Soil conductivity (mmhos/cm): Click to enter text.

Method of application: Click to enter text.

Attach a separate engineering report with the water balance and storage volume calculations, method of application, irrigation efficiency, and nitrogen balance.

Attachment: Click to enter text.

B. Evaporation ponds

Daily average effluent flow into ponds, in gallons per day: Click to enter text.

Attach a separate engineering report with the water balance and storage volume calculations.

Attachment: Click to enter text.

C. Evapotranspiration beds

Number of beds: Click to enter text.

Area of bed(s), in acres: Click to enter text.

Depth of bed(s), in feet: Click to enter text.

Void ratio of soil in the beds: Click to enter text.

Storage volume within the beds, in acre-feet: Click to enter text.

Attach a separate engineering report with the water balance and storage volume calculations, and a description of the lining.

Attachment: Click to enter text.

D. Overland flow

Area used for application, in acres: Click to enter text.

Slopes for application area, percent (%): Click to enter text.

Design application rate, in gpm/foot of slope width: Click to enter text.

Slope length, in feet: Click to enter text.

Design BOD_5 loading rate, in lbs BOD_5/acre/day: Click to enter text.

Design application frequency:

hours/day: Click to enter text. **And** days/week: Click to enter text.

Attach a separate engineering report with the method of application and design requirements according to *30 TAC Chapter 217*.

Attachment: Click to enter text.

Section 2. Edwards Aquifer (Instructions Page 73)

Is the facility subject to *30 TAC Chapter 213*, Edwards Aquifer Rules?

☐ Yes ☐ No

If **yes**, is the facility located on the Edwards Aquifer Recharge Zone?

☐ Yes ☐ No

If yes, attach a geological report addressing potential recharge features.

Attachment: Click to enter text.

DOMESTIC WASTEWATER PERMIT APPLICATION WORKSHEET 3.2: SURFACE LAND DISPOSAL OF EFFLUENT

The following **is required** for **new and major amendment** permit applications. Renewal and minor amendments applicants may be asked for the worksheet on a case by case basis.

NOTE: All applicants proposing new/amended subsurface disposal MUST complete and submit Worksheet 7.0. This worksheet applies to any subsurface disposal system that **does not meet** the definition of a subsurface area drip dispersal system as defined in *30 TAC Chapter 222, Subsurface Area Drip Dispersal System.*

Section 1. Subsurface Application (Instructions Page 74)

Identify the type of system:

☐ Conventional Gravity Drainfield, Beds, or Trenches (new systems must be less than 5,000 GPD)

☐ Low Pressure Dosing

☐ Other, specify: Click to enter text.

Application area, in acres: Click to enter text.

Area of drainfield, in square feet: Click to enter text.

Application rate, in gal/square foot/day: Click to enter text.

Depth to groundwater, in feet: Click to enter text.

Area of trench, in square feet: Click to enter text.

Dosing duration per area, in hours: Click to enter text.

Number of beds: Click to enter text.

Dosing amount per area, in inches/day: Click to enter text.

Infiltration rate, in inches/hour: Click to enter text.

Storage volume, in gallons: Click to enter text.

Area of bed(s), in square feet: Click to enter text.

Soil Classification: Click to enter text.

Attach a separate engineering report with the information required in *30 TAC § 309.20,* excluding the requirements of § 309.20 b(3)(A) and (B) design analysis which may be asked for on a case by case basis. Include a description of the schedule of dosing basin rotation.

Attachment: Click to enter text.

Section 2. Edwards Aquifer (Instructions Page 74)

Is the subsurface system over the Edwards Aquifer Recharge Zone as mapped by TCEQ?

☐ Yes ☐ No

Is the subsurface system over the Edwards Aquifer Transition Zone as mapped by TCEQ?

☐ Yes ☐ No

If yes to either question, the subsurface system may be prohibited by *30 TAC §213.8.* Please call the Municipal Permits Team, at 512-239-4671, to schedule a pre-application meeting.

DOMESTIC WASTEWATER PERMIT APPLICATION WORKSHEET 3.3: SUBSURFACE AREA DRIP DISPERSAL (SADDS) LAND DISPOSAL OF EFFLUENT

The following **is required** for **new and major amendment** subsurface area drip dispersal system permit applications. Renewal and minor amendments applicants may be asked for the worksheet on a case by case basis.

NOTE: All applicants proposing new/amended subsurface disposal MUST complete and submit Worksheet 7.0. This worksheet applies to any subsurface disposal system that **meets** the definition of a subsurface area drip dispersal system as defined in *30 TAC Chapter 222, Subsurface Area Drip Dispersal System.*

Section 1. Administrative Information (Instructions Page 75)

A. Provide the legal name of all corporations or other business entities managed, owned, or otherwise closely related to the owner of the treatment facility:

B. Click to enter text. Is the owner of the land where the treatment facility is located the same as the owner of the treatment facility?

☐ Yes ☐ No

If **no**, provide the legal name of all corporations or other business entities managed, owned, or otherwise closely related to the owner of the land where the treatment facility is located.

Click to enter text.

C. Owner of the subsurface area drip dispersal system: Click to enter text.

D. Is the owner of the subsurface area drip dispersal system the same as the owner of the wastewater treatment facility or the site where the wastewater treatment facility is located?

☐ Yes ☐ No

If **no**, identify the names of all corporations or other business entities managed, owned, or otherwise closely related to the entity identified in Item 1.C.

Click to enter text.

E. Owner of the land where the subsurface area drip dispersal system is located: Click to enter text.

F. Is the owner of the land where the subsurface area drip dispersal system is located the same as owner of the wastewater treatment facility, the site where the wastewater treatment facility is located, or the owner of the subsurface area drip dispersal system?

☐ Yes ☐ No

If **no**, identify the name of all corporations or other business entities managed, owned, or otherwise closely related to the entity identified in item 1.E.

Click to enter text.

Section 2. Subsurface Area Drip Dispersal System (Instructions Page 75)

A. Type of system

☐ Subsurface Drip Irrigation

☐ Surface Drip Irrigation

☐ Other, specify: Click to enter text.

B. Irrigation operations

Application area, in acres: Click to enter text.

Infiltration Rate, in inches/hour: Click to enter text.

Average slope of the application area, percent (%): Click to enter text.

Maximum slope of the application area, percent (%): Click to enter text.

Storage volume, in gallons: Click to enter text.

Major soil series: Click to enter text.

Depth to groundwater, in feet: Click to enter text.

C. Application rate

Is the facility located **west** of the boundary shown in *30 TAC § 222.83* **and** also using a vegetative cover of non-native grasses over seeded with cool season grasses during the winter months (October-March)?

☐ Yes ☐ No

If yes, then the facility may propose a hydraulic application rate not to exceed 0.1 gal/square foot/day.

Is the facility located **east** of the boundary shown in *30 TAC § 222.83* **or** in any part of the state when the vegetative cover is any crop other than non-native grasses?

☐ Yes ☐ No

If **yes**, the facility must use the formula in *30 TAC §222.83* to calculate the maximum hydraulic application rate.

Do you plan to submit an alternative method to calculate the hydraulic application rate for approval by the executive director?

☐ Yes ☐ No

Hydraulic application rate, in gal/square foot/day: Click to enter text.

Nitrogen application rate, in lbs/gal/day: Click to enter text.

D. Dosing information

Number of doses per day: Click to enter text.

Dosing duration per area, in hours: Click to enter text.

Rest period between doses, in hours: Click to enter text.

Dosing amount per area, in inches/day: Click to enter text.

Number of zones: Click to enter text.

Does the proposed subsurface drip irrigation system use tree vegetative cover as a crop?

☐ Yes ☐ No

If **yes**, provide a vegetation survey by a certified arborist. Please call the Water Quality Assessment Team at (512) 239-4671 to schedule a pre-application meeting.

Attachment: Click to enter text.

Section 3. Required Plans (Instructions Page 75)

A. Recharge feature plan

Attach a Recharge Feature Plan with all information required in *30 TAC §222.79*.

Attachment: Click to enter text.

B. Soil evaluation

Attach a Soil Evaluation with all information required in *30 TAC §222.73*.

Attachment: Click to enter text.

C. Site preparation plan

Attach a Site Preparation Plan with all information required in *30 TAC §222.75*.

Attachment: Click to enter text.

D. Soil sampling/testing

Attach soil sampling and testing that includes all information required in *30 TAC §222.157*.

Attachment: Click to enter text.

Section 4. Floodway Designation (Instructions Page 76)

A. Site location

Is the existing/proposed land application site within a designated floodway?

☐ Yes ☐ No

B. Flood map

Attach either the FEMA flood map or alternate information used to determine the floodway.

Attachment: Click to enter text.

Section 5. Surface Waters in the State (Instructions Page 76)

A. Buffer Map

Attach a map showing appropriate buffers on surface waters in the state, water wells, and springs/seeps.

Attachment: Click to enter text.

B. Buffer variance request

Do you plan to request a buffer variance from water wells or waters in the state?

☐ Yes ☐ No

If yes, then attach the additional information required in *30 TAC § 222.81(c).*

Attachment: Click to enter text.

Section 6. Edwards Aquifer (Instructions Page 76)

A. Is the SADDS located over the Edwards Aquifer Recharge Zone as mapped by TCEQ?

☐ Yes ☐ No

B. Is the SADDS located over the Edwards Aquifer Transition Zone as mapped by TCEQ?

☐ Yes ☐ No

If yes to either question, then the SADDS may be prohibited by *30 TAC §213.8.* Please call the Municipal Permits Team at 512-239-4671 to schedule a pre-application meeting.

Leander Fe 6/25/25

DOMESTIC WASTEWATER PERMIT APPLICATION WORKSHEET 4.0: POLLUTANT ANALYSIS REQUIREMENTS

The following **is required** for facilities with a permitted or proposed flow of **1.0 MGD or greater**, facilities with an approved **pretreatment** program, or facilities classified as a **major** facility. See instructions for further details.

This worksheet is not required minor amendments without renewal.

Section 1. Toxic Pollutants (Instructions Page 78)

For pollutants identified in Table 4.0(1), indicate the type of sample.

Grab ☐ Composite ☒

Date and time sample(s) collected: 6/25/24

Table 4.0(1) – Toxics Analysis

Pollutant	AVG Effluent Conc. (μg/l)	MAX Effluent Conc. (μg/l)	Number of Samples	MAL (μg/l)
Acrylonitrile	<7.80			50
Aldrin	<0.00113			0.01
Aluminum	124			2.5
Anthracene	<1.50			10
Antimony	<1.05			5
Arsenic	0.727			0.5
Barium	25			3
Benzene	<0.496			10
Benzidine	<4.80			50
Benzo(a)anthracene	<0.173			5
Benzo(a)pyrene	<0.364			5
Bis(2-chloroethyl)ether	<2.16			10
Bis(2-ethylhexyl)phthalate	<0.277			10
Bromodichloromethane	11.3			10
Bromoform	<1.33			10
Cadmium	<0.258			1
Carbon Tetrachloride	<1.26			2
Carbaryl	<1.85			5
Chlordane*	<0.103			0.2
Chlorobenzene	<0.945			10

Pollutant	AVG Effluent Conc. (µg/l)	MAX Effluent Conc. (µg/l)	Number of Samples	MAL (µg/l)
Chlorodibromomethane	4.98			10
Chloroform	20.8			10
Chlorpyrifos	<0.360			0.05
Chromium (Total)	0.905			3
Chromium (Tri) **(*1)**	<3.45			N/A
Chromium (Hex)	13.4			3
Copper	7.72			2
Chrysene	<0.222			5
p-Chloro-m-Cresol	<2.62			10
4,6-Dinitro-o-Cresol	<1.44			50
p-Cresol	<2.62			10
Cyanide **(*2)**	<2.33			10
4,4'- DDD	<0.000814			0.1
4,4'- DDE	<0.00109			0.1
4,4'- DDT	<0.00379			0.02
2,4-D	<1.08			0.7
Demeton (O and S)	<0.209			0.20
Diazinon	<0.147			0.5/0.1
1,2-Dibromoethane	<0.631			10
m-Dichlorobenzene	<1.08			10
o-Dichlorobenzene	<0.603			10
p-Dichlorobenzene	<0.637			10
3,3'-Dichlorobenzidine	<0.341			5
1,2-Dichloroethane	<1.53			10
1,1-Dichloroethylene	<0.575			10
Dichloromethane	<0.829			20
1,2-Dichloropropane	<1.55			10
1,3-Dichloropropene	<0.195			10
Dicofol	<0.05			1
Dieldrin	<0.000953			0.02
2,4-Dimethylphenol	<0.649			10
Di-n-Butyl Phthalate	0.331			10
Diuron	0.0784			0.09

Pollutant	AVG Effluent Conc. (µg/l)	MAX Effluent Conc. (µg/l)	Number of Samples	MAL (µg/l)
Endosulfan I (alpha)	<0.00107			0.01
Endosulfan II (beta)	<0.00122			0.02
Endosulfan Sulfate	<0.00112			0.1
Endrin	<0.00156			0.02
Ethylbenzene	<0.878			10
Fluoride	157			500
Guthion	<0.353			0.1
Heptachlor	<0.00446			0.01
Heptachlor Epoxide	<0.00134			0.01
Hexachlorobenzene	<0.307			5
Hexachlorobutadiene	<0.238			10
Hexachlorocyclohexane (alpha)	<0.00142			0.05
Hexachlorocyclohexane (beta)	<0.00389			0.05
gamma-Hexachlorocyclohexane (Lindane)	<0.00299			0.05
Hexachlorocyclopentadiene	<4.58			10
Hexachloroethane	<0.526			20
Hexachlorophene	<10			10
Lead	<0.140			0.5
Malathion	<0.133			0.1
Mercury	0.000936			0.005
Methoxychlor	<0.00390			2
Methyl Ethyl Ketone	<4.53			50
Mirex	<0.0200			0.02
Nickel	2.11			2
Nitrate-Nitrogen	13.3			100
Nitrobenzene	<1.66			10
N-Nitrosodiethylamine	<1.75			20
N-Nitroso-di-n-Butylamine	<1.49			20
Nonylphenol	<10.0			333
Parathion (ethyl)	<0.144			0.1
Pentachlorobenzene	<1.07			20
Pentachlorophenol	<0.234			5

Pollutant	AVG Effluent Conc. (µg/l)	MAX Effluent Conc. (µg/l)	Number of Samples	MAL (µg/l)
Phenanthrene	<1.42			10
Polychlorinated Biphenyls (PCB's) **(*3)**	<0.100			0.2
Pyridine	<2.64			20
Selenium	0.720			5
Silver	<0.118			0.5
1,2,4,5-Tetrachlorobenzene	<1.32			20
1,1,2,2-Tetrachloroethane	<1.71			10
Tetrachloroethylene	<0.900			10
Thallium	<0.215			0.5
Toluene	<1.61			10
Toxaphene	<0.0769			0.3
2,4,5-TP (Silvex)	<1.20			0.3
Tributyltin (see instructions for explanation)	<0.00112			0.01
1,1,1-Trichloroethane	<1.45			10
1,1,2-Trichloroethane	<0.747			10
Trichloroethylene	<1.69			10
2,4,5-Trichlorophenol	<2.00			50
TTHM (Total Trihalomethanes)	37.1			10
Vinyl Chloride	<0.592			10
Zinc	42.8			5

(*1) Determined by subtracting hexavalent Cr from total Cr.

(*2) Cyanide, amenable to chlorination or weak-acid dissociable.

(*3) The sum of seven PCB congeners 1242, 1254, 1221, 1232, 1248, 1260, and 1016.

Section 2. Priority Pollutants

For pollutants identified in Tables 4.0(2)A-E, indicate type of sample.

Grab ☐ Composite ☒

Date and time sample(s) collected: 6/25/24

Table 4.0(2)A – Metals, Cyanide, and Phenols

Pollutant	AVG Effluent Conc. (µg/l)	MAX Effluent Conc. (µg/l)	Number of Samples	MAL (µg/l)
Antimony	<1.05			5
Arsenic	0.727			0.5
Beryllium	<0.148			0.5
Cadmium	<0.258			1
Chromium (Total)	0.905			3
Chromium (Hex)	13.4			3
Chromium (Tri) **(*1)**	<3.45			N/A
Copper	7.72			2
Lead	<0.140			0.5
Mercury	0.000936			0.005
Nickel	2.11			2
Selenium	0.720			5
Silver	<0.118			0.5
Thallium	<0.215			0.5
Zinc	42.8			5
Cyanide **(*2)**	<2.33			10
Phenols, Total	<0.423			10

(*1) Determined by subtracting hexavalent Cr from total Cr.

(*2) Cyanide, amenable to chlorination or weak-acid dissociable

Table 4.0(2)B – Volatile Compounds

Pollutant	AVG Effluent Conc. (µg/l)	MAX Effluent Conc. (µg/l)	Number of Samples	MAL (µg/l)
Acrolein	<23.1			50
Acrylonitrile	<7.80			50
Benzene	<0.496			10
Bromoform	<1.33			10
Carbon Tetrachloride	<1.26			2
Chlorobenzene	<0.945			10
Chlorodibromomethane	4.98			10
Chloroethane	<1.45			50
2-Chloroethylvinyl Ether	<1.20			10
Chloroform	20.8			10
Dichlorobromomethane [Bromodichloromethane]	11.3			10
1,1-Dichloroethane	<1.03			10
1,2-Dichloroethane	<1.53			10
1,1-Dichloroethylene	<0.575			10
1,2-Dichloropropane	<1.55			10
1,3-Dichloropropylene [1,3-Dichloropropene]	<0.195			10
1,2-Trans-Dichloroethylene	<0.903			10
Ethylbenzene	<0.878			10
Methyl Bromide	<1.88			50
Methyl Chloride	<0.941			50
Methylene Chloride	<0.829			20
1,1,2,2-Tetrachloroethane	<1.71			10
Tetrachloroethylene	<0.900			10
Toluene	<1.61			10
1,1,1-Trichloroethane	<1.45			10
1,1,2-Trichloroethane	<0.747			10
Trichloroethylene	<1.69			10
Vinyl Chloride	<0.592			10

Table 4.0(2)C – Acid Compounds

Pollutant	AVG Effluent Conc. (µg/l)	MAX Effluent Conc. (µg/l)	Number of Samples	MAL (µg/l)
2-Chlorophenol	<0.649			10
2,4-Dichlorophenol	<0.314			10
2,4-Dimethylphenol	<0.649			10
4,6-Dinitro-o-Cresol	<1.44			50
2,4-Dinitrophenol	<1.61			50
2-Nitrophenol	<1.67			20
4-Nitrophenol	<4.91			50
P-Chloro-m-Cresol	<2.62			10
Pentalchlorophenol	<0.234			5
Phenol	<0.423			10
2,4,6-Trichlorophenol	<1.42			10

Table 4.0(2)D – Base/Neutral Compounds

Pollutant	AVG Effluent Conc. (µg/l)	MAX Effluent Conc. (µg/l)	Number of Samples	MAL (µg/l)
Acenaphthene	<1.39			10
Acenaphthylene	<1.41			10
Anthracene	<1.50			10
Benzidine	<4.80			50
Benzo(a)Anthracene	<0.173			5
Benzo(a)Pyrene	<0.364			5
3,4-Benzofluoranthene	<2.04			10
Benzo(ghi)Perylene	<2.68			20
Benzo(k)Fluoranthene	<0.375			5
Bis(2-Chloroethoxy)Methane	<1.76			10
Bis(2-Chloroethyl)Ether	<2.16			10
Bis(2-Chloroisopropyl)Ether	<1.79			10
Bis(2-Ethylhexyl)Phthalate	<0.277			10
4-Bromophenyl Phenyl Ether	<0.256			10
Butyl benzyl Phthalate	<0.337			10
2-Chloronaphthalene	<0.462			10
4-Chlorophenyl phenyl ether	<1.28			10
Chrysene	<0.222			5
Dibenzo(a,h)Anthracene	<0.246			5
1,2-(o)Dichlorobenzene	<0.603			10
1,3-(m)Dichlorobenzene	<1.08			10
1,4-(p)Dichlorobenzene	<0.637			10
3,3-Dichlorobenzidine	<0.341			5
Diethyl Phthalate	<1.59			10
Dimethyl Phthalate	<0.299			10
Di-n-Butyl Phthalate	0.331			10
2,4-Dinitrotoluene	<1.31			10
2,6-Dinitrotoluene	<1.61			10
Di-n-Octyl Phthalate	<0.373			10
1,2-Diphenylhydrazine (as Azo-benzene)	<1.49			20
Fluoranthene	<1.59			10
Fluorene	<1.63			10

Pollutant	AVG Effluent Conc. (µg/l)	MAX Effluent Conc. (µg/l)	Number of Samples	MAL (µg/l)
Hexachlorobenzene	<0.307			5
Hexachlorobutadiene	<0.238			10
Hexachlorocyclo-pentadiene	<4.58			10
Hexachloroethane	<0.526			20
Indeno(1,2,3-cd)pyrene	<2.29			5
Isophorone	<1.64			10
Naphthalene	<0.542			10
Nitrobenzene	<1.66			10
N-Nitrosodimethylamine	<2.02			50
N-Nitrosodi-n-Propylamine	<2.88			20
N-Nitrosodiphenylamine	<1.81			20
Phenanthrene	<1.42			10
Pyrene	<0.178			10
1,2,4-Trichlorobenzene	<0.593			10

Table 4.0(2)E - Pesticides

Pollutant	AVG Effluent Conc. (µg/l)	MAX Effluent Conc. (µg/l)	Number of Samples	MAL (µg/l)
Aldrin	<0.00113			0.01
alpha-BHC (Hexachlorocyclohexane)	<0.00142			0.05
beta-BHC (Hexachlorocyclohexane)	<0.00389			0.05
gamma-BHC (Hexachlorocyclohexane)	<0.00299			0.05
delta-BHC (Hexachlorocyclohexane)	<0.00245			0.05
Chlordane	<0.103			0.2
4,4-DDT	<0.00379			0.02
4,4-DDE	<0.00109			0.1
4,4,-DDD	<0.000814			0.1
Dieldrin	<0.000953			0.02
Endosulfan I (alpha)	<0.00107			0.01
Endosulfan II (beta)	<0.00122			0.02
Endosulfan Sulfate	<0.00112			0.1
Endrin	<0.00156			0.02
Endrin Aldehyde	<0.00118			0.1
Heptachlor	<0.00446			0.01
Heptachlor Epoxide	<0.00134			0.01
PCB-1242	<0.0125			0.2
PCB-1254	<0.00780			0.2
PCB-1221	<0.0125			0.2
PCB-1232	<0.0125			0.2
PCB-1248	<0.0125			0.2
PCB-1260	<0.00780			0.2
PCB-1016	<0.0125			0.2
Toxaphene	<0.0769			0.3

* For PCBS, if all are non-detects, enter the highest non-detect preceded by a "<".

Section 3. Dioxin/Furan Compounds

A. Indicate which of the following compounds from may be present in the influent from a contributing industrial user or significant industrial user. Check all that apply.

☐ 2,4,5-trichlorophenoxy acetic acid

Common Name 2,4,5-T, CASRN 93-76-5

☐ 2-(2,4,5-trichlorophenoxy) propanoic acid

Common Name Silvex or 2,4,5-TP, CASRN 93-72-1

☐ 2-(2,4,5-trichlorophenoxy) ethyl 2,2-dichloropropionate

Common Name Erbon, CASRN 136-25-4

☐ 0,0-dimethyl 0-(2,4,5-trichlorophenyl) phosphorothioate

Common Name Ronnel, CASRN 299-84-3

☐ 2,4,5-trichlorophenol

Common Name TCP, CASRN 95-95-4

☐ hexachlorophene

Common Name HCP, CASRN 70-30-4

For each compound identified, provide a brief description of the conditions of its/their presence at the facility.

Click to enter text.

B. Do you know or have any reason to believe that 2,3,7,8 Tetrachlorodibenzo-P-Dioxin (TCDD) or any congeners of TCDD may be present in your effluent?

☐ Yes ☐ No

If **yes**, provide a brief description of the conditions for its presence.

Click to enter text.

C. If any of the compounds in Subsection A **or** B are present, complete Table 4.0(2)F.

For pollutants identified in Table 4.0(2)F, indicate the type of sample.

Grab ☐ Composite ☐

Date and time sample(s) collected: Click to enter text.

Table 4.0(2)F – Dioxin/Furan Compounds

Compound	**Toxic Equivalency Factors**	**Wastewater Concentration (ppq)**	**Wastewater Equivalents (ppq)**	**Sludge Concentration (ppt)**	**Sludge Equivalents (ppt)**	**MAL (ppq)**
2,3,7,8 TCDD	1					10
1,2,3,7,8 PeCDD	0.5					50
2,3,7,8 HxCDDs	0.1					50
1,2,3,4,6,7,8 HpCDD	0.01					50
2,3,7,8 TCDF	0.1					10
1,2,3,7,8 PeCDF	0.05					50
2,3,4,7,8 PeCDF	0.5					50
2,3,7,8 HxCDFs	0.1					50
2,3,4,7,8 HpCDFs	0.01					50
OCDD	0.0003					100
OCDF	0.0003					100
PCB 77	0.0001					0.5
PCB 81	0.0003					0.5
PCB 126	0.1					0.5
PCB 169	0.03					0.5
Total						

DOMESTIC WASTEWATER PERMIT APPLICATION WORKSHEET 5.0: TOXICITY TESTING REQUIREMENTS

The following **is required** for facilities with a current operating design flow of**1.0 MGD or greater**, with an EPA-approved **pretreatment** program (or those required to have one under 40 CFR Part 403), or are required to perform Whole Effluent Toxicity testing. See instructions for further details.

This worksheet is not required minor amendments without renewal.

Section 1. Required Tests (Instructions Page 88)

Indicate the number of 7-day chronic or 48-hour acute Whole Effluent Toxicity (WET) tests performed in the four and one-half years prior to submission of the application.

7-day Chronic: 23

48-hour Acute: 8

Section 2. Toxicity Reduction Evaluations (TREs)

Has this facility completed a TRE in the past four and a half years? Or is the facility currently performing a TRE?

☐ Yes ☒ No

If yes, describe the progress to date, if applicable, in identifying and confirming the toxicant.

Click to enter text.

Section 3. Summary of WET Tests

If the required biomonitoring test information has not been previously submitted via both the Discharge Monitoring Reports (DMRs) and the Table 1 (as found in the permit), provide a summary of the testing results for all valid and invalid tests performed over the past four and one-half years. Make additional copies of this table as needed.

Table 5.0(1) Summary of WET Tests

Test Date	Test Species	NOEC Survival	NOEC Sub-lethal
	Information provided via DMRs.		

DOMESTIC WASTEWATER PERMIT APPLICATION WORKSHEET 6.0: INDUSTRIAL WASTE CONTRIBUTION

The following **is required** for **all publicly owned treatment works**.

Section 1. All POTWs (Instructions Page 89)

A. Industrial users (IUs)

Provide the number of each of the following types of industrial users (IUs) that discharge to your POTW and the daily flows from each user. See the Instructions for definitions of Categorical IUs, Significant IUs – non-categorical, and Other IUs.

If there are no users, enter 0 (zero).

Categorical IUs:

Number of IUs: 0

Average Daily Flows, in MGD: 0

Significant IUs – non-categorical:

Number of IUs: 0

Average Daily Flows, in MGD: 0

Other IUs:

Number of IUs: 0

Average Daily Flows, in MGD: 0

B. Treatment plant interference

In the past three years, has your POTW experienced treatment plant interference (see instructions)?

☐ Yes ☒ No

If yes, identify the dates, duration, description of interference, and probable cause(s) and possible source(s) of each interference event. Include the names of the IUs that may have caused the interference.

Click to enter text.

C. Treatment plant pass through

In the past three years, has your POTW experienced pass through (see instructions)?

☐ Yes ☒ No

If yes, identify the dates, duration, a description of the pollutants passing through the treatment plant, and probable cause(s) and possible source(s) of each pass through event. Include the names of the IUs that may have caused pass through.

Click to enter text.

D. Pretreatment program

Does your POTW have an approved pretreatment program?

☐ Yes ☒ No

If yes, complete Section 2 only of this Worksheet.

Is your POTW required to develop an approved pretreatment program?

☐ Yes ☒ No

If yes, complete Section 2.c. and 2.d. only, and skip Section 3.

If no to either question above, skip Section 2 and complete Section 3 for each significant industrial user and categorical industrial user.

Section 2. POTWs with Approved Programs or Those Required to Develop a Program (Instructions Page 90)

A. Substantial modifications

Have there been any **substantial modifications** to the approved pretreatment program that have not been submitted to the TCEQ for approval according to *40 CFR §403.18*?

☐ Yes ☐ No

If yes, identify the modifications that have not been submitted to TCEQ, including the purpose of the modification.

Click to enter text.

B. Non-substantial modifications

Have there been any **non-substantial modifications** to the approved pretreatment program that have not been submitted to TCEQ for review and acceptance?

☐ Yes ☐ No

If yes, identify all non-substantial modifications that have not been submitted to TCEQ, including the purpose of the modification.

Click to enter text.

C. Effluent parameters above the MAL

In Table 6.0(1), list all parameters measured above the MAL in the POTW's effluent monitoring during the last three years. Submit an attachment if necessary.

Table 6.0(1) – Parameters Above the MAL

Pollutant	Concentration	MAL	Units	Date

D. Industrial user interruptions

Has any SIU, CIU, or other IU caused or contributed to any problems (excluding interferences or pass throughs) at your POTW in the past three years?

☐ Yes ☐ No

If yes, identify the industry, describe each episode, including dates, duration, description of the problems, and probable pollutants.

Click to enter text.

Section 3. Significant Industrial User (SIU) Information and Categorical Industrial User (CIU) (Instructions Page 90)

A. General information

Company Name: Click to enter text.

SIC Code: Click to enter text.

Contact name: Click to enter text.

Address: Click to enter text.

City, State, and Zip Code: Click to enter text.

Telephone number: Click to enter text.

Email address: Click to enter text.

B. Process information

Describe the industrial processes or other activities that affect or contribute to the SIU(s) or CIU(s) discharge (i.e., process and non-process wastewater).

Click to enter text.

C. Product and service information

Provide a description of the principal product(s) or services performed.

Click to enter text.

D. Flow rate information

See the Instructions for definitions of “process” and “non-process wastewater.”

Process Wastewater:

Discharge, in gallons/day: Click to enter text.

Discharge Type: ☐ Continuous ☐ Batch ☐ Intermittent

Non-Process Wastewater:

Discharge, in gallons/day: Click to enter text.

Discharge Type: ☐ Continuous ☐ Batch ☐ Intermittent

E. Pretreatment standards

Is the SIU or CIU subject to technically based local limits as defined in the *i*nstructions?

☐ Yes ☐ No

Is the SIU or CIU subject to categorical pretreatment standards found in *40 CFR Parts 405-471*?

☐ Yes ☐ No

If subject to categorical pretreatment standards, indicate the applicable category and subcategory for each categorical process.

Category: Subcategories: Click to enter text.

Click or tap here to enter text. Click to enter text.

Category: Click to enter text.

Subcategories: Click to enter text.

Category: Click to enter text.

Subcategories: Click to enter text.

Category: Click to enter text.

Subcategories: Click to enter text.

Category: Click to enter text.

Subcategories: Click to enter text.

F. Industrial user interruptions

Has the SIU or CIU caused or contributed to any problems (e.g., interferences, pass through, odors, corrosion, blockages) at your POTW in the past three years?

☐ Yes ☐ No

If yes, identify the SIU, describe each episode, including dates, duration, description of problems, and probable pollutants.

Click to enter text.

WORKSHEET 7.0

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

CLASS V INJECTION WELL INVENTORY/AUTHORIZATION FORM

Submit the completed form to:

TCEQ
IUC Permits Team
Radioactive Materials Division
MC-233
PO Box 13087
Austin, Texas 78711-3087
512-239-6466

For TCEQ Use Only
Reg. No.______________
Date Received__________
Date Authorized_________

Section 1. General Information (Instructions Page 92)

1. **TCEQ Program Area**

   Program Area (PST, VCP, IHW, etc.): Click to enter text.

   Program ID: Click to enter text.

   Contact Name: Click to enter text.

   Phone Number: Click to enter text.

2. **Agent/Consultant Contact Information**

   Contact Name: Click to enter text.

   Address: Click to enter text.

   City, State, and Zip Code: Click to enter text.

   Phone Number: Click to enter text.

3. **Owner/Operator Contact Information**

   ☐ Owner ☐ Operator

   Owner/Operator Name: Click to enter text.

   Contact Name: Click to enter text.

   Address: Click to enter text.

   City, State, and Zip Code: Click to enter text.

   Phone Number: Click to enter text.

4. **Facility Contact Information**

   Facility Name: Click to enter text.

   Address: Click to enter text.

   City, State, and Zip Code: Click to enter text.

   Location description (if no address is available): Click to enter text.

   Facility Contact Person: Click to enter text.

   Phone Number: Click to enter text.

5. **Latitude and Longitude, in degrees-minutes-seconds**

Latitude: Click to enter text.

Longitude: Click to enter text.

Method of determination (GPS, TOPO, etc.): Click to enter text.

Attach topographic quadrangle map as attachment A.

6. **Well Information**

Type of Well Construction, select one:

- ☐ Vertical Injection
- ☐ Subsurface Fluid Distribution System
- ☐ Infiltration Gallery
- ☐ Temporary Injection Points
- ☐ Other, Specify: Click to enter text.

Number of Injection Wells: Click to enter text.

7. **Purpose**

Detailed Description regarding purpose of Injection System:

Click to enter text.

Attach a Site Map as Attachment B (Attach the Approved Remediation Plan, if appropriate.)

8. **Water Well Driller/Installer**

Water Well Driller/Installer Name: Click to enter text.

City, State, and Zip Code: Click to enter text.

Phone Number: Click to enter text.

License Number: Click to enter text.

Section 2. Proposed Down Hole Design

Attach a diagram signed and sealed by a licensed engineer as Attachment C.

Table 7.0(1) – Down Hole Design Table

Name of String	Size	Setting Depth	Sacks Cement/Grout – Slurry Volume – Top of Cement	Hole Size	Weight (lbs/ft) PVC/Steel
Casing					
Tubing					
Screen					

Section 3. Proposed Trench System, Subsurface Fluid Distribution System, or Infiltration Gallery

Attach a diagram signed and sealed by a licensed engineer as Attachment D.

System(s) Dimensions: Click to enter text.

System(s) Construction: Click to enter text.

Section 4. Site Hydrogeological and Injection Zone Data

1. Name of Contaminated Aquifer: Click to enter text.

2. Receiving Formation Name of Injection Zone: Click to enter text.

3. Well/Trench Total Depth: Click to enter text.

4. Surface Elevation: Click to enter text.

5. Depth to Ground Water: Click to enter text.

6. Injection Zone Depth: Click to enter text.

7. Injection Zone vertically isolated geologically? ☐ Yes ☐ No

Impervious Strata between Injection Zone and nearest Underground Source of Drinking Water:

Name: Click to enter text.

Thickness: Click to enter text.

8. Provide a list of contaminants and the levels (ppm) in contaminated aquifer

Attach as Attachment E.

9. Horizontal and Vertical extent of contamination and injection plume

Attach as Attachment F.

10. Formation (Injection Zone) Water Chemistry (Background levels) TDS, etc.

Attach as Attachment G.

11. Injection Fluid Chemistry in PPM at point of injection

Attach as Attachment H.

12. Lowest Known Depth of Ground Water with < 10,000 PPM TDS: Click to enter text.

13. Maximum injection Rate/Volume/Pressure: Click to enter text.

14. Water wells within 1/4 mile radius (attach map as Attachment I): Click to enter text.

15. Injection wells within 1/4 mile radius (attach map as Attachment J): Click to enter text.

16. Monitor wells within 1/4 mile radius (attach drillers logs and map as Attachment K): Click to enter text.

17. Sampling frequency: Click to enter text.

18. Known hazardous components in injection fluid: Click to enter text.

Section 5. Site History

1. Type of Facility: Click to enter text.
2. Contamination Dates: Click to enter text.
3. Original Contamination (VOCs, TPH, BTEX, etc.) and Concentrations (attach as Attachment L): Click to enter text.
4. Previous Remediation (attach results of any previous remediation as attachment M): Click to enter text.

NOTE: Authorization Form should be completed in detail and authorization given by the TCEQ before construction, operation, and/or conversion can begin. Attach additional pages as necessary.

Class V Injection Well Designations

5A07 Heat Pump/AC return (IW used for groundwater to heat and/or cool buildings)
5A19 Industrial Cooling Water Return Flow (IW used to cool industrial process equipment)
5B22 Salt Water Intrusion Barrier (IW used to inject fluids to prevent the intrusion of salt water into an aquifer)
5D02 Storm Water Drainage (IW designed for the disposal of rain water)
5D04 Industrial Stormwater Drainage Wells (IW designed for the disposal of rain water associated with industrial facilities)
5F01 Agricultural Drainage (IW that receive agricultural runoff)
5R21 Aquifer Recharge (IW used to inject fluids to recharge an aquifer)
5S23 Subsidence Control Wells (IW used to control land subsidence caused by ground water withdrawal)
5W09 Untreated Sewage
5W10 Large Capacity Cesspools (Cesspools that are designed for 5,000 gpd or greater)
5W11 Large Capacity Septic systems (Septic systems designed for 5,000 gpd or greater)
5W12 WTTP disposal
5W20 Industrial Process Waste Disposal Wells
5W31 Septic System (Well Disposal method)
5W32 Septic System Drainfield Disposal
5X13 Mine Backfill (IW used to control subsidence, dispose of mining byproducts, and/or fill sections of a mine)
5X25 Experimental Wells (Pilot Test) (IW used to test new technologies or tracer dye studies)
5X26 Aquifer Remediation (IW used to clean up, treat, or prevent contamination of a USDW)
5X27 Other Wells
5X28 Motor Vehicle Waste Disposal Wells (IW used to dispose of waste from a motor vehicle site - These are currently banned)
5X29 Abandoned Drinking Water Wells (waste disposal)

TECHNICAL REPORT
ATTACHMENT LIST

- ATTACHMENT A: EXISTING 2.25 MGD PLANT DESIGN CALCULATIONS, DESCRIPTIONS, AND TABLE OF TREATMENT UNITS
- ATTACHMENT B: PROPOSED INTERIM II 2.0 MGD PLANT DESIGN CALCULATIONS, DESCRIPTIONS, AND TABLE OF TREATMENT UNITS
- ATTACHMENT C: PROPOSED FINAL 1.0 MGD PLANT DESIGN CALCULATIONS, DESCRIPTIONS, AND TABLE OF TREATMENT UNITS
- ATTACHMENT D: FLOW DIAGRAM
- ATTACHMENT E: SITE DRAWING
- ATTACHMENT F: TCEQ SUMMARY LETTER
- ATTACHMENT G: TCEQ APPROVAL LETTER
- ATTACHMENT H: 210 REUSE AUTHORIZATION NO. R12644001
- ATTACHMENT I: UTILITY CCN AREAS
- ATTACHMENT J: 100 YEAR FLOODPLAIN MAP
- ATTACHMENT K: WIND ROSE
- ATTACHMENT L: SLUDGE PLAN
- ATTACHMENT M: LAB RESULTS
- ATTACHMENT N: 2020 LEANDER COMPREHENSIVE PLAN CHAPTER 4
- ATTACHMENT O: 2024 SANITARY SEWER COLLECTION SYSTEM MASTER PLAN
- ATTACHMENT P: 2024 WASTEWATER FACILITY PLAN

ATTACHMENT A

ENVIROQUIP, INC.

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(512) 834-6000 • fax: (512) 834-6039

2.25 mgd
Common Wall
Wastewater Treatment Plant

by:
Enviroquip, Inc.
P.O. Box 9069
Austin, Texas 78766

for:
Jay Engineering Company
and
The City of Leander, Texas

Design Parameters:

Influent:

Average Flow =	2.25	mgd	Peaking	
Peak Flow =	4,688	gpm	Factor =	3.0
BOD_5 =	200	mg/l		
TSS =	200	mg/l		
NH_3-N =	35	mg/l		

Effluent:

BOD_5 =	10	mg/l
TSS =	15	mg/l
NH_3-N =	2	mg/l
Total P =	1	mg/l

Site Data:

Elevation =	500	ft amsl
Air Temperature =	100	°F

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General Process Criteria:

Rapid Mix Basin:		
Detention Time =	0.75	hrs
Anaerobic Basin:		
Detention Time =	1.5	hrs
Aeration Basin:		
Organic Loading =	35	lbs BOD_5/1,000 cf
Oxygen Requirements =	1.5	lbs/lb BOD_5
	4.6	lbs/lb NH_3 - N
Minimum Airflow =	15.0	scfm/1,000 cf
Aeration Basin Mixed Liquor =	2,800	mg/l
Secondary Clarifier:		
Surface Loading =	600	gpd/sf (@ average flow)
	1,200	gpd/sf (@ peak flow)
Detention Time =	3.0	hrs (@ average flow)
	1.5	hrs (@ peak flow)
R.A.S. Flow Rate =	150%	of average flow
Chlorine Contact:		
Detention Time =	20	min (@ peak flow)
Airflow =	25	scfm/1,000 cf
Sludge Handling:		
Sludge Production =	0.65	lbs sludge/lb BOD_5
	0.30	lbs sludge/lb TSS
W.A.S. Concentration =	0.80%	
Pre-Mix Airflow =	50	scfm/1,000 cf
Thickener Floor Loading =	7.0	lbs/sf
Digester Concentration =	1.50%	
Sludge Retention Time =	25	days
Min. Digester Temperature =	18	°C
Oxygen Requirement =	2.0	lbs/lb VSR
Airflow =	30	scfm/1,000 cf

Rapid Mix/Anaerobic

Rapid Mix Basin:

Volume Required:

Volume Required =	9,399	cf

Basin Dimensions:

Number of Basins =	1	
Sidewater Depth =	22.00	ft
Basin Width =	10.0	ft
Basin Length =	46.8	ft
Actual Volume =	10,303	cf per basin
Actual Detention =	0.82	hrs

Anaerobic Basins:

Volume Required:

Volume Required =	18,799	cf

Basin Dimensions:

Number of Basins =	2	
Sidewater Depth =	22.00	ft
Basin Width =	10.0	ft
Basin Length =	46.0	ft
Actual Volume =	10,120	cf per basin
Actual Detention =	1.61	hrs

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Aeration Basin

Basin Sizing:

Volume Required:

Influent BOD_5 =	3,755	lbs/day
Volume Required =	107,297	cf (@ 35 lbs/1,000 cf)

Basin Dimensions:

Number of Basins =	2	
Sidewater Depth =	22.0	ft
Basin Width =	32.0	ft
Basin Length =	76.2	ft (effective length)
Actual Volume =	53,651	cf per basin

Actual Loading:

Actual Organic Loading =	35.0	lbs BOD/1,000 cf
F/M Ratio =	0.29	lbs/lb

Aeration System:

Oxygen Calculation:

Carbonaceous Oxygen =	5,633	lbs/day
Nitrogenous Oxygen =	3,023	lbs/day
Total Actual Oxygen =	8,656	lbs/day
AOR/SOR =	65.0%	(see attached calculation)

Airflow Calculation:

Clean Water Transfer =	15.8%	
Required Airflow =	1,703	scfm per basin
Minimum Airflow =	805	scfm per basin

Aeration System:

Design Airflow =	1,703	scfm per basin
Diffuser Size =	1	inch
Number of Diffusers =	94	
Airflow per Diffuser =	18.1	scfm
Diffuser Submergence =	14.0	ft
Total Airflow =	3,406	scfm

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Secondary Clarifier

Basin Sizing:

Basin Requirements:

@ Average Flow =	3,750	sf
	37,598	cf
@ Peak Flow =	5,625	sf
	56,396	cf

Basin Dimensions:

Number of Basins =	2	
Basin Diameter =	70.0	ft
Sidewater Depth =	14.0	ft
Actual Surface Area =	3,848	sf per basin
Actual Volume =	53,878	cf per basin

Actual Surface Loading:

@ Average Flow =	292	gpd/sf
@ Peak Flow =	877	gpd/sf

Actual Detention Time:

@ Average Flow =	8.6	hrs > 3.0 hrs (o.k.)
@ Peak Flow =	2.9	hrs > 1.5 hrs (o.k.)

Clarifier Piping:

Inlet Piping:

Average Flow plus R.A.S. =	1,953	gpm per clarifier
Peak Flow plus R.A.S. =	3,516	gpm per clarifier
Inlet Pipe Diameter =	24	inch
Flow Velocity =	1.4	fps (@ average flow)
	2.6	fps (@ peak flow)

R.A.S. Piping:

R.A.S. Flow Rate =	586	gpm per clarifier
R.A.S. Pipe Diameter =	10	inch
Flow Velocity =	2.3	fps

Effluent Piping:

Average Flow =	781	gpm per clarifier
Peak Flow =	2,344	gpm per clarifier
Effluent Pipe Diameter =	20	inch
Flow Velocity =	0.8	fps (@ average flow)
	2.5	fps (@ peak flow)

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Chlorine Contact Basin

Basin Sizing:		
Volume Required =	12,533	cf
Number of Basins =	2	
Sidewater Depth =	12.0	ft
Basin Width =	12.0	ft
Basin Length =	44.0	ft
Actual Volume =	6,336	cf per basin
Actual Detention Time =	20.2	min
Aeration System:		
Design Airflow =	158	scfm per basin
Diffuser Size =	1	inch
Number of Diffusers =	9	
Airflow per Diffuser =	17.6	scfm
Diffuser Submergence =	11.67	ft
Total Airflow =	317	scfm
Effluent Measurement:		
V-Notch Angle =	90.0	°
Weir Head =	13.70	in (@ average flow)
	21.26	in (@ peak flow)

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Sludge Pumping

Return Sludge:		
R.A.S. Design Flow =	2,344	gpm
Number of Airlift Pumps =	4	
Pump Run Time =	60	min/hr
Design Pump Capacity =	586	gpm
Pump Size =	8	inch
Design Airflow =	60	scfm per airlift
Total Airflow =	240	scfm
Waste Sludge:		
W.A.S. Design Flow =	37	gpm (@ 0.80% solids)
Number of Airflift Pumps =	2	
Pump Run Time =	5	min/hr
Design Pump Capacity =	223	gpm
Pump Size =	6	inch
Design Airflow =	20	scfm per airlift
Total Airflow =	40	scfm

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Solids Handling

W.A.S. Calculations:

Influent BOD_5 =	3,755	lbs/day
Influent TSS =	3,755	lbs/day
Waste Sludge =	3,568	lbs/day
Volatile Fraction =	68%	(estimated)
Temperature x S.R.T. =	450	°C x days
Volatile Solids Reduction =	40%	
<or>	976	lbs/day
Digested Sludge =	2,591	lbs/day

Basin Sizing:

Gravity Thickener:

Surface Area @ 7.0 lbs/sf =	510	sf
Sidewater Depth =	21.50	ft
Basin Diameter =	26.0	ft
Actual Surface Area =	531	sf

Pre-Mix Basin:

Basin Width =	4.0	ft
Basin Length =	26.0	ft
Actual Volume =	2,236	cf

Aerobic Digester:

Volume @ 25 days S.R.T. =	69,210	cf
Number of Basins =	2	
Sidewater Depth =	22.00	ft
Basin Width =	31.2	ft
Basin Length =	56.4	ft
Actual Volume =	38,684	cf per basin

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Digester Aeration

Aeration Calculations:

Oxygen Required =	1,953	lbs/day
AOR/SOR =	65.0%	(see attached calculation)
Clean Water Transfer =	15.8%	
Required Airflow =	385	scfm per basin
Minimum Airflow =	1,165	scfm per basin

Aeration System:

Design Airflow =	1,165	scfm
Diffuser Size =	1	inch
Number of Diffusers =	64	
Airflow per Diffuser =	18.2	scfm
Diffuser Submergence =	14.00	ft
Total Airflow =	2,330	scfm

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Blower Summary

Air Requirements:

Basin Description	Airflow	Pressure
R.A.S. Airlift Pump =	240	6.20
Aeration Basin =	3,406	7.07
Chlorine Contact Basin =	317	6.06
Pre-Mix Basin =	112	7.07
Aerobic Digester =	2,330	7.07
Total Airflow =	6,405	7.07

Blower Sizing:

Number of Blowers =	3	(2 duty - 1 standby)
Design Airflow =	3,202	scfm per blower
Discharge Pressure =	7.07	psig

Blower Horsepower:

Site Conditions:

Elevation =	500	ft amsl
Air Temperature =	100	°F

"R" Constant:

{R = (P1 + P2) / P1}

P1 =	14.42	psia
P2 =	7.07	psig
R =	1.49	

Blower Efficiency: 65%

Airflow per Blower: 3,202 scfm

Blower Horsepower:

{HP = 0.04293 x SCFM x (460 + T) x (R^0.283 - 1)/Blower Efficiency}

Estimated HP per Blower = 141.5 HP

Blower Operation:

Local Electricity Cost = 0.06 per KWh

{Annual Power Cost = HP x 0.7457 KW/HP x 24 x 365 x $0.06/KWh}

	DESIGN	
Power Cost per Blower =	55,467	per year

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AOR/SOR Calculation

AOR/SOR = alpha x (Csw - DO) / Cs x 1.024^(T-20)

alpha = Ratio of oxygen transfer to wastewater / oxygen transfer to clean water
beta = Ratio of oxygen saturation value of wastewater / oxygen saturation of clean water
T = Wastewater temperature, ºC
DO = Dissolved oxygen to be maintained in the wastewater, mg/l
Cs = Oxygen saturation value of clean water at 20 °C and 14.70 psia, (9.17 mg/l)
Csw = Oxygen saturation value of the wastewater, mg/l = Beta * Css * P
Css = Oxygen saturation value of clean water at specified wastewater temperature, mg/l
Pstd = Barometric pressure at sea level, (14.70 psia)
Psite = Barometric pressure at the site, psia
P = Ratio of Psite / Pstd

Alpha:	0.91	
Beta:	0.95	
T:	20.0	°C
DO:	2.00	mg/l
Cs:	9.17	mg/l
Csw:	8.55	mg/l
Css:	9.17	mg/l
Elevation:	500	ft amsl

AOR/SOR = 65.0%

DETAILED DESCRIPTION OF TREATMENT PROCESSES

EXISTING 2.25 MGD PLANT

Preliminary Treatment

Automatic Bar Screen – Large solids, such as sticks, plastic materials, cloth, paper, glass, and inorganic solids are removed from the wastewater by a coarse screen, which is automatically raked by the headworks equipment. These coarse screenings are conveyed to a dumpster via an auger washer/compactor.
Grit Chamber – Sand, silt and gravel that pass through the bar screen are settled in the grit chamber. A mixer in the center of the basin allows the grit to settle to the bottom of the chamber for removal, while other biological treatment components remain in solution.
Grit Washing – Grit is washed to remove the remaining detritus, or organic matter, from the grit. Water from the grit washing is returned to the head of the plant for treatment.

Primary Treatment

Anoxic Mixing Basin – A small percentage (approximately 0% - 20%) of the wastewater that exits the Grit Chamber enters the basin where it will serve as a carbon source for the biological activity in the basin. Treatment activity in the basin will eliminate oxygen, nitrates, nitrites, and any other source that the bacteria can convert to oxygen. The phosphorus release and denitrification processes begin in this basin. Return Activated Sludge (RAS) is returned to this basin.
Anaerobic Chambers (2) – Influent not entering the Anoxic Mixing Basin described above enters the Anaerobic Chambers, where it is mixed with effluent from the Anoxic Mixing Basin that has been deprived of oxygen. Phosphorus release by bacteria begins immediately and continues throughout the detention time of the basin.

At this point in the treatment process, the plant can be operated in series or parallel (during periods of high flow). Under normal conditions, the plant is operated in series.

Aeration Basins (2)

The complete mix aeration basins are, in effect, biological reactors because they present conditions that allow bacteria to grow. This accomplished through flow retention, aeration & mixing, and biological treatment.

- **Flow Retention** – The aeration tank receives flow from the Anaerobic Basins where it is retained for a specified amount of time to allow for biological growth.
- **Aeration and Mixing** – The blower setting determines the amount of the air entering the chamber through the coarse bubble diffusers. They also must create the proper “roll” or mixing throughout the chamber.

- **Biological Treatment** – The dissolved oxygen in this chamber provides the proper environment for bacterial growth for removal of the waste materials, which are the bacteria's food supply. Additionally, in this region of the treatment plant, there is a "luxury uptake" of phosphorus by the bacteria. In other words, the bacteria will take in more phosphorus than was released in the Anaerobic Basins.
- **Phosphorus Removal** –Liquid Aluminum Sulfate is introduced in the aeration basin for removal of phosphorus.

Secondary Treatment

Secondary Clarifiers (2)

Effluent from the aeration basins enter the clarifier through a center ring, so that suspended solids can settle and the "clarified" effluent sent forward for further treatment. Heavier solids are removed by settling and lighter solids are removed by skimming. Settled solids (underflow) either are returned to the Anoxic Chamber or are sent to the Carousel for removal from the plant in Clarifier 2 (North Clarifier). Settled solids (underflow) are returned to the Anoxic Chamber only in Clarifier 1 (South Clarifier). Skimmed solids are sent to the Carousel for removal. In normal operations, effluent from Clarifier 1 will be sent to Clarifier 2 by airlift pumps. In this situation, Clarifier 2 acts as a tertiary clarifier, with little sludge in the bottom of the basin.

Disinfection

Chlorine Contact Chambers (2)

Clarifier effluent enters the Chlorine Contact Chamber, where it is dosed with a liquid Hypochlorite solution for disinfection. Sufficient Hypochlorite solution is applied to maintain a 1.0 mg/L after a 20-minute contact time.

Filtration

Filters (5)

Chlorine Contact Chamber effluent is filtered during this element of the treatment process by five disk filters running in parallel. Phosphorus bound by alum is also removed in the filtration process.

Dechlorination

Filtered effluent is dechlorinated using Sulphur Dioxide from feed unit to ensure water is fit for discharge.

Final Treatment & Usage

Non-Potable Water System

A portion of the filtered effluent is used in the Non-Potable Water System. This water is used for spray bars, wash down, and other plant operations not requiring potable water.

Discharge

Water not used in the Non-Potable Water System is discharged to stream after dechlorination with sodium bisulfate. This reaction is instantaneous and requires minimal detention time.

Sludge Handling

Carousel

Waste Activated Sludge is transferred from the North Clarifier at the new plant to the carousel for further processing and dewatering. Aluminum Sulfate is added prior to the Carousel to precipitate phosphorus and allow it to mix with the sludge. The Carousel is used as a "holding facility," where the sludge is mixed and aerated.

South Sludge Handling Clarifier

Sludge from the Carousel is gravity-fed to the South Sludge Handling Clarifier, where sludge is allowed to separate from the water and settle. Clarified effluent flows to a lift station, where centrate from the Screw Press is also sent.

Sludge Thickener

The sludge is transferred via pump from the South Sludge Handling Clarifier to the Sludge Thickener ("Old PEECO Plant"). This sludge should have a high phosphorus level.

Screw Press

Sludge from the Sludge Thickener is pumped to the Screw Press in the Screw Press Building. There, the dewatering Screw Press separates liquids from solids through a gravitational process. Solids are transferred to a dumpster by conveyer belt.

Lift Station

The centrate flows to a lift station, where additional Aluminum Sulfate is added for phosphorus reduction. Additionally, the water that overflows the weirs from the South Clarifier is discharged into this lift station.

North Sludge Handling Clarifier

Water from the Lift Station is pumped into the North Sludge Clarifier. The underflow of the North Sludge Clarifier is returned to the Carousel. The water overflowing the weirs is returned to the head of the plant.

ATTACHMENT A.2

Table 1.0(1) – Treatment Units

Existing 2.25 MGD Wastewater Treatment Plant

Treatment Unit Type	Number of Units	Dimensions (L x W x D)
Bar Screen	1	23’ x 3.5’ x 4’
Grit Basin	1	14’ x 14’ x 22’
Anoxic Basin	1	16.7’ x 10’ x 25’
Anaerobic Basins	2	46’ x 10’ 25’
Aeration Basins	2	70’ x 32’ x 24’
Clarifiers	2	70’ x 16’
Chlorine Contact Basins	2	92.5’ x 6’ x 13’
Travelling Bridge Filter	1	49’ x 18.25’ x 10’
Disk Filters	5	9’ x 8.5’ 10’
Carousel Digester	1	199’ x 42’ 11’
Sludge Clarifiers	2	25’ x 10’
Sludge Thickener	1	47’ x 28’ x 11’
Sludge Thickener	1	28’ x 11’ x 11’
Sludge Thickener	1	44’ x 27.4’ x 11’
Sludge Thickener	2	37.3’ x 15’ x 11’
Dechlorination	1	12’ x 12’ x 10’
Screw Press	2	7.4’ x 16’

ATTACHMENT B

Design Calculations For
Leander WWTP Interim II Phase 2 MGD

Design Type:	**VIPR**		**Plant Location:**	**Leander**	
Phase:	**Interim II**		**Latitude:**	**30°34'49.33"N**	
Design Flow:	**2**	**MGD**	**Longitude:**	**97°50'28.42"W**	
Design Flow :	**1390**	**gpm**	**Elevation:**	**939**	AMSL
Peak Factor:	**3**				
2-Hour Peak Flow	**4160**	**gpm**			

Design Parameters

Influent Waste Characterization			Waste Loading		
BOD_5 Concentration =	280	mg/l	$CBOD_5$ Loading =	4,670	lb/d
TSS Concentration =	280	mg/l	TSS Loading =	4,670	lb/d
$(NH_3\text{-}N)_0$ Concentration =	50	mg/l	NH_3-N Loading =	834	lb/d
$(NO_2^-/NO_3^-)_o$ Concentration =	1		NO_2^-/NO_3^- Loading =	17	lb/d
Organic N =	25		Organic N Loading =	417	lb/d
P Concentration =	9	mg/l	P Loading =	150	lb/d

Effluent Parameter Set			Required Removal Efficiencies	
BOD_5 Concentration (Daily Ave.) =	5	mg/l	$CBOD_5$ =	98.21%
TSS Concentration (Daily Ave.) =	5	mg/l	TSS =	98.21%
$(NH_3\text{-}N)_e$ Concentration (Daily Ave.) =	2	mg/l	NH_3-N =	96.00%
$(NO_2^-/NO_3^-)_e$ Concentration =	1.05		NO_2^-/NO_3^-	-5.00%
Organic N =	3.85		Organic N =	84.60%
P Concentration (Daily Ave.)=	1		P =	88.89%
pH =	6.0-9.0			
D.O. =	6	mg/l		

Drum Screening

Note:Rotary drum screens remove 25-50% of BOD and TSS (From Metcalf and Eddy)

Influent Waste Reduction			Waste Loading		
BOD_5 Concentration =	280	mg/l	$CBOD_5$ Loading =	3,503	lb/d
TSS Concentration =	280	mg/l	TSS Loading =	3,503	lb/d
Percent Removal of BOD =	25%				
Percent Removal of TSS =	25%		Required Removal Efficiencies		
Reduced BOD_5 Concentration =	**210**	**mg/l**	$CBOD_5$ =	97.62%	
Reduced TSS Concentration =	**210**	**mg/l**	TSS =	97.62%	

Anoxic Basin (Rapid Mix)

Note: Single basin will serve Interim Phase II and the Final Phase.

$(NO_3^- \text{-} N)_e$ Effluent Nitrate Conc. =	5 mg/l			
Recycle Ratio (R) =		$(((NH_3\text{-}N)_0\text{-}(NH_3\text{-}N)_e)/(NO_3^-\text{-}N)_e)\text{-}1$ =	**8.6**	
Number of Downstream Treatment Trains =	3			
V_r Volume of Reactor (Aeration) =	400,868 gal			
V_r Volume of Reactors (All Aeration Basins) =	1,202,604 gal			
X_a Aeration MLVSS =	4,480 mg/l			
Q'_w Wasting Rate From Recycle =	15,827 gpd			
X_r MLVSS in Return Sludge Line =	14,933 mg/l			
Q_e Flow from Clarifier =	984,173 gpd			
Xe MLVSS from Clarifier =	5 mg/l			
θ_c MCRT Aeration =		$(V_rX_a)/((Q'_wX_r\text{-}Q_eX_e)$=	**22.33**	**d**
$V_{aerobic}$ Aerobic Volume Fraction =	0.750 (Adjust until Anoxic Res. Time is Satisfied)			
θ'_c Solids Retention Time for Nitrification Combined System =		$\theta_c/V_{aerobic}$ =	**30**	**d**
f'_{vss} Degradable Fraction of MLVSS =	0.75 assumed			
k_d Endogenous Decay Rate Coeff. @ 15°C =	0.04 d^{-1}			
f_{vss} Adj. Degradable Fraction (using θ'_c) =		$f_{vss}/[1+(1\text{-}f'_{vss})k_d\theta'_c]$ =	**0.58**	
$S_o\text{-}S_e$ Influent - Effluent CBOD =	205 mg/l			
Y_h Heterotrophic Yield Coeff.	0.55 mgVSS/mgBOD_5			
θ_a Overall System Aerobic Residence Time =		$[\theta'_cY_h(S_o\text{-}S_e)]/\{X_a[1+k_df_{vss}\theta'_c]\}$=	**0.44**	**d**
			10.65	**hr**
θ_{DN} Anoxic Res. Time =		$(1\text{-}V_{aerobic})\theta_a$ =	**2.66**	**hr**
N_{denit} (Amount of Nitrate to be Denitrified)=		$(NH_3\text{-}N)_0\text{-}(NH_3\text{-}N)_e\text{-}(NO_2^-/NO_3^-)_e$ =	**46.95**	**mg/l**
U_{DN} =	0.11 d^{-1}			
θ'_{DN} Anoxic Res. Time Required for Denitrification =		$N_{denit}/(U_{DN}X_a)$ =	**0.0953**	**d**
			2.29	**hr**
		Check (Anoxic Res. Time Must Exceed Time Required for Denitrification) =	**OK**	
Aeration Chamber Volume for Nitrification Residence Time				
$V_{aeration}$ =		θ_aQ =	**443,836**	**gal**
		Check (Vr must exceed Vaeration)	**OK**	
Anoxic Chamber Volume for Denitrification Residence Time				
V_{DN} =		$\theta'_{DN}Q$ =	**95,272**	**gal**
		Check (Vr must exceed Vaeration)	**OK**	
		Anoxic Chamber Sidewater Depth =	**22**	**ft**
		Anoxic Chamber Length =	**58**	**ft**
		Required Anoxic Chamber Width =	**10**	**ft**
		Provided Anoxic Chamber Width =	**15.0**	ft
Final Dimensions =	**58' Long x 15' Wide x 22' Deep**			

Anaerobic Basins

Design Detention Time =	2	hr
Design Flow =	2.00	MGD
Peak Flow =	6	MGD
Flow Rate at Peak Flow =	250,000	gal/hr
Number of Basins =	2	
Detention Volume @ Detention Time =	500,000	gal
Detention Volume @ Detention Time =	66,845	cuft
Detention Volume @ Detention Time per Basin =	33,422	cuft
Width =	20	ft
Depth =	22	ft
Length =	76.0	ft

Selected Anaerobic Basin Dimensions

Width =	20.0	ft
Depth =	22.0	ft
Length =	80.0	ft
Volume =	35,200	cuft
Supplied Detention Time =	2.11	hr
Check =	**OK**	

Final Dimensions = 80' Long x 22' Wide x 22' Deep

Aeration

Modifiel Ludzack-Ettinger

Flow (Wet Weather 30 Day ave.) =	2	(MGD)			
Peak Flow =	6	(MGD)			
BOD Loading to Aeration =	210	(mg/l)			
Water Depth Avg. =	22	(ft)			
Number of Trains =	2				

TCEQ Criteria

Minimum Depth (ft) =	8	
Minimum Freeboard (in) =	18	
Max. Organic Loading (lb BOD5/d/1000ft^3) =	35	

Total Organic Loading =	(BOD Loading)(Flow)(8.34) =	3,503	lb/d
Organic Loading (per basin) =	(BOD Loading)(Flow)(8.34) / No. Trains =	1,751	lb/d
Required Aeration Volume (per basin)=	((Organic Loading)(1000 ft^3))/Max Org. Load) / No. Trains =	50,040	ft^3
Required Surface Area (per basin) =	(Required Aeration Volume) / (Depth) =	2,275	ft^2
Aeration Basin Length =	(Width of Clarifier Section) =	58	ft
Required Aeration Basin Width =	(Surface Area/Length) =	39.2	ft
Provided Aeration Basin Width =		**42.0**	**ft**
Final Dimensions =	**58' Long x 42' Wide x 22' Deep**		
	Design/Provided Aeration Volume =	53,592	ft^3
Organic Loading at Proposed Design =	(Organic Loading)/(Length)(Width)(Depth)/(1000) =	**32.68**	lb/d/1000ft^3
	Equal or Less Than TCEQ Criteria =	**OK**	

F/M Ratio

MLSS =	5,600	mg/l
MLVSS = 0.8 MLSS =	4,480	mg/l

F/M Ratio =	(Flow)(BOD Conc.)/(Vol Aer)(MLVSS) =	**0.12**	
	For Single Stage Nitrification between 0.10 and 0.25 =	**OK**	

RAS & WAS

60 Minute Set	300	ml
RVSS (RAS VSS) =	14,933	mg/l
WAS =	0.047	MGD

Approximate MCRT =	(Vol Aer)(MLVSS)/(WAS)(RVSS) =	**2.36**	d

TCEQ 217 Airflow Requirements

1SCFM =	0.01725	lb/O2
Fine Bubble Diffuser Efficiency per Foot =	2.00%	
Submergance Depth =	20	ft

O_2R =	1.5 (BODu) + 4.3 (NH3-N) / BODu	2.27	lb O_2/lb BOD
Clean Water Oxygen Transfer Efficiency (clear water) =	(Fine Bubble Diffuser Eff./ft.)(Submergance Depth) =	40.00%	
Wastewater Oxygen Transfer Efficiency (WOTE) =	(0.45)(Clean WOTE) =	18.00%	
Diffuser Submergence Correction Factors (DCF) =		0.64	
Required Air Flow (RAF) =	**(DCF*(PPD BOD5)*(O2R))/(WOTE*0.23*0.075*1440)**	**1,137**	**SCFM**

TCEQ Mixing Requirements

Air requirements for mixing must be greater than or equal to 0.12 scfm per square foot for a fine bubble diffuser =	**0.12**
SCFM / SF =	**0.47**
Check (Air Supplied must exceed Mixing Air Required) =	**OK**

Aeration Equipment

Air Flow per Diffuser	18 scfm		
Number of Diffusers Required =	**(Required Air Flow)/(Air Flow per Diffuser) =**	**63**	

Secondary Clarifier

Flow =	2	(MGD)	
Peak Flow =	6	(MGD)	
Solids Loading to Clarifier =	5,600	(mg/l)	
Depth =	13.5	(ft)	
Number of Trains =	2		
RAS Rate =	150%	Flow	
Inlet Pipe Diameter =	16	(in)	
RAS Pipe Diameter =	12	(in)	

TCEQ Criteria

Max. Surface Loading @ Peak (g/d/ft^2) =	1200
Min. Detention Time @ Peak (hr) =	1.8
Max. Surface Loading @ Design (g/d/ft^2) =	600
Min. Detention Time @ Design (hr) =	3
Max. Weir Loading @ Peak (g/d/ft) =	30,000
Max. Solids Loading @ Peak (lb/d/ft^2) =	50

Surface Area @ Peak =	(Peak Flow)/(Max. Surface Loading @ Peak) =	2,500	ft^2
Diameter @ Peak =	2* SQRT((Surface Area)/PI)) =	56.4	ft
Volume Time @ Peak =	(Min. Det. Time)(Peak Flow)/((7.48)(24) =	30,080	ft^3
Surface Area @ Peak =	Volume/Depth =	2,228	ft^2
Diameter @ Peak =	2* SQRT((Surface Area)/PI)) =	53	ft
Surface Area @ Design =	(Design Flow)/(Max. Surface Loading @ Design) =	1667	ft^2
Diameter @ Design =	2* SQRT((Surface Area)/PI)) =	46	ft
Volume @ Design =	(Min. Det. Time)(Design Flow)/((7.48)(24) =	16,711	ft^3
Surface Area @ Design =	Volume/Depth =	1238	ft^2
Diameter @ Design =	2* SQRT((Surface Area)/PI)) =	40	ft
Minimum Diameter =	**Largest Dia. Based on Peak and Design Flows for Detention Time and Surface Loading =**	**56.4**	**ft**
Selected Diameter =		**58**	**ft**
Actual Weir Loading =	(Peak Flow)/((2)(PI)(Radius)) =	17,052	g/d/ft
	Equal to or less than TCEQ Requirements =	**OK**	
Solids Loading =	(Solids Loading To Clarifier)(Peak Flow)(8.34) =	46,704	lb/d
Actual Solids Loading Rate =	(Solids Loading)/(Surface Area) =	18	lb/d/ft^2
	Equal to or less than TCEQ Requirements =	**OK**	
Actual Peak Surface Loading =	(Peak Flow)(1440)/(Selected Surface Area) =	1,135	lb/d/ft^2
	Equal to or less than TCEQ Requirements =	**OK**	
Actual Detention Time at Peak =	(Actual Volume)/(Peak Flow) =	2.14	hours
	Greater than or equal to TCEQ Requirements =	**OK**	

Clarifier Piping

Inlet Piping

Average Flow Plus RAS =	(Average Flow)+(RAS)	5.00	mgd
Average Flow Plus RAS =	((Average Flow)+(RAS))(1000000/1440)	3472	gpm
Peak Flow Plus RAS =	(Peak Flow)+(RAS)	9.00	mgd
Peak Flow Plus RAS =	((Peak Flow)+(RAS))(1000000/1440)	6250	gpm
Inlet Pipe Velocity at Ave. Flow =	(Avg. Flow Plus RAS)/(Pipe Area)	5.54	fps
Inlet Pipe Velocity at Peak Flow =	(Peak Flow Plus RAS)/(Pipe Area)	9.97	fps

RAS Piping

RAS Flow =	(Average Flow)(RAS rate) =	3.00	mgd
RAS Flow =		2083	gpm
RAS Velocity in RAS Pipe =	(RAS Flow Plus RAS)/(Pipe Area)	5.91	fps

Final Dimensions = 58' Diameter x 16' Deep

Tertiary Filtration

Flow (Wet Weather 30 Day ave.) =	2	(MGD)	**TCEQ Criteria**		
Peak Flow =	6	(MGD)	Maximum Design Filter Rate =	6.5	gpm/sf
Number of Treatment Trains =	2		Average Design Filter Rate =	3	gpm/sf
Number of Redundant Filters =	1				
Number of Filter Basins =	3				

Average Flow =	(MGD)(1000000)/((1440)) =	463	ft^3/min
Area of Each Filter Disc =		10.8	ft^2
Number of Discs per Filter =		20	
Total Area of Filter Discs =		**216**	ft^2
Flow Rate Across Media =		2.14	gpm/ft^2
	Equal to or greater than TCEQ Requirements =	**OK**	
Peak Flow Per Filter =	(MGD)(1000000)/((1440)) =	1389	ft^3/min
Area of Each Filter Disc =		11	ft^2
Number of Discs per Filter =		20	
Total Area of Filter Discs =		**216**	ft^2
Flow Rate Across Media =		6.43	gpm/ft^2
	Equal to or greater than TCEQ Requirements =	**OK**	
Basin Length =		8.5	ft
Basin Width =		18.25	ft
Basin Depth =		6.33	ft
Total Basin Length =	(Number of Filter Basins)(Basin Length + Distance Between Basins)	38.00	ft
Final Dimensions =	**20' Width x 6.5' Depth x 38' Length**		

Ultraviolet Disinfection

Note: The following calculations are for Phase I, Interim Phase II, and Final Phase.

Total Ultimate Design Flow =	5.25	(MGD)
Total Ultimate Peak Flow =	15.75	(MGD)
Minimum Transmittance =	65%	
Maximum TSS (Daily Average) =	10	mg/l
End of Life Lamp Output =	0.85	
End of Life Fouling Factor =	0.9	
Minimum UV Dose =	40	mJ/cm2

Flow Rate @ Peak =	((Peak Flow)/(1440))(1000000) =	10,938	gpm
Flow Rate @ Peak =	((Peak Flow)/(1440))(1000000)(3.79) =	41,453	L/min
Combined Correction Factor =	(End of Life Lamp Output)(End of Life Fouling Factor) =	0.765	
Flow Rate per Lamp =	((Minimum UV Dose)/((10^(-2.428)) * ((Minimum Transmittance*100)^3.126) * (Combined Correction Factor)))^(-1/(Minimum Transmittance) =	219	L/min-lamp
Number of Lamps Required =	(Flow Rate @ Peak) / (Flow Rate per Lamp) =	190	

Number of Units =	3	
Power per Lamp =	800	W
Assumed Velocity =	4	ft/s

Minimum Number of Lamps per Unit =	(Number of Lamps Required) / (Number of Units) =	64	
Final Number of Lamps =	(Number of Units) (Minimum Number of Lamps per Unit) =	192	
Cross Sectional Area of Influent Pipe =	((Total Ultimate Peak Flow) / (Assumed Velocity) / (Number of Units)) (1000000) / (7.48) / (24) / (3600) =	2	ft^2
Minimum Diameter =	sqrt (Cross Sectional Area / pi()) (24) =	19.30	in
Selected Diameter =		**24.00**	**in**
Final Diameter of Influent Pipe to UV Units =	**24" Diameter**		

Aerobic Sludge Digestion

Total Ultimate Design Flow =	5.25	(MGD)
Total Ultimate Peak Flow =	15.75	(MGD)
Plant Influent BOD5 Loading =	9,195	lb/day
Plant Influent TSS Loading =	9,195	lb/day
Sludge Production =	0.65	lb sludge/lb BOD5
Sludge Production =	0.30	lb sludge/lb TSS
Waste Sludge =	8,735	lb/day
Volatile Fraction =	0.80	
Volatile Solids =	6,988	lb/day
Volatile Solids Reduction =	0.40	
Volatile Solids Reduced =	2,795	lb/day
Digested Sludge =	5,940	lb/day
Percent Solids Concentration =	1.5%	
Number of Digester Basins =	2	
Depth =	**22**	**ft**

TCEQ Criteria*

Min. Sludge Retention Time (d) =	40
Max. Solids Concentration used to Calc Total Detention Time (%) =	2%
Min. Volatile Solids Loading Rate (lbs / ft3 / d) =	100
Max. Volatile Solids Loading Rate (lbs) =	200

*All pertinent requirements listed in TCEQ Rule 217.249 (t) will be followed during the determination of the final design calculations.

Note: The following calculations are for Phase I, Interim Phase II, and Final Phase.

CBOD5 Removal =	Influent CBOD5 Conc. - Effluent CBOD5 Conc. =	205	mg/l
100% Flow Pounds of Dry Sludge Produced =	Digested Sludge =	5,940	lb/day
100% Flow Pounds of Wet Sludge Produced =	(Digested Sludge) (Percent Solids Concentration) =	395,998	lb/day
Volume of Wet Sludge Produced =	(Peak Flow Pounds of Wet Sludge Produced) / 8.34 =	47,482	gpd
Overall Required Digester Volume =	(Min. SRT) (Volume of Wet Sludge Produced) / 7.48 =	253,913	cu ft
Volume per Basin =	(Required Digester Volume) / 2 =	126,957	cu ft
Area per Basin =	Volumer per Basin / Depth	5,771	sq ft
Provided Width per Basin =		**55**	**ft**
Length per Basin =	**Area per Basin / Width per Basin =**	**105**	**ft**

Assumed Pressure =	24.8	psia
Assumed Temperature =	68	°F

Oxygen Requirement =	(Volatile Solids Reduced) (2.3 lb O2/lb VSS) =	6,429	lb O2/d
Volume of Air Requied per Minute (Assuming Air is 23.2% O2 by Weight and 10% Oxygen Transfer Efficiency) =	(Oxygen Requirement) / (0.232 * Air Density) / (Oxygen Transfer Efficiency) (1440) =	2,516	cu ft/min
Required Air Flow (Conversion to SCFM) =	**CFM * (P/14.7psi)*(528R/T) =**	**4,247**	**SCFM**
Air Requirement per Digester Volume =	(Volume of Air Required per Minute) / (Volume per Basin) =	0.0334	SCFM/cu ft

TCEQ Requirements

Maximum Solids Concentration Check =	**OK**	
The volatile solids loading rate must be designed to be at least 100 pounds but not more than 200 pounds of volatile solids per 1,000 cubic feet per day =	69,882	cu ft
Volatile Solids Loading Check =	**Warning***	

***To meet the minimum required time for SRT, the organic loading rate falls below the TCEQ range of 100 to 200 lbs of volatile solids per 1,000 cubic feet per day.**

Final Dimensions per Basin = 105' Length x 22' Depth x 55' Width

Gravity Thickener

Depth = 22 (ft)

TCEQ Criteria

Surface Loading Rate Maximum (gal/d/sf) = 800

Note: The following calculations are for Phase I, Interim Phase II, and Final Phase.

Gravity Thickener =	7.0 lb/sf =	1248	sf
	Required Basin Diameter =	19.9	ft
	Supplied Thickener Diameter =	35	ft

Final Dimensions = 35' Diameter x 22' Deep

DETAILED DESCRIPTION OF TREATMENT PROCESSES

PROPOSED 2.0 MGD INTERIM PHASE II PLANT

Preliminary Treatment

Drum Screen – Large solids, such as sticks, plastic materials, cloth, paper, glass, and inorganic solids are removed from the wastewater by a rotating cylindrical screen. The captured solids are removed via spray system, brush, or scraper mechanism and deposited into a collection hopper for disposal.
Grit Chamber – Sand, silt and gravel that pass through the bar screen are settled in the grit chamber. A mixer in the center of the basin allows the grit to settle to the bottom of the chamber for removal, while other biological treatment components remain in solution.
Grit Washing – Grit is washed to remove the remaining detritus, or organic matter, from the grit. Water from the grit washing is returned to the head of the plant for treatment.

Primary Treatment

Anoxic Mixing Basin – A small percentage (approximately 0% - 20%) of the wastewater that exits the Grit Chamber enters the basin where it will serve as a carbon source for the biological activity in the basin. Treatment activity in the basin will eliminate oxygen, nitrates, nitrites, and any other source that the bacteria can convert to oxygen. The phosphorus release and denitrification processes begin in this basin. Return Activated Sludge (RAS) is returned to this basin.
Anaerobic Chambers (2) – Influent not entering the Anoxic Mixing Basin described above enters the Anaerobic Chambers, where it is mixed with effluent from the Anoxic Mixing Basin that has been deprived of oxygen. Phosphorus release by bacteria begins immediately and continues throughout the detention time of the basin.

Aeration Basins (2)

The complete mix aeration basins are, in effect, biological reactors because they present conditions that allow bacteria to grow. This accomplished through flow retention, aeration & mixing, and biological treatment.

- **Flow Retention** – The aeration tank receives flow from the Anaerobic Basins where it is retained for a specified amount of time to allow for biological growth.
- **Aeration and Mixing** – The blower setting determines the amount of the air entering the chamber through the coarse bubble diffusers. They also must create the proper “roll” or mixing throughout the chamber.
- **Biological Treatment** – The dissolved oxygen in this chamber provides the proper environment for bacterial growth for removal of the waste materials, which are the bacteria’s food supply. Additionally, in this region of the treatment plant, there is a

"luxury uptake" of phosphorus by the bacteria. In other words, the bacteria will take in more phosphorus than was released in the Anaerobic Basins.

- **Phosphorus Removal** –Liquid Aluminum Sulfate is introduced in the aeration basin for removal of phosphorus.

Secondary Treatment

Secondary Clarifiers (2)

Effluent from the aeration basins enter the clarifier through a center ring, so that suspended solids can settle and the "clarified" effluent sent forward for further treatment. Heavier solids are removed by settling and lighter solids are removed by skimming. Settled solids (underflow) either are returned to the Anoxic Chamber or are sent to the Digesters for removal from the plant in Clarifier 2 (North Clarifier). Settled solids (underflow) are returned to the Anoxic Chamber only in Clarifier 1 (South Clarifier). Skimmed solids are sent to the Digesters for removal. In normal operations, effluent from Clarifier 2 will be sent to Clarifier 1 by airlift pumps. In this situation, Clarifier 1 acts as a tertiary clarifier, with little sludge in the bottom of the basin.

Disinfection

In-Line UV Disinfection Chamber (2)

Clarifier effluent enters the In-Line Ultraviolet (UV) Disinfection units, where electromagnetic energy from mercury arc lamps disrupts the genetic material of organisms, preventing reproduction.

Filtration

Filters (4)

Chlorine Contact Chamber effluent is filtered during this element of the treatment process by five disk filters running in parallel. Phosphorus bound by alum is also removed in the filtration process.

Final Treatment & Usage

Non-Potable Water System

A portion of the filtered effluent is used in the Non-Potable Water System. This water is used for spray bars, wash down, and other plant operations not requiring potable water.

Discharge

Water not used in the Non-Potable Water System is discharged to stream after dechlorination with sodium bisulfate. This reaction is instantaneous and requires minimal detention time.

Sludge Handling

Pre-mix

Waste Activated Sludge is transferred from the clarifiers via air lift pump for mixing with digested sludge.

Digesters (2)

Waste Activated Sludge is transferred from the Clarifiers to the Digesters for further processing and dewatering. Before entering the Digester, aluminum sulfate is added to precipitate the phosphorus, allowing it to mix with the sludge. The digesters serve as holding facilities where the sludge is mixed and aerated to facilitate biological decomposition. This process reduces the total mass of solids, destroys pathogens, and enhances the ability to dewater the sludge.

Gravity Thickener

The sludge is transferred via pump from the Digestors to the Gravity Thickener. This sludge should have a high phosphorus level.

Screw Press (1)

Sludge from the Sludge Thickener is pumped to the Screw Press in the Screw Press Building. There, the dewatering Screw Press separates liquids from solids through a gravitational process. Solids are transferred to a dumpster by conveyer belt.

ATTACHMENT B.2

Table 1.0(1) – Proposed Treatment Units

Proposed 2.0 MGD Interim Phase II Wastewater Treatment Plant

Treatment Unit Type	Number of Units	Dimensions (L x W x D)
Rotary Drum Screen	3	16’ x 7.5’ x 6.7’
Grit Basin	1	20’ x 20’ x22’
Rapid Mix/ Anoxic Basin	1	58’ x 15’ x 22’
Anaerobic Basins	2	80’ x 22’ x 22’
Aeration Basins	2	58’ x 42’ x 22’
Clarifiers	2	58’ diameter x 16’ deep
Disc Filters	4	38’ x 20’ x 6.5’
UV Disinfection	3	20” In-Line UV Units
Pre-Mix	1	36’ x 20’ x 22’
Sludge Thickener	1	35’ x 35’ x 22’
Digesters	2	105’ x 55’ x 22’
Operations Center	1	6000 SF

ATTACHMENT C

Design Calculations For
Leander WWTP Final Phase 1 MGD

Design Type:	**VIPR**		**Plant Location:**	**Leander**	
Phase:	**Final**		**Latitude:**	**30°34'49.33"N**	
Design Flow:	**1**	**MGD**	**Longitude:**	**97°50'28.42"W**	
Design Flow :	**690**	**gpm**	**Elevation:**	**939**	AMSL
Peak Factor:	**3**				
2-Hour Peak Flow	**2080**	**gpm**			

Design Parameters

Influent Waste Characterization			Waste Loading		
BOD_5 Concentration =	280	mg/l	$CBOD_5$ Loading =	2,335	lb/d
TSS Concentration =	280	mg/l	TSS Loading =	2,335	lb/d
$(NH_3\text{-}N)_0$ Concentration =	50	mg/l	NH_3-N Loading =	417	lb/d
$(NO_2^-/NO_3^-)_o$ Concentration =	1		NO_2^-/NO_3^- Loading =	8	lb/d
Organic N =	25		Organic N Loading =	209	lb/d
P Concentration =	9	mg/l	P Loading =	75	lb/d

Effluent Parameter Set			Required Removal Efficiencies	
BOD_5 Concentration (Daily Ave.) =	5	mg/l	$CBOD_5$ =	98.21%
TSS Concentration (Daily Ave.) =	5	mg/l	TSS =	98.21%
$(NH_3\text{-}N)_e$ Concentration (Daily Ave.) =	2	mg/l	NH_3-N =	96.00%
$(NO_2^-/NO_3^-)_e$ Concentration =	1.05		NO_2^-/NO_3^-	-5.00%
Organic N =	3.85		Organic N =	84.60%
P Concentration (Daily Ave.)=	1		P =	88.89%
pH =	6.0-9.0			
D.O. =	6	mg/l		

Drum Screening

Note:Rotary drum screens remove 25-50% of BOD and TSS (From Metcalf and Eddy)

Influent Waste Reduction			Waste Loading		
BOD_5 Concentration =	280	mg/l	$CBOD_5$ Loading =	1,751	lb/d
TSS Concentration =	280	mg/l	TSS Loading =	1,751	lb/d
Percent Removal of BOD =	25%				
Percent Removal of TSS =	25%		Required Removal Efficiencies		
Reduced BOD_5 Concentration =	**210**	**mg/l**	$CBOD_5$ =	97.62%	
Reduced TSS Concentration =	**210**	**mg/l**	TSS =	97.62%	

Anoxic Basin (Rapid Mix)

*Calculations are shown in Interim Phase II (Attachment B)

Anaerobic Basins

Design Detention Time =	2	hr
Design Flow =	1.00	MGD
Peak Flow =	3	MGD
Flow Rate at Peak Flow =	125,000	gal/hr
Number of Basins =	1	
Detention Volume @ Detention Time =	250,000	gal
Detention Volume @ Detention Time =	33,422	cuft
Detention Volume @ Detention Time per Basin =	33,422	cuft
Width =	20	ft
Depth =	22	ft
Length =	76.0	ft

Selected Anaerobic Basin Dimensions

Width =	20.0	ft
Depth =	22.0	ft
Length =	80.0	ft
Volume =	35,200	cuft
Supplied Detention Time =	2.11	hr
Check =	**OK**	

Final Dimensions = 80' Long x 22' Wide x 22' Deep

Aeration

Modifiel Ludzack-Ettinger

Flow (Wet Weather 30 Day ave.) =	1	(MGD)			
Peak Flow =	3	(MGD)			
BOD Loading to Aeration =	210	(mg/l)			
Water Depth Avg. =	22	(ft)			
Number of Trains =	1				

TCEQ Criteria

Minimum Depth (ft) =	8	
Minimum Freeboard (in) =	18	
Max. Organic Loading (lb BOD5/d/1000ft^3) =	35	

Total Organic Loading =	(BOD Loading)(Flow)(8.34) =	1,751	lb/d
Organic Loading (per basin) =	(BOD Loading)(Flow)(8.34) / No. Trains =	1,751	lb/d
Required Aeration Volume (per basin)=	((Organic Loading)(1000 ft^3))/Max Org. Load) / No. Trains =	50,040	ft^3
Required Surface Area (per basin) =	(Required Aeration Volume) / (Depth) =	2,275	ft^2
Aeration Basin Length =	(Width of Clarifier Section) =	58	ft
Required Aeration Basin Width =	(Surface Area/Length) =	39.2	ft
Provided Aeration Basin Width =		**42.0**	**ft**
Final Dimensions =	**58' Long x 42' Wide x 22' Deep**		
	Design/Provided Aeration Volume =	53,592	ft^3
Organic Loading at Proposed Design =	(Organic Loading)/(Length)(Width)(Depth)/(1000) =	**32.68**	lb/d/1000ft^3
	Equal or Less Than TCEQ Criteria =	**OK**	

F/M Ratio

MLSS =	5,600	mg/l
MLVSS = 0.8 MLSS =	4,480	mg/l

F/M Ratio =	(Flow)(BOD Conc.)/(Vol Aer)(MLVSS) =	**0.12**
	For Single Stage Nitrification between 0.10 and 0.25 =	**OK**

RAS & WAS

60 Minute Set	300	ml
RVSS (RAS VSS) =	14,933	mg/l
WAS =	0.047	MGD

Approximate MCRT =	(Vol Aer)(MLVSS)/(WAS)(RVSS) =	**2.36**	d

TCEQ 217 Airflow Requirements

1SCFM =	0.01725	lb/O2
Fine Bubble Diffuser Efficiency per Foot =	2.00%	
Submergance Depth =	20	ft

O_2R =	1.5 (BODu) + 4.3 (NH3-N) / BODu	2.27	lb O_2/lb BOD
Clean Water Oxygen Transfer Efficiency (clear water) =	(Fine Bubble Diffuser Eff./ft.)(Submergance Depth) =	40.00%	
Wastewater Oxygen Transfer Efficiency (WOTE) =	(0.45)(Clean WOTE) =	18.00%	
Diffuser Submergence Correction Factors (DCF) =		0.64	
Required Air Flow (RAF) =	**(DCF*(PPD BOD5)*(O2R))/(WOTE*0.23*0.075*1440)**	**568**	**SCFM**

TCEQ Mixing Requirements

Air requirements for mixing must be greater than or equal to 0.12 scfm per square foot for a fine bubble diffuser =	**0.12**
SCFM / SF =	**0.23**
Check (Air Supplied must exceed Mixing Air Required) =	**OK**

Aeration Equipment

Air Flow per Diffuser	18	scfm
Number of Diffusers Required =	**(Required Air Flow)/(Air Flow per Diffuser) =**	**32**

Secondary Clarifier

Flow =	1	(MGD)		**TCEQ Criteria**		
Peak Flow =	3	(MGD)		Max. Surface Loading @ Peak (g/d/ft^2) =	1200	
Solids Loading to Clarifier =	5,600	(mg/l)		Min. Detention Time @ Peak (hr) =	1.8	
Depth =	13.5	(ft)		Max. Surface Loading @ Design (g/d/ft^2) =	600	
Number of Trains =	1			Min. Detention Time @ Design (hr) =	3	
RAS Rate =	150%	Flow		Max. Weir Loading @ Peak (g/d/ft) =	30,000	
Inlet Pipe Diameter =	16	(in)		Max. Solids Loading @ Peak (lb/d/ft^2) =	50	
RAS Pipe Diameter =	12	(in)				

Surface Area @ Peak =	(Peak Flow)/(Max. Surface Loading @ Peak) =	2,500	ft^2
Diameter @ Peak =	2* SQRT((Surface Area)/PI)) =	56.4	ft
Volume Time @ Peak =	(Min. Det. Time)(Peak Flow)/((7.48)(24) =	30,080	ft^3
Surface Area @ Peak =	Volume/Depth =	2,228	ft^2
Diameter @ Peak =	2* SQRT((Surface Area)/PI)) =	53	ft
Surface Area @ Design =	(Design Flow)/(Max. Surface Loading @ Design) =	1667	ft^2
Diameter @ Design =	2* SQRT((Surface Area)/PI)) =	46	ft
Volume @ Design =	(Min. Det. Time)(Design Flow)/((7.48)(24) =	16,711	ft^3
Surface Area @ Design =	Volume/Depth =	1238	ft^2
Diameter @ Design =	2* SQRT((Surface Area)/PI)) =	40	ft
Minimum Diameter =	**Largest Dia. Based on Peak and Design Flows for Detention Time and Surface Loading =**	**56.4**	**ft**
Selected Diameter =		**58**	**ft**
Actual Weir Loading =	(Peak Flow)/((2)(PI)(Radius)) =	17,052	g/d/ft
	Equal to or less than TCEQ Requirements =	**OK**	
Solids Loading =	(Solids Loading To Clarifier)(Peak Flow)(8.34) =	46,704	lb/d
Actual Solids Loading Rate =	(Solids Loading)/(Surface Area) =	18	lb/d/ft^2
	Equal to or less than TCEQ Requirements =	**OK**	
Actual Peak Surface Loading =	(Peak Flow)(1440)/(Selected Surface Area) =	1,135	lb/d/ft^2
	Equal to or less than TCEQ Requirements =	**OK**	
Actual Detention Time at Peak =	(Actual Volume)/(Peak Flow) =	2.14	hours
	Greater than or equal to TCEQ Requirements =	**OK**	

Clarifier Piping

Inlet Piping

Average Flow Plus RAS =	(Average Flow)+(RAS)	2.50	mgd
Average Flow Plus RAS =	((Average Flow)+(RAS))(1000000/1440)	1736	gpm
Peak Flow Plus RAS =	(Peak Flow)+(RAS)	4.50	mgd
Peak Flow Plus RAS =	((Peak Flow)+(RAS))(1000000/1440)	3125	gpm
Inlet Pipe Velocity at Ave. Flow =	(Avg. Flow Plus RAS)/(Pipe Area)	2.77	fps
Inlet Pipe Velocity at Peak Flow =	(Peak Flow Plus RAS)/(Pipe Area)	4.99	fps

RAS Piping

RAS Flow =	(Average Flow)(RAS rate) =	1.50	mgd
RAS Flow =		1042	gpm
RAS Velocity in RAS Pipe =	(RAS Flow Plus RAS)/(Pipe Area)	2.96	fps

Final Dimensions = 58' Diameter x 16' Deep

Tertiary Filtration

Flow (Wet Weather 30 Day ave.) =	1	(MGD)	
Peak Flow =	3	(MGD)	
Number of Treatment Trains =	1		
Number of Redundant Filters =	0		
Number of Filter Basins =	2		

TCEQ Criteria

Maximum Design Filter Rate =	6.5	gpm/sf
Average Design Filter Rate =	3	gpm/sf

Average Flow =	(MGD)(1000000)/((1440)) =	347	ft^3/min
Area of Each Filter Disc =		10.8	ft^2
Number of Discs per Filter =		20	
Total Area of Filter Discs =		**216**	ft^2
Flow Rate Across Media =		1.61	gpm/ft^2
	Equal to or greater than TCEQ Requirements =	**OK**	
Peak Flow Per Filter =	(MGD)(1000000)/((1440)) =	1042	ft^3/min
Area of Each Filter Disc =		11	ft^2
Number of Discs per Filter =		20	
Total Area of Filter Discs =		**216**	ft^2
Flow Rate Across Media =		4.82	gpm/ft^2
	Equal to or greater than TCEQ Requirements =	**OK**	
Basin Length =		8.5	ft
Basin Width =		18.25	ft
Basin Depth =		6.33	ft
Total Basin Length =	(Number of Filter Basins)(Basin Length + Distance Between Basins)	19.00	ft
Final Dimensions =	**20' Width x 6.5' Depth x 20' Length**		

Ultraviolet Disinfection

*Calculations are shown in Interim Phase II (Attachment B)

Aerobic Sludge Digestion

*Calculations are shown in Interim Phase II (Attachment B)

Gravity Thickener

*Calculations are shown in Interim Phase II (Attachment B)

DETAILED DESCRIPTION OF TREATMENT PROCESSES

PROPOSED 1.0 MGD FINAL PLANT

Primary Treatment

Anaerobic Chambers (1) – Influent not entering the Anoxic Mixing Basin described above enters the Anaerobic Chambers, where it is mixed with effluent from the Anoxic Mixing Basin that has been deprived of oxygen. Phosphorus release by bacteria begins immediately and continues throughout the detention time of the basin.

Aeration Basins (1)

The complete mix aeration basins are, in effect, biological reactors because they present conditions that allow bacteria to grow. This accomplished through flow retention, aeration & mixing, and biological treatment.

- **Flow Retention** – The aeration tank receives flow from the Anaerobic Basins where it is retained for a specified amount of time to allow for biological growth.
- **Aeration and Mixing** – The blower setting determines the amount of the air entering the chamber through the coarse bubble diffusers. They also must create the proper “roll” or mixing throughout the chamber.
- **Biological Treatment** – The dissolved oxygen in this chamber provides the proper environment for bacterial growth for removal of the waste materials, which are the bacteria’s food supply. Additionally, in this region of the treatment plant, there is a “luxury uptake” of phosphorus by the bacteria. In other words, the bacteria will take in more phosphorus than was released in the Anaerobic Basins.
- **Phosphorus Removal** –Liquid Aluminum Sulfate is introduced in the aeration basin for removal of phosphorus.

Secondary Treatment

Secondary Clarifiers (1)

Effluent from the aeration basins enter the clarifier through a center ring, so that suspended solids can settle and the “clarified” effluent sent forward for further treatment. Heavier solids are removed by settling and lighter solids are removed by skimming. Settled solids (underflow) either are returned to the Anoxic Chamber or are sent to the Digesters for removal from the plant in Clarifier 2 (North Clarifier). Settled solids (underflow) are returned to the Anoxic Chamber only in Clarifier 1 (South Clarifier). Skimmed solids are sent to the Digesters for removal. In normal operations, effluent from Clarifier 2 will be sent to Clarifier 1 by airlift pumps. In this situation, Clarifier 1 acts as a tertiary clarifier, with little sludge in the bottom of the basin.

Filtration

Filters (2)

Chlorine Contact Chamber effluent is filtered during this element of the treatment process by five disk filters running in parallel. Phosphorus bound by alum is also removed in the filtration process.

ATTACHMENT C.2

Table 1.0(1) – Proposed Treatment Units

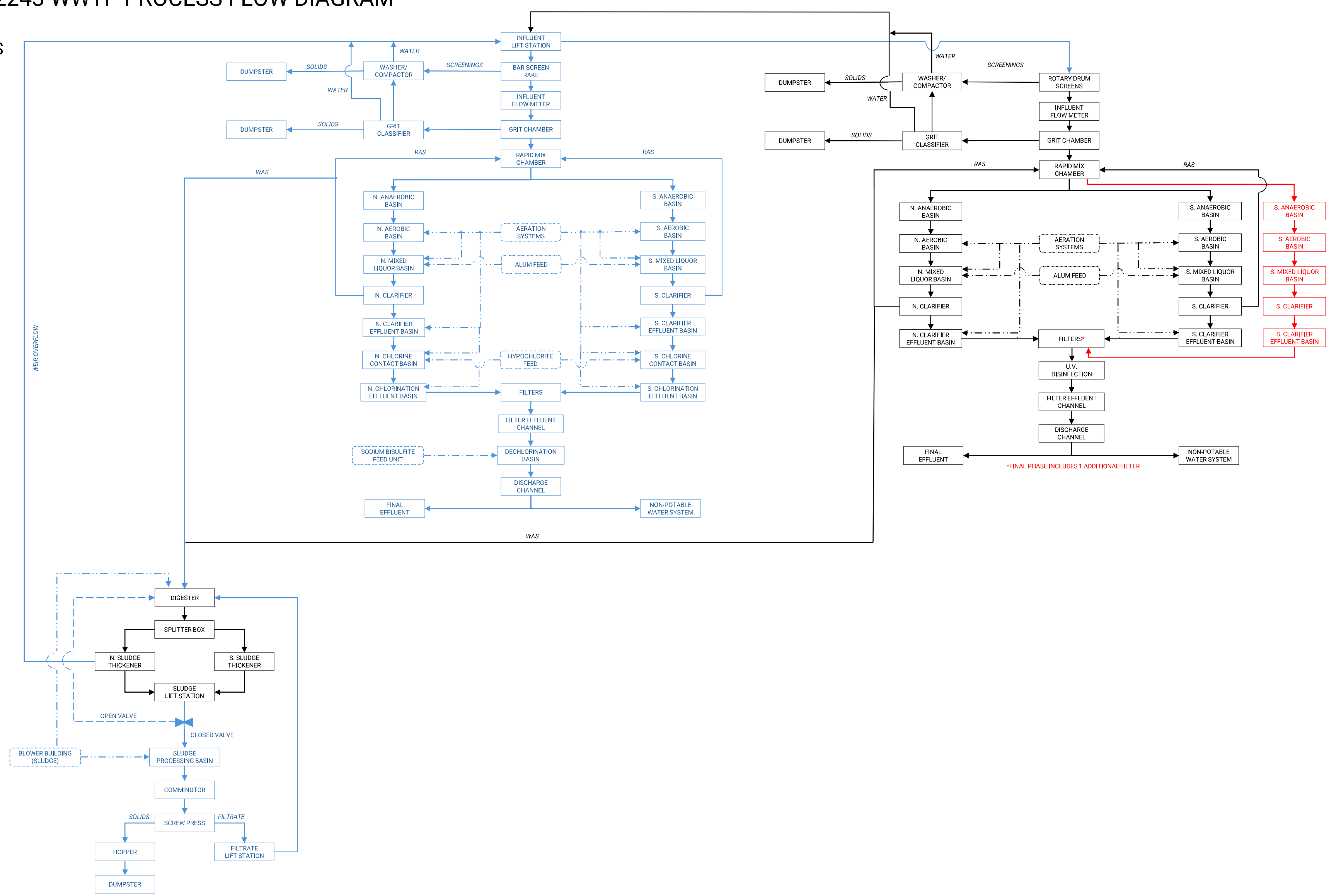
Proposed 1.0 MGD Final Wastewater Treatment Plant

Treatment Unit Type	Number of Units	Dimensions (L x W x D)
Anaerobic Basins	1	80’ x 22’ x 22’
Aeration Basins	1	58’ x 42’ x 22’
Clarifiers	1	58’ diameter x 16’ deep
Disc Filter	2	20’ x 20’ x 6.5’

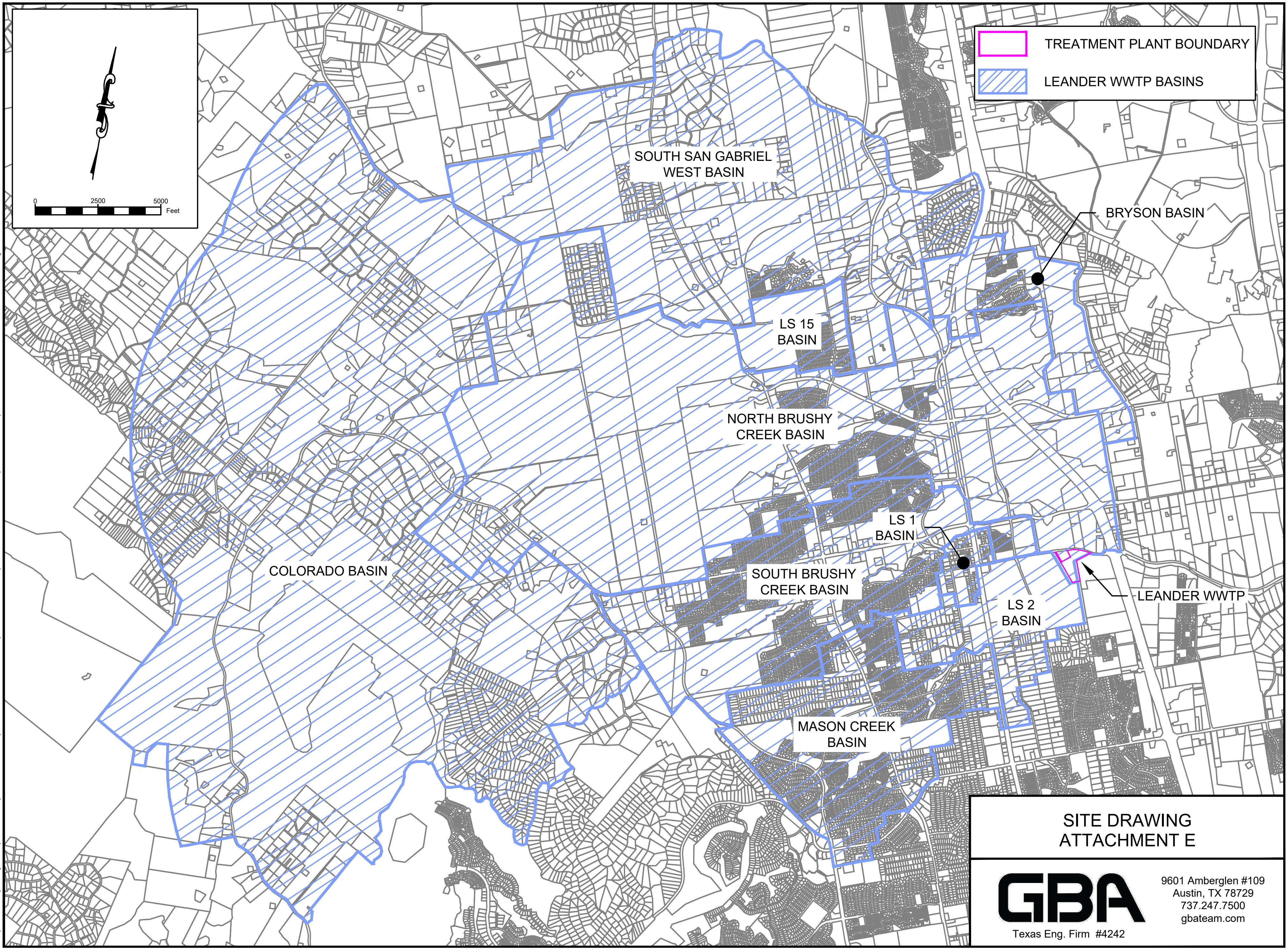
ATTACHMENT D

CITY OF LEANDER RM2243 WWTP PROCESS FLOW DIAGRAM

EXISTING TREATMENT UNITS
INTERIM II TREATMENT UNITS
FINAL TREATMENT UNITS



ATTACHMENT E



SITE DRAWING
ATTACHMENT E

G:\16532\Analysis\Environ\Wastewater\TCEQ Documents\Technical Report Attachments\CAD Files\ATT E_SITE-DRAWING-MAP.dwg

ATTACHMENT F

JAY ENGINEERING COMPANY, INC.
PMB 503, 8650 Spicewood Springs Road, Suite 145
Austin, TX 78759-4399 (512) 259-3882 Fax 259-8016

FILE COPY

November 9, 2000

Mr. Lewis Herrin, III, P.E.
TNRCC - MC 148
P.O. Box 13087
Austin, Texas 78711-3087

Re: Chapter 317 Summary Transmittal Letter
City of Leander
Wastewater Treatment Facility Expansion
Williamson County, Texas

Dear Mr. Herrin:

The purpose of this letter is to provide the TNRCC with the information necessary to comply with the requirements of 317.1(a)(3)(D) of the TNRCC's rules titled, Design Criteria for Sewerage Systems. The necessary information includes:

1. Jay Engineering Company, Inc.
   PMB 503, 8650 Spicewood Springs Road, Suite 145
   Austin, Texas 78759-4399

2. Frederick A. Jay, P.E., (512) 259-3882, Fax# (512) 259-8016.

3. Williamson County, Texas. Wastewater Treatment Facility Expansion for the City of Leander, Texas.

4. City of Leander, Texas

5. City of Leander, Texas Wastewater Treatment Facility, Permit Number 12644-001

6. No variances are requested.

7. No innovative or nonconforming technologies are proposed as part of this project.

8. The plans and specifications, which describe the project identified in this letter, are in substantial compliance with all the requirements of Chapter 317. Any deviations from the requirements are based on our best professional judgment.

9. This project consists of the expansion of the existing City of Leander Wastewater Treatment Facility from 0.75 million gallons per day (MGD) to 2.25 MGD. We propose to accomplish this by constructing a new complete-mix activated sludge facility with biological nutrient removal. The existing Carrousel system will remain in service during construction and be retrofitted for sludge processing.

   Sewage will be pumped from a proposed new lift station operating at a firm capacity equal to the peak capacity of the plant of 4,680 gallons per minute (gpm). The sewage will be pumped through the necessary headworks into a mixing basin where return activated sludge will be introduced. Sewage will then flow to an anaerobic basin where biological phosphorus removal will take place. Alum will also be available onsite in case it is needed to meet the permitted phosphorus effluent limit of 1 mg/l. Sewage will then flow through an aeration basin, clarifier and chlorination chamber for further treatment. In order to meet the permitted BOD_5 and TSS effluent limits of 5 mg/l, the flow will pass through a traveling bridge filter prior to being dechlorinated and released.

Sludge dewatering will be performed using a centrifuge. The centrifuge will be installed in a building also used as separate storage for Chlorine, Sulfur Dioxide, polymer and Alum. The dewatered sludge will be conveyed from the centrifuge via a belt conveyor to a dumpster. The dumpster will be provided overhead protection from weather while allowing truck access for hauling purposes.

Research was performed by PEC (Pedernales Electric Cooperative) to determine the history of power outages at this site. Based on their results, a back-up power generator will be provided for the plant and lift station in order to avoid a possible sewage spill.

Thank you for your assistance in this matter. You can contact us at the above letterhead address if you should need additional information, or have any questions in this regard.

Sincerely,

Frederick A. Jay, P.E.
FAJ/SDK/s

STATE OF TEXAS
FREDERICK A. JAY
41185
LICENSED
PROFESSIONAL ENGINEER

Pn: 116-022-20

ATTACHMENT G

TEXAS NATURAL RESOURCE CONSERVATION COMMISSION

Protecting Texas by Reducing and Preventing Pollution

November 28, 2000

Frederick A. Jay, P.E.
Jay Engineering Company, Inc.
PMB 503, 8650 Spicewood Springs Road, Suite 145
Austin, Texas 78759-4399

Re: CIty of Leander
Texas Natural Resource Conservation Commission Permit #12644-001
WWPR Log No. 1100/043
Williamson County

Dear Mr. Frederick:

We have received the design submittal included with your cover letter dated November 09, 2000.

The rules which regulate the design, installation and testing of domestic wastewater projects are found in 30 TAC, Chapter 317, of the TNRCC's rules titled, Design Criteria for Sewerage Systems.

Section 317.1(a)(4)(D), relating to case-by-case reviews, states in part that upon submittal of plans, specifications, and engineering reports (including commission-approved application forms) to the commission, the executive director may approve of the submitted materials without a technical review of the submitted materials.

Under the authority of §317.1(a)(4)(D) a technical review of the submitted materials was not performed. However, **the project proposed in the submittal is approved for construction. Please note, that this conditional approval does not relieve the applicant of any responsibilities to obtain all other necessary permits or authorizations, such as wastewater treatment permit or other authorization as required by Chapter 26 of the Texas Water Code.** Below are provisions of the Chapter 317 regulations, which must be met as a condition of approval. These items are provided as a reminder. If you have already met these requirements, please disregard this additional notice.

1. You must keep certain materials on file for the life of the project and provide them to TNRCC upon request. These materials include an engineering report, test results, a cover letter, and the final version of the project plans and specifications. These materials shall be prepared and sealed by a Professional Engineer licensed in the State of Texas and must show substantial compliance with Chapter 317. All plans and specifications must conform to any waste discharge requirements authorized in a permit by the TNRCC. Certain specific items which shall be addressed in the engineering report are discussed in §317.1(c). Additionally, the engineering report must include all constants, graphs, equations, and calculations needed to show substantial compliance with Chapter 317. The items which shall be included in the cover letter are addressed in §317.1(a)(3).

2. Any deviations from Chapter 317 shall be disclosed in the cover letter and the technical justifications for those deviations shall be provided in the engineering report. Any deviations from Chapter 317 shall be based on the best professional judgement of the licensed professional engineer sealing the materials and the engineer's judgement that the design would not result in a threat to public health or the environment.

3. Any variance from a Chapter 317 requirement disclosed in your cover letter is approved. If in the future, additional variances from the Chapter 317 requirements are desired for the project, each variance must be requested in writing by the design engineer. Then, the TNRCC will consider granting a written approval to the variance from the rules for the specific project and the specific circumstances.

4. Within 60 days of the completion of construction, an appointed engineer shall notify both the Wastewater Permits Section of the TNRCC and the appropriate Region Office of the date of completion. The engineer shall also provide written certification that all construction, materials, and equipment were substantially in accordance with the approved plans and specifications, the rules of the TNRCC, and any change orders filed with the TNRCC. All notifications, certifications, and change orders must include the signed and dated seal of a Professional Engineer licensed in the State of Texas.

This approval does not mean that future submittals will be approved without a technical review. The TNRCC will provide a notification of intent to review whenever a submittal is to undergo a review. Please be reminded of §317.1(a)(2) of the rules which states, "Approval given by the executive director...shall not relieve the sewerage system owner or the design engineer of any liabilities or responsibilities with respect to the proper design, construction, or authorized operation of the project in accordance with applicable commission rules."

If you have any questions or if we can be of any further assistance, please call me at (512) 239-4552.

Sincerely,

Louis C. Herrin

Louis C. Herrin, III, P.E.
Wastewater Permits Section

cc: TNRCC, Region 11 Office

ATTACHMENT H

JAY ENGINEERING COMPANY, INC.
P.O. Box 1220 ***(512) 259-3882***
Leander, TX 78646 ***Fax 259-8016***
Texas Registered Engineering Firm F-478

April 10, 2019

Texas Commission on Environmental Quality
Applications Review and Processing Team (MC148)
P.O. Box 13087
Austin, Texas 78711-3087

Re: Amendment to Authorization for Re-Use of Domestic Reclaimed Water
City of Leander
Re-Use Authorization Number R12644001
CN 600646012, RN101917722

Executive Director:

Enclosed are an original and one copy of the above-mentioned request for amendment to the existing City of Leander authorization. The request packages have been assembled in accordance with Chapter 210 of Title 30 of the Texas Administrative Code. These are submitted for your review and approval.

The request for authorization amendment for re-use of domestic reclaimed water expands approved uses from soil compaction and dust suppression during road construction to include: irrigation, construction water, dust control, water features, wetland enhancement, riparian habitat enhancement, chilling water, industrial and manufacturing uses. The authorization amendment also requests approval for Type I wastewater effluent in-lieu of the currently authorized Type II.

Presently there are no reclaimed water storage ponds nor any contracted users, so attachments to the application are limited to the required Core Data Form (TCEQ-10400), Service Area Map and the City of Leander Reclaimed Water System Operation and Maintenance Plan.

Let us know if you should have any questions in this regard.

Sincerely,

Frank T. Phelan

Frank T. Phelan, P.E.

FTP/s

Enclosures

PN: 116-044-20

TCEQ Office Use Only
Permit No:
CN:
RN:
Region:

Authorization for Re-Use of Domestic Reclaimed Water

This application is for the beneficial reuse of domestic reclaimed water in accordance with 30 Texas Administrative Code (TAC) Chapter 210, Subchapters A, B, C, and D.

REASON FOR APPLICATION:

Select the reason you are submitting this application:

- ☐ New authorization
- ☒ Amendment of reuse authorization number: R 12644001

SOURCE OF THE RECLAIMED WATER:

What is the permit number for the wastewater treatment plant where the reclaimed water is produced: WQ00 12644001

What is the expiration date of the wastewater permit? 12/1/2018

Section 1. Producer (Applicant)

a) What is the Customer Number (CN) issued to this entity? CN 600646012

b) What is the Legal Name of the entity (applicant) applying for this authorization? (The legal name must be spelled exactly as filed with the Texas Secretary of State, County, or in the legal document forming the entity.)

City of Leander

Section 2. Provider

Is the Provider the same as the Producer?

- ☒ Yes, go to Section 3)
- ☐ No, complete section below

a) What is the Customer Number (CN) issued to this entity? CN Click here to enter text.

b) What is the Legal Name of the entity (applicant) applying for this authorization? (The legal name must be spelled exactly as filed with the Texas Secretary of State, County, or in the legal document forming the entity.)

Click here to enter text.

Section 3. Application Contact

This is the person TCEQ will contact if additional information is needed about this application.

Prefix (Mr. Ms. or Miss): Mr.

First and Last Name: Frank T. Phelan Suffix: P.E.

Title: Senior Engineer Credentials: TX PE 93874

Phone Number: (512) 259-3882 ex. 308 Fax Number: (512) 259-8016

Email: fphelan@jaeco.net

Mailing Address: P.O. Box 1220

City, State, and Zip Code: Leander, TX 78646-1220

Section 4. Regulated Entity (RE) Information

For this section, provide the requested information for the wastewater treatment plant (WWTP) where the reclaimed water is produced.

a) What is the Regulated Entity Number (RN) issued to the WWTP? RN 101917722

b) What is the Site Name for the WWTP? City of Leander Wastewater Treatment Facility

Section 5. General Characteristics

a) Type of reclaimed water being used:

- ☒ Type I
- ☐ Type II
- ☐ Both

b) Identify additional treatment processes that may be needed to achieve the effluent quality.

Type I: None

Type II: None

c) Provide the following effluent limits in the WWTP discharge permit.

1. Flow, in million gallons per day:

   Current: 1.1 MGD

   Proposed, if applicable: 5.25 MGD

2. Oxygen Demand. Select the appropriate limit and provide the limit value.

   - ☐ BOD_5
   - ☒ $CBOD_5$

   Limit value, in milligrams per liter: 5 mg/l

3. Bacteria. Select the appropriate limit and provide the limit value.

   - ☒ *Escherichia coli*
   - ☐ *Enterococci*

   Limit value, in colony forming units per 100 milliliters: 126

Section 6. Storage Requirements

a) Is the reclaimed water stored in a fabricated tank that is leak proof certified?

- ☒ Yes, go to Section 7
- ☐ No, complete section below

b) Are any of the reclaimed water storage or usage sites located in the Edwards Aquifer Recharge Zone?

☐ Yes ☒ No

c) Are any of the reclaimed water usage sites located outside the Edwards Aquifer Recharge Zone, but within the DRASTIC Designated Areas having a pollution potential index figure of 110 or greater?

☒ Yes ☐ No

d) If you answered Yes to questions b) or c), complete the following questions.

1. Do pond construction materials meet 30 TAC §210.23(c)(1), (2), and (4)?

   ☐ Yes ☐ No ☒ NA

2. Do liners meet the requirements in 30 TAC §210.23(c)(3) or (5)?

   ☐ Yes ☐ No ☒ NA

3. Have the liners been certified according to 30 §TAC 210.23(c)(6)?

   ☐ Yes ☐ No ☒ NA

4. Do the soil embankment walls meet the requirements in 30 TAC §210.23(c)(7)?

   ☐ Yes ☐ No ☒ NA

5. If you answered No or NA to questions 1) - 4), provide an explanation.

   Reclaimed water will be stored in tanks

e) If you answered No to questions b) and c), complete the following questions.

1. Do pond construction materials meet 30 TAC §210.23(d)(1) and (2)?

   ☐ Yes ☐ No ☒ NA

2. Do liners meet the requirements in 30 TAC §210.23(d)(3) or (4)?

   ☐ Yes ☐ No ☒ NA

3. Have the liners been certified according to 30 §TAC 210.23(d)(5)?

   ☐ Yes ☐ No ☒ NA

4. Do the soil embankment walls meet the requirements in 30 TAC §210.23(d)(6)?

   ☐ Yes ☐ No ☒ NA

5. If you answered No or NA to questions 1) - 4), provide an explanation.

   Reclaimed water will be stored in tanks

Section 7. Reclaimed Water Uses

a) Describe all potential uses of the reclaimed water at the WWTP.

   Irrigation, construction water.

b) Describe all potential uses of the reclaimed water at other sites.

   Irrigation, construction water, dust control, water features, wetland enhancement, riparian habitat enhancement, chilling water, industrial, manufacturing.

Section 8. Reclaimed Water Users

a) Is the producer, provider, and user the same entity?

- ☒ Yes, go to Section 9
- ☐ No, attach a copy of the contract template and complete this section.

b) Does the contract have an operation and maintenance plan as required by 30 TAC 210.4(a)(4)?

- ☐ Yes, attach a copy of the operation and maintenance plan.
- ☐ No. Do not submit this form until an operation and maintenance plan has been developed.

c) For each user, provide the following information. If there are more than two users, complete Attachment A.

1. Name of the User:
2. What is the contact information for this User?

   Prefix (Mr. Ms. or Miss):

   First and Last Name: Suffix:

   Title: Credentials:

   Phone Number: Fax Number:

   Email:

   Mailing Address:

   City, State, and Zip Code:

3. Types of Uses (irrigation, dust suppression, cooling water, etc):
4. Is there a contract, legal agreement, or ordinance between this user and the provider?

   - ☐ Yes
   - ☐ No

   If no, please explain:

5. Is the reclaimed water being supplied to the user on a "demand only" basis as required by 30 TAC §210.7?

   - ☐ Yes
   - ☐ No

   If no, please explain:

---

1. Name of the User:
2. What is the contact information for this User?

   Prefix (Mr. Ms. or Miss):

First and Last Name: Click here to enter text. Suffix: Click here to enter text.

Title: Click here to enter text. Credentials: Click here to enter text.

Phone Number: Click here to enter text. Fax Number: Click here to enter text.

Email: Click here to enter text.

Mailing Address: Click here to enter text.

City, State, and Zip Code: Click here to enter text.

3. Types of Uses (irrigation, dust suppression, cooling water, etc): Click here to enter text.

4. Is there a contract, legal agreement, or ordinance between this user and the provider?

   ☐ Yes
   ☐ No

   If no, please explain: Click here to enter text.

5. Is the reclaimed water being supplied to the user on a "demand only" basis as required by 30 TAC §210.7?

   ☐ Yes
   ☐ No

   If no, please explain: Click here to enter text.

Section 9. Attachments

This application must include the following attachments:

a) A completed Core Data Form (TCEQ-10400);

b) A map of the service area for the reclaimed water;

c) A map showing the location of all reclaimed water storage ponds;

d) A copy of the user contracts, if the user is a different entity than the producer and provider; and

e) A copy of the operation and maintenance plan for each contract.

Section 10. Producer Certification

I understand that if there is a major change in the use of reclaimed water, the producer/provider must notify the TCEQ of the change at least 45 days before the planned implementation. Examples of major changes include:

- a change in the boundary of the approved service area;
- the addition of a new user;
- a change in the intended uses; and
- a change from Type I to Type II reclaimed water or vice versa.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

I further certify that I am authorized under 30 Texas Administrative Code §305.44 to sign and submit this document, and can provide documentation in proof of such authorization upon request.

Producer Signatory Name: KENT CAGLE

Producer Signatory Title: CITY MANAGER

Signature (use blue ink): Kent Cagle Date: 4/3/2019

Section 11. Provider Certification

If the provider is a different entity than the producer, the provider must complete this section.

I understand that if there is a major change in the use of reclaimed water, the producer/provider must notify the TCEQ of the change at least 45 days before the planned implementation. Examples of major changes include:

- a change in the boundary of the approved service area;
- the addition of a new user;
- a change in the intended uses; and
- a change from Type I to Type II reclaimed water or vice versa.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

I further certify that I am authorized under 30 Texas Administrative Code §305.44 to sign and submit this document, and can provide documentation in proof of such authorization upon request.

Provider Signatory Name: KENT CAGLE

Provider Signatory Title: CITY MANAGER

Signature (use blue ink): Kent Cagle Date: 4/3/2019

Attachment A
Additional Users

Use this page if there are more than two users. Make additional copies as needed.

1. Name of the User: Click here to enter text.
2. What is the contact information for this User?

   Prefix (Mr. Ms. or Miss): Click here to enter text.

   First and Last Name: Click here to enter text. Suffix: Click here to enter text.

   Title: Click here to enter text. Credentials: Click here to enter text.

   Phone Number: Click here to enter text. Fax Number: Click here to enter text.

   Email: Click here to enter text.

   Mailing Address: Click here to enter text.

   City, State, and Zip Code: Click here to enter text.
3. Types of Uses (irrigation, dust suppression, cooling water, etc): Click here to enter text.
4. Is there a contract, legal agreement, or ordinance between this user and the provider?

   ☐ Yes
   ☐ No
   If no, please explain: Click here to enter text.
5. Is the reclaimed water being supplied to the user on a "demand only" basis as required by 30 TAC §210.7?

   ☐ Yes
   ☐ No
   If no, please explain: Click here to enter text.

N/A

ATTACHMENT A

CORE DATA FORM

TCEQ

TCEQ Use Only

TCEQ Core Data Form

For detailed instructions regarding completion of this form, please read the Core Data Form Instructions or call 512-239-5175.

SECTION I: General Information

1. Reason for Submission *(If other is checked please describe in space provided.)*

☐ New Permit, Registration or Authorization *(Core Data Form should be submitted with the program application.)*

☐ Renewal *(Core Data Form should be submitted with the renewal form)* ☒ Other **Authorization Amendment**

2. Customer Reference Number *(if issued)*	Follow this link to search for CN or RN numbers in Central Registry**	**3. Regulated Entity Reference Number *(if issued)***
CN 600646012		RN 101917722

SECTION II: Customer Information

4. General Customer Information | **5. Effective Date for Customer Information Updates** (mm/dd/yyyy)

☐ New Customer ☐ Update to Customer Information ☐ Change in Regulated Entity Ownership

☐ Change in Legal Name (Verifiable with the Texas Secretary of State or Texas Comptroller of Public Accounts)

The Customer Name submitted here may be updated automatically based on what is current and active with the Texas Secretary of State (SOS) or Texas Comptroller of Public Accounts (CPA).

6. Customer Legal Name *(If an individual, print last name first: eg: Doe, John)*	*If new Customer, enter previous Customer below:*
City of Leander	

7. TX SOS/CPA Filing Number	**8. TX State Tax ID** (11 digits)	**9. Federal Tax ID** (9 digits)	**10. DUNS Number** *(if applicable)*
	30006111881		

11. Type of Customer: ☐ Corporation ☐ Individual Partnership: ☐ General ☐ Limited

Government: ☒ City ☐ County ☐ Federal ☐ State ☐ Other ☐ Sole Proprietorship ☐ Other:

12. Number of Employees
☐ 0-20 ☐ 21-100 ☐ 101-250 ☒ 251-500 ☐ 501 and higher

13. Independently Owned and Operated?
☐ **Yes** ☐ **No**

14. Customer Role (Proposed or Actual) – *as it relates to the Regulated Entity listed on this form. Please check one of the following:*

☐ Owner ☐ Operator ☒ Owner & Operator
☐ Occupational Licensee ☐ Responsible Party ☐ Voluntary Cleanup Applicant ☐ Other:

15. Mailing Address:							
	P.O. Box 319						
City	Leander	**State**	TX	**ZIP**	78646	**ZIP + 4**	0319

16. Country Mailing Information *(if outside USA)*	**17. E-Mail Address** *(if applicable)*
	dcrabtree@leandertx.gov

18. Telephone Number	**19. Extension or Code**	**20. Fax Number** *(if applicable)*
(512) 528-2743		(512) 259-1605

SECTION III: Regulated Entity Information

21. General Regulated Entity Information *(If 'New Regulated Entity" is selected below this form should be accompanied by a permit application)*

☐ New Regulated Entity ☐ Update to Regulated Entity Name ☐ Update to Regulated Entity Information

The Regulated Entity Name submitted may be updated in order to meet TCEQ Agency Data Standards (removal of organizational endings such as Inc, LP, or LLC.)

22. Regulated Entity Name *(Enter name of the site where the regulated action is taking place.)*

City of Leander Wastewater Treatment Facility

23. Street Address of the Regulated Entity: *(No PO Boxes)*	10201 Ranch Road 2243							
	City	Leander	State	TX	ZIP	78641	ZIP + 4	1524
24. County	Williamson							

Enter Physical Location Description if no street address is provided.

25. Description to Physical Location:	Facility is located approximately 2,300 west of the intersection of US183A and Ranch Road 2243

26. Nearest City	State	Nearest ZIP Code
Leander	TX	78641

27. Latitude (N) In Decimal:			28. Longitude (W) In Decimal:		
Degrees	Minutes	Seconds	Degrees	Minutes	Seconds
30	34	52.97	-97	50	25.17

29. Primary SIC Code (4 digits)	30. Secondary SIC Code (4 digits)	31. Primary NAICS Code (5 or 6 digits)	32. Secondary NAICS Code (5 or 6 digits)
4950	4952	221320	221320

33. What is the Primary Business of this entity? *(Do not repeat the SIC or NAICS description.)*

34. Mailing Address:	P.O. Box 319							
	City	Leander	State	TX	ZIP	78646	ZIP + 4	319
35. E-Mail Address:	dcrabtree@leandertx.gov							

36. Telephone Number	37. Extension or Code	38. Fax Number *(if applicable)*
(512) 528-2743		(512) 259-1605

39. TCEQ Programs and ID Numbers Check all Programs and write in the permits/registration numbers that will be affected by the updates submitted on this form. See the Core Data Form instructions for additional guidance.

☐ Dam Safety	☐ Districts	☐ Edwards Aquifer	☐ Emissions Inventory Air	☐ Industrial Hazardous Waste
☐ Municipal Solid Waste	☐ New Source Review Air	☐ OSSF	☐ Petroleum Storage Tank	☐ PWS
☐ Sludge	☐ Storm Water	☐ Title V Air	☐ Tires	☐ Used Oil
☐ Voluntary Cleanup	☒ Waste Water	☐ Wastewater Agriculture	☐ Water Rights	☐ Other:

SECTION IV: Preparer Information

40. Name:	Frank T. Phelan, P.E.		41. Title:	Senior Engineer
42. Telephone Number	43. Ext./Code	44. Fax Number	45. E-Mail Address	
(512) 259-3882	308	(512) 259-8016	fphelan@jaeco.net	

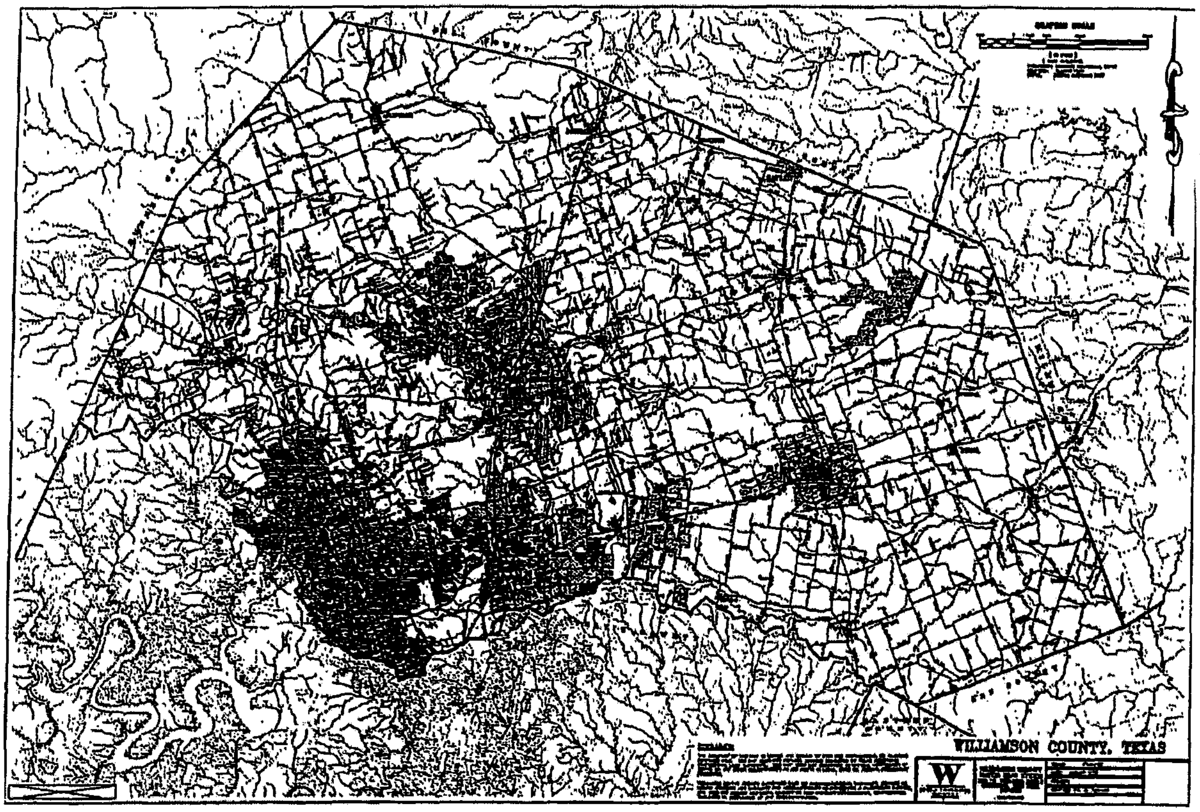
SECTION V: Authorized Signature

46. By my signature below, I certify, to the best of my knowledge, that the information provided in this form is true and complete, and that I have signature authority to submit this form on behalf of the entity specified in Section II, Field 6 and/or as required for the updates to the ID numbers identified in field 39.

Company:	Jay Engineering Company, Inc.	Job Title:	Senior Engineer
Name*(In Print)*:	Frank T. Phelan	Phone:	(512) 259-3882
Signature:	Frank T. Phelan	Date:	4/3/2019

ATTACHMENT B

SERVICE AREA MAP



ATTACHMENT C

OPERATION AND MAINTENANCE PLAN

CITY OF LEANDER, TEXAS

Reclaimed Water System
Operation and Maintenance Plan

In order to provide beneficial use of reclaimed water within the City of Leander (the "City"), the City is initiating permitting that will allow reclaimed water to be used for irrigation, construction water, dust control, water features, wetland enhancement, riparian habitat enhancement, chilling water, industrial and manufacturing activities. The utilization of reclaimed water for the listed items will provide a beneficial use of the reclaimed water.

In accordance with Section 210.4.(a) of 30 TAC, the City adopted this Operation and Maintenance Plan for the City's reclaimed water system. The plan includes policies and procedures for labeling and separation of facilities, security, system monitoring, risk management, maintenance, staff training and contingencies. These procedures will ensure there shall be no nuisance conditions resulting from the distribution, the use, or the storage of reclaimed water. Further, reclaimed water will not be utilized in a way that degrades ground water quality to a degree adversely affecting its actual or potential uses.

Table of Contents

01. Labeling and Separation Plan

To prevent misuse, cross-connection, inadvertent contact with or spilling of reclaimed water the following labeling and separation plan procedures must be followed.

a. Labeling Plan

1. All reclaimed water system pipelines, hose bibs, valves, irrigation heads, amenities and appurtenances must labeled with the following methods:

A). Pipelines must be labeled with one of the following methods:

(1) All exposed piping and piping within a building shall be either purple pipe or painted purple.

(2) All buried piping shall be one of the following: manufactured in purple, painted purple, taped with purple metallic tape, or bagged in a purple plastic liner.

(3) All exposed piping should be stenciled in white with a warning reading "NON-POTABLE WATER."

B). Hose Bibs must be painted purple and be labeled with signs having a minimum size of eight inches by eight inches, as shown in Figure 1.0, shall be posted at all storage areas and on all hose bibs and faucets reading, in both English and Spanish, "Reclaimed Water, Do Not Drink" or similar warning.

Figure 1.0

DO NOT DRINK THE WATER

NO TOMAR EL AGUA

All hose bibs and faucets shall be painted purple and shall be designed to prevent connection to a standard water hose. Hose bibs shall be located in locked, below grade vaults which shall be clearly labeled as being of non-potable quality. As an alternative to the use of locked, below grade vaults with standard hose bibs, hose bibs may be placed in a non-lockable service boxes which can only be operated by a special tool. The hose bib must also be clearly labeled as non-potable water accordance with this section.

C). Valves must be in valve boxes with purple valve covers.

D). All areas to be irrigated with reclaimed water or amenities utilizing reclaimed water must be posted with signs that say "Non-potable water" or "Irrigated with non-potable water" in both English and Spanish. The signs must be posted at the perimeter of the irrigated or use area. Sign intervals must be such that signs are visible from each other.

b. Separation Plan

1. Water line/new reclaimed water line separation. When new reclaimed water lines are installed, they shall be installed no closer to waterlines than nine feet in all directions. The nine-foot separation is to be measured between the outside diameters of the pipes. Reclaimed water lines that parallel waterlines must be installed in separate trenches. Where the nine-foot separation distance cannot be achieved, the following guidelines will apply:

A). Where a reclaimed water line parallels a waterline, the reclaimed water line shall be constructed of cast iron, ductile iron or PVC meeting ASTM specifications with a pressure rating for both the pipe and joints of 150 psi. The vertical separation shall be a minimum of two feet between outside diameters and the horizontal separation shall be a minimum of four feet between outside diameters. The vertical and horizontal separation distances are to be measured between the outside diameters of the pipes. The sewer shall be located below the waterline.

2. Where a reclaimed water line crosses a waterline and the reclaimed water line is constructed of cast iron, ductile iron or PVC

with a minimum pressure rating of 150 psi, an absolute minimum distance of 6 inches between outside diameters shall be maintained. In addition, the reclaimed water line shall be located below the waterline where possible and one length of the reclaimed water line pipe must be centered on the waterline.

3. Where a reclaimed water line crosses over a waterline all portions of the reclaimed water line within nine feet of the waterline shall be constructed of cast iron, ductile iron, or PVC pipe with a pressure rating of at least 150 psi using appropriate adapters. In lieu of this procedure, the new conveyance may be encased in a joint of 150 psi pressure class pipe at least 18 feet long and two nominal sizes larger than the new conveyance. The space around the carrier pipe shall be supported at 5 feet intervals with spacers or be filled to the springline with washed sand. The encasement pipe should be centered on the crossing and both ends sealed with cement grout or manufactured seal.

4. Where a reclaimed water line parallels a sewer line the horizontal separation distance shall be three feet (outside pipe diameter to outside pipe diameter) with the reclaimed water line at the level of or above the sewer line. Reclaimed water lines which parallel sewer lines may be placed in the same benched trench. Where a reclaimed water line crosses a sewer line, the requirements of Sections 01.b.3 and 01.b.4 of this title (relating to Location of Water Lines) shall be followed, with "reclaimed water line" substituted in Sections 01.b.3 and 01.b.4 of this title (relating to Location of Water Lines) for "water line."

02. Security Measures:

a. Secured Facilities: All facilities utilized for reclaimed applications must be effectively secured. All sites must be secured with fencing that meets or exceeds the requirements of 30 TAC Chapter 217.

1. Plant protection. All plant areas shall be completely fenced and have lockable gates at all access points. Fencing will be six-foot chain link fence with a minimum single apron barbed wire outrigger with three strands of barb wire. Hazard signs stating "Danger - No Trespassing" must be secured to the fence, within visible sighting of each other, as well as on all gates. Plants shall have at least one all-weather access road with the driving surface situated above the 100-year floodplain or be provided by an alternate method of access approved by the commission.

2. All plants, and hazardous areas in particular, shall be posted in accordance with the Hazardous Communication Act.

3. All pressurization, storage equipment will be monitored via a Supervisory Control and Data Acquisition (SCADA) or autodialer system. The SCADA or autodailer system will monitor each remote facility via a radio telemetry system or phone/cell service. The radio telemetry/autodialer information will be transmitted to a central control system capable of paging operations staff or page operations staff directly.

4. Hose bibs shall be located in locked, below grade vaults which shall be clearly labeled as being of non-potable quality. As an alternative to the use of locked, below grade vaults with standard hose bibs services, hose bibs may be placed in a non-lockable

service box which can only be operated by a special tool so long as the hose bib is clearly labeled as non-potable water in accordance with this manual.

5. For any area where reclaimed water is stored or where there exist hose bibs or faucets: (1) Signs having a minimum size of eight inches by eight inches, as shown in Figure 1.0, shall be posted at all storage areas and on all hose bibs and faucets reading, in both English and Spanish, "Reclaimed Water, Do Not Drink" or similar warning.

03. Monitoring Water Use and Quality

a. Water Balance Measures:

1. Master meters and sub meters will be used to monitor reclaimed water transfer and use. A master meter will be in-line at the pumping and storage facilities located at the water reclamation plant. The master meter will measure all reclaimed water pumped to users or the distribution system.

2. Sub meters will be located by the Users at all amenities and at selected sites within the distribution system to enable performance of water balance calculations to monitor system integrity.

3. System flows at the master meter may also be monitored by the SCADA system controller to provide instantaneous monitoring of flows and totalized flows within the reclaimed system. Alarm set points will be programmed into the SCADA (if used) to control software to alert the operations staff in the event of unusually high or unbalanced flow conditions.

b. Monthly inspections of the City's system and the User's system will be conducted to confirm compliance with TCEQ Rules and Regulations and the City's Policies and Procedures. Reports will be made by the City's operations staff to the City Council regarding compliance status of the system.

c. The City shall maintain the following records on site for a period of five years:

1. Copies of notifications made to the commission concerning reclaimed water projects

2. Reclaimed water quality analytical results and reports for monitoring parameters

d. The City shall report to the commission on a monthly basis the following information on forms furnished by the executive director. Such reports are due to the commission by the 20th day of the month following the reporting period.

1. Volume of reclaimed water used

2. Quality of reclaimed water, reported as a monthly average for each quality criteria except those listed as "not to exceed" which shall be reported as individual analyses

e. Irrigation Management

1. The User shall provide reasonable control of the application rates for reclaimed water applied to irrigation areas. These controls shall encourage the efficient use of reclaimed water and avoid

excessive application of reclaimed water that results in surface runoff or excessive percolation below the root zone.

2. The User operations staff shall determine and document typical irrigation demands for the proposed use based on type of vegetation and land area to be irrigated. The method for determining irrigation needs is shown in Figure 1 of this section.

FIGURE 1:

TABLE 1
WATER BALANCE EXAMPLE
(All Units are Inches of Water per Acre of Irrigated Area)

Month (1)	a Average Precipi-tation (2)	b Average Runoff (3)	Ri Average Infil-trated Rainfall (4)	c Evapo-transpi-ration (5)	d Required Leaching (6)	Total Water Needs (5)+(6) (7)	Effluent Needed in Root Zone (7)-(4) (8)	e Evapo-ration from Reservoir Surface (9)	f Effluent to be Applied to Land (8)/K (10)	g Consumption from Reservoir (9)+(10) (11)
Jan.	2.11	0.40	1.71	0.80	0.00	0.80	0.00	0.02	0.00	0.02
Feb.	2.43	0.57	1.86	1.20	0.00	1.20	0.00	0.01	0.00	0.01
Mar.	2.02	0.36	1.66	2.80	0.20	3.00	1.34	0.09	1.58	1.67
Apr.	3.19	1.03	2.16	3.40	0.22	3.62	1.46	0.05	1.72	1.77
May	4.19	1.74	2.45	6.10	0.64	6.74	4.29	0.10	5.05	5.15
June	3.30	1.10	2.20	6.50	0.76	7.26	5.06	0.20	5.95	6.15
July	2.20	0.45	1.75	6.70	0.87	7.57	5.82	0.34	6.85	7.19
Aug.	2.12	0.41	1.71	4.60	0.51	5.11	3.40	0.34	4.00	4.34
Sept.	3.58	1.30	2.28	5.10	0.50	5.60	3.32	0.19	3.91	4.10
Oct.	3.09	0.96	2.13	4.10	0.35	4.45	2.32	0.14	2.73	2.87
Nov.	2.23	0.46	1.77	2.10	0.06	2.16	0.39	0.07	0.46	0.53
Dec.	2.34	0.52	1.82	1.00	0.00	1.00	0.00	0.03	0.00	0.03

32.80	9.30	23.50	44.40	4.11	48.51	27.40	1.58	32.25	33.83

Table 1

Footnotes

a. Up-to date rainfall and evaporation data sets are available from the Texas Natural Resources Information System.

b. Runoff should be determined by an acceptable method such as the Soil Conservation Service method found in SCS Technical Releases No. 55. For calculation purposes only, a CN value of 74 was assumed for good pasture with Class "C" soils.

c. Suggested source of values is the "Bulletin 6019, Consumptive Use of Water by Major Crops in Texas", Texas Board of Water Engineers.

d. In low rainfall areas, this is the required leaching to avoid salinity build-up in the soil where:

$$L = \frac{Ce}{C1-Ce}(E - Ri)$$

Ri = Infiltrated rainfall

Ce = Electrical conductivity of effluent

C1 = Maximum Allowable Conductivity of Soil Solution (Table 3)

E = Evapotranspiration

For calculation purposes only, Ce is measured to be 1.5 milliohms/cm @ 25° and C1 is 10.0 (Bermuda Grass)

e. Net evaporation from reservoir surface. For the purpose of calculation, an assumption must be made as to the ratio of irrigated land area to reservoir surface area. For this example problem, the necessary reservoir area was assumed to be 17% of the irrigated area. If, after all calculations are made, the reservoir dimensions do not seem reasonable, then a new assumption must be made and the calculations repeated. Values in column (9) are adjusted to be inches per irrigated acre.

f. K is the irrigation efficiency which for this example is taken to be 0.85.

g. The total of this column together with the expected annual volume of effluent will determine the acreage of irrigated land required.

3. The User is responsible for ensuring that reclaimed water overflow, crop stress, and undesirable soil contamination by salt does not occur. To prevent such occurrences, the User's operations staff are required to consider, evaluate, and respond appropriately to the following factors as the need arises:

A). Precipitation inputs to the water balance should utilize the average monthly precipitation based on past rainfall records.

B). The consumptive use requirements (evapotranspiration losses) of the crop system should be developed on a monthly basis. The method of determining the consumptive use requirement shall be documented by the User operations staff as a part of the water balance study and the records of the study maintained for possible commission review.

C). A leaching requirement, calculated as shown in Table 1 of this section, shall be included in the water balance study when the total dissolved solids concentration of the reclaimed water presents the potential for developing excessive soil salinity buildup due to the long term operation of the irrigation system.

D). The irrigation site must be maintained with a vegetative cover or be under cultivation during times when reclaimed water is being applied.

E). The irrigation practices shall be designed so as to prevent incidental ponding or standing water.

F). Irrigation application rates and application times shall be developed so as to minimize "wet grass" conditions in unrestricted landscaped areas during the periods the area could be in use.

G). Irrigation systems shall be designed so that the irrigation spray does not reach any privately-owned premises outside the designated irrigation area or reach public drinking fountains.

H). There shall be no application of effluent when the ground is water-saturated or frozen.

I). Distribution systems must be designed to prevent operation by unauthorized personnel.

J). Irrigation operations shall be managed in a manner to minimize the inadvertent contact of reclaimed water with humans.

K). Operational or tailwater controls shall be provided to preclude discharge of reclaimed water from irrigation sites.

04. Human Exposure Risk Management

a. City policies and system design constraints will be implemented by the User to minimize the potential for human exposure via the following provisions:

1. All irrigation areas utilizing reclaimed water will have restricted access via controlled access through locked gates and fences. The restricted access will prohibit access by the public to the irrigated areas during irrigation events.

2. All pumping and control facilities will be secured as required in the Secure Measures section of this manual. Access to these facilities will be limited to User operations staff that has been trained in the operation and maintenance of the facilities.

3. Although all design elements for the reclaimed water system, including the irrigation system minimize the potential for human contact, some

potential still exists. The User's system will be designed to utilize Type 1 reclaimed water.

The minimum water quality standards for Type 1 reclaimed water are show below in Table 2.0

Table 2.0

Parameter	Upper Limit
$CBOD_5$	5 mg/l
Tubidity	3 NTU
Fecal Coliform	20 CFU/100 ml*
Fecal Coliform	75 CFU/100 ml**
Enterococci	4 CFU/100ml*
Fecal Coliform	9 CFU/100 ml**

* geometric mean
** maximum single grab sample

The City shall sample the reclaimed water prior to distribution to assure that the water quality is in accordance with the intended use. Analytical methods shall be in accordance with those specified in Chapter 319 of 30 TAC. The minimum sampling and analysis frequency for reclaimed water for the applicable parameters is twice per week for Type 1 Reclaimed Water Uses.

05. Routine Maintenance

a. City operations staff will be responsible for the routine maintenance of the facilities. Routine maintenance will consist of the minimum following procedures:

1. System Monitoring:

A). Daily inspections of any City storage and pumping facilities will be performed by operations staff. Daily logs will be made of pump run times, water quality monitoring data and pumped water volumes. This data will be reviewed and retained by the City.

Security provisions will also be checked to ensure site control integrity is maintained.

B). The City's operation staff will perform weekly inspections of any City amenities and irrigation system. These inspections will check that all amenities and irrigation systems are functioning correctly and that notification signs are in proper condition.

C). All equipment will be maintained under a preventative maintenance program that includes:

(1) Lubrication of all required fittings, valves, bearings

(a) All required lubrications will be performed in accordance with manufacturer recommendations for each piece of equipment. Lubrication oils and greases will be in accordance with manufacturer recommendations. Lubrication intervals will be in accordance with manufacturer recommendations.

(2) Inspection of controls

(a) All control panels will be checked on an annual basis for loose wiring or faulty equipment.

(3) Calibration of meters and monitors

(a) All water meters will be calibrated on an annual basis or as required. Certifications of meter calibrations will be retained in City records.

(b) All water quality monitoring equipment will be calibrated in accordance with manufacturer recommendations.

(4) Logs will be kept of all preventative maintenance activities.

06. Employee Training

a. All City employees operating the reclaimed water system will be under the supervision of a wastewater operator licensed by the Texas Commission on Environmental Quality. Operation staff will attend continuing education classes as required to maintain proper licensure status.

b. All City employees will attend an annual training seminar that will include a review of the TCEQ 210 Rules and Regulations, wholesale water contracts (as required), and City Policies and Procedures.

07. Contingency Plan

The contingency plan will include steps for prevention and mitigation of system failures, unauthorized discharges and system upsets. The following elements are included in the contingency plan:

a. The contingency plan will include policies for notification of the TCEQ and City Officers in the event of a system failure, bypass or upset that results in a non-compliant condition. The City currently employs a 24-hour monitoring service and has around the clock on-call operations staff to respond to any emergency.

In the event of system failure, bypass or upset that results in a non-compliant condition, City operations staff will notify the TCEQ as per TCEQ rules and regulations and City management. Crews will be dispatched as required to mitigate any failure, bypass or upset.

A written submission of such information shall also be provided to the TCEQ regional office and to the Austin Office, Water Enforcement Section (MC-149), within five (5) working days of becoming aware of the non-compliant condition. The written submission shall contain a description of any non-compliance and its cause; the potential danger to human health or safety, or the environment; the period of noncompliance, including exact dates and times; if the non-compliance has not been corrected, the anticipated time it is expected to continue; and, steps taken or planned to reduce, eliminate, and prevent recurrence of the noncompliance, and to mitigate its adverse effects.

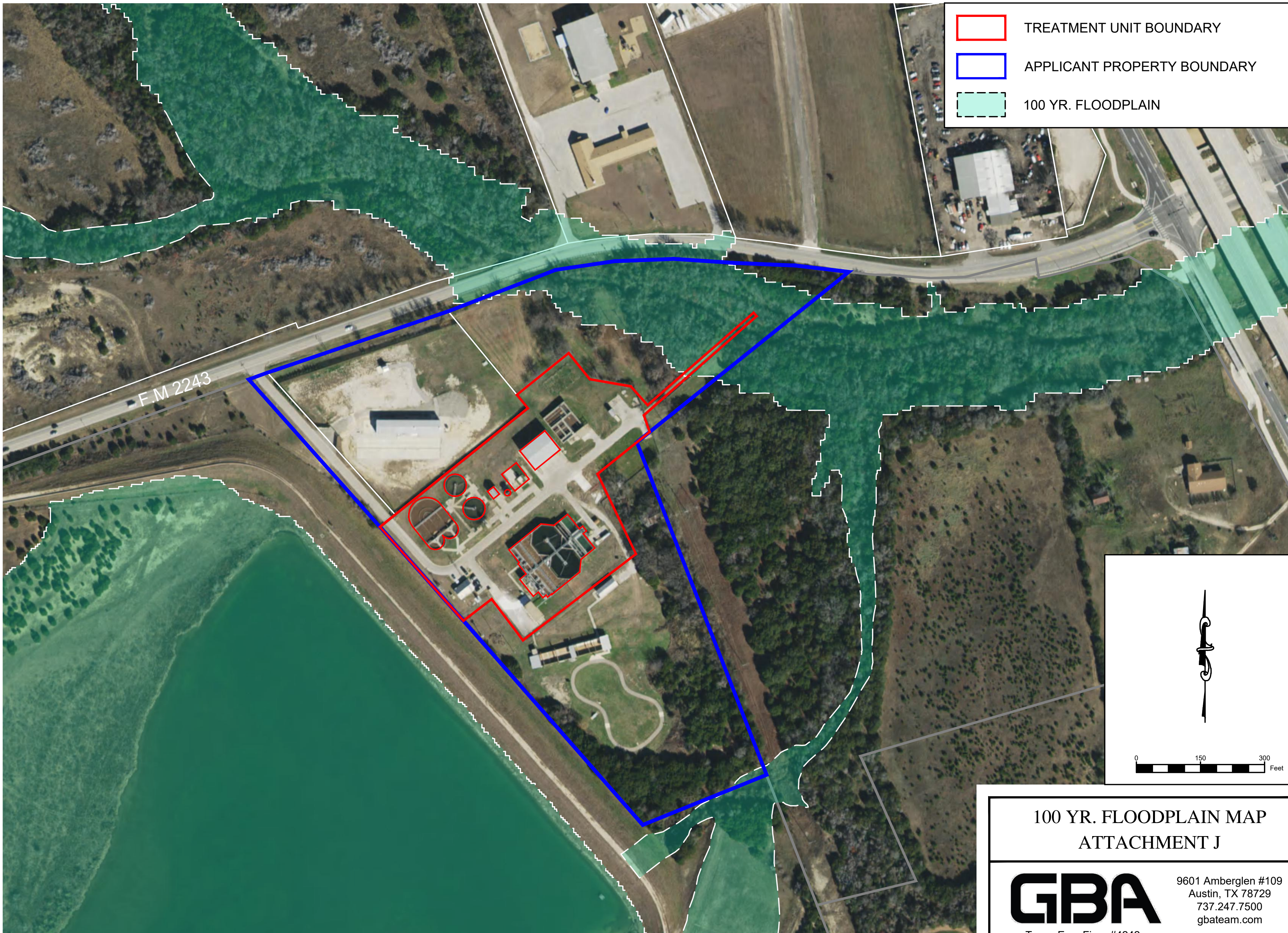
b. The City will also maintain an inventory of spare parts, pipe and signage for emergency situations. The City operations group currently has equipment capable of maintaining the system facilities and performing emergency repairs.

ATTACHMENT I

Attachment I

The City of Leander's CCN area (20626) includes a portion that overlaps with another utility's CCN area, specifically Cedar Park (CCN 20580). However, this shared service area is already fully developed and will not require any new connecting facilities or plant expansion.

ATTACHMENT J



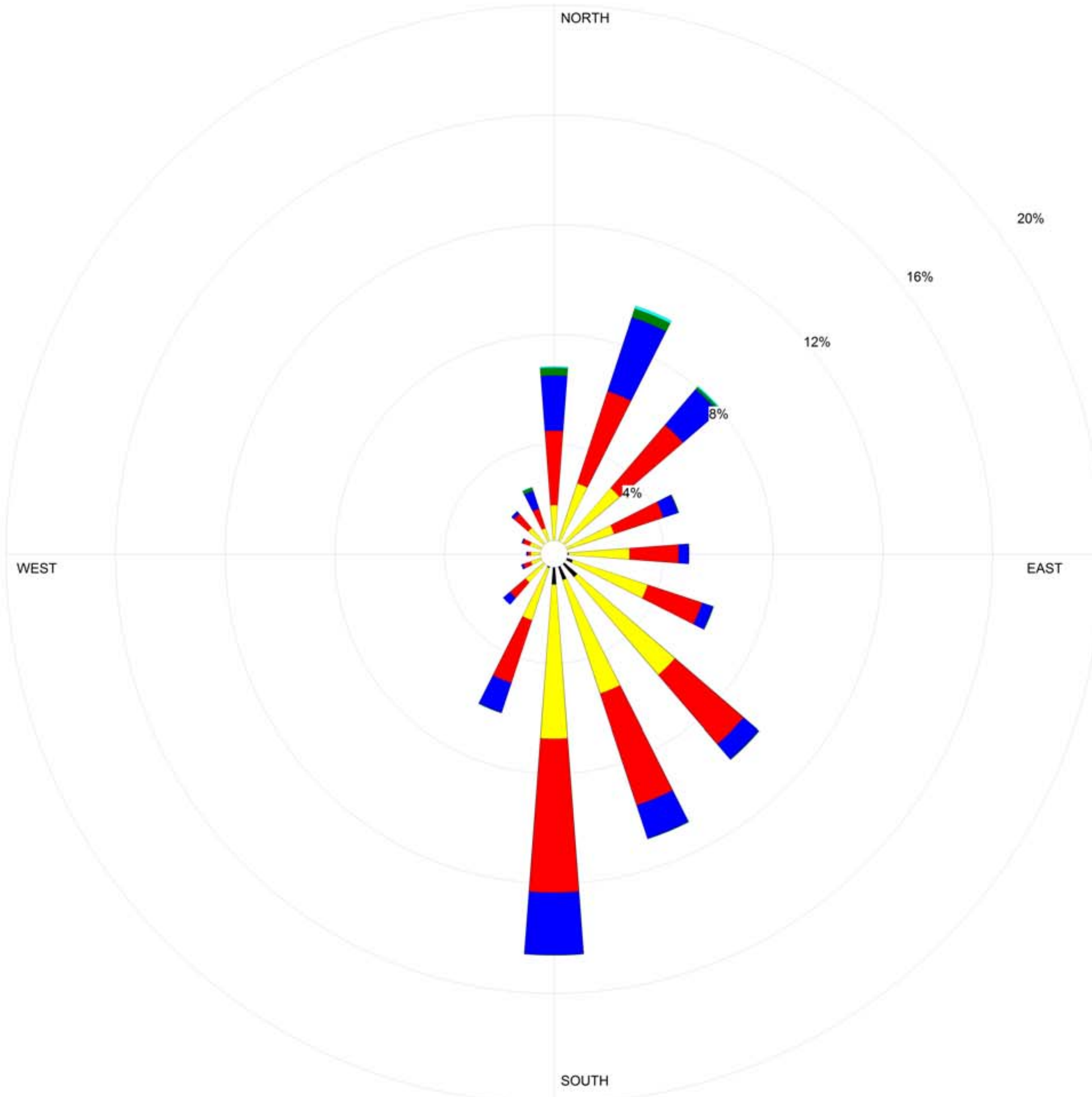
100 YR. FLOODPLAIN MAP
ATTACHMENT J

GBA
Texas Eng. Firm #4242
9601 Amberglen #109
Austin, TX 78729
737.247.7500
gbateam.com

ATTACHMENT K

WIND ROSE PLOT

Station #13958 - AUSTIN/MUNICIPAL ARPT, TX



Wind Speed (m/s)	MODELER	DATE	COMPANY NAME
> 11.06	**Sara West**	**8/29/2002**	**USDA-ARS**
8.49 - 11.06	DISPLAY **Wind Speed**	UNIT **m/s**	COMMENTS
5.40 - 8.49	AVG. WIND SPEED **3.83 m/s**	CALM WINDS **7.55%**	
3.34 - 5.40	ORIENTATION **Direction (blowing from)**	PLOT YEAR-DATE-TIME **1961 Sep 1 - Sep 30 Midnight - 11 PM**	
1.80 - 3.34			
0.51 - 1.80			

WRPLOT View 3.5 by Lakes Environmental Software - www.lakes-environmental.com

ATTACHMENT L

Sludge Management Plan

Owner:	**RM 2243 WWTP**	
Plant Phase:	**All Phases**	
Plant Capacity:	**5,250,000**	**gpd (total)**

Design Parameters

Sludge Retention Time =	40	days
Sludge Holding Length =	105	ft
Sludge Holding Width	55	ft
Sidewater Depth =	22	ft
Number of Basins =	2	
Overall Digester Volume =	253,913	cu ft
MLSS =	5,600	mg/l
WAS =	6,988	lb/day

Plant Influent BOD5 Loading =	9,195	lb/day
Plant Influent TSS Loading =	9,195	lb/day
Sludge Production =	0.65	lb sludge/lb BOD5
Sludge Production =	0.30	lb sludge/lb TSS
Waste Sludge =	8,735	lb/day
Volitile Fraction =	0.80	est.
Volitile Solids =	6,988	lb/day
Volitile Solids Reduction =	0.40	
Volitile Solids Reduced =	2,795	lb/day
Digested Sludge =	5,940	lb/day

CBOD5 Removal

Influent Concentration =	210	mg/l
Effluent Concentration =	5	mg/l
Net Removal =	205	mg/l

Solids Generation

	100% Flow	75% Flow	50% Flow	25% Flow
Pounds of Dry Sludge Produced =	5,940	4,455	2,970	1,485
Pounds of Wet Sludge Produced =	395,998	296,999	197,999	99,000
Volume of Wet Sludge Produced (gpd) =	47,482	35,611	23,741	11,870

Assumes:

Percent Solids = 1.50%

Removal Schedule

	100% Flow	75% Flow	50% Flow	25% Flow
Days Between Removal =	40	53	80	160

Sludge will be removed as liquid sludge when digester becomes full of thickened solids. Sludge will be pressed on-site using a screw press and then the cake hauled to a licensed facility for disposal.

ATTACHMENT M

ENVIRONMENTAL MONITORING LABORATORY, L.L.C.

BIOLOGICAL & CHEMICAL ANALYSIS / UTILITIES MANAGEMENT & OPERATION / WATERWELL DRILLING & SERVICE / GEOLOGICAL INVESTIGATION

T104704247-22-23

ENVIRONMENTAL SCIENTIST
President
C.C. "Chuck" Blair, M.S. P.G. - B/B

July 16, 2024

City of Leander
ATTN: Kenley Crowder
PO BOX 319
Leander TX 78641-0319

Re: City of Leander – Table – 870-28030-1

Dear Client:

EML collected samples on 06/25/24 and submitted them for analysis on 06/25/24. The following is the result of the analytical procedures performed on this sample and listed on the following pages that include QA/QC information, chain of custody form, and other lab identification information.

Respectfully Submitted,
Environmental Monitoring Laboratory

Lisa Soward

Lisa Soward B.A
Data Manager

Home Office: P. O. BOX 477 Hillsboro, TX 76645 Office: (254) 582-2622 Fax: (254) 582-0380 Email: homeoffice@yourwaterlab.com
Panhandle Division: 13260 South US Highway 287 Amarillo, TX 79114 Office: (806) 335-9393
Southwest Division: 811 E Young Street, Llano, TX 78643 Office: (325) 247-3295
East Texas Division: 14295 S.H. 155 North, Winona, TX 75792 Office: (903) 877-9222
Coastal Division: 34 East Avenue, Schulenburg, TX 78956 Office: (979) 743-7010

eurofins Environment Testing

ANALYTICAL REPORT

PREPARED FOR

Attn: Serissa Beck
Environmental Monitoring Laboratory, LLC
6145 State Highway 171
PO BOX 477
Hillsboro, Texas 76645

Generated 7/16/2024 3:44:11 PM

JOB DESCRIPTION

City of Leander

JOB NUMBER

870-28030-1

Eurofins Dallas
9701 Harry Hines Blvd
Dallas TX 75220

See page two for job notes and contact information.

myEOL

Eurofins Dallas

Job Notes

This report may not be reproduced except in full, and with written approval from the laboratory. The results relate only to the samples tested. For questions please contact the Project Manager at the e-mail address or telephone number listed on this page.

Analytical test results meet all requirements of the associated regulatory program (i.e., NELAC (TNI), DoD, and ISO 17025) unless otherwise noted under the individual analysis.

Authorization

Generated
7/16/2024 3:44:11 PM

Authorized for release by
Anita Patel, Project Manager
Anita.Patel@et.eurofinsus.com
(832)776-2275

Table of Contents

Qualifiers

GC/MS VOA

Qualifier	Qualifier Description
*+	LCS and/or LCSD is outside acceptance limits, high biased.
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.
U	Indicates the analyte was analyzed for but not detected.

GC/MS Semi VOA

Qualifier	Qualifier Description
*+	LCS and/or LCSD is outside acceptance limits, high biased.
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.
U	Indicates the analyte was analyzed for but not detected.

GC/MS Semi VOA TICs

Qualifier	Qualifier Description
U	Indicates the analyte was analyzed for but not detected.

GC Semi VOA

Qualifier	Qualifier Description
*+	LCS and/or LCSD is outside acceptance limits, high biased.
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.
S1+	Surrogate recovery exceeds control limits, high biased.
U	Indicates the analyte was analyzed for but not detected.

HPLC/IC

Qualifier	Qualifier Description
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.
U	Indicates the analyte was analyzed for but not detected.

LCMS

Qualifier	Qualifier Description
U	Indicates the analyte was analyzed for but not detected.

Metals

Qualifier	Qualifier Description
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.
U	Indicates the analyte was analyzed for but not detected.

General Chemistry

Qualifier	Qualifier Description
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.
U	Indicates the analyte was analyzed for but not detected.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)

Glossary (Continued)

Abbreviation	These commonly used abbreviations may or may not be present in this report.
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

Job ID: 870-28030-1 Eurofins Dallas

Job Narrative
870-28030-1

Analytical test results meet all requirements of the associated regulatory program listed on the Accreditation/Certification Summary Page unless otherwise noted under the individual analysis. Data qualifiers are applied to indicate exceptions. Noncompliant quality control (QC) is further explained in narrative comments.

- Matrix QC may not be reported if insufficient sample or site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD may be performed, unless otherwise specified in the method.
- Surrogate and/or isotope dilution analyte recoveries (if applicable) which are outside of the QC window are confirmed unless attributed to a dilution or otherwise noted in the narrative.

Regulated compliance samples (e.g. SDWA, NPDES) must comply with the associated agency requirements/permits.

Receipt
The samples were received on 6/25/2024 1:31 PM. Unless otherwise noted below, the samples arrived in good condition, and, where required, properly preserved and on ice. The temperature of the cooler at receipt time was 26.9°C.

Receipt Exceptions
The following samples were received at the laboratory outside the required temperature criteria: Final Effluent Composite (870-28030-1), Field Blank LL Hg (870-28030-2) and Final Effluent (870-28030-3). The sample(s) is considered acceptable since it was collected and submitted to the laboratory on the same day and there is evidence that the chilling process has begun.

GC/MS VOA
Method 624.1: The laboratory control sample (LCS) and laboratory control sample duplicate (LCSD) for analytical batch 870-20930 recovered outside control limits for Methylene-chloride. This analyte was biased high in the Calibration.

Method 624.1: The laboratory control sample (LCS) and laboratory control sample duplicate (LCSD) for analytical batch 870-20930 recovered outside control limits Methylene Chloride. This analyte was biased high in the LCS/LCSD and was not detected in the associated samples; therefore, the data have been reported.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/ Glossary page.

GC/MS Semi VOA
Method 625.1: The laboratory control sample duplicate (LCSD) for preparation batch 860-168369 and analytical batch 860-168436 recovered outside control limits for the following analytes: 2,4,5-Trichlorophenol. This analytes was biased high in the LCSD and was not detected in the associated samples; therefore, the data have been reported.

Method Organotins_SIM: The laboratory control sample (LCS) was performed in duplicate (LCSD) to provide precision data for this batch.
Insufficient sample volume was available to perform a matrix spike/matrix spike duplicate (MS/MSD) associated with preparation batch 570-456153.Organotins-W

No additional analytical or quality issues were noted, other than those described above or in the Definitions/ Glossary page.

PCBs
Method 608.3_PCB: The surrogate recovery for the laboratory control sample duplicate (LCSD) associated with preparation batch 860-168882 and analytical batch 860-168967 was outside the upper control limits.

(LCSD 860-168882/5-A)

Method 608.3_PCB: The laboratory control sample (LCS) and laboratory control sample duplicate (LCSD) for preparation batch 860-168882 and analytical batch 860-168967 recovered outside control limits for the following analytes: PCB-1016. These analytes were biased high in the LCS and were not detected in the associated samples; therefore, the data have been reported.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/ Glossary page.

Pesticides
Method 608.3_Pest: Surrogate recovery for the following sample was outside the upper control limit: Final Effluent Composite

Job ID: 870-28030-1 (Continued) — Eurofins Dallas

(870-28030-1). This sample did not contain any target analytes; therefore, re-extraction and/or re-analysis was not performed.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/ Glossary page.

HPLC/IC
No additional analytical or quality issues were noted, other than those described above or in the Definitions/ Glossary page.

Herbicides
No additional analytical or quality issues were noted, other than those described above or in the Definitions/ Glossary page.

Metals
No additional analytical or quality issues were noted, other than those described above or in the Definitions/ Glossary page.

General Chemistry
No additional analytical or quality issues were noted, other than those described above or in the Definitions/ Glossary page.

Detection Summary

Client: Environmental Monitoring Laboratory, LLC
Project/Site: City of Leander

Job ID: 870-28030-1

Client Sample ID: Final Effluent Composite

Lab Sample ID: 870-28030-1

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Di-n-butyl phthalate	0.331	J	5.00	0.252	ug/L	1		625.1	Total/NA
Fluoride	0.157	J	0.500	0.100	mg/L	1		300.0	Total/NA
Nitrate as N	13.3		0.100	0.0391	mg/L	1		300.0	Total/NA
Diuron	0.0784	J	0.0900	0.0514	ug/L	1		632	Total/NA
Mercury	0.936		0.500	0.200	ng/L	1		1631E	Total/NA
Aluminum	0.124		0.0200	0.00301	mg/L	1		200.8	Total Recoverable
Arsenic	0.000727	J	0.00400	0.000341	mg/L	1		200.8	Total Recoverable
Barium	0.0250		0.00400	0.000289	mg/L	1		200.8	Total Recoverable
Chromium	0.000905	J	0.00400	0.000325	mg/L	1		200.8	Total Recoverable
Copper	0.00772		0.00400	0.000690	mg/L	1		200.8	Total Recoverable
Nickel	0.00211		0.00200	0.000486	mg/L	1		200.8	Total Recoverable
Selenium	0.000720	J	0.00200	0.000685	mg/L	1		200.8	Total Recoverable
Zinc	0.0428		0.00400	0.000885	mg/L	1		200.8	Total Recoverable
Cr (VI)	0.0134		0.0100	0.00280	mg/L	1		7196A	Total/NA

Client Sample ID: Field Blank LL Hg

Lab Sample ID: 870-28030-2

No Detections.

Client Sample ID: Final Effluent

Lab Sample ID: 870-28030-3

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Bromodichloromethane	0.0113		0.00200	0.000696	mg/L	1		624.1	Total/NA
Chloroform	0.0208		0.00500	0.00121	mg/L	1		624.1	Total/NA
Dibromochloromethane	0.00498	J	0.00500	0.00175	mg/L	1		624.1	Total/NA
Trihalomethanes, Total	37.1		5.00	1.75	ug/L	1		624.1	Total/NA
Cyanide, Non-amenable	3.30	J	5.00	2.33	ug/L	1		4500 CN G NonAm	Total/NA

This Detection Summary does not include radiochemical test results.

Client Sample ID: Final Effluent Composite
Date Collected: 06/25/24 08:30
Date Received: 06/25/24 13:31

Lab Sample ID: 870-28030-1
Matrix: Water

Method: EPA 625.1 - Semivolatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,2,4,5-Tetrachlorobenzene	<1.32	U	10.0	1.32	ug/L		06/27/24 05:16	06/27/24 18:30	1
1,2-Diphenylhydrazine	<1.49	U	10.0	1.49	ug/L		06/27/24 05:16	06/27/24 18:30	1
bis (2-chloroisopropyl) ether	<1.79	U	10.0	1.79	ug/L		06/27/24 05:16	06/27/24 18:30	1
2,4,5-Trichlorophenol	<2.00	U *+	10.0	2.00	ug/L		06/27/24 05:16	06/27/24 18:30	1
2,4,6-Trichlorophenol	<1.42	U	5.00	1.42	ug/L		06/27/24 05:16	06/27/24 18:30	1
2,4-Dichlorophenol	<0.314	U	5.00	0.314	ug/L		06/27/24 05:16	06/27/24 18:30	1
2,4-Dimethylphenol	<0.649	U	5.00	0.649	ug/L		06/27/24 05:16	06/27/24 18:30	1
2,4-Dinitrophenol	<1.61	U	10.0	1.61	ug/L		06/27/24 05:16	06/27/24 18:30	1
2,4-Dinitrotoluene	<1.31	U	10.0	1.31	ug/L		06/27/24 05:16	06/27/24 18:30	1
2,6-Dinitrotoluene	<1.61	U	5.00	1.61	ug/L		06/27/24 05:16	06/27/24 18:30	1
2-Chloronaphthalene	<0.462	U	5.00	0.462	ug/L		06/27/24 05:16	06/27/24 18:30	1
2-Chlorophenol	<0.649	U	5.00	0.649	ug/L		06/27/24 05:16	06/27/24 18:30	1
2-Nitrophenol	<1.67	U	10.0	1.67	ug/L		06/27/24 05:16	06/27/24 18:30	1
o-Cresol	<1.62	U	10.0	1.62	ug/L		06/27/24 05:16	06/27/24 18:30	1
m & p - Cresol	<2.62	U	10.0	2.62	ug/L		06/27/24 05:16	06/27/24 18:30	1
3,3'-Dichlorobenzidine	<0.341	U	5.00	0.341	ug/L		06/27/24 05:16	06/27/24 18:30	1
4,6-Dinitro-o-cresol	<1.44	U	10.0	1.44	ug/L		06/27/24 05:16	06/27/24 18:30	1
4-Bromophenyl phenyl ether	<0.256	U	5.00	0.256	ug/L		06/27/24 05:16	06/27/24 18:30	1
4-Chlorophenyl phenyl ether	<1.28	U	10.0	1.28	ug/L		06/27/24 05:16	06/27/24 18:30	1
4-Nitrophenol	<4.91	U	7.20	4.91	ug/L		06/27/24 05:16	06/27/24 18:30	1
4-Chloro-3-methylphenol	<1.57	U	5.00	1.57	ug/L		06/27/24 05:16	06/27/24 18:30	1
Acenaphthene	<1.39	U	5.70	1.39	ug/L		06/27/24 05:16	06/27/24 18:30	1
Acenaphthylene	<1.41	U	10.0	1.41	ug/L		06/27/24 05:16	06/27/24 18:30	1
Anthracene	<1.50	U	5.70	1.50	ug/L		06/27/24 05:16	06/27/24 18:30	1
Azobenzene	<1.50	U	10.0	1.50	ug/L		06/27/24 05:16	06/27/24 18:30	1
Benzidine	<4.80	U	20.0	4.80	ug/L		06/27/24 05:16	06/27/24 18:30	1
Benzo[a]anthracene	<0.173	U	5.00	0.173	ug/L		06/27/24 05:16	06/27/24 18:30	1
Benzo[a]pyrene	<0.364	U	5.00	0.364	ug/L		06/27/24 05:16	06/27/24 18:30	1
Benzo[b]fluoranthene	<2.04	U	10.0	2.04	ug/L		06/27/24 05:16	06/27/24 18:30	1
Benzo[g,h,i]perylene	<2.68	U	10.0	2.68	ug/L		06/27/24 05:16	06/27/24 18:30	1
Benzo[k]fluoranthene	<0.375	U	5.00	0.375	ug/L		06/27/24 05:16	06/27/24 18:30	1
Butyl benzyl phthalate	<0.337	U	5.00	0.337	ug/L		06/27/24 05:16	06/27/24 18:30	1
Chrysene	<0.222	U	5.00	0.222	ug/L		06/27/24 05:16	06/27/24 18:30	1
Dibenz(a,h)anthracene	<0.246	U	5.00	0.246	ug/L		06/27/24 05:16	06/27/24 18:30	1
Diethyl phthalate	<1.59	U	5.00	1.59	ug/L		06/27/24 05:16	06/27/24 18:30	1
Dimethyl phthalate	<0.299	U	2.50	0.299	ug/L		06/27/24 05:16	06/27/24 18:30	1
Fluoranthene	<1.59	U	5.00	1.59	ug/L		06/27/24 05:16	06/27/24 18:30	1
Fluorene	<1.63	U	5.00	1.63	ug/L		06/27/24 05:16	06/27/24 18:30	1
Hexachlorobenzene	<0.307	U	5.00	0.307	ug/L		06/27/24 05:16	06/27/24 18:30	1
Hexachlorobutadiene	<0.238	U	1.00	0.238	ug/L		06/27/24 05:16	06/27/24 18:30	1
Hexachlorocyclopentadiene	<4.58	U	10.0	4.58	ug/L		06/27/24 05:16	06/27/24 18:30	1
Hexachloroethane	<0.526	U	4.80	0.526	ug/L		06/27/24 05:16	06/27/24 18:30	1
Hexachlorophene	<10.0	U	100	10.0	ug/L		06/27/24 05:16	06/27/24 18:30	1
Indeno[1,2,3-cd]pyrene	<2.29	U	10.0	2.29	ug/L		06/27/24 05:16	06/27/24 18:30	1
Isophorone	<1.64	U	5.00	1.64	ug/L		06/27/24 05:16	06/27/24 18:30	1
N-Nitrosodi-n-butylamine	<1.49	U	10.0	1.49	ug/L		06/27/24 05:16	06/27/24 18:30	1
N-Nitrosodiethylamine	<1.75	U	10.0	1.75	ug/L		06/27/24 05:16	06/27/24 18:30	1
N-Nitrosodimethylamine	<2.02	U	10.0	2.02	ug/L		06/27/24 05:16	06/27/24 18:30	1
Naphthalene	<0.542	U	2.50	0.542	ug/L		06/27/24 05:16	06/27/24 18:30	1

Client Sample ID: Final Effluent Composite
Lab Sample ID: 870-28030-1

Date Collected: 06/25/24 08:30
Matrix: Water

Date Received: 06/25/24 13:31

Method: EPA 625.1 - Semivolatile Organic Compounds (GC/MS) (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Nitrobenzene	<1.66	U	5.00	1.66	ug/L		06/27/24 05:16	06/27/24 18:30	1
Nonylphenol	<10.0	U	10.0	10.0	ug/L		06/27/24 05:16	06/27/24 18:30	1
Pentachlorobenzene	<1.07	U	10.0	1.07	ug/L		06/27/24 05:16	06/27/24 18:30	1
Pentachlorophenol	<0.234	U	10.0	0.234	ug/L		06/27/24 05:16	06/27/24 18:30	1
Phenanthrene	<1.42	U	10.0	1.42	ug/L		06/27/24 05:16	06/27/24 18:30	1
Phenol	<0.423	U	4.50	0.423	ug/L		06/27/24 05:16	06/27/24 18:30	1
Pyrene	<0.178	U	5.00	0.178	ug/L		06/27/24 05:16	06/27/24 18:30	1
Pyridine	<2.64	U	10.0	2.64	ug/L		06/27/24 05:16	06/27/24 18:30	1
Bis(2-chloroethyl)ether	<2.16	U	10.0	2.16	ug/L		06/27/24 05:16	06/27/24 18:30	1
Bis(2-chloroethoxy)methane	<1.76	U	10.0	1.76	ug/L		06/27/24 05:16	06/27/24 18:30	1
Bis(2-ethylhexyl) phthalate	<0.277	U	5.00	0.277	ug/L		06/27/24 05:16	06/27/24 18:30	1
Di-n-butyl phthalate	**0.331**	**J**	5.00	0.252	ug/L		06/27/24 05:16	06/27/24 18:30	1
Di-n-octyl phthalate	<0.373	U	5.00	0.373	ug/L		06/27/24 05:16	06/27/24 18:30	1
N-Nitrosodi-n-propylamine	<2.88	U	10.0	2.88	ug/L		06/27/24 05:16	06/27/24 18:30	1
N-Nitrosodiphenylamine	<1.81	U	10.0	1.81	ug/L		06/27/24 05:16	06/27/24 18:30	1
Total Cresols	<0.00262	U	0.0100	0.00262	mg/L		06/27/24 05:16	06/27/24 18:30	1

Tentatively Identified Compound	*Est. Result*	*Qualifier*	*Unit*	*D*	*RT*	*CAS No.*	*Prepared*	*Analyzed*	*Dil Fac*
bis(2-chloromethyl)ether TIC	*<0.100*	*U*	*mg/L*			*542-88-1*	*06/27/24 05:16*	*06/27/24 18:30*	*1*

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2,4,6-Tribromophenol (Surr)	*98*		*31 - 132*	*06/27/24 05:16*	*06/27/24 18:30*	*1*
2-Fluorobiphenyl (Surr)	*90*		*29 - 112*	*06/27/24 05:16*	*06/27/24 18:30*	*1*
2-Fluorophenol (Surr)	*34*		*28 - 114*	*06/27/24 05:16*	*06/27/24 18:30*	*1*
Nitrobenzene-d5 (Surr)	*87*		*15 - 314*	*06/27/24 05:16*	*06/27/24 18:30*	*1*
p-Terphenyl-d14 (Surr)	*98*		*20 - 141*	*06/27/24 05:16*	*06/27/24 18:30*	*1*
Phenol-d5 (Surr)	*20*		*8 - 424*	*06/27/24 05:16*	*06/27/24 18:30*	*1*

Method: Lab SOP Organotins SIM - Organotins (GC/MS SIM)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Tributyltin	<1.12	U	2.95	1.12	ng/L		06/30/24 11:45	07/01/24 14:59	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Tripentyltin	*44*		*10 - 120*	*06/30/24 11:45*	*07/01/24 14:59*	*1*

Method: EPA 608.3 - Organochlorine Pesticides in Water

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aldrin	<0.00113	U	0.0100	0.00113	ug/L		06/29/24 11:31	07/01/24 13:17	1
alpha-BHC	<0.00142	U	0.00900	0.00142	ug/L		06/29/24 11:31	07/01/24 13:17	1
beta-BHC	<0.00389	U	0.0180	0.00389	ug/L		06/29/24 11:31	07/01/24 13:17	1
delta-BHC	<0.00245	U	0.250	0.00245	ug/L		06/29/24 11:31	07/01/24 13:17	1
gamma-BHC (Lindane)	<0.00299	U	0.0100	0.00299	ug/L		06/29/24 11:31	07/01/24 13:17	1
4,4'-DDD	<0.000814	U	0.0100	0.000814	ug/L		06/29/24 11:31	07/01/24 13:17	1
4,4'-DDE	<0.00109	U	0.0100	0.00109	ug/L		06/29/24 11:31	07/01/24 13:17	1
4,4'-DDT	<0.00379	U	0.0200	0.00379	ug/L		06/29/24 11:31	07/01/24 13:17	1
Dieldrin	<0.000953	U	0.0100	0.000953	ug/L		06/29/24 11:31	07/01/24 13:17	1
Endosulfan I	<0.00107	U	0.0100	0.00107	ug/L		06/29/24 11:31	07/01/24 13:17	1
Endosulfan II	<0.00122	U	0.0100	0.00122	ug/L		06/29/24 11:31	07/01/24 13:17	1
Endosulfan sulfate	<0.00112	U	0.0100	0.00112	ug/L		06/29/24 11:31	07/01/24 13:17	1
Endrin	<0.00156	U	0.0100	0.00156	ug/L		06/29/24 11:31	07/01/24 13:17	1
Endrin aldehyde	<0.00118	U	0.0100	0.00118	ug/L		06/29/24 11:31	07/01/24 13:17	1

Client: Environmental Monitoring Laboratory, LLC
Project/Site: City of Leander

Job ID: 870-28030-1

Client Sample ID: Final Effluent Composite

Date Collected: 06/25/24 08:30
Date Received: 06/25/24 13:31

Lab Sample ID: 870-28030-1
Matrix: Water

Method: EPA 608.3 - Organochlorine Pesticides in Water (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Dicofol	<0.0500	U	0.100	0.0500	ug/L		06/29/24 11:31	07/01/24 13:17	1
Heptachlor	<0.00446	U	0.00900	0.00446	ug/L		06/29/24 11:31	07/01/24 13:17	1
Heptachlor epoxide	<0.00134	U	0.0100	0.00134	ug/L		06/29/24 11:31	07/01/24 13:17	1
Toxaphene	<0.0769	U	0.200	0.0769	ug/L		06/29/24 11:31	07/01/24 13:17	1
Chlordane	<0.103	U	0.250	0.103	ug/L		06/29/24 11:31	07/01/24 13:17	1
Methoxychlor	<0.00390	U *+	0.0200	0.00390	ug/L		06/29/24 11:31	07/01/24 13:17	1
Mirex	<0.0200	U	0.0200	0.0200	ug/L		06/29/24 11:31	07/01/24 13:17	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
DCB Decachlorobiphenyl (Surr)	*145*	*S1+*	*15 - 136*	*06/29/24 11:31*	*07/01/24 13:17*	*1*
Tetrachloro-m-xylene	*101*		*18 - 126*	*06/29/24 11:31*	*07/01/24 13:17*	*1*

Method: EPA 608.3 - Polychlorinated Biphenyls (PCBs) (GC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
PCB-1016	<0.0125	U *+	0.100	0.0125	ug/L		06/29/24 11:31	07/01/24 11:18	1
PCB-1221	<0.0125	U	0.100	0.0125	ug/L		06/29/24 11:31	07/01/24 11:18	1
PCB-1232	<0.0125	U	0.100	0.0125	ug/L		06/29/24 11:31	07/01/24 11:18	1
PCB-1242	<0.0125	U	0.100	0.0125	ug/L		06/29/24 11:31	07/01/24 11:18	1
PCB-1248	<0.0125	U	0.100	0.0125	ug/L		06/29/24 11:31	07/01/24 11:18	1
PCB-1254	<0.00780	U	0.100	0.00780	ug/L		06/29/24 11:31	07/01/24 11:18	1
PCB-1260	<0.00780	U	0.100	0.00780	ug/L		06/29/24 11:31	07/01/24 11:18	1
Polychlorinated biphenyls, Total	<0.100	U	0.100	0.100	ug/L		06/29/24 11:31	07/01/24 11:18	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Tetrachloro-m-xylene (Surr)	*74*		*18 - 126*	*06/29/24 11:31*	*07/01/24 11:18*	*1*
DCB Decachlorobiphenyl (Surr)	*108*		*15 - 136*	*06/29/24 11:31*	*07/01/24 11:18*	*1*

Method: EPA-01 614 - Organophosphorous Pesticides (GC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Guthion	<0.353	U	2.50	0.353	ug/L		06/27/24 10:25	06/29/24 10:20	1
Diazinon	<0.147	U	0.500	0.147	ug/L		06/27/24 10:25	06/29/24 10:20	1
Disulfoton	<0.322	U	0.999	0.322	ug/L		06/27/24 10:25	06/29/24 10:20	1
Malathion	<0.133	U	2.00	0.133	ug/L		06/27/24 10:25	06/29/24 10:20	1
Methyl parathion	<0.141	U	4.00	0.141	ug/L		06/27/24 10:25	06/29/24 10:20	1
Parathion	<0.144	U	0.999	0.144	ug/L		06/27/24 10:25	06/29/24 10:20	1
Demeton, Total	<0.209	U	3.00	0.209	ug/L		06/27/24 10:25	06/29/24 10:20	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Chlormefos	*65*		*49 - 171*	*06/27/24 10:25*	*06/29/24 10:20*	*1*
Triphenylphosphate	*92*		*60 - 154*	*06/27/24 10:25*	*06/29/24 10:20*	*1*

Method: SW846 8141B - Organophosphorous Compounds by Gas Chromatography, Capillary Column Technique

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chlorpyrifos	<0.360	U	1.50	0.360	ug/L		06/27/24 10:25	06/29/24 10:20	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Triphenylphosphate (Surr)	*92*		*42 - 120*	*06/27/24 10:25*	*06/29/24 10:20*	*1*
Chlormephos (Surr)	*65*		*27 - 120*	*06/27/24 10:25*	*06/29/24 10:20*	*1*

Client: Environmental Monitoring Laboratory, LLC
Project/Site: City of Leander

Job ID: 870-28030-1

Client Sample ID: Final Effluent Composite
Date Collected: 06/25/24 08:30
Date Received: 06/25/24 13:31

Lab Sample ID: 870-28030-1
Matrix: Water

Method: EPA 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Fluoride	0.157	J	0.500	0.100	mg/L			06/26/24 20:29	1
Nitrate as N	13.3		0.100	0.0391	mg/L			06/26/24 20:29	1

Method: EPA-01 632 - Carbamate and Urea Pesticides (HPLC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Carbaryl	<1.85	U	5.00	1.85	ug/L		06/27/24 05:22	06/27/24 17:07	1
Diuron	0.0784	J	0.0900	0.0514	ug/L		06/27/24 05:22	06/27/24 17:07	1

Method: SW846 8321B - Herbicides (LC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Silvex (2,4,5-TP)	<1.20	U	5.00	1.20	ug/L			07/01/24 16:08	1
Dichlorprop	<0.707	U	5.00	0.707	ug/L			07/01/24 16:08	1
2,4,5-T	<1.73	U	5.00	1.73	ug/L			07/01/24 16:08	1
Pentachlorophenol	<0.325	U	1.00	0.325	ug/L			07/01/24 16:08	1
MCPP	<0.646	U	1.00	0.646	ug/L			07/01/24 16:08	1
MCPA	<0.536	U	1.00	0.536	ug/L			07/01/24 16:08	1
Dinoseb	<0.936	U	5.00	0.936	ug/L			07/01/24 16:08	1
Dicamba	<1.72	U	5.00	1.72	ug/L			07/01/24 16:08	1
2,4-DB	<1.54	U	5.00	1.54	ug/L			07/01/24 16:08	1
2,4-D	<1.08	U	5.00	1.08	ug/L			07/01/24 16:08	1
Dalapon	<1.54	U	5.00	1.54	ug/L			07/01/24 16:08	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
DCAA	*99*		*50 - 150*		*07/01/24 16:08*	*1*

Method: EPA 1631E - Mercury, Low Level (CVAFS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	0.936		0.500	0.200	ng/L		06/27/24 16:12	06/28/24 12:47	1

Method: EPA 200.8 - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	0.124		0.0200	0.00301	mg/L		06/27/24 08:45	06/27/24 19:45	1
Antimony	<0.00105	U	0.00200	0.00105	mg/L		06/27/24 08:45	06/27/24 19:45	1
Arsenic	0.000727	J	0.00400	0.000341	mg/L		06/27/24 08:45	06/27/24 19:45	1
Barium	0.0250		0.00400	0.000289	mg/L		06/27/24 08:45	06/27/24 19:45	1
Beryllium	<0.000148	U	0.00200	0.000148	mg/L		06/27/24 08:45	06/27/24 19:45	1
Cadmium	<0.000258	U	0.00200	0.000258	mg/L		06/27/24 08:45	06/27/24 19:45	1
Chromium	0.000905	J	0.00400	0.000325	mg/L		06/27/24 08:45	06/27/24 19:45	1
Copper	0.00772		0.00400	0.000690	mg/L		06/27/24 08:45	06/27/24 19:45	1
Lead	<0.000140	U	0.00200	0.000140	mg/L		06/27/24 08:45	06/27/24 19:45	1
Nickel	0.00211		0.00200	0.000486	mg/L		06/27/24 08:45	06/27/24 19:45	1
Selenium	0.000720	J	0.00200	0.000685	mg/L		06/27/24 08:45	06/27/24 19:45	1
Silver	<0.000118	U	0.00200	0.000118	mg/L		06/27/24 08:45	06/27/24 19:45	1
Thallium	<0.000215	U	0.00200	0.000215	mg/L		06/27/24 08:45	06/27/24 19:45	1
Zinc	0.0428		0.00400	0.000885	mg/L		06/27/24 08:45	06/27/24 19:45	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cr (VI) (SW846 7196A)	0.0134		0.0100	0.00280	mg/L			06/25/24 19:52	1
Cr (III) (SW846 7196A)	<0.00345	U	0.0100	0.00345	mg/L			07/03/24 16:49	1

Client Sample Results

Client: Environmental Monitoring Laboratory, LLC
Project/Site: City of Leander

Job ID: 870-28030-1

Client Sample ID: Field Blank LL Hg

Lab Sample ID: 870-28030-2

Date Collected: 06/25/24 08:30

Matrix: Water

Date Received: 06/25/24 13:31

Method: EPA 1631E - Mercury, Low Level (CVAFS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	<0.200	U	0.500	0.200	ng/L		06/27/24 16:12	06/28/24 12:55	1

Client Sample ID: Final Effluent

Lab Sample ID: 870-28030-3

Date Collected: 06/25/24 08:31

Matrix: Water

Date Received: 06/25/24 13:31

Method: EPA 624.1 - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,1,1-Trichloroethane	<0.00145	U	0.00500	0.00145	mg/L			06/25/24 19:55	1
1,1,2,2-Tetrachloroethane	<0.00171	U	0.00500	0.00171	mg/L			06/25/24 19:55	1
1,1,2-Trichloroethane	<0.000747	U	0.00200	0.000747	mg/L			06/25/24 19:55	1
1,1-Dichloroethane	<0.00103	U	0.00500	0.00103	mg/L			06/25/24 19:55	1
1,1-Dichloroethene	<0.000575	U	0.00200	0.000575	mg/L			06/25/24 19:55	1
1,2-Dichloroethane	<0.00153	U	0.00500	0.00153	mg/L			06/25/24 19:55	1
1,2-Dichloropropane	<0.00155	U	0.00500	0.00155	mg/L			06/25/24 19:55	1
2-Chloroethyl vinyl ether	<0.00120	U	0.00500	0.00120	mg/L			06/25/24 19:55	1
Acrolein	<0.0231	U	0.0500	0.0231	mg/L			06/25/24 19:55	1
1,2,4-Trichlorobenzene	<0.000593	U	0.00200	0.000593	mg/L			06/25/24 19:55	1
Acrylonitrile	<0.00780	U	0.0500	0.00780	mg/L			06/25/24 19:55	1
Benzene	<0.000496	U	0.00200	0.000496	mg/L			06/25/24 19:55	1
Bromodichloromethane	**0.0113**		0.00200	0.000696	mg/L			06/25/24 19:55	1
1,2-Dibromoethane	<0.000631	U	0.00200	0.000631	mg/L			06/25/24 19:55	1
Bromoform	<0.00133	U	0.00500	0.00133	mg/L			06/25/24 19:55	1
1,2-Dichlorobenzene	<0.000603	U	0.00200	0.000603	mg/L			06/25/24 19:55	1
Bromomethane	<0.00188	U	0.00500	0.00188	mg/L			06/25/24 19:55	1
Carbon tetrachloride	<0.00126	U	0.00200	0.00126	mg/L			06/25/24 19:55	1
Chlorobenzene	<0.000945	U	0.00500	0.000945	mg/L			06/25/24 19:55	1
Chloroethane	<0.00145	U	0.00500	0.00145	mg/L			06/25/24 19:55	1
1,3-Dichlorobenzene	<0.00108	U	0.00500	0.00108	mg/L			06/25/24 19:55	1
Chloroform	**0.0208**		0.00500	0.00121	mg/L			06/25/24 19:55	1
Chloromethane	<0.000941	U	0.00500	0.000941	mg/L			06/25/24 19:55	1
1,4-Dichlorobenzene	<0.000637	U	0.00200	0.000637	mg/L			06/25/24 19:55	1
Dibromochloromethane	**0.00498**	**J**	0.00500	0.00175	mg/L			06/25/24 19:55	1
Dichlorodifluoromethane	<0.000833	U	0.00500	0.000833	mg/L			06/25/24 19:55	1
Ethylbenzene	<0.000878	U	0.00500	0.000878	mg/L			06/25/24 19:55	1
Methylene Chloride	<0.000829	U *+	0.00500	0.000829	mg/L			06/25/24 19:55	1
Methyl ethyl ketone (MEK)	<0.00453	U	0.0200	0.00453	mg/L			06/25/24 19:55	1
Tetrachloroethene	<0.000900	U	0.00500	0.000900	mg/L			06/25/24 19:55	1
Toluene	<0.00161	U	0.00500	0.00161	mg/L			06/25/24 19:55	1
Trichloroethene	<0.00169	U	0.00500	0.00169	mg/L			06/25/24 19:55	1
Trichlorofluoromethane	<0.00124	U	0.00500	0.00124	mg/L			06/25/24 19:55	1
Vinyl chloride	<0.000592	U	0.00200	0.000592	mg/L			06/25/24 19:55	1
cis-1,3-Dichloropropene	<0.000885	U	0.00500	0.000885	mg/L			06/25/24 19:55	1
trans-1,2-Dichloroethene	<0.000903	U	0.00500	0.000903	mg/L			06/25/24 19:55	1
trans-1,3-Dichloropropene	<0.00195	U	0.00500	0.00195	mg/L			06/25/24 19:55	1
Bromochloromethane	<0.000250	U	0.00200	0.000250	mg/L			06/25/24 19:55	1
Trihalomethanes, Total	**37.1**		5.00	1.75	ug/L			06/25/24 19:55	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*102*		*76 - 118*		*06/25/24 19:55*	*1*

Client Sample ID: Final Effluent
Lab Sample ID: 870-28030-3

Date Collected: 06/25/24 08:31
Matrix: Water
Date Received: 06/25/24 13:31

Method: EPA 624.1 - Volatile Organic Compounds (GC/MS) (Continued)

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
4-Bromofluorobenzene (Surr)	*101*		*76 - 119*		*06/25/24 19:55*	*1*
Dibromofluoromethane (Surr)	*104*		*61 - 132*		*06/25/24 19:55*	*1*
Toluene-d8 (Surr)	*100*		*74 - 130*		*06/25/24 19:55*	*1*

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cyanide, Total (EPA 335.4)	<2.00	U	5.00	2.00	ug/L		06/26/24 16:28	06/27/24 10:13	1
Phenols, Total (EPA 420.4)	<0.00580	U	0.0100	0.00580	mg/L			06/27/24 13:37	1
Cyanide, Non-amenable (SM 4500 CN G NonAm)	**3.30**	**J**	5.00	2.33	ug/L		06/27/24 17:55	06/28/24 16:35	1
Cyanide - Available (SM 4500 CN G)	<2.33	U	5.00	2.33	ug/L			06/28/24 20:29	1

Surrogate Summary

Client: Environmental Monitoring Laboratory, LLC
Job ID: 870-28030-1
Project/Site: City of Leander

Method: 624.1 - Volatile Organic Compounds (GC/MS)

Matrix: Water **Prep Type: Total/NA**

		Percent Surrogate Recovery (Acceptance Limits)			
Lab Sample ID	**Client Sample ID**	**DCA (76-118)**	**BFB (76-119)**	**DBFM (61-132)**	**TOL (74-130)**
870-28030-3	Final Effluent	102	101	104	100
LCS 870-20930/3	Lab Control Sample	95	100	97	99
LCSD 870-20930/4	Lab Control Sample Dup	98	95	102	100
MB 870-20930/5	Method Blank	104	94	100	93

Surrogate Legend

DCA = 1,2-Dichloroethane-d4 (Surr)
BFB = 4-Bromofluorobenzene (Surr)
DBFM = Dibromofluoromethane (Surr)
TOL = Toluene-d8 (Surr)

Method: 625.1 - Semivolatile Organic Compounds (GC/MS)

Matrix: Water **Prep Type: Total/NA**

		Percent Surrogate Recovery (Acceptance Limits)					
Lab Sample ID	**Client Sample ID**	**TBP (31-132)**	**FBP (29-112)**	**2FP (28-114)**	**NBZ (15-314)**	**TPHd14 (20-141)**	**PHL (8-424)**
870-28030-1	Final Effluent Composite	98	90	34	87	98	20
LCS 860-168369/2-A	Lab Control Sample	103	99	53	89	107	34
LCSD 860-168369/3-A	Lab Control Sample Dup	111	103	54	93	113	33
MB 860-168369/1-A	Method Blank	102	99	44	99	111	29

Surrogate Legend

TBP = 2,4,6-Tribromophenol (Surr)
FBP = 2-Fluorobiphenyl (Surr)
2FP = 2-Fluorophenol (Surr)
NBZ = Nitrobenzene-d5 (Surr)
TPHd14 = p-Terphenyl-d14 (Surr)
PHL = Phenol-d5 (Surr)

Method: Organotins SIM - Organotins (GC/MS SIM)

Matrix: Water **Prep Type: Total/NA**

		Percent Surrogate Recovery (Acceptance Limits)
Lab Sample ID	**Client Sample ID**	**TPTT (10-120)**
870-28030-1	Final Effluent Composite	44
LCS 570-456153/2-A	Lab Control Sample	57
LCSD 570-456153/3-A	Lab Control Sample Dup	49
MB 570-456153/1-A	Method Blank	60

Surrogate Legend

TPTT = Tripentyltin

Method: 608.3 - Organochlorine Pesticides in Water

Matrix: Water **Prep Type: Total/NA**

		Percent Surrogate Recovery (Acceptance Limits)	
Lab Sample ID	**Client Sample ID**	**DCB1 (15-136)**	**TCX1 (18-126)**
870-28030-1	Final Effluent Composite	145 S1+	101
LCS 860-168882/2-A	Lab Control Sample	104	111

Method: 608.3 - Organochlorine Pesticides in Water (Continued)

Matrix: Water

Prep Type: Total/NA

		Percent Surrogate Recovery (Acceptance Limits)	
Lab Sample ID	**Client Sample ID**	**DCB1 (15-136)**	**TCX1 (18-126)**
LCSD 860-168882/3-A	Lab Control Sample Dup	98	109
MB 860-168882/1-A	Method Blank	101	117

Surrogate Legend

DCB = DCB Decachlorobiphenyl (Surr)

TCX = Tetrachloro-m-xylene

Method: 608.3 - Polychlorinated Biphenyls (PCBs) (GC)

Matrix: Water

Prep Type: Total/NA

		Percent Surrogate Recovery (Acceptance Limits)	
Lab Sample ID	**Client Sample ID**	**TCX1 (18-126)**	**DCB1 (15-136)**
870-28030-1	Final Effluent Composite	74	108
LCS 860-168882/4-A	Lab Control Sample	108	132
LCSD 860-168882/5-A	Lab Control Sample Dup	108	137 S1+
MB 860-168882/1-A	Method Blank	107	133

Surrogate Legend

TCX = Tetrachloro-m-xylene (Surr)

DCB = DCB Decachlorobiphenyl (Surr)

Method: 614 - Organophosphorous Pesticides (GC)

Matrix: Water

Prep Type: Total/NA

		Percent Surrogate Recovery (Acceptance Limits)	
Lab Sample ID	**Client Sample ID**	**CMF1 (49-171)**	**TPP1 (60-154)**
870-28030-1	Final Effluent Composite	65	92
LCS 280-658559/2-A	Lab Control Sample	75	113
MB 280-658559/1-A	Method Blank	69	100

Surrogate Legend

CMF = Chlormefos

TPP = Triphenylphosphate

Method: 8141B - Organophosphorous Compounds by Gas Chromatography, Capillary Column Technique

Matrix: Water

Prep Type: Total/NA

		Percent Surrogate Recovery (Acceptance Limits)	
Lab Sample ID	**Client Sample ID**	**TPP1 (42-120)**	**CMF1 (27-120)**
870-28030-1	Final Effluent Composite	92	65
LCS 280-658559/2-A	Lab Control Sample	113	75
MB 280-658559/1-A	Method Blank	100	69

Surrogate Legend

TPP = Triphenylphosphate (Surr)

CMF = Chlormephos (Surr)

Method: 8321B - Herbicides (LC/MS)

Matrix: Water
Prep Type: Total/NA

Percent Surrogate Recovery (Acceptance Limits)

Lab Sample ID	Client Sample ID	DCPAA (50-150)
870-28030-1	Final Effluent Composite	99
LB 860-168818/1-A	Method Blank	95
LCS 860-168997/5	Lab Control Sample	89
LCSD 860-168997/6	Lab Control Sample Dup	91
MB 860-168997/10	Method Blank	99

Surrogate Legend

DCPAA = DCAA

Method: 624.1 - Volatile Organic Compounds (GC/MS)

Lab Sample ID: MB 870-20930/5
Client Sample ID: Method Blank
Matrix: Water
Prep Type: Total/NA
Analysis Batch: 20930

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,1,1-Trichloroethane	<0.00145	U	0.00500	0.00145	mg/L			06/25/24 11:03	1
1,1,2,2-Tetrachloroethane	<0.00171	U	0.00500	0.00171	mg/L			06/25/24 11:03	1
1,1,2-Trichloroethane	<0.000747	U	0.00200	0.000747	mg/L			06/25/24 11:03	1
1,1-Dichloroethane	<0.00103	U	0.00500	0.00103	mg/L			06/25/24 11:03	1
1,1-Dichloroethene	<0.000575	U	0.00200	0.000575	mg/L			06/25/24 11:03	1
1,2-Dichloroethane	<0.00153	U	0.00500	0.00153	mg/L			06/25/24 11:03	1
1,2-Dichloropropane	<0.00155	U	0.00500	0.00155	mg/L			06/25/24 11:03	1
2-Chloroethyl vinyl ether	<0.00120	U	0.00500	0.00120	mg/L			06/25/24 11:03	1
Acrolein	<0.0231	U	0.0500	0.0231	mg/L			06/25/24 11:03	1
1,2,4-Trichlorobenzene	<0.000593	U	0.00200	0.000593	mg/L			06/25/24 11:03	1
Acrylonitrile	<0.00780	U	0.0500	0.00780	mg/L			06/25/24 11:03	1
Benzene	<0.000496	U	0.00200	0.000496	mg/L			06/25/24 11:03	1
Bromodichloromethane	<0.000696	U	0.00200	0.000696	mg/L			06/25/24 11:03	1
1,2-Dibromoethane	<0.000631	U	0.00200	0.000631	mg/L			06/25/24 11:03	1
Bromoform	<0.00133	U	0.00500	0.00133	mg/L			06/25/24 11:03	1
1,2-Dichlorobenzene	<0.000603	U	0.00200	0.000603	mg/L			06/25/24 11:03	1
Bromomethane	<0.00188	U	0.00500	0.00188	mg/L			06/25/24 11:03	1
Carbon tetrachloride	<0.00126	U	0.00200	0.00126	mg/L			06/25/24 11:03	1
Chlorobenzene	<0.000945	U	0.00500	0.000945	mg/L			06/25/24 11:03	1
Chloroethane	<0.00145	U	0.00500	0.00145	mg/L			06/25/24 11:03	1
1,3-Dichlorobenzene	<0.00108	U	0.00500	0.00108	mg/L			06/25/24 11:03	1
Chloroform	<0.00121	U	0.00500	0.00121	mg/L			06/25/24 11:03	1
Chloromethane	<0.000941	U	0.00500	0.000941	mg/L			06/25/24 11:03	1
1,4-Dichlorobenzene	<0.000637	U	0.00200	0.000637	mg/L			06/25/24 11:03	1
Dibromochloromethane	<0.00175	U	0.00500	0.00175	mg/L			06/25/24 11:03	1
Dichlorodifluoromethane	<0.000833	U	0.00500	0.000833	mg/L			06/25/24 11:03	1
Ethylbenzene	<0.000878	U	0.00500	0.000878	mg/L			06/25/24 11:03	1
Methylene Chloride	<0.000829	U	0.00500	0.000829	mg/L			06/25/24 11:03	1
Methyl ethyl ketone (MEK)	<0.00453	U	0.0200	0.00453	mg/L			06/25/24 11:03	1
Tetrachloroethene	<0.000900	U	0.00500	0.000900	mg/L			06/25/24 11:03	1
Toluene	<0.00161	U	0.00500	0.00161	mg/L			06/25/24 11:03	1
Trichloroethene	<0.00169	U	0.00500	0.00169	mg/L			06/25/24 11:03	1
Trichlorofluoromethane	<0.00124	U	0.00500	0.00124	mg/L			06/25/24 11:03	1
Vinyl chloride	<0.000592	U	0.00200	0.000592	mg/L			06/25/24 11:03	1
cis-1,3-Dichloropropene	<0.000885	U	0.00500	0.000885	mg/L			06/25/24 11:03	1
trans-1,2-Dichloroethene	<0.000903	U	0.00500	0.000903	mg/L			06/25/24 11:03	1
trans-1,3-Dichloropropene	<0.00195	U	0.00500	0.00195	mg/L			06/25/24 11:03	1
Bromochloromethane	<0.000250	U	0.00200	0.000250	mg/L			06/25/24 11:03	1
Trihalomethanes, Total	<1.75	U	5.00	1.75	ug/L			06/25/24 11:03	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*104*		*76 - 118*		*06/25/24 11:03*	*1*
4-Bromofluorobenzene (Surr)	*94*		*76 - 119*		*06/25/24 11:03*	*1*
Dibromofluoromethane (Surr)	*100*		*61 - 132*		*06/25/24 11:03*	*1*
Toluene-d8 (Surr)	*93*		*74 - 130*		*06/25/24 11:03*	*1*

QC Sample Results

Client: Environmental Monitoring Laboratory, LLC
Project/Site: City of Leander

Job ID: 870-28030-1

Method: 624.1 - Volatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: LCS 870-20930/3
Matrix: Water
Analysis Batch: 20930

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
1,1,1-Trichloroethane	0.0503	0.04979		mg/L		99	70 - 130
1,1,2,2-Tetrachloroethane	0.0504	0.04952		mg/L		98	70 - 130
1,1,2-Trichloroethane	0.0503	0.04693		mg/L		93	75 - 130
1,1-Dichloroethane	0.0505	0.04670		mg/L		93	71 - 130
1,1-Dichloroethene	0.0504	0.05073		mg/L		101	70 - 130
1,2-Dichloroethane	0.0505	0.04764		mg/L		94	72 - 130
1,2-Dichloropropane	0.0504	0.04743		mg/L		94	70 - 130
2-Chloroethyl vinyl ether	0.0501	0.04758		mg/L		95	70 - 130
Acrolein	0.494	0.5695		mg/L		115	70 - 130
1,2,4-Trichlorobenzene	0.0504	0.04876		mg/L		97	70 - 130
Acrylonitrile	0.504	0.4504		mg/L		89	70 - 130
Benzene	0.0503	0.04618		mg/L		92	70 - 130
Bromodichloromethane	0.0505	0.04823		mg/L		96	70 - 130
1,2-Dibromoethane	0.0504	0.04959		mg/L		98	70 - 130
Bromoform	0.0504	0.05190		mg/L		103	70 - 130
1,2-Dichlorobenzene	0.0503	0.04857		mg/L		97	70 - 130
Bromomethane	0.0501	0.05809		mg/L		116	70 - 130
Carbon tetrachloride	0.0505	0.05403		mg/L		107	70 - 125
Chlorobenzene	0.0504	0.04725		mg/L		94	70 - 130
Chloroethane	0.0500	0.05696		mg/L		114	70 - 130
1,3-Dichlorobenzene	0.0504	0.04884		mg/L		97	75 - 130
Chloroform	0.0505	0.04620		mg/L		92	70 - 121
Chloromethane	0.0500	0.05221		mg/L		104	70 - 130
1,4-Dichlorobenzene	0.0504	0.04846		mg/L		96	70 - 130
Dibromochloromethane	0.0503	0.04982		mg/L		99	70 - 130
Dichlorodifluoromethane	0.0501	0.05852		mg/L		117	70 - 130
Ethylbenzene	0.0504	0.04767		mg/L		95	75 - 130
Methylene Chloride	0.0504	0.09744	*+	mg/L		193	70 - 130
Methyl ethyl ketone (MEK)	0.504	0.5069		mg/L		101	70 - 130
Tetrachloroethene	0.0503	0.04980		mg/L		99	70 - 130
Toluene	0.0505	0.04505		mg/L		89	75 - 130
Trichloroethene	0.0503	0.05069		mg/L		101	75 - 130
Trichlorofluoromethane	0.0500	0.05449		mg/L		109	70 - 130
Vinyl chloride	0.0500	0.05574		mg/L		111	70 - 130
cis-1,3-Dichloropropene	0.0505	0.04828		mg/L		96	70 - 130
trans-1,2-Dichloroethene	0.0505	0.04884		mg/L		97	70 - 130
trans-1,3-Dichloropropene	0.0504	0.05162		mg/L		102	70 - 130
Bromochloromethane	0.0503	0.04760		mg/L		95	70 - 130

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
1,2-Dichloroethane-d4 (Surr)	*95*		*76 - 118*
4-Bromofluorobenzene (Surr)	*100*		*76 - 119*
Dibromofluoromethane (Surr)	*97*		*61 - 132*
Toluene-d8 (Surr)	*99*		*74 - 130*

Method: 624.1 - Volatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: LCSD 870-20930/4
Client Sample ID: Lab Control Sample Dup
Matrix: Water
Prep Type: Total/NA
Analysis Batch: 20930

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
1,1,1-Trichloroethane	0.0503	0.04851		mg/L		96	70 - 130	3	21
1,1,2,2-Tetrachloroethane	0.0504	0.04478		mg/L		89	70 - 130	10	25
1,1,2-Trichloroethane	0.0503	0.04608		mg/L		92	75 - 130	2	25
1,1-Dichloroethane	0.0505	0.04637		mg/L		92	71 - 130	1	24
1,1-Dichloroethene	0.0504	0.05023		mg/L		100	70 - 130	1	25
1,2-Dichloroethane	0.0505	0.04576		mg/L		91	72 - 130	4	25
1,2-Dichloropropane	0.0504	0.04601		mg/L		91	70 - 130	3	25
2-Chloroethyl vinyl ether	0.0501	0.04581		mg/L		92	70 - 130	4	25
Acrolein	0.494	0.5127		mg/L		104	70 - 130	10	25
1,2,4-Trichlorobenzene	0.0504	0.04631		mg/L		92	70 - 130	5	25
Acrylonitrile	0.504	0.4341		mg/L		86	70 - 130	4	25
Benzene	0.0503	0.04506		mg/L		90	70 - 130	2	25
Bromodichloromethane	0.0505	0.04803		mg/L		95	70 - 130	0	25
1,2-Dibromoethane	0.0504	0.04794		mg/L		95	70 - 130	3	25
Bromoform	0.0504	0.04893		mg/L		97	70 - 130	6	25
1,2-Dichlorobenzene	0.0503	0.04576		mg/L		91	70 - 130	6	25
Bromomethane	0.0501	0.05905		mg/L		118	70 - 130	2	25
Carbon tetrachloride	0.0505	0.05308		mg/L		105	70 - 125	2	25
Chlorobenzene	0.0504	0.04688		mg/L		93	70 - 130	1	25
Chloroethane	0.0500	0.05690		mg/L		114	70 - 130	0	25
1,3-Dichlorobenzene	0.0504	0.04675		mg/L		93	75 - 130	4	24
Chloroform	0.0505	0.04616		mg/L		91	70 - 121	0	25
Chloromethane	0.0500	0.05199		mg/L		104	70 - 130	0	25
1,4-Dichlorobenzene	0.0504	0.04540		mg/L		90	70 - 130	7	25
Dibromochloromethane	0.0503	0.04904		mg/L		98	70 - 130	2	25
Dichlorodifluoromethane	0.0501	0.05905		mg/L		118	70 - 130	1	25
Ethylbenzene	0.0504	0.04729		mg/L		94	75 - 130	1	25
Methylene Chloride	0.0504	0.09969	*+	mg/L		198	70 - 130	2	25
Methyl ethyl ketone (MEK)	0.504	0.4861		mg/L		96	70 - 130	4	25
Tetrachloroethene	0.0503	0.04819		mg/L		96	70 - 130	3	23
Toluene	0.0505	0.04458		mg/L		88	75 - 130	1	22
Trichloroethene	0.0503	0.04973		mg/L		99	75 - 130	2	25
Trichlorofluoromethane	0.0500	0.05628		mg/L		113	70 - 130	3	25
Vinyl chloride	0.0500	0.05617		mg/L		112	70 - 130	1	25
cis-1,3-Dichloropropene	0.0505	0.04756		mg/L		94	70 - 130	1	25
trans-1,2-Dichloroethene	0.0505	0.04709		mg/L		93	70 - 130	4	25
trans-1,3-Dichloropropene	0.0504	0.04928		mg/L		98	70 - 130	5	25
Bromochloromethane	0.0503	0.04794		mg/L		95	70 - 130	1	25

Surrogate	*LCSD %Recovery*	*LCSD Qualifier*	*Limits*
1,2-Dichloroethane-d4 (Surr)	98		76 - 118
4-Bromofluorobenzene (Surr)	95		76 - 119
Dibromofluoromethane (Surr)	102		61 - 132
Toluene-d8 (Surr)	100		74 - 130

Client: Environmental Monitoring Laboratory, LLC
Project/Site: City of Leander

Job ID: 870-28030-1

Method: 625.1 - Semivolatile Organic Compounds (GC/MS)

Lab Sample ID: MB 860-168369/1-A
Matrix: Water
Analysis Batch: 168436

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 168369

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,2,4,5-Tetrachlorobenzene	<1.32	U	10.0	1.32	ug/L		06/27/24 05:16	06/27/24 13:54	1
1,2-Diphenylhydrazine	<1.49	U	10.0	1.49	ug/L		06/27/24 05:16	06/27/24 13:54	1
bis (2-chloroisopropyl) ether	<1.79	U	10.0	1.79	ug/L		06/27/24 05:16	06/27/24 13:54	1
2,4,5-Trichlorophenol	<2.00	U	10.0	2.00	ug/L		06/27/24 05:16	06/27/24 13:54	1
2,4,6-Trichlorophenol	<1.42	U	5.00	1.42	ug/L		06/27/24 05:16	06/27/24 13:54	1
2,4-Dichlorophenol	<0.314	U	5.00	0.314	ug/L		06/27/24 05:16	06/27/24 13:54	1
2,4-Dimethylphenol	<0.649	U	5.00	0.649	ug/L		06/27/24 05:16	06/27/24 13:54	1
2,4-Dinitrophenol	<1.61	U	10.0	1.61	ug/L		06/27/24 05:16	06/27/24 13:54	1
2,4-Dinitrotoluene	<1.31	U	10.0	1.31	ug/L		06/27/24 05:16	06/27/24 13:54	1
2,6-Dinitrotoluene	<1.61	U	5.00	1.61	ug/L		06/27/24 05:16	06/27/24 13:54	1
2-Chloronaphthalene	<0.462	U	5.00	0.462	ug/L		06/27/24 05:16	06/27/24 13:54	1
2-Chlorophenol	<0.649	U	5.00	0.649	ug/L		06/27/24 05:16	06/27/24 13:54	1
2-Nitrophenol	<1.67	U	10.0	1.67	ug/L		06/27/24 05:16	06/27/24 13:54	1
o-Cresol	<1.62	U	10.0	1.62	ug/L		06/27/24 05:16	06/27/24 13:54	1
m & p - Cresol	<2.62	U	10.0	2.62	ug/L		06/27/24 05:16	06/27/24 13:54	1
3,3'-Dichlorobenzidine	<0.341	U	5.00	0.341	ug/L		06/27/24 05:16	06/27/24 13:54	1
4,6-Dinitro-o-cresol	<1.44	U	10.0	1.44	ug/L		06/27/24 05:16	06/27/24 13:54	1
4-Bromophenyl phenyl ether	<0.256	U	5.00	0.256	ug/L		06/27/24 05:16	06/27/24 13:54	1
4-Chlorophenyl phenyl ether	<1.28	U	10.0	1.28	ug/L		06/27/24 05:16	06/27/24 13:54	1
4-Nitrophenol	<4.91	U	7.20	4.91	ug/L		06/27/24 05:16	06/27/24 13:54	1
4-Chloro-3-methylphenol	<1.57	U	5.00	1.57	ug/L		06/27/24 05:16	06/27/24 13:54	1
Acenaphthene	<1.39	U	5.70	1.39	ug/L		06/27/24 05:16	06/27/24 13:54	1
Acenaphthylene	<1.41	U	10.0	1.41	ug/L		06/27/24 05:16	06/27/24 13:54	1
Anthracene	<1.50	U	5.70	1.50	ug/L		06/27/24 05:16	06/27/24 13:54	1
Azobenzene	<1.50	U	10.0	1.50	ug/L		06/27/24 05:16	06/27/24 13:54	1
Benzidine	<4.80	U	20.0	4.80	ug/L		06/27/24 05:16	06/27/24 13:54	1
Benzo[a]anthracene	<0.173	U	5.00	0.173	ug/L		06/27/24 05:16	06/27/24 13:54	1
Benzo[a]pyrene	<0.364	U	5.00	0.364	ug/L		06/27/24 05:16	06/27/24 13:54	1
Benzo[b]fluoranthene	<2.04	U	10.0	2.04	ug/L		06/27/24 05:16	06/27/24 13:54	1
Benzo[g,h,i]perylene	<2.68	U	10.0	2.68	ug/L		06/27/24 05:16	06/27/24 13:54	1
Benzo[k]fluoranthene	<0.375	U	5.00	0.375	ug/L		06/27/24 05:16	06/27/24 13:54	1
Butyl benzyl phthalate	<0.337	U	5.00	0.337	ug/L		06/27/24 05:16	06/27/24 13:54	1
Chrysene	<0.222	U	5.00	0.222	ug/L		06/27/24 05:16	06/27/24 13:54	1
Dibenz(a,h)anthracene	<0.246	U	5.00	0.246	ug/L		06/27/24 05:16	06/27/24 13:54	1
Diethyl phthalate	<1.59	U	5.00	1.59	ug/L		06/27/24 05:16	06/27/24 13:54	1
Dimethyl phthalate	<0.299	U	2.50	0.299	ug/L		06/27/24 05:16	06/27/24 13:54	1
Fluoranthene	<1.59	U	5.00	1.59	ug/L		06/27/24 05:16	06/27/24 13:54	1
Fluorene	<1.63	U	5.00	1.63	ug/L		06/27/24 05:16	06/27/24 13:54	1
Hexachlorobenzene	<0.307	U	5.00	0.307	ug/L		06/27/24 05:16	06/27/24 13:54	1
Hexachlorobutadiene	<0.238	U	1.00	0.238	ug/L		06/27/24 05:16	06/27/24 13:54	1
Hexachlorocyclopentadiene	<4.58	U	10.0	4.58	ug/L		06/27/24 05:16	06/27/24 13:54	1
Hexachloroethane	<0.526	U	4.80	0.526	ug/L		06/27/24 05:16	06/27/24 13:54	1
Hexachlorophene	<10.0	U	100	10.0	ug/L		06/27/24 05:16	06/27/24 13:54	1
Indeno[1,2,3-cd]pyrene	<2.29	U	10.0	2.29	ug/L		06/27/24 05:16	06/27/24 13:54	1
Isophorone	<1.64	U	5.00	1.64	ug/L		06/27/24 05:16	06/27/24 13:54	1
N-Nitrosodi-n-butylamine	<1.49	U	10.0	1.49	ug/L		06/27/24 05:16	06/27/24 13:54	1
N-Nitrosodiethylamine	<1.75	U	10.0	1.75	ug/L		06/27/24 05:16	06/27/24 13:54	1
N-Nitrosodimethylamine	<2.02	U	10.0	2.02	ug/L		06/27/24 05:16	06/27/24 13:54	1

Method: 625.1 - Semivolatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: MB 860-168369/1-A
Matrix: Water
Analysis Batch: 168436

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 168369

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Naphthalene	<0.542	U	2.50	0.542	ug/L		06/27/24 05:16	06/27/24 13:54	1
Nitrobenzene	<1.66	U	5.00	1.66	ug/L		06/27/24 05:16	06/27/24 13:54	1
Nonylphenol	<10.0	U	10.0	10.0	ug/L		06/27/24 05:16	06/27/24 13:54	1
Pentachlorobenzene	<1.07	U	10.0	1.07	ug/L		06/27/24 05:16	06/27/24 13:54	1
Pentachlorophenol	<0.234	U	10.0	0.234	ug/L		06/27/24 05:16	06/27/24 13:54	1
Phenanthrene	<1.42	U	10.0	1.42	ug/L		06/27/24 05:16	06/27/24 13:54	1
Phenol	<0.423	U	4.50	0.423	ug/L		06/27/24 05:16	06/27/24 13:54	1
Pyrene	<0.178	U	5.00	0.178	ug/L		06/27/24 05:16	06/27/24 13:54	1
Pyridine	<2.64	U	10.0	2.64	ug/L		06/27/24 05:16	06/27/24 13:54	1
Bis(2-chloroethyl)ether	<2.16	U	10.0	2.16	ug/L		06/27/24 05:16	06/27/24 13:54	1
Bis(2-chloroethoxy)methane	<1.76	U	10.0	1.76	ug/L		06/27/24 05:16	06/27/24 13:54	1
Bis(2-ethylhexyl) phthalate	<0.277	U	5.00	0.277	ug/L		06/27/24 05:16	06/27/24 13:54	1
Di-n-butyl phthalate	<0.252	U	5.00	0.252	ug/L		06/27/24 05:16	06/27/24 13:54	1
Di-n-octyl phthalate	<0.373	U	5.00	0.373	ug/L		06/27/24 05:16	06/27/24 13:54	1
N-Nitrosodi-n-propylamine	<2.88	U	10.0	2.88	ug/L		06/27/24 05:16	06/27/24 13:54	1
N-Nitrosodiphenylamine	<1.81	U	10.0	1.81	ug/L		06/27/24 05:16	06/27/24 13:54	1
Total Cresols	<0.00262	U	0.0100	0.00262	mg/L		06/27/24 05:16	06/27/24 13:54	1

Tentatively Identified Compound	*MB Est. Result*	*MB Qualifier*	*Unit*	*D*	*RT*	*CAS No.*	*Prepared*	*Analyzed*	*Dil Fac*
bis(2-chloromethyl)ether TIC	*NR*		*ug/mL*		*3.77*	*542-88-1*	*06/27/24 05:16*	*06/27/24 13:54*	*1*

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2,4,6-Tribromophenol (Surr)	*102*		*31 - 132*	*06/27/24 05:16*	*06/27/24 13:54*	*1*
2-Fluorobiphenyl (Surr)	*99*		*29 - 112*	*06/27/24 05:16*	*06/27/24 13:54*	*1*
2-Fluorophenol (Surr)	*44*		*28 - 114*	*06/27/24 05:16*	*06/27/24 13:54*	*1*
Nitrobenzene-d5 (Surr)	*99*		*15 - 314*	*06/27/24 05:16*	*06/27/24 13:54*	*1*
p-Terphenyl-d14 (Surr)	*111*		*20 - 141*	*06/27/24 05:16*	*06/27/24 13:54*	*1*
Phenol-d5 (Surr)	*29*		*8 - 424*	*06/27/24 05:16*	*06/27/24 13:54*	*1*

Lab Sample ID: LCS 860-168369/2-A
Matrix: Water
Analysis Batch: 168436

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 168369

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
1,2,4,5-Tetrachlorobenzene	40.0	39.43		ug/L		99	41 - 125
1,2-Diphenylhydrazine	40.0	32.64		ug/L		82	28 - 136
bis (2-chloroisopropyl) ether	40.0	35.62		ug/L		89	63 - 139
2,4,5-Trichlorophenol	40.0	44.54		ug/L		111	35 - 111
2,4,6-Trichlorophenol	40.0	43.19		ug/L		108	52 - 129
2,4-Dichlorophenol	40.0	41.81		ug/L		105	53 - 122
2,4-Dimethylphenol	40.0	30.69		ug/L		77	42 - 120
2,4-Dinitrophenol	40.0	43.44		ug/L		109	12 - 173
2,4-Dinitrotoluene	40.0	42.77		ug/L		107	48 - 127
2,6-Dinitrotoluene	40.0	41.29		ug/L		103	68 - 137
2-Chloronaphthalene	40.0	39.17		ug/L		98	65 - 120
2-Chlorophenol	40.0	31.16		ug/L		78	36 - 120
2-Nitrophenol	40.0	39.68		ug/L		99	45 - 167
o-Cresol	40.0	25.33		ug/L		63	14 - 176

Method: 625.1 - Semivolatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: LCS 860-168369/2-A **Client Sample ID: Lab Control Sample**
Matrix: Water **Prep Type: Total/NA**
Analysis Batch: 168436 **Prep Batch: 168369**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
m & p - Cresol	40.0	24.68		ug/L		62	14 - 176
3,3'-Dichlorobenzidine	40.0	41.92		ug/L		105	18 - 213
4,6-Dinitro-o-cresol	40.0	40.10		ug/L		100	53 - 130
4-Bromophenyl phenyl ether	40.0	42.12		ug/L		105	65 - 120
4-Chlorophenyl phenyl ether	40.0	41.44		ug/L		104	38 - 145
4-Nitrophenol	40.0	17.95		ug/L		45	13 - 129
4-Chloro-3-methylphenol	40.0	36.75		ug/L		92	41 - 128
Acenaphthene	40.0	38.26		ug/L		96	60 - 132
Acenaphthylene	40.0	37.97		ug/L		95	54 - 126
Anthracene	40.0	39.89		ug/L		100	43 - 120
Azobenzene	40.0	32.64		ug/L		82	28 - 136
Benzidine	40.0	20.64		ug/L		52	25 - 125
Benzo[a]anthracene	40.0	40.60		ug/L		101	42 - 133
Benzo[a]pyrene	40.0	39.91		ug/L		100	32 - 148
Benzo[b]fluoranthene	40.0	40.84		ug/L		102	42 - 140
Benzo[g,h,i]perylene	40.0	43.14		ug/L		108	13 - 195
Benzo[k]fluoranthene	40.0	39.76		ug/L		99	25 - 146
Butyl benzyl phthalate	40.0	39.82		ug/L		100	12 - 140
Chrysene	40.0	41.80		ug/L		104	44 - 140
Dibenz(a,h)anthracene	40.0	40.16		ug/L		100	16 - 200
Diethyl phthalate	40.0	41.51		ug/L		104	17 - 120
Dimethyl phthalate	40.0	38.58		ug/L		96	25 - 120
Fluoranthene	40.0	40.57		ug/L		101	43 - 121
Fluorene	40.0	39.97		ug/L		100	70 - 120
Hexachlorobenzene	40.0	40.82		ug/L		102	8 - 142
Hexachlorobutadiene	40.0	38.21		ug/L		96	38 - 120
Hexachlorocyclopentadiene	40.0	32.83		ug/L		82	41 - 125
Hexachloroethane	40.0	30.74		ug/L		77	55 - 120
Indeno[1,2,3-cd]pyrene	40.0	42.25		ug/L		106	13 - 151
Isophorone	40.0	34.61		ug/L		87	47 - 180
N-Nitrosodi-n-butylamine	40.0	34.36		ug/L		86	33 - 141
N-Nitrosodiethylamine	40.0	42.75		ug/L		107	30 - 160
N-Nitrosodimethylamine	40.0	19.82		ug/L		50	20 - 125
Naphthalene	40.0	35.50		ug/L		89	36 - 120
Nitrobenzene	40.0	35.94		ug/L		90	54 - 158
Pentachlorobenzene	40.0	40.94		ug/L		102	25 - 131
Pentachlorophenol	40.0	38.83		ug/L		97	38 - 152
Phenanthrene	40.0	39.22		ug/L		98	65 - 120
Phenol	40.0	16.48		ug/L		41	17 - 120
Pyrene	40.0	41.70		ug/L		104	70 - 120
Pyridine	40.0	8.877	J	ug/L		22	5 - 94
Bis(2-chloroethyl)ether	40.0	32.90		ug/L		82	43 - 126
Bis(2-chloroethoxy)methane	40.0	36.91		ug/L		92	49 - 165
Bis(2-ethylhexyl) phthalate	40.0	39.23		ug/L		98	29 - 137
Di-n-butyl phthalate	40.0	36.87		ug/L		92	8 - 120
Di-n-octyl phthalate	40.0	35.63		ug/L		89	19 - 132
N-Nitrosodi-n-propylamine	40.0	33.70		ug/L		84	14 - 198
N-Nitrosodiphenylamine	40.0	39.45		ug/L		99	2 - 196

QC Sample Results

Client: Environmental Monitoring Laboratory, LLC
Project/Site: City of Leander

Job ID: 870-28030-1

Method: 625.1 - Semivolatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: LCS 860-168369/2-A
Matrix: Water
Analysis Batch: 168436

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 168369

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
2,4,6-Tribromophenol (Surr)	*103*		*31 - 132*
2-Fluorobiphenyl (Surr)	*99*		*29 - 112*
2-Fluorophenol (Surr)	*53*		*28 - 114*
Nitrobenzene-d5 (Surr)	*89*		*15 - 314*
p-Terphenyl-d14 (Surr)	*107*		*20 - 141*
Phenol-d5 (Surr)	*34*		*8 - 424*

Lab Sample ID: LCSD 860-168369/3-A
Matrix: Water
Analysis Batch: 168436

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 168369

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
1,2,4,5-Tetrachlorobenzene	40.0	42.19		ug/L		105	41 - 125	7	30
1,2-Diphenylhydrazine	40.0	34.69		ug/L		87	28 - 136	6	30
bis (2-chloroisopropyl) ether	40.0	36.82		ug/L		92	63 - 139	3	30
2,4,5-Trichlorophenol	40.0	47.51	*+	ug/L		119	35 - 111	6	30
2,4,6-Trichlorophenol	40.0	47.10		ug/L		118	52 - 129	9	30
2,4-Dichlorophenol	40.0	44.56		ug/L		111	53 - 122	6	30
2,4-Dimethylphenol	40.0	31.48		ug/L		79	42 - 120	3	30
2,4-Dinitrophenol	40.0	45.41		ug/L		114	12 - 173	4	30
2,4-Dinitrotoluene	40.0	44.55		ug/L		111	48 - 127	4	25
2,6-Dinitrotoluene	40.0	43.58		ug/L		109	68 - 137	5	29
2-Chloronaphthalene	40.0	42.20		ug/L		106	65 - 120	7	15
2-Chlorophenol	40.0	32.27		ug/L		81	36 - 120	4	30
2-Nitrophenol	40.0	42.60		ug/L		107	45 - 167	7	30
o-Cresol	40.0	25.39		ug/L		63	14 - 176	0	30
m & p - Cresol	40.0	24.98		ug/L		62	14 - 176	1	30
3,3'-Dichlorobenzidine	40.0	44.73		ug/L		112	18 - 213	7	30
4,6-Dinitro-o-cresol	40.0	42.52		ug/L		106	53 - 130	6	30
4-Bromophenyl phenyl ether	40.0	45.07		ug/L		113	65 - 120	7	26
4-Chlorophenyl phenyl ether	40.0	43.70		ug/L		109	38 - 145	5	30
4-Nitrophenol	40.0	17.53		ug/L		44	13 - 129	2	30
4-Chloro-3-methylphenol	40.0	37.72		ug/L		94	41 - 128	3	30
Acenaphthene	40.0	39.82		ug/L		100	60 - 132	4	29
Acenaphthylene	40.0	39.76		ug/L		99	54 - 126	5	30
Anthracene	40.0	42.19		ug/L		105	43 - 120	6	30
Azobenzene	40.0	34.69		ug/L		87	28 - 136	6	30
Benzidine	40.0	19.62	J	ug/L		49	25 - 125	5	30
Benzo[a]anthracene	40.0	43.09		ug/L		108	42 - 133	6	30
Benzo[a]pyrene	40.0	42.52		ug/L		106	32 - 148	6	30
Benzo[b]fluoranthene	40.0	44.40		ug/L		111	42 - 140	8	30
Benzo[g,h,i]perylene	40.0	46.21		ug/L		116	13 - 195	7	30
Benzo[k]fluoranthene	40.0	41.97		ug/L		105	25 - 146	5	30
Butyl benzyl phthalate	40.0	41.89		ug/L		105	12 - 140	5	30
Chrysene	40.0	44.36		ug/L		111	44 - 140	6	30
Dibenz(a,h)anthracene	40.0	43.36		ug/L		108	16 - 200	8	30
Diethyl phthalate	40.0	43.49		ug/L		109	17 - 120	5	30
Dimethyl phthalate	40.0	40.81		ug/L		102	25 - 120	6	30

Method: 625.1 - Semivolatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: LCSD 860-168369/3-A
Matrix: Water
Analysis Batch: 168436

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 168369

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Fluoranthene	40.0	42.23		ug/L		106	43 - 121	4	30
Fluorene	40.0	42.03		ug/L		105	70 - 120	5	23
Hexachlorobenzene	40.0	42.96		ug/L		107	8 - 142	5	30
Hexachlorobutadiene	40.0	40.22		ug/L		101	38 - 120	5	30
Hexachlorocyclopentadiene	40.0	35.57		ug/L		89	41 - 125	8	30
Hexachloroethane	40.0	31.87		ug/L		80	55 - 120	4	30
Indeno[1,2,3-cd]pyrene	40.0	45.04		ug/L		113	13 - 151	6	30
Isophorone	40.0	36.31		ug/L		91	47 - 180	5	30
N-Nitrosodi-n-butylamine	40.0	35.65		ug/L		89	33 - 141	4	30
N-Nitrosodiethylamine	40.0	45.16		ug/L		113	30 - 160	5	30
N-Nitrosodimethylamine	40.0	19.50		ug/L		49	20 - 125	2	30
Naphthalene	40.0	37.87		ug/L		95	36 - 120	6	30
Nitrobenzene	40.0	37.41		ug/L		94	54 - 158	4	30
Pentachlorobenzene	40.0	43.07		ug/L		108	25 - 131	5	30
Pentachlorophenol	40.0	41.20		ug/L		103	38 - 152	6	30
Phenanthrene	40.0	41.78		ug/L		104	65 - 120	6	30
Phenol	40.0	16.07		ug/L		40	17 - 120	3	30
Pyrene	40.0	44.60		ug/L		112	70 - 120	7	30
Pyridine	40.0	7.912	J	ug/L		20	5 - 94	12	30
Bis(2-chloroethyl)ether	40.0	34.65		ug/L		87	43 - 126	5	30
Bis(2-chloroethoxy)methane	40.0	38.49		ug/L		96	49 - 165	4	30
Bis(2-ethylhexyl) phthalate	40.0	41.48		ug/L		104	29 - 137	6	30
Di-n-butyl phthalate	40.0	38.89		ug/L		97	8 - 120	5	28
Di-n-octyl phthalate	40.0	37.27		ug/L		93	19 - 132	5	30
N-Nitrosodi-n-propylamine	40.0	34.73		ug/L		87	14 - 198	3	30
N-Nitrosodiphenylamine	40.0	42.06		ug/L		105	2 - 196	6	30

Surrogate	*LCSD %Recovery*	*LCSD Qualifier*	*Limits*
2,4,6-Tribromophenol (Surr)	*111*		*31 - 132*
2-Fluorobiphenyl (Surr)	*103*		*29 - 112*
2-Fluorophenol (Surr)	*54*		*28 - 114*
Nitrobenzene-d5 (Surr)	*93*		*15 - 314*
p-Terphenyl-d14 (Surr)	*113*		*20 - 141*
Phenol-d5 (Surr)	*33*		*8 - 424*

Method: Organotins SIM - Organotins (GC/MS SIM)

Lab Sample ID: MB 570-456153/1-A
Matrix: Water
Analysis Batch: 456324

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 456153

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Tributyltin	<1.14	U	3.00	1.14	ng/L		06/30/24 11:45	07/01/24 12:04	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Tripentyltin	*60*		*10 - 120*	*06/30/24 11:45*	*07/01/24 12:04*	*1*

Method: Organotins SIM - Organotins (GC/MS SIM) (Continued)

Lab Sample ID: LCS 570-456153/2-A　　**Client Sample ID: Lab Control Sample**
Matrix: Water　　**Prep Type: Total/NA**
Analysis Batch: 456324　　**Prep Batch: 456153**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Tributyltin	178	115.3		ng/L		65	10 - 120

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
Tripentyltin	*57*		*10 - 120*

Lab Sample ID: LCSD 570-456153/3-A　　**Client Sample ID: Lab Control Sample Dup**
Matrix: Water　　**Prep Type: Total/NA**
Analysis Batch: 456324　　**Prep Batch: 456153**

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Tributyltin	178	108.0		ng/L		61	10 - 120	7	30

Surrogate	*LCSD %Recovery*	*LCSD Qualifier*	*Limits*
Tripentyltin	*49*		*10 - 120*

Method: 608.3 - Organochlorine Pesticides in Water

Lab Sample ID: MB 860-168882/1-A　　**Client Sample ID: Method Blank**
Matrix: Water　　**Prep Type: Total/NA**
Analysis Batch: 168961　　**Prep Batch: 168882**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aldrin	<0.00113	U	0.0100	0.00113	ug/L		06/29/24 11:31	07/01/24 09:48	1
alpha-BHC	<0.00142	U	0.00900	0.00142	ug/L		06/29/24 11:31	07/01/24 09:48	1
beta-BHC	<0.00389	U	0.0180	0.00389	ug/L		06/29/24 11:31	07/01/24 09:48	1
delta-BHC	<0.00245	U	0.250	0.00245	ug/L		06/29/24 11:31	07/01/24 09:48	1
gamma-BHC (Lindane)	<0.00299	U	0.0100	0.00299	ug/L		06/29/24 11:31	07/01/24 09:48	1
4,4'-DDD	<0.000814	U	0.0100	0.000814	ug/L		06/29/24 11:31	07/01/24 09:48	1
4,4'-DDE	<0.00109	U	0.0100	0.00109	ug/L		06/29/24 11:31	07/01/24 09:48	1
4,4'-DDT	<0.00379	U	0.0200	0.00379	ug/L		06/29/24 11:31	07/01/24 09:48	1
Dieldrin	<0.000953	U	0.0100	0.000953	ug/L		06/29/24 11:31	07/01/24 09:48	1
Endosulfan I	<0.00107	U	0.0100	0.00107	ug/L		06/29/24 11:31	07/01/24 09:48	1
Endosulfan II	<0.00122	U	0.0100	0.00122	ug/L		06/29/24 11:31	07/01/24 09:48	1
Endosulfan sulfate	<0.00112	U	0.0100	0.00112	ug/L		06/29/24 11:31	07/01/24 09:48	1
Endrin	<0.00156	U	0.0100	0.00156	ug/L		06/29/24 11:31	07/01/24 09:48	1
Endrin aldehyde	<0.00118	U	0.0100	0.00118	ug/L		06/29/24 11:31	07/01/24 09:48	1
Dicofol	<0.0500	U	0.100	0.0500	ug/L		06/29/24 11:31	07/01/24 09:48	1
Heptachlor	<0.00446	U	0.00900	0.00446	ug/L		06/29/24 11:31	07/01/24 09:48	1
Heptachlor epoxide	<0.00134	U	0.0100	0.00134	ug/L		06/29/24 11:31	07/01/24 09:48	1
Toxaphene	<0.0769	U	0.200	0.0769	ug/L		06/29/24 11:31	07/01/24 09:48	1
Chlordane	<0.103	U	0.250	0.103	ug/L		06/29/24 11:31	07/01/24 09:48	1
Methoxychlor	<0.00390	U	0.0200	0.00390	ug/L		06/29/24 11:31	07/01/24 09:48	1
Mirex	<0.0200	U	0.0200	0.0200	ug/L		06/29/24 11:31	07/01/24 09:48	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
DCB Decachlorobiphenyl (Surr)	*101*		*15 - 136*	*06/29/24 11:31*	*07/01/24 09:48*	*1*
Tetrachloro-m-xylene	*117*		*18 - 126*	*06/29/24 11:31*	*07/01/24 09:48*	*1*

Method: 608.3 - Organochlorine Pesticides in Water (Continued)

Lab Sample ID: LCS 860-168882/2-A
Matrix: Water
Analysis Batch: 168961

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 168882

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Aldrin	0.100	0.1095		ug/L		110	42 - 140
alpha-BHC	0.100	0.1108		ug/L		111	37 - 140
beta-BHC	0.100	0.1208		ug/L		121	17 - 147
delta-BHC	0.100	0.08390	J	ug/L		84	19 - 140
gamma-BHC (Lindane)	0.100	0.1187		ug/L		119	34 - 140
4,4'-DDD	0.100	0.1170		ug/L		117	31 - 141
4,4'-DDE	0.100	0.1147		ug/L		115	30 - 145
4,4'-DDT	0.100	0.1287		ug/L		129	25 - 160
Dieldrin	0.100	0.1147		ug/L		115	36 - 146
Endosulfan I	0.100	0.1180		ug/L		118	45 - 153
Endosulfan II	0.100	0.1195		ug/L		119	22 - 171
Endosulfan sulfate	0.100	0.1061		ug/L		106	26 - 144
Endrin	0.100	0.1353		ug/L		135	30 - 147
Endrin aldehyde	0.100	0.09444		ug/L		94	60 - 130
Heptachlor	0.100	0.1191		ug/L		119	34 - 140
Heptachlor epoxide	0.100	0.1152		ug/L		115	37 - 142
Methoxychlor	0.100	0.1336	*+	ug/L		134	50 - 130

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
DCB Decachlorobiphenyl (Surr)	*104*		*15 - 136*
Tetrachloro-m-xylene	*111*		*18 - 126*

Lab Sample ID: LCSD 860-168882/3-A
Matrix: Water
Analysis Batch: 168961

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 168882

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Aldrin	0.100	0.1110		ug/L		111	42 - 140	1	30
alpha-BHC	0.100	0.1127		ug/L		113	37 - 140	2	30
beta-BHC	0.100	0.1225		ug/L		122	17 - 147	1	30
delta-BHC	0.100	0.08414	J	ug/L		84	19 - 140	0	30
gamma-BHC (Lindane)	0.100	0.1208		ug/L		121	34 - 140	2	30
4,4'-DDD	0.100	0.1155		ug/L		116	31 - 141	1	30
4,4'-DDE	0.100	0.1151		ug/L		115	30 - 145	0	30
4,4'-DDT	0.100	0.1285		ug/L		128	25 - 160	0	30
Dieldrin	0.100	0.1149		ug/L		115	36 - 146	0	30
Endosulfan I	0.100	0.1190		ug/L		119	45 - 153	1	30
Endosulfan II	0.100	0.1180		ug/L		118	22 - 171	1	30
Endosulfan sulfate	0.100	0.1043		ug/L		104	26 - 144	2	30
Endrin	0.100	0.1355		ug/L		135	30 - 147	0	30
Endrin aldehyde	0.100	0.09132		ug/L		91	60 - 130	3	30
Heptachlor	0.100	0.1209		ug/L		121	34 - 140	2	30
Heptachlor epoxide	0.100	0.1168		ug/L		117	37 - 142	1	30
Methoxychlor	0.100	0.1303		ug/L		130	50 - 130	2	30

Surrogate	*LCSD %Recovery*	*LCSD Qualifier*	*Limits*
DCB Decachlorobiphenyl (Surr)	*98*		*15 - 136*
Tetrachloro-m-xylene	*109*		*18 - 126*

QC Sample Results

Client: Environmental Monitoring Laboratory, LLC
Project/Site: City of Leander

Job ID: 870-28030-1

Method: 608.3 - Polychlorinated Biphenyls (PCBs) (GC)

Lab Sample ID: MB 860-168882/1-A
Matrix: Water
Analysis Batch: 168967

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 168882

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
PCB-1016	<0.0125	U	0.100	0.0125	ug/L		06/29/24 11:31	07/01/24 10:41	1
PCB-1221	<0.0125	U	0.100	0.0125	ug/L		06/29/24 11:31	07/01/24 10:41	1
PCB-1232	<0.0125	U	0.100	0.0125	ug/L		06/29/24 11:31	07/01/24 10:41	1
PCB-1242	<0.0125	U	0.100	0.0125	ug/L		06/29/24 11:31	07/01/24 10:41	1
PCB-1248	<0.0125	U	0.100	0.0125	ug/L		06/29/24 11:31	07/01/24 10:41	1
PCB-1254	<0.00780	U	0.100	0.00780	ug/L		06/29/24 11:31	07/01/24 10:41	1
PCB-1260	<0.00780	U	0.100	0.00780	ug/L		06/29/24 11:31	07/01/24 10:41	1
Polychlorinated biphenyls, Total	<0.100	U	0.100	0.100	ug/L		06/29/24 11:31	07/01/24 10:41	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Tetrachloro-m-xylene (Surr)	*107*		*18 - 126*	*06/29/24 11:31*	*07/01/24 10:41*	*1*
DCB Decachlorobiphenyl (Surr)	*133*		*15 - 136*	*06/29/24 11:31*	*07/01/24 10:41*	*1*

Lab Sample ID: LCS 860-168882/4-A
Matrix: Water
Analysis Batch: 168967

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 168882

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
PCB-1016	1.00	1.083	*+	ug/L		108	61 - 103
PCB-1260	1.00	1.160		ug/L		116	37 - 130

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
Tetrachloro-m-xylene (Surr)	*108*		*18 - 126*
DCB Decachlorobiphenyl (Surr)	*132*		*15 - 136*

Lab Sample ID: LCSD 860-168882/5-A
Matrix: Water
Analysis Batch: 168967

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 168882

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
PCB-1016	1.00	1.101	*+	ug/L		110	61 - 103	2	24
PCB-1260	1.00	1.191		ug/L		119	37 - 130	3	28

Surrogate	*LCSD %Recovery*	*LCSD Qualifier*	*Limits*
Tetrachloro-m-xylene (Surr)	*108*		*18 - 126*
DCB Decachlorobiphenyl (Surr)	*137*	*S1+*	*15 - 136*

Method: 614 - Organophosphorous Pesticides (GC)

Lab Sample ID: MB 280-658559/1-A
Matrix: Water
Analysis Batch: 658820

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 658559

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Guthion	<0.353	U	2.50	0.353	ug/L		06/27/24 10:25	06/28/24 20:19	1
Diazinon	<0.147	U	0.500	0.147	ug/L		06/27/24 10:25	06/28/24 20:19	1
Disulfoton	<0.322	U	1.00	0.322	ug/L		06/27/24 10:25	06/28/24 20:19	1
Malathion	<0.133	U	2.00	0.133	ug/L		06/27/24 10:25	06/28/24 20:19	1

Client: Environmental Monitoring Laboratory, LLC
Project/Site: City of Leander

Job ID: 870-28030-1

Method: 614 - Organophosphorous Pesticides (GC) (Continued)

Lab Sample ID: MB 280-658559/1-A
Matrix: Water
Analysis Batch: 658820

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 658559

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Methyl parathion	<0.141	U	4.00	0.141	ug/L		06/27/24 10:25	06/28/24 20:19	1
Parathion	<0.144	U	1.00	0.144	ug/L		06/27/24 10:25	06/28/24 20:19	1
Demeton, Total	<0.209	U	3.00	0.209	ug/L		06/27/24 10:25	06/28/24 20:19	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Chlormefos	*69*		*49 - 171*	*06/27/24 10:25*	*06/28/24 20:19*	*1*
Triphenylphosphate	*100*		*60 - 154*	*06/27/24 10:25*	*06/28/24 20:19*	*1*

Lab Sample ID: LCS 280-658559/2-A
Matrix: Water
Analysis Batch: 658820

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 658559

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Guthion	4.00	3.603		ug/L		90	42 - 125
Diazinon	4.00	3.491		ug/L		87	47 - 149
Disulfoton	4.00	3.140		ug/L		78	44 - 139
Malathion	4.00	3.784		ug/L		95	53 - 137
Methyl parathion	4.00	3.744	J	ug/L		94	55 - 131
Parathion	4.00	3.995		ug/L		100	47 - 142
Demeton, Total	4.00	3.069		ug/L		77	33 - 141

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
Chlormefos	*75*		*49 - 171*
Triphenylphosphate	*113*		*60 - 154*

Method: 8141B - Organophosphorous Compounds by Gas Chromatography, Capillary Column Technique

Lab Sample ID: MB 280-658559/1-A
Matrix: Water
Analysis Batch: 658819

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 658559

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chlorpyrifos	<0.360	U	1.50	0.360	ug/L		06/27/24 10:25	06/28/24 20:19	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Triphenylphosphate (Surr)	*100*		*42 - 120*	*06/27/24 10:25*	*06/28/24 20:19*	*1*
Chlormephos (Surr)	*69*		*27 - 120*	*06/27/24 10:25*	*06/28/24 20:19*	*1*

Lab Sample ID: LCS 280-658559/2-A
Matrix: Water
Analysis Batch: 658819

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 658559

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Chlorpyrifos	4.00	3.432		ug/L		86	43 - 120

Method: 8141B - Organophosphorous Compounds by Gas Chromatography, Capillary Column Technique (Continued)

Lab Sample ID: LCS 280-658559/2-A
Matrix: Water
Analysis Batch: 658819

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 658559

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
Triphenylphosphate (Surr)	*113*		*42 - 120*
Chlormephos (Surr)	*75*		*27 - 120*

Method: 300.0 - Anions, Ion Chromatography

Lab Sample ID: MB 860-168223/13
Matrix: Water
Analysis Batch: 168223

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Fluoride	<0.100	U	0.500	0.100	mg/L			06/26/24 18:10	1

Lab Sample ID: LCS 860-168223/14
Matrix: Water
Analysis Batch: 168223

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Fluoride	10.0	9.978		mg/L		100	90 - 110

Lab Sample ID: LCSD 860-168223/15
Matrix: Water
Analysis Batch: 168223

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Fluoride	10.0	9.981		mg/L		100	90 - 110	0	20

Lab Sample ID: LLCS 860-168223/17
Matrix: Water
Analysis Batch: 168223

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LLCS Result	LLCS Qualifier	Unit	D	%Rec	%Rec Limits
Fluoride	0.500	0.5236		mg/L		105	50 - 150

Lab Sample ID: 870-28030-1 MS
Matrix: Water
Analysis Batch: 168223

Client Sample ID: Final Effluent Composite
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec Limits
Fluoride	0.157	J	10.0	9.708		mg/L		96	90 - 110

Lab Sample ID: 870-28030-1 MSD
Matrix: Water
Analysis Batch: 168223

Client Sample ID: Final Effluent Composite
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Fluoride	0.157	J	10.0	9.763		mg/L		96	90 - 110	1	15

Method: 300.0 - Anions, Ion Chromatography (Continued)

Lab Sample ID: MB 860-168224/13
Matrix: Water
Analysis Batch: 168224

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Nitrate as N	<0.0391	U	0.100	0.0391	mg/L			06/26/24 18:10	1

Lab Sample ID: LCS 860-168224/14
Matrix: Water
Analysis Batch: 168224

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Nitrate as N	10.0	10.05		mg/L		100	90 - 110

Lab Sample ID: LCSD 860-168224/15
Matrix: Water
Analysis Batch: 168224

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Nitrate as N	10.0	10.00		mg/L		100	90 - 110	0	20

Lab Sample ID: LLCS 860-168224/16
Matrix: Water
Analysis Batch: 168224

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LLCS Result	LLCS Qualifier	Unit	D	%Rec	%Rec Limits
Nitrate as N	0.100	0.1133		mg/L		113	50 - 150

Lab Sample ID: 870-28030-1 MS
Matrix: Water
Analysis Batch: 168224

Client Sample ID: Final Effluent Composite
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec Limits
Nitrate as N	13.3		10.0	22.66		mg/L		94	90 - 110

Lab Sample ID: 870-28030-1 MSD
Matrix: Water
Analysis Batch: 168224

Client Sample ID: Final Effluent Composite
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Nitrate as N	13.3		10.0	22.80		mg/L		95	90 - 110	1	15

Method: 632 - Carbamate and Urea Pesticides (HPLC)

Lab Sample ID: MB 860-168370/1-A
Matrix: Water
Analysis Batch: 170008

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 168370

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Carbaryl	<1.85	U	5.00	1.85	ug/L		06/27/24 05:22	06/27/24 12:33	1
Diuron	<0.0514	U	0.0900	0.0514	ug/L		06/27/24 05:22	06/27/24 12:33	1

Method: 632 - Carbamate and Urea Pesticides (HPLC) (Continued)

Lab Sample ID: LCS 860-168370/2-A **Client Sample ID: Lab Control Sample**
Matrix: Water **Prep Type: Total/NA**
Analysis Batch: 170008 **Prep Batch: 168370**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Carbaryl	100	106.0		ug/L		106	70 - 130
Diuron	2.00	2.104		ug/L		105	70 - 130

Lab Sample ID: LCSD 860-168370/3-A **Client Sample ID: Lab Control Sample Dup**
Matrix: Water **Prep Type: Total/NA**
Analysis Batch: 170008 **Prep Batch: 168370**

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Carbaryl	100	108.2		ug/L		108	70 - 130	2	20
Diuron	2.00	2.066		ug/L		103	70 - 130	2	20

Method: 8321B - Herbicides (LC/MS)

Lab Sample ID: LB 860-168818/1-A **Client Sample ID: Method Blank**
Matrix: Water **Prep Type: Total/NA**
Analysis Batch: 168997

Analyte	LB Result	LB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Silvex (2,4,5-TP)	<0.600	U	2.50	0.600	ug/L			07/01/24 12:56	1
Dichlorprop	<0.354	U	2.50	0.354	ug/L			07/01/24 12:56	1
2,4,5-T	<0.866	U	2.50	0.866	ug/L			07/01/24 12:56	1
Pentachlorophenol	<0.162	U	0.500	0.162	ug/L			07/01/24 12:56	1
MCPP	<0.323	U	0.500	0.323	ug/L			07/01/24 12:56	1
MCPA	<0.268	U	0.500	0.268	ug/L			07/01/24 12:56	1
Dinoseb	<0.468	U	2.50	0.468	ug/L			07/01/24 12:56	1
Dicamba	<0.861	U	2.50	0.861	ug/L			07/01/24 12:56	1
2,4-DB	<0.772	U	2.50	0.772	ug/L			07/01/24 12:56	1
2,4-D	<0.539	U	2.50	0.539	ug/L			07/01/24 12:56	1
Dalapon	<0.772	U	2.50	0.772	ug/L			07/01/24 12:56	1

Surrogate	*LB %Recovery*	*LB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
DCAA	*95*		*50 - 150*		*07/01/24 12:56*	*1*

Lab Sample ID: MB 860-168997/10 **Client Sample ID: Method Blank**
Matrix: Water **Prep Type: Total/NA**
Analysis Batch: 168997

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Silvex (2,4,5-TP)	<1.20	U	5.00	1.20	ug/L			07/01/24 12:25	1
Dichlorprop	<0.707	U	5.00	0.707	ug/L			07/01/24 12:25	1
2,4,5-T	<1.73	U	5.00	1.73	ug/L			07/01/24 12:25	1
Pentachlorophenol	<0.325	U	1.00	0.325	ug/L			07/01/24 12:25	1
MCPP	<0.646	U	1.00	0.646	ug/L			07/01/24 12:25	1
MCPA	<0.536	U	1.00	0.536	ug/L			07/01/24 12:25	1
Dinoseb	<0.936	U	5.00	0.936	ug/L			07/01/24 12:25	1
Dicamba	<1.72	U	5.00	1.72	ug/L			07/01/24 12:25	1
2,4-DB	<1.54	U	5.00	1.54	ug/L			07/01/24 12:25	1
2,4-D	<1.08	U	5.00	1.08	ug/L			07/01/24 12:25	1
Dalapon	<1.54	U	5.00	1.54	ug/L			07/01/24 12:25	1

Method: 8321B - Herbicides (LC/MS) (Continued)

Surrogate	MB %Recovery	MB Qualifier	Limits	Prepared	Analyzed	Dil Fac
DCAA	99		50 - 150		07/01/24 12:25	1

Lab Sample ID: LCS 860-168997/5
Matrix: Water
Analysis Batch: 168997

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Silvex (2,4,5-TP)	40.2	44.33		ug/L		110	50 - 150
Dichlorprop	40.4	42.72		ug/L		106	50 - 150
2,4,5-T	39.8	38.17		ug/L		96	50 - 150
Pentachlorophenol	40.3	40.85		ug/L		101	50 - 150
MCPP	40.4	49.11		ug/L		122	50 - 150
MCPA	40.1	44.47		ug/L		111	50 - 150
Dinoseb	40.3	36.35		ug/L		90	50 - 150
Dicamba	40.4	43.95		ug/L		109	50 - 150
2,4-DB	40.2	37.39		ug/L		93	50 - 150
2,4-D	40.7	41.16		ug/L		101	50 - 150
Dalapon	40.1	44.03		ug/L		110	50 - 150

Surrogate	LCS %Recovery	LCS Qualifier	Limits
DCAA	89		50 - 150

Lab Sample ID: LCSD 860-168997/6
Matrix: Water
Analysis Batch: 168997

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Silvex (2,4,5-TP)	40.2	43.03		ug/L		107	50 - 150	3	30
Dichlorprop	40.4	42.28		ug/L		105	50 - 150	1	30
2,4,5-T	39.8	37.32		ug/L		94	50 - 150	2	30
Pentachlorophenol	40.3	40.40		ug/L		100	50 - 150	1	30
MCPP	40.4	47.59		ug/L		118	50 - 150	3	30
MCPA	40.1	43.61		ug/L		109	50 - 150	2	30
Dinoseb	40.3	36.53		ug/L		91	50 - 150	1	30
Dicamba	40.4	41.63		ug/L		103	50 - 150	5	30
2,4-DB	40.2	37.04		ug/L		92	50 - 150	1	30
2,4-D	40.7	41.31		ug/L		102	50 - 150	0	30
Dalapon	40.1	41.13		ug/L		102	50 - 150	7	30

Surrogate	LCSD %Recovery	LCSD Qualifier	Limits
DCAA	91		50 - 150

Method: 1631E - Mercury, Low Level (CVAFS)

Lab Sample ID: MB 400-676263/3-A
Matrix: Water
Analysis Batch: 676388

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 676263

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	<0.200	U	0.500	0.200	ng/L		06/27/24 15:23	06/28/24 10:14	1

QC Sample Results

Client: Environmental Monitoring Laboratory, LLC
Project/Site: City of Leander

Job ID: 870-28030-1

Method: 1631E - Mercury, Low Level (CVAFS) (Continued)

Lab Sample ID: LCS 400-676263/4-A
Matrix: Water
Analysis Batch: 676388

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 676263

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Mercury	5.00	4.372		ng/L		87	79 - 121

Lab Sample ID: LCSD 400-676263/5-A
Matrix: Water
Analysis Batch: 676388

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 676263

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Mercury	5.00	4.157		ng/L		83	79 - 121	5	20

Method: 200.8 - Metals (ICP/MS)

Lab Sample ID: MB 860-168407/1-A
Matrix: Water
Analysis Batch: 168738

Client Sample ID: Method Blank
Prep Type: Total Recoverable
Prep Batch: 168407

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	<0.00301	U	0.0200	0.00301	mg/L		06/27/24 08:45	06/27/24 18:16	1
Antimony	<0.00105	U	0.00200	0.00105	mg/L		06/27/24 08:45	06/27/24 18:16	1
Arsenic	<0.000341	U	0.00400	0.000341	mg/L		06/27/24 08:45	06/27/24 18:16	1
Barium	<0.000289	U	0.00400	0.000289	mg/L		06/27/24 08:45	06/27/24 18:16	1
Beryllium	<0.000148	U	0.00200	0.000148	mg/L		06/27/24 08:45	06/27/24 18:16	1
Cadmium	<0.000258	U	0.00200	0.000258	mg/L		06/27/24 08:45	06/27/24 18:16	1
Chromium	<0.000325	U	0.00400	0.000325	mg/L		06/27/24 08:45	06/27/24 18:16	1
Copper	<0.000690	U	0.00400	0.000690	mg/L		06/27/24 08:45	06/27/24 18:16	1
Lead	<0.000140	U	0.00200	0.000140	mg/L		06/27/24 08:45	06/27/24 18:16	1
Nickel	<0.000486	U	0.00200	0.000486	mg/L		06/27/24 08:45	06/27/24 18:16	1
Selenium	<0.000685	U	0.00200	0.000685	mg/L		06/27/24 08:45	06/27/24 18:16	1
Silver	<0.000118	U	0.00200	0.000118	mg/L		06/27/24 08:45	06/27/24 18:16	1
Thallium	<0.000215	U	0.00200	0.000215	mg/L		06/27/24 08:45	06/27/24 18:16	1
Zinc	<0.000885	U	0.00400	0.000885	mg/L		06/27/24 08:45	06/27/24 18:16	1

Lab Sample ID: LCS 860-168407/2-A
Matrix: Water
Analysis Batch: 168738

Client Sample ID: Lab Control Sample
Prep Type: Total Recoverable
Prep Batch: 168407

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Aluminum	0.500	0.4920		mg/L		98	85 - 115
Antimony	0.100	0.09250		mg/L		93	85 - 115
Arsenic	0.100	0.09798		mg/L		98	85 - 115
Barium	0.100	0.09516		mg/L		95	85 - 115
Beryllium	0.100	0.09687		mg/L		97	85 - 115
Cadmium	0.100	0.09735		mg/L		97	85 - 115
Chromium	0.100	0.09866		mg/L		99	85 - 115
Copper	0.100	0.09764		mg/L		98	85 - 115
Lead	0.100	0.09616		mg/L		96	85 - 115
Nickel	0.100	0.09662		mg/L		97	85 - 115
Selenium	0.100	0.09833		mg/L		98	85 - 115
Silver	0.0500	0.04873		mg/L		97	85 - 115
Thallium	0.100	0.09727		mg/L		97	85 - 115

Method: 200.8 - Metals (ICP/MS) (Continued)

Lab Sample ID: LCS 860-168407/2-A
Matrix: Water
Analysis Batch: 168738

Client Sample ID: Lab Control Sample
Prep Type: Total Recoverable
Prep Batch: 168407

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Zinc	0.100	0.09760		mg/L		98	85 - 115

Lab Sample ID: LCSD 860-168407/3-A
Matrix: Water
Analysis Batch: 168738

Client Sample ID: Lab Control Sample Dup
Prep Type: Total Recoverable
Prep Batch: 168407

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Aluminum	0.500	0.4896		mg/L		98	85 - 115	0	20
Antimony	0.100	0.09457		mg/L		95	85 - 115	2	20
Arsenic	0.100	0.09823		mg/L		98	85 - 115	0	20
Barium	0.100	0.09558		mg/L		96	85 - 115	0	20
Beryllium	0.100	0.09643		mg/L		96	85 - 115	0	20
Cadmium	0.100	0.09734		mg/L		97	85 - 115	0	20
Chromium	0.100	0.09884		mg/L		99	85 - 115	0	20
Copper	0.100	0.09690		mg/L		97	85 - 115	1	20
Lead	0.100	0.09624		mg/L		96	85 - 115	0	20
Nickel	0.100	0.09609		mg/L		96	85 - 115	1	20
Selenium	0.100	0.09658		mg/L		97	85 - 115	2	20
Silver	0.0500	0.04909		mg/L		98	85 - 115	1	20
Thallium	0.100	0.09789		mg/L		98	85 - 115	1	20
Zinc	0.100	0.09774		mg/L		98	85 - 115	0	20

Lab Sample ID: LLCS 860-168407/4-A
Matrix: Water
Analysis Batch: 168738

Client Sample ID: Lab Control Sample
Prep Type: Total Recoverable
Prep Batch: 168407

Analyte	Spike Added	LLCS Result	LLCS Qualifier	Unit	D	%Rec	%Rec Limits
Aluminum	0.0200	0.01907	J	mg/L		95	50 - 150
Antimony	0.00200	0.001947	J	mg/L		97	50 - 150
Arsenic	0.00400	0.004122		mg/L		103	50 - 150
Barium	0.00400	0.003881	J	mg/L		97	50 - 150
Beryllium	0.00200	0.002020		mg/L		101	50 - 150
Cadmium	0.00200	0.001965	J	mg/L		98	50 - 150
Chromium	0.00400	0.004188		mg/L		105	50 - 150
Copper	0.00400	0.004098		mg/L		102	50 - 150
Lead	0.00200	0.001951	J	mg/L		98	50 - 150
Nickel	0.00200	0.002009		mg/L		100	50 - 150
Selenium	0.00200	0.002760		mg/L		138	50 - 150
Silver	0.00200	0.002041		mg/L		102	50 - 150
Thallium	0.00200	0.001916	J	mg/L		96	50 - 150
Zinc	0.00400	0.003321	J	mg/L		83	50 - 150

Method: 335.4 - Cyanide, Total

Lab Sample ID: MB 860-168292/4-A
Matrix: Water
Analysis Batch: 168576

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 168292

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cyanide, Total	<2.00	U	5.00	2.00	ug/L		06/26/24 16:27	06/27/24 10:03	1

Method: 335.4 - Cyanide, Total

Lab Sample ID: LCS 860-168292/5-A **Client Sample ID: Lab Control Sample**
Matrix: Water **Prep Type: Total/NA**
Analysis Batch: 168576 **Prep Batch: 168292**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Cyanide, Total	100	101.7		ug/L		102	90 - 110

Method: 420.4 - Phenolics, Total Recoverable

Lab Sample ID: MB 860-168775/30 **Client Sample ID: Method Blank**
Matrix: Water **Prep Type: Total/NA**
Analysis Batch: 168775

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Phenols, Total	<0.00580	U	0.0100	0.00580	mg/L			06/27/24 12:19	1

Lab Sample ID: LCS 860-168775/31 **Client Sample ID: Lab Control Sample**
Matrix: Water **Prep Type: Total/NA**
Analysis Batch: 168775

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Phenols, Total	0.100	0.1002		mg/L		100	90 - 110

Lab Sample ID: LCSD 860-168775/32 **Client Sample ID: Lab Control Sample Dup**
Matrix: Water **Prep Type: Total/NA**
Analysis Batch: 168775

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Phenols, Total	0.100	0.09960		mg/L		100	90 - 110	1	20

Method: 4500 CN G NonAm - Cyanide, Non-amenable

Lab Sample ID: MB 860-168560/4-A **Client Sample ID: Method Blank**
Matrix: Water **Prep Type: Total/NA**
Analysis Batch: 168832 **Prep Batch: 168560**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cyanide, Non-amenable	<2.33	U	5.00	2.33	ug/L		06/27/24 17:55	06/28/24 16:27	1

Method: 7196A - Chromium, Hexavalent

Lab Sample ID: MB 870-20973/9 **Client Sample ID: Method Blank**
Matrix: Water **Prep Type: Total/NA**
Analysis Batch: 20973

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cr (VI)	<0.00280	U	0.0100	0.00280	mg/L			06/25/24 19:52	1

Lab Sample ID: LCS 870-20973/10 **Client Sample ID: Lab Control Sample**
Matrix: Water **Prep Type: Total/NA**
Analysis Batch: 20973

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Cr (VI)	0.499	0.4729		mg/L		95	85 - 115

Method: 7196A - Chromium, Hexavalent (Continued)

Lab Sample ID: LCSD 870-20973/11
Matrix: Water
Analysis Batch: 20973

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Cr (VI)	0.499	0.4839		mg/L		97	85 - 115	2	20

QC Association Summary

Client: Environmental Monitoring Laboratory, LLC
Project/Site: City of Leander

Job ID: 870-28030-1

GC/MS VOA

Analysis Batch: 20930

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
870-28030-3	Final Effluent	Total/NA	Water	624.1	
MB 870-20930/5	Method Blank	Total/NA	Water	624.1	
LCS 870-20930/3	Lab Control Sample	Total/NA	Water	624.1	
LCSD 870-20930/4	Lab Control Sample Dup	Total/NA	Water	624.1	

GC/MS Semi VOA

Prep Batch: 168369

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
870-28030-1	Final Effluent Composite	Total/NA	Water	625	
MB 860-168369/1-A	Method Blank	Total/NA	Water	3510C	
LCS 860-168369/2-A	Lab Control Sample	Total/NA	Water	3510C	
LCSD 860-168369/3-A	Lab Control Sample Dup	Total/NA	Water	3510C	

Analysis Batch: 168436

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
870-28030-1	Final Effluent Composite	Total/NA	Water	625.1	168369
MB 860-168369/1-A	Method Blank	Total/NA	Water	625.1	168369
LCS 860-168369/2-A	Lab Control Sample	Total/NA	Water	625.1	168369
LCSD 860-168369/3-A	Lab Control Sample Dup	Total/NA	Water	625.1	168369

Prep Batch: 456153

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
870-28030-1	Final Effluent Composite	Total/NA	Water	Organotin	
MB 570-456153/1-A	Method Blank	Total/NA	Water	Organotin	
LCS 570-456153/2-A	Lab Control Sample	Total/NA	Water	Organotin	
LCSD 570-456153/3-A	Lab Control Sample Dup	Total/NA	Water	Organotin	

Analysis Batch: 456324

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
870-28030-1	Final Effluent Composite	Total/NA	Water	Organotins SIM	456153
MB 570-456153/1-A	Method Blank	Total/NA	Water	Organotins SIM	456153
LCS 570-456153/2-A	Lab Control Sample	Total/NA	Water	Organotins SIM	456153
LCSD 570-456153/3-A	Lab Control Sample Dup	Total/NA	Water	Organotins SIM	456153

GC Semi VOA

Prep Batch: 168882

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
870-28030-1	Final Effluent Composite	Total/NA	Water	608	
MB 860-168882/1-A	Method Blank	Total/NA	Water	3510C	
LCS 860-168882/2-A	Lab Control Sample	Total/NA	Water	3510C	
LCS 860-168882/4-A	Lab Control Sample	Total/NA	Water	3510C	
LCSD 860-168882/3-A	Lab Control Sample Dup	Total/NA	Water	3510C	
LCSD 860-168882/5-A	Lab Control Sample Dup	Total/NA	Water	3510C	

Analysis Batch: 168961

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
870-28030-1	Final Effluent Composite	Total/NA	Water	608.3	168882
MB 860-168882/1-A	Method Blank	Total/NA	Water	608.3	168882
LCS 860-168882/2-A	Lab Control Sample	Total/NA	Water	608.3	168882
LCSD 860-168882/3-A	Lab Control Sample Dup	Total/NA	Water	608.3	168882

QC Association Summary

GC Semi VOA

Analysis Batch: 168967

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
870-28030-1	Final Effluent Composite	Total/NA	Water	608.3	168882
MB 860-168882/1-A	Method Blank	Total/NA	Water	608.3	168882
LCS 860-168882/4-A	Lab Control Sample	Total/NA	Water	608.3	168882
LCSD 860-168882/5-A	Lab Control Sample Dup	Total/NA	Water	608.3	168882

Prep Batch: 658559

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
870-28030-1	Final Effluent Composite	Total/NA	Water	3510C	
MB 280-658559/1-A	Method Blank	Total/NA	Water	3510C	
LCS 280-658559/2-A	Lab Control Sample	Total/NA	Water	3510C	

Analysis Batch: 658819

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
870-28030-1	Final Effluent Composite	Total/NA	Water	8141B	658559
MB 280-658559/1-A	Method Blank	Total/NA	Water	8141B	658559
LCS 280-658559/2-A	Lab Control Sample	Total/NA	Water	8141B	658559

Analysis Batch: 658820

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
870-28030-1	Final Effluent Composite	Total/NA	Water	614	658559
MB 280-658559/1-A	Method Blank	Total/NA	Water	614	658559
LCS 280-658559/2-A	Lab Control Sample	Total/NA	Water	614	658559

HPLC/IC

Analysis Batch: 168223

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
870-28030-1	Final Effluent Composite	Total/NA	Water	300.0	
MB 860-168223/13	Method Blank	Total/NA	Water	300.0	
LCS 860-168223/14	Lab Control Sample	Total/NA	Water	300.0	
LCSD 860-168223/15	Lab Control Sample Dup	Total/NA	Water	300.0	
LLCS 860-168223/17	Lab Control Sample	Total/NA	Water	300.0	
870-28030-1 MS	Final Effluent Composite	Total/NA	Water	300.0	
870-28030-1 MSD	Final Effluent Composite	Total/NA	Water	300.0	

Analysis Batch: 168224

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
870-28030-1	Final Effluent Composite	Total/NA	Water	300.0	
MB 860-168224/13	Method Blank	Total/NA	Water	300.0	
LCS 860-168224/14	Lab Control Sample	Total/NA	Water	300.0	
LCSD 860-168224/15	Lab Control Sample Dup	Total/NA	Water	300.0	
LLCS 860-168224/16	Lab Control Sample	Total/NA	Water	300.0	
870-28030-1 MS	Final Effluent Composite	Total/NA	Water	300.0	
870-28030-1 MSD	Final Effluent Composite	Total/NA	Water	300.0	

Prep Batch: 168370

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
870-28030-1	Final Effluent Composite	Total/NA	Water	CWA_Prep	
MB 860-168370/1-A	Method Blank	Total/NA	Water	CWA_Prep	
LCS 860-168370/2-A	Lab Control Sample	Total/NA	Water	CWA_Prep	
LCSD 860-168370/3-A	Lab Control Sample Dup	Total/NA	Water	CWA_Prep	

HPLC/IC

Analysis Batch: 170008

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
870-28030-1	Final Effluent Composite	Total/NA	Water	632	168370
MB 860-168370/1-A	Method Blank	Total/NA	Water	632	168370
LCS 860-168370/2-A	Lab Control Sample	Total/NA	Water	632	168370
LCSD 860-168370/3-A	Lab Control Sample Dup	Total/NA	Water	632	168370

LCMS

Leach Batch: 168818

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
LB 860-168818/1-A	Method Blank	Total/NA	Water	1311	

Analysis Batch: 168997

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
870-28030-1	Final Effluent Composite	Total/NA	Water	8321B	
LB 860-168818/1-A	Method Blank	Total/NA	Water	8321B	168818
MB 860-168997/10	Method Blank	Total/NA	Water	8321B	
LCS 860-168997/5	Lab Control Sample	Total/NA	Water	8321B	
LCSD 860-168997/6	Lab Control Sample Dup	Total/NA	Water	8321B	

Metals

Prep Batch: 168407

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
870-28030-1	Final Effluent Composite	Total Recoverable	Water	200.8	
MB 860-168407/1-A	Method Blank	Total Recoverable	Water	200.8	
LCS 860-168407/2-A	Lab Control Sample	Total Recoverable	Water	200.8	
LCSD 860-168407/3-A	Lab Control Sample Dup	Total Recoverable	Water	200.8	
LLCS 860-168407/4-A	Lab Control Sample	Total Recoverable	Water	200.8	

Analysis Batch: 168738

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
870-28030-1	Final Effluent Composite	Total Recoverable	Water	200.8	168407
MB 860-168407/1-A	Method Blank	Total Recoverable	Water	200.8	168407
LCS 860-168407/2-A	Lab Control Sample	Total Recoverable	Water	200.8	168407
LCSD 860-168407/3-A	Lab Control Sample Dup	Total Recoverable	Water	200.8	168407
LLCS 860-168407/4-A	Lab Control Sample	Total Recoverable	Water	200.8	168407

Prep Batch: 676263

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
870-28030-1	Final Effluent Composite	Total/NA	Water	1631E	
870-28030-2	Field Blank LL Hg	Total/NA	Water	1631E	
MB 400-676263/3-A	Method Blank	Total/NA	Water	1631E	
LCS 400-676263/4-A	Lab Control Sample	Total/NA	Water	1631E	
LCSD 400-676263/5-A	Lab Control Sample Dup	Total/NA	Water	1631E	

Analysis Batch: 676388

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
870-28030-1	Final Effluent Composite	Total/NA	Water	1631E	676263
870-28030-2	Field Blank LL Hg	Total/NA	Water	1631E	676263
MB 400-676263/3-A	Method Blank	Total/NA	Water	1631E	676263
LCS 400-676263/4-A	Lab Control Sample	Total/NA	Water	1631E	676263
LCSD 400-676263/5-A	Lab Control Sample Dup	Total/NA	Water	1631E	676263

General Chemistry

Analysis Batch: 20973

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
870-28030-1	Final Effluent Composite	Total/NA	Water	7196A	
MB 870-20973/9	Method Blank	Total/NA	Water	7196A	
LCS 870-20973/10	Lab Control Sample	Total/NA	Water	7196A	
LCSD 870-20973/11	Lab Control Sample Dup	Total/NA	Water	7196A	

Prep Batch: 168292

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
870-28030-3	Final Effluent	Total/NA	Water	Distill/CN	
MB 860-168292/4-A	Method Blank	Total/NA	Water	Distill/CN	
LCS 860-168292/5-A	Lab Control Sample	Total/NA	Water	Distill/CN	

Prep Batch: 168560

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
870-28030-3	Final Effluent	Total/NA	Water	Distill/CN	
MB 860-168560/4-A	Method Blank	Total/NA	Water	Distill/CN	

Analysis Batch: 168576

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
870-28030-3	Final Effluent	Total/NA	Water	335.4	168292
MB 860-168292/4-A	Method Blank	Total/NA	Water	335.4	168292
LCS 860-168292/5-A	Lab Control Sample	Total/NA	Water	335.4	168292
LCSD 860-168292/6-A	Lab Control Sample Dup	Total/NA	Water	335.4	

Analysis Batch: 168591

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
870-28030-3	Final Effluent	Total/NA	Water	SM 4500 CN G	

Analysis Batch: 168775

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
870-28030-3	Final Effluent	Total/NA	Water	420.4	
MB 860-168775/30	Method Blank	Total/NA	Water	420.4	
LCS 860-168775/31	Lab Control Sample	Total/NA	Water	420.4	
LCSD 860-168775/32	Lab Control Sample Dup	Total/NA	Water	420.4	

Analysis Batch: 168807

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
870-28030-1	Final Effluent Composite	Total/NA	Water	7196A	

Analysis Batch: 168832

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
870-28030-3	Final Effluent	Total/NA	Water	4500 CN G NonAm	168560
MB 860-168560/4-A	Method Blank	Total/NA	Water	4500 CN G NonAm	168560

Client Sample ID: Final Effluent Composite Lab Sample ID: 870-28030-1

Date Collected: 06/25/24 08:30 **Matrix: Water**

Date Received: 06/25/24 13:31

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	625			1000 mL	1.00 mL	168369	06/27/24 05:16	DR	EET HOU
Total/NA	Analysis	625.1		1	1 mL	1 mL	168436	06/27/24 18:30	PXS	EET HOU
Total/NA	Prep	Organotin			1018.1 mL	1 mL	456153	06/30/24 11:45	UWEZ	EET CAL 4
Total/NA	Analysis	Organotins SIM		1	1 mL	1 mL	456324	07/01/24 14:59	ULLI	EET CAL 4
Total/NA	Prep	608			1000 mL	1 mL	168882	06/29/24 11:31	BH	EET HOU
Total/NA	Analysis	608.3		1			168967	07/01/24 11:18	WP	EET HOU
Total/NA	Prep	608			1000 mL	1 mL	168882	06/29/24 11:31	BH	EET HOU
Total/NA	Analysis	608.3		1			168961	07/01/24 13:17	A1S	EET HOU
Total/NA	Prep	3510C			1000.7 mL	2 mL	658559	06/27/24 10:25	DN	EET DEN
Total/NA	Analysis	614		1	0.25 mL	0.25 mL	658820	06/29/24 10:20	SP	EET DEN
Total/NA	Prep	3510C			1000.7 mL	2 mL	658559	06/27/24 10:25	DN	EET DEN
Total/NA	Analysis	8141B		1	0.25 mL	0.25 mL	658819	06/29/24 10:20	SP	EET DEN
Total/NA	Analysis	300.0		1	0 mL	1.0 mL	168223	06/26/24 20:29	HN	EET HOU
Total/NA	Analysis	300.0		1	0 mL	1.0 mL	168224	06/26/24 20:29	HN	EET HOU
Total/NA	Prep	CWA_Prep			1000 mL	10 mL	168370	06/27/24 05:22	DR	EET HOU
Total/NA	Analysis	632		1			170008	06/27/24 17:07	YG	EET HOU
Total/NA	Analysis	8321B		1	0.5 mL	1 mL	168997	07/01/24 16:08	JBS	EET HOU
Total/NA	Prep	1631E			40 mL	40 mL	676263	06/27/24 16:12	VLC	EET PEN
							Completed:	06/28/24 09:00 [1]		
Total/NA	Analysis	1631E		1			676388	06/28/24 12:47	VLC	EET PEN
Total Recoverable	Prep	200.8			50 mL	50 mL	168407	06/27/24 08:45	MD	EET HOU
Total Recoverable	Analysis	200.8		1			168738	06/27/24 19:45	DP	EET HOU
Total/NA	Analysis	7196A		1			168807	07/03/24 16:49	JDM	EET HOU
Total/NA	Analysis	7196A		1	10 mL	10 mL	20973	06/25/24 19:52	WP	EET DAL

Client Sample ID: Field Blank LL Hg Lab Sample ID: 870-28030-2

Date Collected: 06/25/24 08:30 **Matrix: Water**

Date Received: 06/25/24 13:31

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	1631E			40 mL	40 mL	676263	06/27/24 16:12	VLC	EET PEN
							Completed:	06/28/24 09:00 [1]		
Total/NA	Analysis	1631E		1			676388	06/28/24 12:55	VLC	EET PEN

Client Sample ID: Final Effluent Lab Sample ID: 870-28030-3

Date Collected: 06/25/24 08:31 **Matrix: Water**

Date Received: 06/25/24 13:31

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	624.1		1	5 mL	5 mL	20930	06/25/24 19:55	MC	EET DAL
Total/NA	Prep	Distill/CN			6 mL	6 mL	168292	06/26/24 16:28	MK	EET HOU
Total/NA	Analysis	335.4		1			168576	06/27/24 10:13	LD	EET HOU
Total/NA	Analysis	420.4		1	10 mL	10 mL	168775	06/27/24 13:37	SC	EET HOU

Client Sample ID: Final Effluent

Lab Sample ID: 870-28030-3

Date Collected: 06/25/24 08:31

Matrix: Water

Date Received: 06/25/24 13:31

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	Distill/CN			6 mL	6 mL	168560	06/27/24 17:55	LD	EET HOU
Total/NA	Analysis	4500 CN G NonAm		1			168832	06/28/24 16:35	LD	EET HOU
Total/NA	Analysis	SM 4500 CN G		1			168591	06/28/24 20:29	MC	EET HOU

[1] This procedure uses a method stipulated length of time for the process. Both start and end times are displayed.

Laboratory References:

EET CAL 4 = Eurofins Calscience Tustin, 2841 Dow Avenue, Tustin, CA 92780, TEL (714)895-5494

EET DAL = Eurofins Dallas, 9701 Harry Hines Blvd, Dallas, TX 75220, TEL (214)902-0300

EET DEN = Eurofins Denver, 4955 Yarrow Street, Arvada, CO 80002, TEL (303)736-0100

EET HOU = Eurofins Houston, 4145 Greenbriar Dr, Stafford, TX 77477, TEL (281)240-4200

EET PEN = Eurofins Pensacola, 3355 McLemore Drive, Pensacola, FL 32514, TEL (850)474-1001

Laboratory: Eurofins Dallas

Unless otherwise noted, all analytes for this laboratory were covered under each accreditation/certification below.

Authority	Program	Identification Number	Expiration Date
Texas	NELAP	T104704295-23-34	06-30-24

The following analytes are included in this report, but the laboratory is not certified by the governing authority. This list may include analytes for which the agency does not offer certification.

Analysis Method	Prep Method	Matrix	Analyte
624.1		Water	1,2,4-Trichlorobenzene
624.1		Water	Bromochloromethane
624.1		Water	Dichlorodifluoromethane

Laboratory: Eurofins Calscience

All accreditations/certifications held by this laboratory are listed. Not all accreditations/certifications are applicable to this report.

Authority	Program	Identification Number	Expiration Date
Arizona	State	AZ0830	11-16-24
California	Los Angeles County Sanitation Districts	9257304	08-01-24
California	State	3082	07-31-24
Kansas	NELAP	E-10420	08-01-24
Nevada	State	CA00111	07-31-24
Oregon	NELAP	4175	02-02-25
USDA	US Federal Programs	P330-22-00059	06-08-26
Washington	State	C916-18	10-11-24

Laboratory: Eurofins Denver

Unless otherwise noted, all analytes for this laboratory were covered under each accreditation/certification below.

Authority	Program	Identification Number	Expiration Date
Texas	NELAP	T104704183-23-23	09-30-24

The following analytes are included in this report, but the laboratory is not certified by the governing authority. This list may include analytes for which the agency does not offer certification.

Analysis Method	Prep Method	Matrix	Analyte
614	3510C	Water	Demeton, Total
614	3510C	Water	Diazinon
614	3510C	Water	Disulfoton
614	3510C	Water	Guthion
614	3510C	Water	Malathion
614	3510C	Water	Methyl parathion
614	3510C	Water	Parathion

Laboratory: Eurofins Houston

Unless otherwise noted, all analytes for this laboratory were covered under each accreditation/certification below.

Authority	Program	Identification Number	Expiration Date
Texas	NELAP	T104704215	06-30-25

The following analytes are included in this report, but the laboratory is not certified by the governing authority. This list may include analytes for which the agency does not offer certification.

Analysis Method	Prep Method	Matrix	Analyte
420.4		Water	Phenols, Total
4500 CN G NonAm	Distill/CN	Water	Cyanide, Non-amenable
608.3	608	Water	Dicofol

Laboratory: Eurofins Houston (Continued)

Unless otherwise noted, all analytes for this laboratory were covered under each accreditation/certification below.

Authority	Program	Identification Number	Expiration Date

The following analytes are included in this report, but the laboratory is not certified by the governing authority. This list may include analytes for which the agency does not offer certification.

Analysis Method	Prep Method	Matrix	Analyte
608.3	608	Water	Mirex
608.3	608	Water	Polychlorinated biphenyls, Total
625.1	625	Water	Azobenzene
625.1	625	Water	Hexachlorophene
625.1	625	Water	m & p - Cresol
625.1	625	Water	Nonylphenol
625.1	625	Water	Total Cresols
632	CWA_Prep	Water	Diuron
7196A		Water	Cr (III)
8321B		Water	Pentachlorophenol

Laboratory: Eurofins Pensacola

All accreditations/certifications held by this laboratory are listed. Not all accreditations/certifications are applicable to this report.

Authority	Program	Identification Number	Expiration Date
Alabama	State	40150	06-30-24
ANAB	ISO/IEC 17025	L2471	02-22-26
Arkansas DEQ	State	88-00689	08-01-24
California	State	2510	06-30-24
Florida	NELAP	E81010	06-30-24
Georgia	State	E81010(FL)	06-30-24
Illinois	NELAP	200041	10-09-24
Kansas	NELAP	E-10253	10-31-24
Kentucky (UST)	State	53	06-30-24
Louisiana (All)	NELAP	30976	06-30-24
Louisiana (DW)	State	LA017	12-31-24
North Carolina (WW/SW)	State	314	12-31-24
Oklahoma	NELAP	9810	08-31-24
Pennsylvania	NELAP	68-00467	01-31-25
South Carolina	State	96026	06-30-24
Tennessee	State	TN02907	06-30-24
Texas	NELAP	T104704286	09-30-24
US Fish & Wildlife	US Federal Programs	A22340	06-30-24
USDA	US Federal Programs	FLGNV23001	01-08-26
USDA	US Federal Programs	P330-21-00056	01-09-26
Virginia	NELAP	460166	06-14-25
West Virginia DEP	State	136	03-31-25

Method Summary

Method	Method Description	Protocol	Laboratory
624.1	Volatile Organic Compounds (GC/MS)	EPA	EET DAL
625.1	Semivolatile Organic Compounds (GC/MS)	EPA	EET HOU
Organotins SIM	Organotins (GC/MS SIM)	Lab SOP	EET CAL 4
608.3	Organochlorine Pesticides in Water	EPA	EET HOU
608.3	Polychlorinated Biphenyls (PCBs) (GC)	EPA	EET HOU
614	Organophosphorous Pesticides (GC)	EPA-01	EET DEN
8141B	Organophosphorous Compounds by Gas Chromatography, Capillary Column Technique	SW846	EET DEN
300.0	Anions, Ion Chromatography	EPA	EET HOU
632	Carbamate and Urea Pesticides (HPLC)	EPA-01	EET HOU
8321B	Herbicides (LC/MS)	SW846	EET HOU
1631E	Mercury, Low Level (CVAFS)	EPA	EET PEN
200.8	Metals (ICP/MS)	EPA	EET HOU
335.4	Cyanide, Total	EPA	EET HOU
420.4	Phenolics, Total Recoverable	EPA	EET HOU
4500 CN G NonAm	Cyanide, Non-amenable	SM	EET HOU
7196A	Chromium, Hexavalent	SW846	EET DAL
7196A	Chromium, Trivalent (Colorimetric)	SW846	EET HOU
SM 4500 CN G	Cyanide, Amenable	SM	EET HOU
1631E	Preparation, Mercury, Low Level	EPA	EET PEN
200.8	Preparation, Total Recoverable Metals	EPA	EET HOU
3510C	Liquid-Liquid Extraction (Separatory Funnel)	SW846	EET DEN
608	Liquid-Liquid Extraction (Separatory Funnel)	EPA	EET HOU
614	Liquid-Liquid Extraction	EPA-01	EET DEN
625	Liquid-Liquid Extraction	EPA	EET HOU
CWA_Prep	Liquid-Liquid Extraction (Separatory Funnel)	EPA	EET HOU
Distill/CN	Distillation, Cyanide	None	EET HOU
Organotin	Extraction (Organotins)	WRC	EET CAL 4

Protocol References:

EPA = US Environmental Protection Agency
EPA-01 = "Methods For The Determination Of Nonconventional Pesticides In Municipal And Industrial Wastewater", EPA/821/R/92/002, April 1992.
Lab SOP = Laboratory Standard Operating Procedure
None = None
SM = "Standard Methods For The Examination Of Water And Wastewater"
SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.
WRC = WRC Notebook 11431-39, ICI America's Western Research Center May, 1989.

Laboratory References:

EET CAL 4 = Eurofins Calscience Tustin, 2841 Dow Avenue, Tustin, CA 92780, TEL (714)895-5494
EET DAL = Eurofins Dallas, 9701 Harry Hines Blvd, Dallas, TX 75220, TEL (214)902-0300
EET DEN = Eurofins Denver, 4955 Yarrow Street, Arvada, CO 80002, TEL (303)736-0100
EET HOU = Eurofins Houston, 4145 Greenbriar Dr, Stafford, TX 77477, TEL (281)240-4200
EET PEN = Eurofins Pensacola, 3355 McLemore Drive, Pensacola, FL 32514, TEL (850)474-1001

Sample Summary

Client: Environmental Monitoring Laboratory, LLC
Project/Site: City of Leander

Job ID: 870-28030-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
870-28030-1	Final Effluent Composite	Water	06/25/24 08:30	06/25/24 13:31
870-28030-2	Field Blank LL Hg	Water	06/25/24 08:30	06/25/24 13:31
870-28030-3	Final Effluent	Water	06/25/24 08:31	06/25/24 13:31

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Chain of Custody

Houston, TX (281) 240-4200, Dallas, TX (214) 902-0300
Midland, TX (432) 704-5440, San Antonio, TX (210) 509-3334
EL Paso, TX (915) 585-3443, Lubbock, TX (806) 794-1296
Hobbs, NM (575) 392-7550, Carlsbad, NM (575) 988-3199

Work Order No: ____________

www.xenco.com Page ______ of ______

~~Project Manager:~~	~~SERISSA BECK~~	~~Bill to: (if different)~~	
Company Name:	ENVIRONMENTAL MONITORING LABORATORY	Company Name:	
Address:	PO BOX 477	Address:	
City, State ZIP:	HILLSBORO TX	City, State ZIP:	
Phone:	254-582-2622	Email:	SBECK@YOURWATERLAB.COM

~~Work Order Comments~~

Program: UST/PST ☐ PRP ☐ Brownfields ☐ RRC ☐ Superfund ☐
State of Project:
Reporting: Level II ☐ Level III ☐ PST/UST ☐ TRRP ☐ Level IV ☐
Deliverables: EDD ☐ ADaPT ☐ Other:

Project Name:	City of Leander	Turn Around	
Project Number:		☐Routine	☐Rush
Project Location:	City of Leander	Due Date:	
Sampler's Name:		TAT starts the day received by the lab, if received by 4:30pm	
PO #:			

SAMPLE RECEIPT	Temp Blank:	Yes No	Wet Ice:	Yes No
Samples Received Intact:	Yes No		Thermometer ID:	
Cooler Custody Seals:	Yes No N/A		Correction Factor:	
Sample Custody Seals:	Yes No N/A		Temperature Reading:	
Total Containers:			Corrected Temperature:	

ANALYSIS REQUEST

Preservative Codes
None: NO DI Water: H_2O
Cool: Cool MeOH: Me
HCL: HC HNO_3: HN
NaOH+Ascorbic Acid: SAPC

870-28030 Chain of Custody

Sample Identification	Matrix	Date Sampled	Time Sampled	Depth	Grab/ Comp	# of Cont	Table 4.0 (TCEQ 10054) 4.0 (1) & 4.0 (2)	614.1, 615.1 (NA-AM)	625.1, 608 PCB/PEST (PLUS DICOFOL AND MIREX) (NA-AM)	EPA300 (NA-PL)	HEX CHROMIUM (Short hold) (NA-PL)	Low-Level Mercury (GL)	METALS 200.8, 245.1 (HN)	VOC Compounds- (624.1 SHORT HOLD) (VOA)	Phenol (H2)	Cyanide (Amenable to chlorination) (NAOH)	Sample Comments
Final Effluent Composite	WW	930 / 830	6-24-24 ~ 6-25-24		C		X										
Final Effluent Composite	WW				C	8		X	X								
Final Effluent Composite	WW				C	1				X							
Final Effluent Composite	WW				C	1					X						
Final Effluent Composite	WW				C	1						X					
Final Effluent Composite	WW				C	1							X				
Field Blank LL Hg	W	830	6-25-24		G	1						X					
Final Effluent	WW	831	6-25-24		G	1								X			
Final Effluent	WW	832	6-25-24		G	1									X		
Final Effluent	WW	833	6-25-24		G	1										X	

Total 200.7 / 6010 200.8 / 6020: 8RCRA 13PPM Texas 11 Al Sb As Ba Be B Cd Ca Cr Co Cu Fe Pb Mg Mn Mo Ni K Se Ag SiO_2 Na Sr Tl Sn U V Zn
Circle Method(s) and Metal(s) to be analyzed **TCLP / SPLP 6010:** 8RCRA Sb As Ba Be Cd Cr Co Cu Pb Mn Mo Ni Se Ag Tl U Hg: 1631 / 245.1 / 7470 / 7471

Relinquished by: (Signature)	Received by: (Signature)	Date/Time	Relinquished by: (Signature)	Received by: (Signature)	Date/Time
1. REFRIGERATOR	[signature]	6-25-24 1331 ~~800~~ 913	2 [signature] 540	[signature]	6/25/24 1331
3			4		
5			6		

Revised Date: 08/25/2020 Rev. 2020.2

870-28030 Waybill

ORIGIN ID:RFA (214) 902-0300
DALLAS SAMPLE RECEIPT

9701 HARRY HINES BLVD

DALLAS, TX 75220
UNITED STATES US

SHIP DATE: 25JUN24
ACTWGT: 10.00 LB
CAD: 110190004/INET4730

BILL SENDER

TO CALSCIENCE - TUSTIN, CA
CALSCIENCE - TUSTIN, CA
2841 DOW AVE
SUITE 100
TUSTIN CA 92780
(714) 895-5494 REF:
INV:
PO: DEPT:

583J5/B21D/9AE3

FedEx Express

E

J242024033501uv

WED - 26 JUN 10:30A
PRIORITY OVERNIGHT

TRK# 0201 7770 5898 5000

92780
CA-US SNA

A7 DTHA

Eurofins Dallas
9701 Harry Hines Blvd
Dallas, TX 75220
Phone: 214-902-0300

Chain of Custody Record

eurofins Environment Testing

Client Information (Sub Contract Lab)	Sampler:	Lab PM: Patel, Anita	Carrier Tracking No(s):	COC No: 870-6443.1
Client Contact: Shipping/Receiving	Phone:	E-Mail: Anita.Patel@et.eurofinsus.com	State of Origin: Texas	Page: Page 1 of 1
Company: TestAmerica Laboratories, Inc.		Accreditations Required (See note): NELAP - Texas		Job #: 870-28030-1
Address: 4955 Yarrow Street, ,	Due Date Requested: 7/2/2024	**Analysis Requested**		Preservation Codes: -
City: Arvada	TAT Requested (days):			
State, Zip: CO, 80002				
Phone: 303-736-0100(Tel) 303-431-7171(Fax)	PO #:			
Email:	WO #:			
Project Name: City of Leander	Project #: 87000461			
Site:	SSOW#:			Other:

Sample Identification - Client ID (Lab ID)	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	614/614_Prep (MOD) Organophosphorous Pesticides (GC)	Total Number of containers	Special Instructions/Note:
			Preservation Code:						
Final Effluent Composite (870-28030-1)	6/25/24	08:30 Central		Water			X	1	

Note: Since laboratory accreditations are subject to change, Eurofins Environment Testing South Central, LLC places the ownership of method, analyte & accreditation compliance upon our subcontract laboratories. This sample shipment is forwarded under chain-of-custody. If the laboratory does not currently maintain accreditation in the State of Origin listed above for analysis/tests/matrix being analyzed, the samples must be shipped back to the Eurofins Environment Testing South Central, LLC laboratory or other instructions will be provided. Any changes to accreditation status should be brought to Eurofins Environment Testing South Central, LLC attention immediately. If all requested accreditations are current to date, return the signed Chain of Custody attesting to said compliance to Eurofins Environment Testing South Central, LLC.

Possible Hazard Identification *Unconfirmed*	*Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)* ☐ *Return To Client* ☐ *Disposal By Lab* ☐ *Archive For ______ Months*
Deliverable Requested: I, II, III, IV, Other (specify) Primary Deliverable Rank: 2	Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	FEDEX Method of Shipment:

Relinquished by: [signature]	Date/Time: 06/25/24 - 1700	Company	Received by: JUN 25 2024	Date/Time	Company
Relinquished by:	Date/Time:	Company	Received by: [signature]	Date/Time 06/26/24 0940	Company ETDEN
Relinquished by:	Date/Time:	Company	Received by:	Date/Time	Company

Custody Seals Intact: Δ Yes Δ No	Custody Seal No.:	Cooler Temperature(s) °C and Other Remarks: 2.7, CF: 7-2, IR: N9ga

Ver: 04/02/2024

Eurofins Dallas
9701 Harry Hines Blvd
Dallas, TX 75220
Phone: 214-902-0300

Chain of Custody Record

eurofins | Environment Testing

Client Information (Sub Contract Lab)	Sampler:	Lab PM: Patel, Anita	Carrier Tracking No(s):	COC No: 870-6444.1
Client Contact: Shipping/Receiving	Phone:	E-Mail: Anita.Patel@et.eurofinsus.com	State of Origin: Texas	Page: Page 1 of 1
Company: Eurofins Environment Testing Southeast L		Accreditations Required (See note): NELAP - Texas		Job #: 870-28030-1
Address: 3355 McLemore Drive,	Due Date Requested: 7/2/2024	**Analysis Requested**		Preservation Codes: -
City: Pensacola	TAT Requested (days):			
State, Zip: FL, 32514				
Phone: 850-474-1001(Tel) 850-478-2671(Fax)	PO #:			
Email:	WO #:			
Project Name: City of Leander	Project #: 87000461			
Site:	SSOW#:			Other:

Sample Identification - Client ID (Lab ID)	Sample Date	Sample Time	Sample Type (C=Comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	1631E/1631E_Prep	Total Number of containers	Special Instructions/Note:
				Preservation Code:					
Final Effluent Composite (870-28030-1)	6/25/24	08:30 Central		Water			X	2	
Field Blank LL Hg (870-28030-2)	6/25/24	08:30 Central		Water			X	2	

Note: Since laboratory accreditations are subject to change, Eurofins Environment Testing South Central, LLC places the ownership of method, analyte & accreditation compliance upon our subcontract laboratories. This sample shipment is forwarded under chain-of-custody. If the laboratory does not currently maintain accreditation in the State of Origin listed above for analysis/tests/matrix being analyzed, the samples must be shipped back to the Eurofins Environment Testing South Central, LLC laboratory or other instructions will be provided. Any changes to accreditation status should be brought to Eurofins Environment Testing South Central, LLC attention immediately. If all requested accreditations are current to date, return the signed Chain of Custody attesting to said compliance to Eurofins Environment Testing South Central, LLC.

Possible Hazard Identification *Unconfirmed*	*Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)* ☐ *Return To Client* ☐ *Disposal By Lab* ☐ *Archive For ______ Months*
Deliverable Requested: I, II, III, IV, Other (specify) Primary Deliverable Rank: 2	Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	FEDEX Method of Shipment:

Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
[signature]	06/25/24-1700		JUN 25 2024		
			[signature]	6-27-24 813	

Custody Seals Intact: Δ Yes Δ No	Custody Seal No.:	Cooler Temperature(s) °C and Other Remarks: 16.1°C/TR8

Ver: 04/02/2024

Page 51 of 59

7/16/2024

ORIGIN ID: [redacted]
DALLAS SAMPLE RECEI...
9701 HARRY HINES BLVD
DALLAS, TX 75220
UNITED STATES US

DATE: 25JUN24
WGT: 5.00 LB
CAD: 110190004/INET473

BILL SENDER

TO SAMPLE RECEIVING
TESTAMERICA PENSACOLA
3355 MCLEMORE DR

PENSACOLA FL 32514
(850) 474-1001 REF:
INV:
PO: DEPT:

A 1494 06.27
10:30 1
074
FZ

J5R21D9AE3

FedEx Express

E

WED - 26 JUN 10:30A
PRIORITY OVERNIGHT

TRK# 0201 7770 5899 1494

16.1
IR8 AH

XS PNSA US

32514
BFM

LOT#

Sample No.

Time Collected

7/16/2024

Eurofins Dallas
9701 Harry Hines Blvd
Dallas, TX 75220
Phone: 214-902-0300

Chain of Custody Record

eurofins

Loc: 870
28030

Client Information (Sub Contract Lab)	Sampler:	Lab PM: Patel, Anita	Carrier Tracking No(s):	COC No: 870-6442.1
Client Contact: Shipping/Receiving	Phone:	E-Mail: Anita.Patel@et.eurofinsus.com	State of Origin: Texas	Page: Page 1 of 1
Company: Eurofins Environment Testing Southwest,		Accreditations Required (See note): NELAP - Texas		Job #: 870-28030-1
Address: 2841 Dow Avenue, Suite 100,	Due Date Requested: 7/2/2024	**Analysis Requested**		Preservation Codes:
City: Tustin	TAT Requested (days):			
State, Zip: CA, 92780				
Phone: 714-895-5494(Tel)	PO #:			
Email:	WO #:			
Project Name: City of Leander	Project #: 87000461			
Site:	SSOW#:			Other:

Sample Identification - Client ID (Lab ID)	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	Organotins_SIM/OrgTin_W_P Tributyltin Only	Total Number of containers	Special Instructions/Note:
			Preservation Code:						
Final Effluent Composite (870-28030-1)	6/25/24	08:30 Central		Water			X	2	

870-28030 Chain of Custody

Note: Since laboratory accreditations are subject to change, Eurofins Environment Testing South Central, LLC places the ownership of method, analyte & accreditation compliance upon our subcontract laboratories. This sample shipment is forwarded under chain-of-custody. If the laboratory does not currently maintain accreditation in the State of Origin listed above for analysis/tests/matrix being analyzed, the samples must be shipped back to the Eurofins Environment Testing South Central, LLC laboratory or other instructions will be provided. Any changes to accreditation status should be brought to Eurofins Environment Testing South Central, LLC attention immediately. If all requested accreditations are current to date, return the signed Chain of Custody attesting to said compliance to Eurofins Environment Testing South Central, LLC.

Possible Hazard Identification
Unconfirmed

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ *Return To Client* ☐ *Disposal By Lab* ☐ *Archive For* ______ *Months*

Deliverable Requested: I, II, III, IV, Other (specify) | Primary Deliverable Rank: 2 | Special Instructions/QC Requirements:

Empty Kit Relinquished by:		Date:	Time: FEDEX	Method of Shipment:	
Relinquished by:	Date/Time: 06/25/2	Company: 1700	Received by: FedEx JUN 25 2024	Date/Time:	Company
Relinquished by: FedEx	Date/Time:	Company	Received by:	Date/Time: 6/26/24 0940	Company: OL
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
Custody Seals Intact: Δ Yes Δ No	Custody Seal No.:		Cooler Temperature(s) °C and Other Remarks: 2.4/2.5 SUY		

Ver: 04/02/2024

Eurofins Dallas
9701 Harry Hines Blvd
Dallas, TX 75220
Phone: 214-902-0300

Chain of Custody Record

eurofins | Environment Testing

Client Information (Sub Contract Lab)	Sampler:	Lab PM: Patel Anita	Carrier Tracking No(s):	COC No: 870-6450 1
Client Contact: Shipping/Receiving	Phone:	E-Mail: Anita.Patel@et.eurofinsus.com	State of Origin: Texas	Page: Page 1 of 1
Company: Eurofins Environment Testing South Centr		Accreditations Required (See note): NELAP Texas		Job #: 870-28030-1
Address: 4145 Greenbriar Dr	Due Date Requested: 7/2/2024	Analysis Requested		Preservation Codes:
City: Stafford	TAT Requested (days):			
State, Zip: TX, 77477				
Phone: 281-240-4200(Tel)	PO #:			
Email:	WO #:			
Project Name: City of Leander	Project #: 87000461			Other:
Site:	SSOW#:			

Sample Identification Client ID (Lab ID)	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	608.3_PCB/608_Prep_PCB PCBs Including Totals	608.3_Pest/608_Prep (MOD) TTO 608	625.1/625_Prep (MOD) Custom List	200.8/200.8_P_TR (MOD) Custom List	7196A_CR3	300_ORGFM_28D/ (MOD) Custom List	300_ORGFMS/ (MOD) Custom List	632/CWA_Prep	615_MOD/3511_Herb_Prep (MOD) Standard List Herbicides	335.4/Distill_CN Total Cyanide	SM4500CN_G_Calc/ Amenable Cyanide	4500_CN_G_NonAm/Distill_CN Non-Amenable Cyanide	420.4_NP/ (MOD) Local Method	Total Number of containers	Special Instructions/Note:
				Preservation Code:																	
Final Effluent Composite (870-28030-1)	6/25/24	08:30 Central		Water			X	X	X	X	X	X	X	X	X					7	Mirex Difocol
Final Effluent (870-28030-3)	6/25/24	08:31 Central		Water												X	X	X	X	3	

Note: Since laboratory accreditations are subject to change, Eurofins Environment Testing South Central, LLC places the ownership of method, analyte & accreditation compliance upon our subcontract laboratories. This sample shipment is forwarded under chain-of-custody. If the laboratory does not currently maintain accreditation in the State of Origin listed above for analysis/tests/matrix being analyzed, the samples must be shipped back to the Eurofins Environment Testing South Central, LLC laboratory or other instructions will be provided. Any changes to accreditation status should be brought to Eurofins Environment Testing South Central, LLC attention immediately. If all requested accreditations are current to date, return the signed Chain of Custody attesting to said compliance to Eurofins Environment Testing South Central, LLC.

Possible Hazard Identification *Unconfirmed*		*Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)* ☐ *Return To Client* ☐ *Disposal By Lab* ☐ *Archive For ______ Months*	
Deliverable Requested: I II III IV Other (specify)	Primary Deliverable Rank: 2	Special Instructions/QC Requirements:	
Empty Kit Relinquished by:	Date:	Time: TPX	Method of Shipment:

Relinquished by: AB	Date/Time: 6/25/24 - 1700	Company:	Received by: JUN 25 2024	Date/Time:	Company:
Relinquished by:	Date/Time:	Company:	Received by:	Date/Time:	Company:
Relinquished by:	Date/Time:	Company:	Received by: Zia	Date/Time: 6-26-24 0944	Company: E
Custody Seals Intact: Δ Yes Δ No	Custody Seal No.		Cooler Temperature(s) °C and Other Remarks: 2.0°, 3.9°, 3.3°, 4.0°		

Ver 04/02/2024

Login Sample Receipt Checklist

Client: Environmental Monitoring Laboratory, LLC

Job Number: 870-28030-1

Login Number: 28030
List Number: 1
Creator: Dabinett, Ian

List Source: Eurofins Dallas

Question	Answer	Comment
The cooler's custody seal, if present, is intact.	N/A	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	False	Received same day of collection; chilling process has begun.
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	N/A	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	

Login Sample Receipt Checklist

Client: Environmental Monitoring Laboratory, LLC

Job Number: 870-28030-1

Login Number: 28030
List Number: 4
Creator: Khana, Piyush

List Source: Eurofins Calscience
List Creation: 06/26/24 03:01 PM

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	N/A	
The cooler's custody seal, if present, is intact.	True	Seal present with no number.
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	2.5
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	N/A	Received project as a subcontract.
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Login Sample Receipt Checklist

Client: Environmental Monitoring Laboratory, LLC

Job Number: 870-28030-1

Login Number: 28030
List Number: 3
Creator: Little, Matthew L

List Source: Eurofins Denver
List Creation: 06/26/24 11:58 AM

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	N/A	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	N/A	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	N/A	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Login Sample Receipt Checklist

Client: Environmental Monitoring Laboratory, LLC

Job Number: 870-28030-1

Login Number: 28030
List Number: 2
Creator: Grandits, Corey

List Source: Eurofins Houston
List Creation: 06/26/24 08:58 AM

Question	Answer	Comment
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	

Login Sample Receipt Checklist

Client: Environmental Monitoring Laboratory, LLC

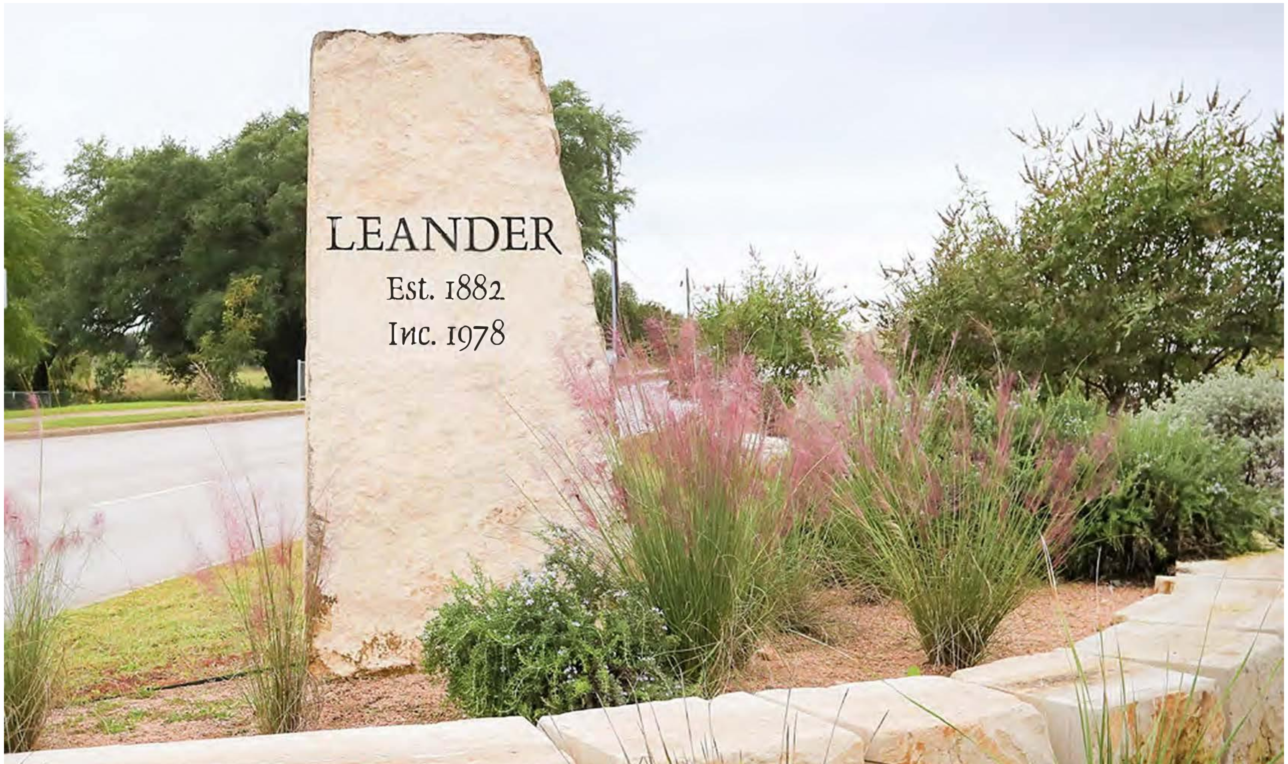
Job Number: 870-28030-1

Login Number: 28030
List Number: 5
Creator: Roberts, Alexis J

List Source: Eurofins Pensacola
List Creation: 06/27/24 02:01 PM

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	N/A	
The cooler's custody seal, if present, is intact.	N/A	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	Thermal preservation not required.
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	16.1°C IR8
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	N/A	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

ATTACHMENT N



2020 LEANDER, TEXAS COMPREHENSIVE PLAN

Updated 01/04/2024

Acknowledgments

The Leander Comprehensive Plan was developed by the City of Leander with the technical support and design assistance of Halff Associates, Inc. and Catalyst Commercial. A special thanks goes to the countless community members, property-owners, staff members and community leaders for their insight and support during the duration of this study. The following individuals are recognized for their substantial contributions towards the creation of the 2020 Leander Comprehensive Plan.

Mayor and City Council

Troy Hill, Mayor

Marci Cannon

Kathryn Pantalion-Parker

Michelle Stephenson

Jason Shaw

Christine Sederquist

Chris Czernek

Annette Sponseller

Planning and Zoning Commission

Becki Ross

Ron May,

Donnie Mahan

John Cosgrove

Marshall Hines

Frank Stiles

Comprehensive Plan Advisory Committee

Randy Hutchison

Deanna Ramirez

Joseph Eckels

Bob Shaver

Jimmy Disler

Bridget Brandt

Herb Meischen

Frank Stiles

Jeffery Fox

Kathy Howell

Pete Tamez

Richard Schaffner

Kelsey Stone

Jason Anderson

Plan Overview

The Leander Comprehensive Plan is our community's unified policy guide and action plan for the community. The planning process began in October of 2019 and was shaped through the involvement of community leaders and city staff; community members, landowners, business owners; and, additional governmental and non-governmental partners. The collective community vision identified in the Leander Comprehensive Plan is supported by policies and actions that will be implemented in the future.

Community Vision Statement

The citizens of Leander envision a future that includes:

1) a strong and diverse economy;

2) people-centered places and spaces;

3) a deep sense of community pride and heritage;

4) destination experiences and amenities; and

5) a dynamic and attractive business climate.

Plan Chapters

Chapter 1: Introduction. This introductory chapter describes the purpose of a comprehensive plan and past planning efforts.

Chapter 2: State of the City. Chapter 2 contains a summary of the City's regional and historic context and present demographic structure.

Chapter 3: Community Engagement. The community engagement chapter consists of a summary of the City's public engagement process and the resulting vision and goals.

Chapter 4: Community Direction. Embodied within Chapter 4 are the desired community directions for growth and development.

Chapter 5: Community Agenda. Rooted in the community vision statement, and in alignment with Chapter 4 planning tools, this chapter sets out a series of actionable steps and policies under a framework of 12 long-term goals.

Chapter 6: Implementation. This chapter contains the implementation steps to achieve the top priorities and who is in responsible for seeing them to fruition.

CHAPTER FOUR

COMMUNITY DIRECTION

In approximately 40 years, Leander has transitioned from a small rural community to one of the fastest-growing suburban cities in the country. This plan aligns the City's future development pattern with the community vision in 2020. Embodied within the following sections are the desired community directions for growth and development.

Introduction

Leander is prepared to achieve the vision and goals established in Chapter 3, *Community Engagement,* through a strong plan for future development that captures the desired community direction and character. Much of the decision-making that will occur throughout this plan horizon are tied to the physical development of the city. For this comprehensive plan to be seen as a success in the future— for Leander to grow and become the community envisioned during this process —the development framework must be thoughtful and achievable.

The land use and development components of a comprehensive plan are designed to clearly identify the community's vision for new development and mobility in the future. Future development and redevelopment are anticipated in areas with a connected transportation network and where existing and/or planned City services can accommodate new growth. The development framework is built upon the foundation of years of planning, changing development patterns and market desires, and the motivations of landowners, developers, and investors that drive construction.

This Community Direction chapter provides guidance for future land development based on the evolution of past planning efforts, successes and failures, and the vision for tomorrow. It is a plan that is designed in the context of real estate markets, grounded in infrastructure and service capacities and is the starting point for more detailed master plans and areas plans. The pages that follow provide the guiding framework to prepare Leander for its future.

WHAT DOES THIS CHAPTER INCLUDE?

- Introduction to elements of the growth and development framework
- Descriptions of land uses and recommended guidance on usage
- Integrated planning maps depicting desired direction

Future Growth and Development

Leander's future growth and development framework should capture the community's values about how, when, and where Leander should develop. This planning framework is built upon a character-based philosophy that focuses more on building form and site characteristics than use and is contextually-sensitive to the desired development areas. This development plan is a series of maps that integrate future land use, connecting green space, and major streets into a master plan for the City of Leander.

This plan is designed to anticipate patterns of future development and is a strategic tool envisioned to be a guide for decision-makers for programs like zoning, CIP (Capital Improvement Program) planning, sub-area plans, and associated community-wide master plans. The components of this plan provide the overarching direction for public and private development decisions that will shape the community through the plan horizon and beyond.

Northline is the key anchor of the Leander Central land use area

Land Use

Leander has seen tremendous growth in the last 20 years and all indications are that the growth pressures will not be subsiding in the near future. This is both a tremendous opportunity and a difficult challenge, as the City will need to both provide and maintain utilities and services across vast areas of existing and future land development. Land use—the types of businesses, residences, and density thereof—is one of the most important elements of determining how Leander remains prosperous in the future.

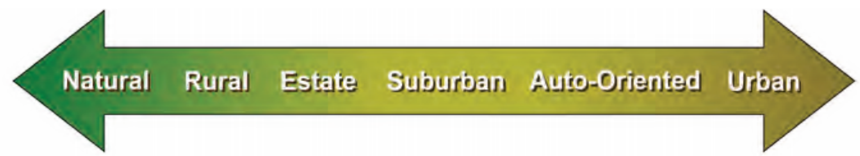
The Future Land Use Map graphically depicts the preferred patterns of future development and is to be used as a tool to guide staff, elected and appointed officials, and the development community during times of critical decision-making. Future land uses are a projection of growth, a balance between desired new development in the community, market realities, and the protection of existing development. These land uses are intended to signal to the citizens and prospective interests that Leander intends to grow reflective of its values and the goals of this plan. In that regard, the desired development framework is perhaps the most important component of this comprehensive plan.

Key issues identified during community conversations include the need for job growth in Leander, managing the market pressure for higher-density residential, preparing for commercial growth potential, and connecting the community through open space and trails. These issues have translated into specific strategies and actions in Chapter 5. *Community Agenda*, and are a focus of the land use component.

Design Character

Using a community character approach provides Leander with both a predictable and flexible system of guiding future growth. Predictability is required to ensure Leander grows with quality, unique and different areas of character. Flexibility is required to allow community builders and developers to respond to the plan through appropriate design and desired development outcomes.

The concept of "character" is a key component of "land use" in that it accounts for the physical and natural traits of an area, based on either traditional or desired built form. For example, in a character-based design framework, a retail use located in a rural area would have different building and site characteristics as one located in the central urban area, because the context of its surroundings would drive a compatible design. Not because of land use but because of a definition of the character appropriate to each location. Much like a transect, there are loose progressions as you move between rural and urban areas, but a clarity between the design character of each.



The character framework is prevalent in the Leander Future Land Use Map in the definitions of each land use category and locations thereof throughout the community. To best implement the land use and character elements envisioned in this chapter, additional steps to assess and amend Leander's various zoning and development codes will be necessary. Since most of the future built environment will be developed by the private sector on private land, it is critical that the proposed future acknowledged in this plan is aligned through enhancements to the City's zoning, subdivision, and development ordinances.

Future Land Use Map

The Future Land Use Map is an important component of the desired development framework, focusing on the land use distribution across the planning area. The map of future land uses is depicted in Map 4.1, *Future Land Use Map*, on page 81 and described as to usage and interpretation on page 82.

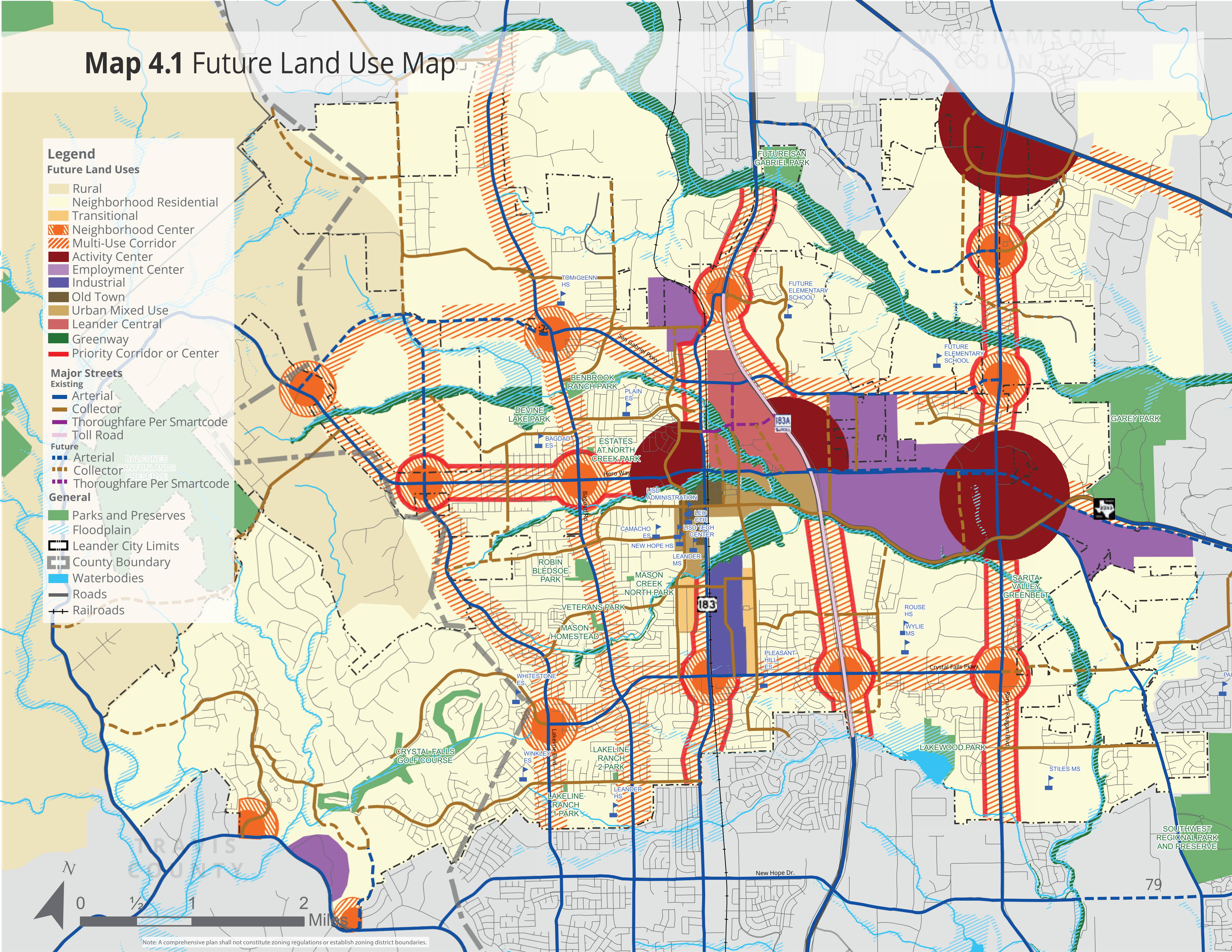
The Future Land Use Map anticipates growth in a residential suburban design character and land use, with a shift towards commercial and employment uses. A mix of uses along street corridors and in enhanced neighborhood centers serve residential neighborhoods while higher density activity and employment centers provide opportunities for regional destination and jobs. The 183A Toll/Hero Way area is the focus of burgeoning future city center at a regional crossroads.

The total amount of projected acres and percentage breakdowns are shown in Figure 4.1, *Land Use Breakdown*, below.

Figure 4.1, Land Use Breakdown

Map Color / Symbol	Land Use Category	Acres	Percent
	Rural	14,177	26.1%
	Neighborhood Residential	19,027	35.1%
	Transitional	70	0.1%
	Neighborhood Center	1,370	2.5%
	Multi-Use Corridor	4,878	9.0%
	Activity Center	2,082	3.8%
	Employment Center	1,434	2.6%
	Industrial	215	0.4%
	Old Town	88	0.2%
	Urban Mixed-Use	149	0.3%
	Leander Central	369	0.7%
	Greenways	1,083	2.0%
	Parks and Preserves	9,294	17.1%
		54,236	100%

Map 4.1 Future Land Use Map



Usage and Interpretation

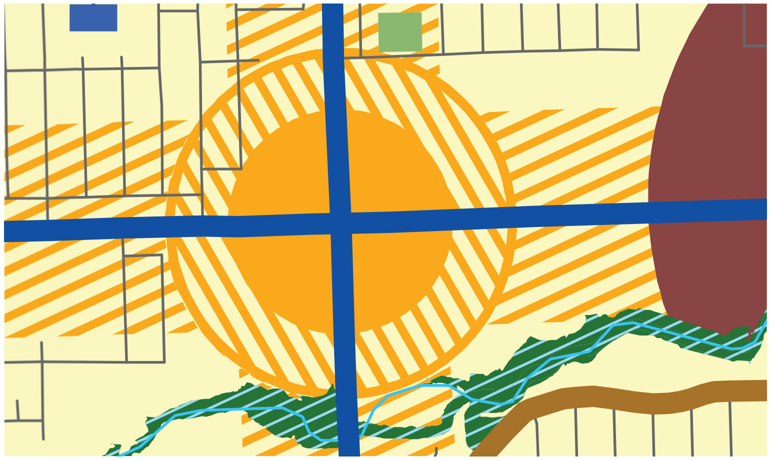
The Future Land Use Map is intended to be used as a planning tool, a guide that is subject to modification over time based upon new or changing information and circumstances. The map itself is used on a regular basis to evaluate zoning requests, so the interpretation of the map is important. By state law, a future land use plan does not have the same force of law as the City's zoning map. Therefore, when considering plan amendments or zoning requests, it is imperative that the interpretation of the plan be understood.

The Leander land use designations are not tied directly to specific land parcels but are representative of general areas consistent with plan goals. The land use colors depicted on the map are arranged to generally represent the balance of land uses desired by the community. While these land use areas are broadly delineated along "centers" and "corridors," the practical application of land use decisions is made in more nuanced context of comprehensive plan direction, site specificity, landowner compatibility, timing, and other factors. Identified in Figure 4.2, *Future Land Use Map Interpretation,* is additional clarification regarding how to interpret proposed development in and along "nodes" and "corridors." Since the land use designations are not tied directly to specific land parcels, it is important to look at the existing conditions of the area. If a large roadway or natural features bisects the future land use area or center-node, it may be beneficial to analyze the area based on these natural or man-made boundaries. As stated in the City Charter, staff will review all development proposals for consistency with the future land use map. All allowed uses in the proposed zoning districts should be analyzed against the intent and purpose of the land categories on the following pages.

CITY CHARTER | SECTION 10.02, COMPREHENSIVE PLAN

The City Council shall adopt and maintain a comprehensive plan, and all public and private development shall conform with the adopted comprehensive plan, or the applicable elements or portions thereof. The comprehensive plan may be amended at anytime and shall be reviewed and considered for amendment or revision every five years.

Figure 4.2 Future Land Use Map Interpretation



How precise are these centers and corridors intended to be? Will the shapes and sizes drive the outcomes?

The graphical depiction of these land uses signal intent and approximate size and location. The context and suitability of each location and existing parcel boundaries lines should determine the size and configuration of proposed zoning boundaries and development projects. For example, there may be instances where a Neighborhood Center is not large enough to accommodate a desired commercial center; as long as the proposed center is compatible with adjacent land uses and justifiably fulfills goals of this plan, it would be a reasonable request. The shape and size are merely reference points—parcels are rarely rounded over—and the configuration of zoning boundaries within will be a case-by-case evaluation of the appropriateness of the proposal, using the guidance of this plan and the zoning regulations.

Amendments to the Future Land Use Map

Development requests that do not align with the future land use map should go through a comprehensive plan amendment process prior to the rezoning process. Based on the land use direction in this comprehensive plan, the staff shall make a determination whether a development proposal is consistent with the comprehensive plan. The comprehensive plan amendment process is not a guarantee for the rezoning, but is to determine if City leadership is in support of a change for the area in question. Any future land use amendment request should be examined to determine the impact to the development pattern of the surrounding area and for compatability of utilities. Further guidance for amendments can be found in Chapter 6, *Implementation*.

Desired Land Use Mix

For some land use categories, a mix of uses is desired to provide a balance and supportive synergy. Several categories include land use mix percentages, including simply as a guide to promote the character and intent described therein. The land use percentages of these mixed-use categories should be applied across a large area or center-node, rather than an individual parcel or ownership. Each development proposal should be analyzed to understand the change in land use mix to the large area or center-node.

While individual developments could propose 100% of the same land use and the overall land use mix would still be maintained, it is best practice to encourage a mix within developments to work toward the desired mix, where possible. For example, the first parcels of a large area or center-node to develop may be considered in a market context and, thus, allow for more residential than the land use area anticipates; this is practical and may be acceptable, but the City should hesitate to delay most commercial land uses out to the future without careful consideration. Additionally, there will be instances where the parcel(s) are too small to accommodate a mix and a single-use may be appropriate.

Ultimately, discretion and context should be used to determine how the recommend percentages are applied to best implement the intent of these land uses. Entitlement mechanisms that allow for certainty and timing should be encouraged where appropriate.

Land Use Category Descriptions

The following pages consist of descriptions of Leander's future land use categories. This collection of uses was prepared with the intent of providing balance between various uses and specific information to aid in their application as the City responds to development requests. The descriptive text in each category is provided to guide staff recommendations and elected and appointed official decisions. The code considerations provide additional guidance to decision-makers as to points of emphasis on future development code adjustments to ensure plan consistency.

Each land use category page contains the following components:

Intent & Character. This subsection provides a general description of the intent and intended character of development.

Appropriate Land Use Types. This subsection provides guidance on the primary, and in many cases, secondary uses which may be appropriate in certain areas of the city.

Representative Photos. Photos of Leander-area examples that would be compatible with the land use category. These are intended to help provide a visual guide to the types of uses, structures, and scale that would be appropriate.

Guidance and Interpretation. Recommendations for decision-making in regards to zoning proposals, location and site considerations, interpretation, and additional pertinent information.

Zoning District Suitability. This subsection provides guidance as to which established zoning district(s) may be most appropriate to implement the intent of the future land use category. In many cases, improvement to the City's regulations may be warranted to fully achieve the envisioned character.

Code Assessment Considerations. In a follow-up action to this plan, these recommended priorities should be considered to achieve the intent and character of the specific land use categories.

RURAL

Intent and Character

The Rural future land use category is intended for land areas that are and will continue to include a more rural, Hill Country character throughout the plan horizon. These areas are categorized by the presence of generally private open spaces, large setbacks, heavy tree cover, topographical undulations and generally low intensity uses. This land use category is found on the western edge of Leander's planning area and has portions located in the ETJ, current City limits, and land under non-annexation agreements.

Typically residential and agricultural in nature, this area may also be appropriate for vineyards, wedding venues, bed and breakfasts and other Hill Country destination uses on larger properties. For the most part, the City will not plan to pay installation costs for long-term suburban or urban utilities (wastewater) in this area, but could consider arrangements with developers to cover that cost, etc.

To preserve this Hill Country character, development standards should be tailored to larger lots with on-site utilities, low impervious cover, and streets with rural cross-sections (e.g., bar ditches, no sidewalks or curbs).

Appropriate Land Use Types

Use	Appropriate Uses
Agricultural	Traditional ranching uses (e.g., ranching, orchards or gardening; greenhouses and nurseries; etc.)
Residential	Large lots, estate subdivisions, homesteads on ranches.
Commercial	Agricultural uses, limited agricultural commercial uses, home-based businesses, tourism-based destinations.
Industrial	Not appropriate
Institutional	Education (e.g., public/private schools, higher-learning); institutional uses (e.g., churches, places of public assembly); public recreational uses (e.g., parks and open space areas); and utility and service use (e.g., electrical substations, fire stations, etc.)
Other	Appropriate additional uses could be acceptable as limited or conditional (e.g., recreational vehicle parks) if they are designed and constructed with a rural site character.

Large Lot Residential

Rural street

Ranchland

Guidance and Interpretation

The following recommendations should be considered for decision-making for zoning requests, development approvals, and regulatory adjustments:

- The Rural land use category is indicative of an area of the community where less intense uses are desired and suburban utilities should generally not fall in the City's wastewater master plans. Special circumstances may be considered.
- Proposed commercial uses should be evaluated to ensure a supporting use of the primary agriculture intent of this category.
- Proposed commercial, civic, and additional non-residential uses should be designed with a rural site design character provided for in the development codes.

Existing Zoning District Suitability

- Single-Family Rural (SFR)
- Single-Family Estate (SFE)
- Planned Unit Development (PUD)

Code Assessment Considerations

- *Review lot standards in the ETJ and the SFR district*
- *Rural site design requirements with Hill Country character*
- *Rural street and rural stormwater design*
- *Consideration of private streets, standards and maintenance*
- *Ensure fire flow (water) requirement consistency*
- *Native tree preservation and canopy retention*
- *Consider impervious cover and lot coverage percentages*
- *Driveways and access frequency on collector streets*

NEIGHBORHOOD RESIDENTIAL

Intent and Character

The Neighborhood Residential future land use category is intended to be developed primarily as new single-family detached residential subdivisions with associated amenities, such as parks, trails, open space areas, and elementary schools. These areas are intended to have a mix of suburban and auto-oriented development character which are primarily found in the form of detached residential lots.

Architectural styles, building height and massing are relatively uniform in this type of land use. Most streets are considered to be local and low-volume with curb and gutter, sidewalks, consistent speeds and highly accessible driveways. Strategically located parks are essential and in some cases a school or other institutional use are integrated or in close proximity.

Appropriate Land Use Types

Use	Appropriate Uses
Agricultural	Not appropriate
Residential	Single-family detached residential; Single-family attached uses; Cottages; Townhouses (up to four units).
Commercial	In Planned Unit Developments, neighborhood-serving retail, personal service, and office uses may be considered if they include strict design standards and compatibility criteria. These uses should typically be found along higher-classification streets and sited at or near intersections.
Industrial	Not appropriate
Institutional	Education (e.g., elementary and secondary schools); institutional uses (e.g., places of public assembly); public recreational uses (e.g., parks and playgrounds; play stadiums); and utility and service uses (e.g., electrical substations, fire stations, etc.). High schools may be permitted if they are located and take access from a collector or greater street classification.
Other	Other uses could be permitted as limited or conditional basis.

Single-Family House

Single-Family House

Neighborhood Open Space

Guidance and Interpretation

The following recommendations should be considered for decision-making for zoning requests, development approvals, and regulatory adjustments:

- Zoning proposals for districts allowing single-family attached uses, cottages, and townhouses are consistent with the land use category if they are located on and take access from a collector or greater road classification and are considered for areas that provide for a transition between single-family detached residential uses and other more intensive uses (e.g., more intensive zoning districts and future development areas). Attached single-family should be secondary to detached product types.

Existing Zoning District Suitability

- Single-Family Rural (SFR)
- Single-Family Estate (SFE)
- Single-Family Suburban (SFS)
- Singe-Family Urban (SFU)
- Single-Family Compact (SFC)
- Planned Unit Development (PUD)
- Single-Family Limited (SFL)
- Single-Family Townhouse (SFT)
- Two-Family (TF)
- Cottage Housing (CH)
- Neighborhood Residential (NR)

* Ordinance 22-031-00 Water Resolution prioritizes low density use components SFR, SFE, and SFS.

Code Assessment Considerations

- *Areas of differing compatibility should be screened by bufferyards*
- *Streets should maintain a suburban cross-section*
- *Consider a new zoning district that would allow for flexible lot sizes within a master planned community without doing a PUD*
- *Connectivity, both vehicular and pedestrian, to other neighborhoods, trail systems, greenways and major street system*
- *Landscaping should be drought tolerant and proposed turf grass areas should be reduced for common areas.*

TRANSITIONAL

Intent and Character

The Transitional future land use category is envisioned for areas that are ripe for or already beginning to transition towards greater density, or provide a more compatible transition to lower-density residential. These areas are intented to be primarily developed with slightly greater density and housing types than those allowed in Neighborhood Residential.

Density and use character are semi-urban, with townhouses, small lot single-family, cottages, local office, local commercial and attached single-family products. In some cases, transitioning densities are similar to Neighborhood Residential yet are seen as a definitive change in density and character from prior use and intensity. In general, these areas, while in differing contexts, provide a transition between lower density Neighborhood Residential and more intensive nonresidential uses.

The Transitional areas in Leander are notable for today's rural streets and lack of proximity to commercial centers. Infrastructure improvements, traffic dispersion, pedestrian upgrades, and adjacency compatibility should be at the forefront of rezoning considerations.

Appropriate Land Use Types

Use	Appropriate Uses
Agricultural	Not appropriate
Residential	Single-family detached residential and single-family attached uses; townhomes, cottages, condominiums, twins, duplexes.
Commercial	Neighborhood-serving office and commercial.
Industrial	Not appropriate
Institutional	Places of public assembly (e.g., churches); education (e.g., elementary and secondary schools); public recreational uses (e.g., parks and playgrounds); and utility and service uses (e.g., electrical substations, fire stations, etc.).
Other	Other uses could be permitted as limited or conditional basis.

Townhouses with Garages

Alley-Loaded Townhouses

Alley-Loaded Houses on Small Lots

Guidance and Interpretation

The following recommendations should be considered for decision-making for zoning requests, development approvals, and regulatory adjustments:

- New single-family detached and attached uses (i.e., townhomes, twins as well as duplexes, triplexes, and fourplexes) are permitted if they keep the current urban character of the area. Detached cottage housing and single-family rental on one lot are other uses that may be considered. Local commercial and office may be considered where compatibility is desired.
- Utility adequacy is critical, as transitional areas may have sub-standard utility infrastructure. Streets are a primary focus due to the changing patterns. Developments in this land use category are required to build to an urban standard and upgrade infrastructure to serve the proposed project, not build to existing standards in the area.
- The main priority for street enhancements is on the pedestrian and preserving the quality of the current street character. All new development requires sidewalks (either new or replacement, if desired) and the planting of street trees between the edge of pavement and the sidewalk.

Existing Zoning District Suitability

- Neighborhood Residential (NR)
- Single-Family Townhouse (SFT)
- Singe-Family Urban (SFU)
- Cottage House (CH)
- Planned Unit Development (PUD)
- Two-Family (TF))
- Local Office (LO)
- Local Commercial (LC)

Code Assessment Considerations

- *Compatibility with directly adjacent single-family should be considered through height compatibility, low-level lighting, pitched roofs, bufferyards*
- *Transportation adequacy, impact fees, traffic impact analysis pro-rata contributions*
- *Retain streetside areas of green setbacks or porches, trees, and sidewalks for townhouses and more intense uses. Additional density should be balanced by an attractive streetscape, which may include alleys or narrower driveway approaches*

NEIGHBORHOOD CENTER

Intent and Character

The Neighborhood Center future land use category is intended for areas that will be developed mostly as nonresidential uses that are of an appropriate use, scale, and design that is compatible with abutting or adjacent residential uses. Site design should be neighborhood-focused, prioritizing walkability, screening, light shielding, street landscaping, compatible height, etc.

Typical uses include personal services, day care centers, small offices, fitness centers, restaurants, and retail plazas. Upper-story residential is recommended to create density to support retail, yet height limited for compatibility and scale. At the intersection of arterials and highways, more substantial retail centers and regional uses are appropriate. These locations may include hotels, vertical mixed-use, grocery stores.

Neighborhood Centers are daily activity nodes that see high traffic and turning movements, elevating access as a critical site consideration. Street relationship to the site should be safe, pedestrian-friendly, and supportive of the use type with adequate driveways.

Appropriate Land Use Types

Use	Appropriate Uses
Agricultural	Not appropriate
Residential	Secondary uses within Neighborhood Centers should be medium density attached residential (townhouses), and upper-story residential use with living units at no more than three stories.
Commercial	Neighborhood-serving retail, personal service, office, and restaurant uses. At highway intersections, hotels, grocery stores and similar regional uses are appropriate.
Industrial	Not appropriate
Institutional	Places of public assembly (e.g., churches); public recreational uses (e.g., parks and playgrounds); and utility and service uses (e.g., electrical substations, fire stations, etc.).
Other	Other uses could be permitted as limited or conditional basis.

Desired Mix (Land distribution)	70-100% Non-Residential 0-30% Residential

Retail Center

Mixed-Use Building

Code Assessment Considerations

- *Ensuring appropriate scale and context*
- *Incentivize sustainable architectural design and adaptive-use spaces*
- *Walkability and gathering places*
- *Ensuring good access around intersections*
- *Flexible parking requirements*
- *Transitions and buffering*

Priority Commercial Centers

- **Along 183A Toll**
- **Along US 183**
- **Along Ronald Reagan**
- **Along Bagdad Road**

Priority Commercial Centers should be focused on commercial uses, not residential, and facilitate more activated non-residential development

Guidance and Interpretation

The following recommendations should be considered for decision-making for zoning requests, development approvals, and regulatory adjustments:

- New Neighborhood Center development should be compatible from a use and design standpoint with existing residential directly adjacent to the property. This should not discourage approval of zoning districts supported by this land use category, but compatibility should be prioritized to ease the transition for legacy residences in these areas.
- New Neighborhood Center areas should be subject to scale based on location, access to the functional street classification, and adjacent development. For example, a center located at 183A with no adjacent residential and access to a frontage road and/or arterial street is a candidate for General Commercial; conversely, a center located at a collector intersection with established residential in close proximity would be more appropriately designated Local Commercial.
- Land within the inner core of the illustrative center should be reserved for office/retail/commercial. Upper-story vertical mixed-use is appropriate, as long as non-residential employment and service uses are required on the street floor.
- Land within the outer core of the illustrative center is intended to be more flexible, including consideration of retail/employment uses, medium density residential, and public assembly/institutions. At major street locations, with proper site design, the entire center is encouraged for employment and retail uses.

Existing Zoning District Suitability

- Single-Family Townhouse (SFT)
- Two-Family (TF)
- Local Office (LO)
- Local Commercial (LC)
- General Commercial (GC) only in Priority Commercial Centers
- Planned Unit Development (PUD)

MULTI-USE CORRIDOR

Intent and Character

The Multi-Use Corridor future land use category is intended for mixed-use areas to be developed at a higher density/intensity and with uses not primarily supported in Neighborhood Residential. These areas are intended to provide for a mix of both commercial and residential uses that are not integrated into neighborhoods but maintain a seamless, compatible transition between residential and commercial uses.

Multi-Use Corridors are not intended for strip commercial nor are they expected to be predominantly commercial. These corridors have been identified as opportunity areas for businesses and daily services, high-intensity residential such as townhouses, civic and employment uses, but also traditional single-family neighborhoods where streets access these corridors.

These areas are intended to be developed with an auto-oriented character, which means vehicles and parking areas are a primary visual characteristic from the street. Access management is recommended to maintain safe traffic movement along these streets. Appropriate bufferyards are required to ensure compatibility with adjacent Neighborhood Residential.

Appropriate Land Use Types

Use	Appropriate Uses
Agricultural	Not appropriate
Residential	Should be secondary to commercial but typically will be medium-density attached residential (attached single-family, cottage housing, townhouses). Single-family may be considered but is not encouraged. Single-family may be best facilitated in a PUD or master planned community with a variety of uses and residential densities. No access to the major street is allowed for individual units.
Commercial	Commercial retail, office, personal service uses, and restaurants, including drive-throughs. These could be stand-alone individual parcels if they are pre-existing or as part of a larger retail center. Near highway intersections and adjacent to Employment Mixed Use/Activity Centers, hotels, grocery stores and similar regional uses may also be appropriate.
Industrial	Not appropriate
Institutional	Education (e.g., elementary, secondary, and high schools); institutional uses (e.g., places of public assembly); public recreational uses (e.g., parks and playgrounds; play stadiums); and utility and service uses (e.g., electrical substations, fire stations, etc.).
Other	Other uses could be permitted as limited or conditional basis.

Mixed Use Building with Outdoor Seating

Townhouses with Garages

Code Assessment Considerations

- *Ensuring appropriate scale and context*
- *Reduce barriers to employment-generating uses and development*
- *Incentivize sustainable architectural design and adaptive-use spaces*
- *Walkability and gathering places*
- *Ensuring good access around intersections*
- *Flexible parking requirements*
- *Transitions and buffering*

Priority Commercial Corridors

- **Along 183A Toll**
- **Along US 183**
- **Along Ronald Reagan**
- **Along Hero Way**

Priority Commercial Centers should be focused on commercial uses, not residential, and facilitate more activated non-residential development

Guidance and Interpretation

The following recommendations should be considered for decision-making for zoning requests, development approvals, and regulatory adjustments:

- New non-residential development should be located on and take primary access from the primary corridor street; secondary access can be taken to within the neighborhood if planned at the time of residential zoning only a collector or greater classification. Pedestrian access to non-residential should be encouraged from the neighborhood. Parking lot landscaping should be used to buffer auto uses and create a suburban character.
- Individual pad lots should be discouraged to avoid strip zoning with multiple access points. Therefore, access management policies should be put into place along corridors based on speed and desired character.
- On arterials and highways, office employment and office center uses should be encouraged to entice businesses, especially in planned developments with a mix of amenities and activity. Upper-story residential and mixed-use is encouraged near and within job centers.
- Areas located near an activity center could be comprised of more intense/dense uses. These areas are suitable for neighborhood shopping centers and higher intensity/density mixed-use developments.
- Single-family attached uses (i.e., duplexes, triplexes, fourplexes, and town-houses (up to six attached units)) as well as single-family detached can be considered for approval as long as the use is secondary to commercial. The residential use may not exceed forty (40%) of the project or area within the MUC area and shall be combined with a commercial use.

Existing Zoning District Suitability

- Single-Family Townhouse (SFT)
- Cottage Housing (CH)
- Two-Family (TF)
- Planned Unit Development (PUD)
- Local Commercial (LC)
- General Commercial (GC) only on Priority Commercial Corridors
- Local Office (LO)

ACTIVITY CENTER

Intent and Character

Activity Center areas are the major strategic commercial centers within the community. They are intended to provide opportunity for diverse retail, employment and mixed-use destinations at critical intersections to create dense, value-intense development. These centers are regional in nature and serve a population beyond Leander, and are found on major highways and arterials. Managing access and traffic in these high-volume areas will require planning and coordination.

In a changing retail environment, Activity Centers are designed to become community destinations with activities, amenities, shopping, restaurants and places to gather, live and work. These mixed-use centers complement neighborhood centers and the urban development around Leander Station. Individually, these centers are expected to have a differing balance of land use, design, and atmosphere based on their location and context. High-density apartments and lofts are appropriate if designed and connected to the larger mixed-use center.

The Activity Center land use is intended to be implemented using a strategically planned framework, typically a PUD. When multiple landowners exist without a unified development scheme, proposed projects should plan for future integration to balance the activity center area as much as possible.

Appropriate Land Use Types

Use	Appropriate Uses
Agricultural	Not appropriate
Residential	In a mixed use development, vertically-integrated mixed use buildings secondary to a non-residential primary use, such as mixed-use urban lofts. Lofts should be integrated into broader development plans, with amenities and walkable connections. Residential uses are not permitted on the first floor of mixed use buildings, including amenities such as fitness centers. Design of the high-density should be in urban and not suburban form.
Commercial	Commercial retail, professional offices, personal services, restaurants, grocery stores, big box retail, entertainment, fuel sales, hotels, and similar regional uses.
Industrial	Not appropriate
Institutional	Public recreational uses (e.g., urban plazas and greens); and utility and service uses (e.g., electrical substations, fire stations, etc.).
Other	Other uses could be permitted as limited or conditional basis, assuming an integration with the design character proposed for the Activity Center.

Desired Mix* (Land distribution)

100% Non-Residential

0% Residential

* Desired Mix applies to the first story building footprints.

Activity Center illustration of a hypothetical integrated, mixed-use development at a strategic location.

Source: 2015 Destination Leander Plan (LandDesign)

Code Assessment Considerations

- *Consider Activity Center zoning guidance for development that is likely to be memorialized as a PUD*
- *Consider including development incentives to signal priorities*
- *Study regional detention options in partnership with developers*
- *Access management and turning movement lanes for entry points*
- *Increase height requirements*
- *Reduce tree and landscaping requirements, but ensure quality streetscapes*
- *Reduce parking ratios and incentivized shared parking*

Guidance and Interpretation

The following recommendations should be considered for decision-making for zoning requests, development approvals, and regulatory adjustments:

- The size of the activity center is intended to be flexible if the proposed development still embodies the intent and character of the activity center classification.
- Development quality (architecture and landscaping) should be of higher quality.
- Although not required, regional detention should be encouraged to serve all parcels in an activity center. This allows for more intensity of use across the rest of the activity center.
- Internal vehicular and pedestrian interconnectivity among uses and parcels is required along with connection to adjacent development.
- Major entrance drives to the activity center should be designed with center planted medians.
- Site development configuration and circulation should account transit stops and accommodations.
- On-site parking should be first accommodated through decreased minimum parking requirements, followed by on-street parking, shared parking, and structured parking placed away from main pedestrian pathways. Individual surface lots for each parcel should not be required.
- Outparcels placed along arterial and collector roads should be developed and connected to serve the internal roads of the activity center.
- Building height and mass should be designed to maximize compatibility with adjacent uses, where the highest intensity is placed at the center of the activity center.

Existing Zoning District Suitability

- Local Office (LO)
- Local Commercial (LC)
- General Commercial (GC)
- Planned Unit Development (PUD)


EMPLOYMENT CENTER

Intent and Character

The Employment Center future land use category is for primary jobs and business in strategic locations. These areas are intended for regional-serving employment in planned campus-like environments for office, research, medical, manufacturing, light industrial, warehouse, and heavy commercial uses. To remain competitive in today's corporate marketplace, contemporary workforce-supporting elements such as amenities, retail and high-density residential are also encouraged in an integrated development pattern.

The Employment Center area is focused on meeting the plan goals of an attractive, high-quality business environment for investors to bring to Leander and grow/diversify the tax base. It complements other nearby regional mixed-use areas, but provides opportunities for larger-footprint, single-tenant buildings that can accommodate numerous employees. These areas may be developed with an auto-oriented, traditional character, or in a mixed-use urban design.

Appropriate Land Use Types

Use	Appropriate Uses
Agricultural	Not appropriate
Residential	High-density residential may be allowed on a limited or conditional basis, only allowed as part of a mixed use development in vertically-integrated mixed use buildings, secondary to an employment use(s) in a project. Design of the high-density should be in urban and not suburban form. Single-family is not appropriate.
Commercial	Commercial retail, office, personal service, and restaurant uses, including drive-throughs. Retail uses are more appropriate for those types of uses which support the employment center but could be considered otherwise based on location and individual circumstances (e.g., at major intersections).
Industrial	Flexible office/warehouse, logistics and distribution centers, data centers, corporate offices and/or campuses, and light manufacturing.
Institutional	Utility and service uses (e.g., electrical substations, fire stations, etc.).
Other	Other uses could be permitted as limited or conditional basis, assuming integration with the design character for the Employment Center area.

Desired Mix* (Land distribution)

100% Non-Residential

0% Residential

* Desired Mix applies to the first story building footprints.

Professional Office and Retail Strip


Office


Vertical Mixed-Use with Ground Floor Office/Retail

Guidance and Interpretation

The following recommendations should be considered for decision-making for zoning requests, development approvals, and regulatory adjustments:

- New non-residential development should be located on and take access from a collector or greater road classification, or an internal road network designed as part of a larger center.
- Areas within this category should adhere to the recommended mix of non-residential and residential, measured by land distribution. This should be interpreted as a broad area distribution and not a project-by-project required mix. Decisions should be made considering broader community goals and market indicators at the time of proposal.
- Landscaping and aesthetic enhancements should be focused along the perimeter, particularly on major streets and highways, to maintain an attractive gateway feeling.
- Heavy commercial and manufacturing uses should not be zoned adjacent to residential-planned or zoned areas. Such commercial users should take access from internal streets, where practical, and separated with transitional zoning districts and substantial buffering from residential.
- Primary Employer is defined as a business and/or industry that produces goods or services for statewide, national, or international markets. The goods and services are exported to consumers outside of the local region, resulting in a stream of new income for the local economy. Common primary employers are manufacturing, medical and technology mixed-use developments.
- Campus-style development is intended for regional-serving, primary employers in a planned, campus-like environment for office, research, medical, manufacturing, light industrial and heavy commercial uses. This development type would typically be seen as a mixed-use planned development primarily consisting of non-residential uses supported by high-density, multi-story residential in an integrated pattern. Defining aspects of the campus style development would include large green space/buffering areas, collaborative spaces/zones, outdoor amenities for both workers and community and walkable sidewalks/bike lanes.

Existing Zoning Suitability

- General Commercial (GC)
- Heavy Commercial (HC)
- Local Office (LO)
- Local Commercial (LC)
- Planned Unit Development (PUD)

Code Assessment Considerations

- *Create a "Corporate Campus" zoning district to distinguish the desired office complsidential—from the Local Office district.*
- *Parking lot and bufferyard landscaping should be used to soften auto-oriented uses and create a suburban character.*
- *Trucking and loading may be likely, as well as noise and lighting, so appropriate screening and distance are required to ensure compatibility with abutting less intense/dense development areas.*
- *Review height, setback, and lot coverage restrictions to ensure regulations are not too restrictive that they discourage development.*

INDUSTRIAL

Intent and Character

The Industrial future land use category is intended for land areas that will be developed to support light or heavy industrial and/or manufacturing uses that are designed for intense, potentially nuisance-creating uses in an appropriate location.

The industrial area along US 183 provides the City with opportunities for local employment and economic development for large and small business to connect into the local supply chain. This area includes legacy industrial uses, opportunity sites for new industrial development, and a mix of building size/site arrangements to accommodate a variety of businesses. The area has dedicated internal circulation, proximity to retail and restaurants, and quick access to major streets and highways.

While accommodating trucking is critical for operations, enhanced bicycle, pedestrian, and transit connectivity is important to provide connectivity to Leander Station. New industrial development should provide setbacks and buffers to adjacent residential, and landscaping/screening from US 183 and other public streets. Conversely, adjacent redevelopment along Horizon Park Road, which is transitioning into higher densities, should acknowledge the existing industrial park with setbacks and buffer areas to protect the value of each property.

Appropriate Land Use Types

Use	Appropriate Uses
Agricultural	Not appropriate
Residential	Not appropriate
Commercial	Some limited food-service uses, fuel sales.
Industrial	Industrial uses are appropriate, with zoning allowances by-right, or on a limited or conditional basis, depending upon the protections required to decrease the amount of sound, dust, vibration, odor, and glare, etc., which can occur off-parcel or between future development categories.
Institutional	Utility and service uses (e.g., electrical substations, fire stations, etc.). While public recreational uses (e.g., parks and playgrounds) are not appropriate, trails and trail connectivity are appropriate with public protections.
Other	Other uses could be permitted as limited or conditional basis, assuming an integration with the design character proposed for an industrial area.

Distribution/Warehousing

Technology Office Park

Flexible Office Space

Guidance and Interpretation

The following recommendations should be considered for decision-making for zoning requests, development approvals, and regulatory adjustments:

- New non-residential development should be located on and take access from a collector or greater road classification, or an internal road network designed as part of a larger center.
- Operations are subject to protections to decrease the amount of sound, dust, vibration, odor, and glare, etc., which can occur off-parcel or between future development categories.
- Protect adjacent property values through adequate setbacks, buffering, nuisance-shielding, etc. through code assessment and adjustments.

Existing Zoning Suitability

- Heavy Commercial (HC)
- Heavy Industrial (HI)
- Planned Unit Development (PUD)

Code Assessment Considerations

- *Areas of differing compatibility should be screened by bufferyards*
- *Enhanced landscaping/screening to US 183 for redevelopment*
- *Truck and loading bay screening*
- *Light and noise shielding and hours of operation*
- *Employee parking balance to square footage*
- *Review use table to ensure accommodation of flexible and hybrid business models*
- *Review food truck policies and eating establishments*

OLD TOWN

Intent and Character

Old Town as a future land use category is intended for a mix of uses that keeps Leander historic center interesting and dynamic. New development and redevelopment within Old Town should be designed in harmony with the existing character that acknowledges Leander's heritage. This includes older buildings and historic, contributing structures along with a mix of new and adaptive reuse buildings.

Old Town buildings are to be activated towards the street, encouraging walkability, eating establishments, central gathering spaces, and civic conversation. Old Town is scaled-down urban without on-site parking requirements, high impervious cover yet green space, street tree canopy and safe mix of vehicles and pedestrians. Old Town character includes small businesses, professional office, entertainment, shopping, arts and culture elements, and civic activity, each contributing to daytime and evening buzz.

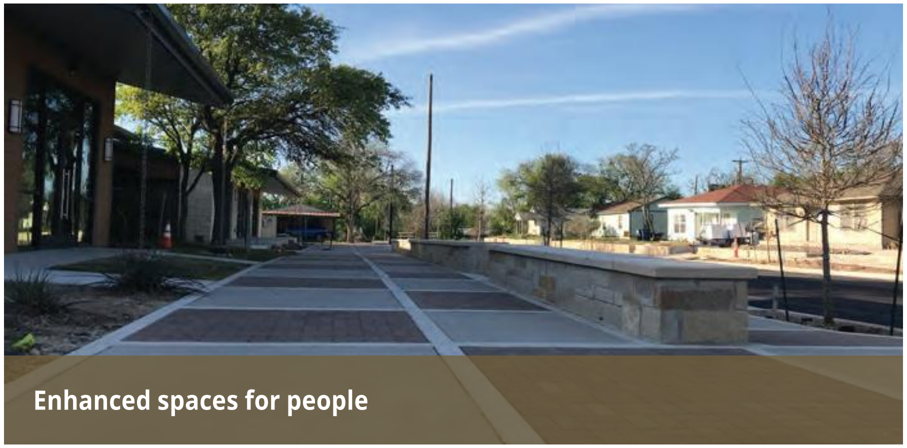
An assortment of residential is suitable and encouraged based on the context, focused on a balance of scale between building, site and streets. In the core, urban lofts and townhouses are appropriate; in the south and east districts, across US 183, attached and detached housing may be appropriate with design context and limitations.

Appropriate Land Use Types

Use	Appropriate Uses
Agricultural	Not appropriate
Residential	Townhouses; mixed-use urban lofts; single-family, attached residential.
Commercial	Most commercial uses are generally appropriate in the Old Town area, as they are to be integrated into the Old Town street character and design criteria.
Industrial	Not appropriate
Institutional	Places of public assembly (e.g., churches); public recreational uses (e.g., urban plazas and greens); and utility and service uses (e.g., electrical substations, fire stations, etc.).
Other	Other uses could be permitted as limited or conditional basis, assuming they meet the Old Town character and relationship with the streets.

House Converted to Non-Residential Use

Architectural history on display



Enhanced spaces for people

Guidance and Interpretation

The following recommendations should be considered for decision-making for zoning requests, development approvals, and regulatory adjustments:

- In Old Town, growth must encourage the regeneration of adaptive reuse, wherever suitable, of current significant buildings.
- Infill growth must match the current character of Old Town.
- Old Town should include a mix of residential and commercial use in an organic fashion, consistent with the future Old Town Master Plan.
- East Old Town retains residential character with some mixed-use elements.

Existing Zoning Suitability

- Transects (T4, T5)

Code Assessment Considerations

- *Consider zoning adjustments following the master plan effort to embody the desired regulatory framework for Old Town development*
- *Encourage outdoor and patio seating*
- *Consider fees-in-lieu for on-site parking to reduce site impacts*
- *Assess environmental, stormwater controls*
- *Review infrastructure requirements to reduce burdens*

URBAN MIXED-USE

Intent and Character

The Urban Mixed-Use future land use category contains the areas directly adjacent to Leander Central and Old Town and is envisioned to provide a transition from those higher density/intensity uses to the traditional residential developments nearby. These areas are supportive to the transit-oriented environment of the Central area and will be connected to the Central developments though streets, trails and greenways.

Residential uses include small-lot single family, townhouse, low-density multi-family, and urban lofts. Commercial development can be a mix of urban and local retail and office, restaurants and entertainment, hotels, civic, and related uses.

These areas are envisioned to be developed with a semi-urban character, with some areas developing under the form-based code and others through traditional zoning. Typically, buildings are more street-oriented, with build-to lines, on-street parking or periphery parking, pedestrian and bicycle facilities, and short blocks with high street connectivity.

Appropriate Land Use Types

Use	Appropriate Uses
Agricultural	Not appropriate
Residential	A Higher-density residential percentage for apartments or lofts may be allowed on a limited or conditional basis, only allowed as part of a mixed-use development in vertically integrated mixed-use buildings, secondary to allowable commercial uses of an Urban Mixed-Use project. Design of the high-density should be urban and not suburban
Commercial	Retail, personal service, office, entertainment and restaurant (without drive-throughs) uses and those uses permitted in the Central area, if they meet appropriate design standards and locational and decision-making criteria.
Industrial	Not appropriate
Institutional	Places of public assembly, public recreational uses (e.g., parks, playgrounds, and urban plazas); and utility and service use (e.g., electrical substations, fire stations, etc.).
Other	Other uses could be permitted as limited or conditional basis, assuming they meet the Urban Mixed-Use character and relationship with the streets.

Desired Mix*
(Land distribution)

0 - 30% Residential

70-100% Non-Residential

* Desired Mix applies to the first story building footprints.

Multi-Family and Senior Living

Educational

Small Lot Urban Neighborhood

Guidance and Interpretation

The following recommendations should be considered for decision-making for zoning requests, development approvals, and regulatory adjustments:

- New development shall follow an integrated street pattern, in the character of the Smartcode street context. Conventional commercial may be appropriate along 183A frontage, without disassociation from the adjacent, transitional development context.
- New development shall be built with an urban character that follows the performance standards indicative to the greater area, including sidewalks and street trees. A variety of residential, community, and commercial uses are appropriate.
- Connectivity to the station and central areas through trails and sidewalks is critical to maintaining access for transportation and recreation.
- New single-family attached uses (i.e., triplexes) and mixed-use urban lofts are permitted if designed to the current urban character of the area.

Existing Zoning Suitability

- Single-Family Townhouse (SFT)
- Cottage Housing (CH)
- Multi-Family (MF)
- Local Office (LO)
- Tiny House (TH)
- Local Commercial (LC)
- General Commercial (GC)
- Planned Unit Development (PUD)
- Transects (T4, T5, Civic, SD)

Code Assessment Considerations

- *Review buffers and screening to ensure compatibility (urban scale)*
- *Ensure subdivision street requirements when conventional district development is permitted, to maintain urban street patterns*
- *Connectivity and efficient infrastructure requirements to add value*
- *Review building height and setbacks for consistency*
- *Green space and shade considerations*

LEANDER CENTRAL

Intent and Character

The Leander Central future land use category encompasses the City's future urban center, in close proximity to Leander Station. This area is envisioned to be a very walkable area which encourages a "sense of place" and should represent the most dense, urban form Leander will have. This is a highly activated area with first floor storefronts, employment, dense residential, and entertainment.

Land uses are less distinguishable and less regulated in the urban environment, where the focus is more on form than function. Important characteristics in the central location are building relationship with the street and pedestrian movement, signage, street design, and public gathering places.

This area is envisioned to be developed with an urban character, meaning development requires on-street or structured parking and an emphasis on pedestrian walkability. Vehicular circulation occurs along a grid-based network of complete streets with short blocks and focus on safety and efficient distribution of vehicles, bikes and pedestrians.

Appropriate Land Use Types

Use	Appropriate Uses
Agricultural	Not appropriate
Residential	Urban multi-family (i.e., apartments); townhouses, and mixed-use urban lofts.
Commercial	Most commercial uses are generally appropriate in the Central area, as they are to be integrated into the urban street character and design criteria.
Industrial	Not appropriate
Institutional	Places of public assembly; public recreational uses (e.g., urban plazas and greens); and utility and service uses (e.g., electrical substations, fire stations, etc.).
Other	Other uses could be permitted as limited or conditional basis, assuming an urban character and relationship with the streets.

Desired Mix
(Land distribution)

60-100% Non-Residential
0-40% Residential

Leander Central - Transit Oriented Development (TOD) Relation

Leander's existing TOD zoning district is governed by a development code tool called the SmartCode, which is based upon New Urbanism principals for a designed-based system of varying densities and uses. The goal of the code is to promote traditional pedestrian-oriented communities with neighborhoods and town centers with a mix and integration of residential, commercial and retail uses, something Leander desires near the rail station.

Leander Central closely aligns with the existing zoning boundaries of the TOD zoning district, as amended. The Leander Central Plan is rooted in the idea of being Leander's newly created downtown space, a concept that is in complete alignment with Old Town as a separate, unique and distinct community asset.

Northline Rendering (source NorthlineLeander.com)

Guidance and Interpretation

The following recommendations should be considered for decision-making for zoning requests, development approvals, and regulatory adjustments:

- Development shall not exceed or alter the current lot and block arrangement, and shall be developed with an urban character that follows the performance standards indicative to the larger area, including public spaces and storefront elements. Parking shall be on-street or in off-street public parking lots or garages (with proper facade treatments).
- Residential uses (i.e., apartments) and mixed-use urban lofts help create the density needed to support retail and employment in these environments as long as they follow the current urban character of the area. Minimum parking requirements for these uses is important although a lesser standard can be justified due to the mixed-use environment.
- The main priority for street enhancements is on the pedestrian and preserving the quality of the current street character. As such, on-street parking is preferable to provide a buffer to the traffic lanes, sidewalks, and the planting of street trees in tree wells at the edge of pavement. Outdoor seating and plazas are encouraged to create a street scene and public gathering spaces.

Existing Zoning Suitability

- Transects (T4, T5, T6, Civic)

Code Assessment Considerations

- *Retain Smartcode character elements*
- *Review for off-street and on-street parking requirements*
- *Maintain green spaces and shaded streets/sidewalks*
- *Signage conducive to urban character environment*
- *Street design, speeds, and movement conducive to slower pace*
- *Storefront activation design and access*

GREENWAYS

Intent and Character

The Greenways future land use category contains active and passive parkland, trails, and open spaces that have been designated for public use. Greenways are linear parks that serve multiple purposes, including connecting the community and managing stormwater impacts. These spaces are also critical to providing green spaces amidst urban development, for the outdoor enjoyment of residents and workers while connecting public (and private) parks and amenities.

A Leander Greenways network is a framework for a regional destination for people looking for trail activities, a cycling loop system, and active transportation routes to employment centers. From a community perspective, greenways are opportunities for placemaking, including art, historical elements, civic spaces, and wildlife viewing.

Development adjacent to the greenway system should primarily be oriented towards the green space, with buildings fronting public paths, parkway streets providing access, and a public relationship between the greenway corridor and adjacent private development. Trail connections should be made frequently to adjacent developments to provide access.

Appropriate Land Use Types

Use	Appropriate Uses
Agricultural	Not appropriate
Residential	Not appropriate
Commercial	Not appropriate
Industrial	Not appropriate
Institutional	Parkland, typically public, although a greenway can be privately owned and maintained with a public access easement. Or, the public parkland may be a narrow piece of land adjacent to private open space/amenity area that adds to the feel of a larger green space.
Other	Greenways may be include, and are likely to include stormwater facilities from adjacent development. These facilities need to be designed thoughtfully, so as to create an enhanced amenity within the greenway and not disrupt the stormwater purposes of managing flooding. Stormwater facilities should be designed with a natural appearance and preferably, publicly accessible.

See Map 4.2, Greenways Map, on Page 108.


Greenway street crossing


Parkway street along a linear park


Community-wide trail through a greenway

Guidance and Interpretation

The following recommendations should be considered for decision-making for zoning requests, development approvals, and regulatory adjustments:

- Greenways shall be defined during the development approval process and dedicated during the first phase of the project.
- Non-residential development should be required to set aside land and build greenway trails for public use.
- Greenways should be considered partial credit for parkland requirements when submitted to meet minimum requirements for open space (e.g., as part of parkland dedication requirements or semi-public common areas as part of new development).
- Greenway linkages are desired regardless of floodplain reclamation or changes in floodplain boundaries. The corridor remains important.
- Stormwater should be well-integrated, with regional solutions desired.
- Trees should be abundant to retain soil durability and shade for patrons. Tree preservation of native hardwood species and native understory should be prioritized, when possible, and new shade trees shall be planted.
- Community and regional trailheads should be located at large public parks, defined parking lots along collector or arterial streets, and should not be located along neighborhood local streets except by special arrangement.
- Current regulations should be evaluated to require and / or incentivize the protection of sensitive natural resources (e.g., river corridors, floodplains, steep slopes, wetlands) as common open space areas.

Existing Zoning District Suitability

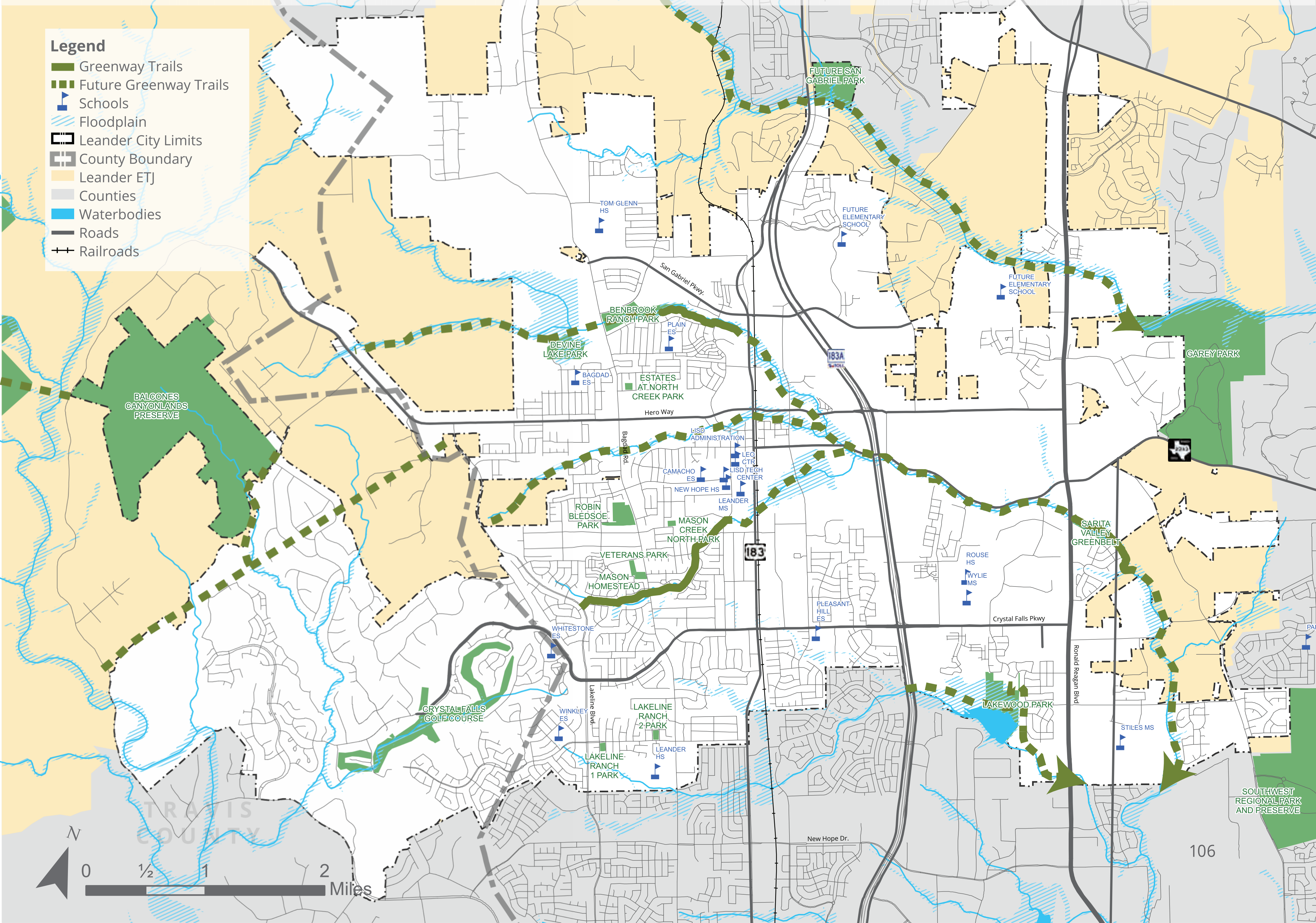
- All existing Leander zoning districts.

Code Assessment Considerations

- *Review design requirements for enhanced stormwater facilities*
- *Tree mitigation fund and soil nutrient enhancements*
- *Parkway (street) requirements*
- *Consistent trail widths and durable materials in high-use areas*
- *Timing of dedication and construction of amenities*
- *Access points and trailheads*
- *Safety features (lighting, shade, visibility, emergency access)*

Map 4.2 Greenways Map

Draft - Subject to change



Primary Street Network

Transportation is a critical element to future land use planning, ensuring that the right transportation infrastructure can adequately serve the demands of the projected abutting land uses and/or needed system throughout. The City of Leander has a Master Transportation Plan that provides the critical details of street design, traffic modeling, access management, pedestrian and bicycle elements, and identification of priority needs and how to achieve them. This comprehensive plan sets the framework of the more detailed transportation plan by ensuring street (and off-street) connectivity, character design elements, and a network of major streets that support the land uses in the Future Land Use Map. This section provides an overview of the transportation system framework.

The design of Leander's future streets should be rooted in both function and desired character of the built environment. Traffic capacity and speed are important for the purpose of vehicle movement but equal to the consideration of design elements and corresponding land development value. This plan recognizes the "transportation-land use connection"—the linkage between buildings and the street—as a critical component of maintaining or creating neighborhoods, districts, and corridors of unique character.

183-A Tollway at RM 2243

Major Streets

The primary street network on page 112, Map 4.3, *Major Streets*, show where street extensions, new streets, and potentially expansion/reconfigurations are needed to accommodate the City's anticipated growth. Set out on Map 4.3, Major Streets, are the existing and proposed citywide connections intended to serve future development as growth occurs throughout the Leander planning area.

The placement of proposed streets on the map is conceptual but intentional at this point in time, representing "approximate" location. Actual locations and design may be adjusted on a case-by-case basis, determined by development constraints, physical design considerations, funding, etc. This provides certainty and clarity for landowners and the development community to ensure that thoroughfares are accounted for as properties develop.

As growth continues in Leander, new development may warrant the identification and development of additional or re-classified streets, which may require consideration of a plan amendment. In similar fashion, significant changes such as re-alignments or re-classifications should be discussed and approved to ensure clarity.

Urban Street

Suburban Street

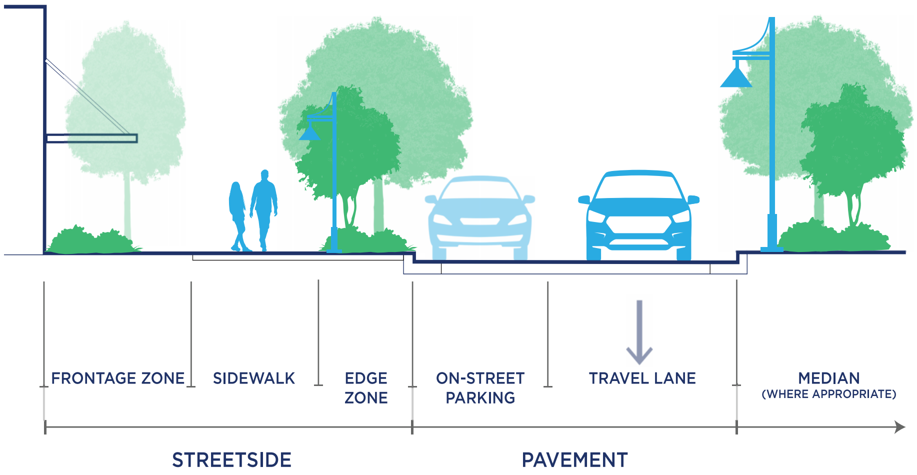
Street Design Character

A character approach to street design focuses primarily on the elements that support the adjacent land use, regardless of traffic capacity and function. The three character design types—Urban, Suburban, and Rural—each contain elements typically found no matter the street type. These character components should be considered when the City creates formal cross-sections for each street classification in the Master Transportation Plan.

Urban Streets

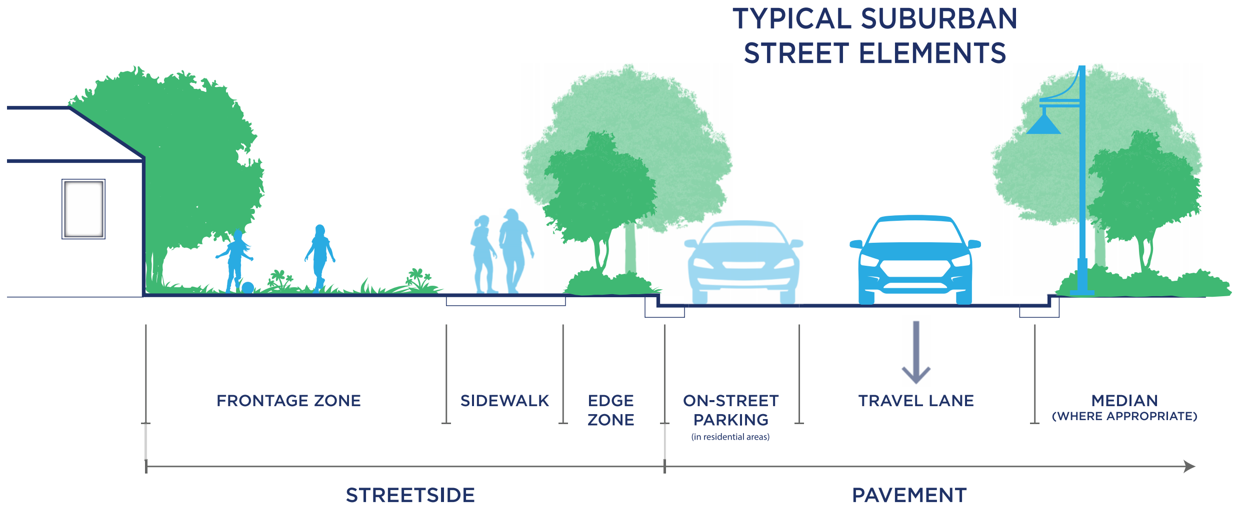
Urban streets should be designed to provide a comfortable and aesthetically pleasing environment that balances vehicle travel with safe bicyclist and pedestrian activity and should include active streetsides that serve as public gathering spaces. Urban streets tend to include many design elements conducive to a variety of users throughout the day, including streetside amenities such as pedestrian lighting and street trees, crosswalks, on-street parking, and proximate relationship to storefronts.

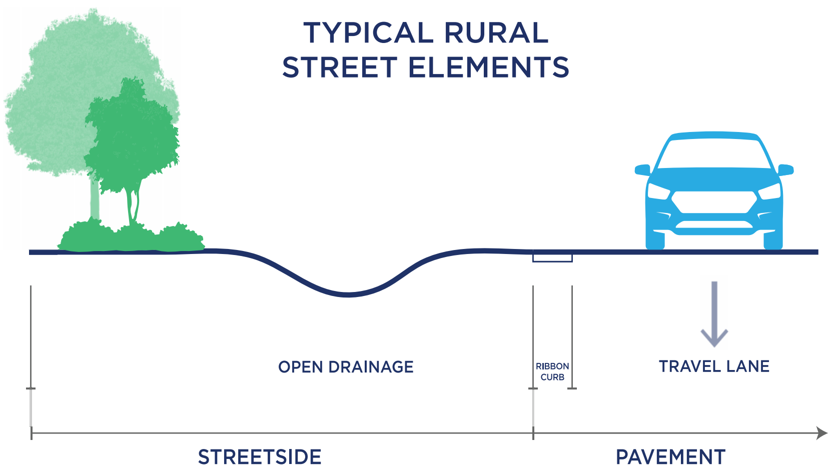
TYPICAL URBAN STREET ELEMENTS



Suburban Streets

Streets within the suburban street character zone most closely resemble standard street sections that have been recently constructed in Leander. New surburban streets should be designed to promote bicyclist and pedestrian activity but travelway emphasis is primarily focused on vehicles. Suburban street pavement elements include space for travel lanes and undefined parking between curbs, with some center-divide medians. Streetside elements include sidewalks with pedestrian-friendly separation edge zones and larger setbacks between the right-of-way and buildings, usually separated by a mixture of greenspace and parking areas. Trees are prominent in green spaces along travelways, usually as part of private property, on-site landscaping.





Rural Streets

Rural streets are primarily designed for mobility and access in rural character areas, both within the City limits and ETJ. Key considerations of rural streets and their appropriate locations. Rural street design assumes that low-density development and primarily non-urban infrastructure is anticipated during the plan horizon. The use of rural street design in suburban areas should be considered sparingly by the City but is an option where contextually appropriate, such as large-lot estate development. Rural collectors may provide residential driveway access due to large lots and minimal access points.

ATTACHMENT O

COLLECTION SYSTEM MASTER PLAN

CITY OF LEANDER, TEXAS

FINAL REPORT

JUNE 2024

Draft

GBA PN 15393.01

TBPE Firm No. 4242
9601 Amberglen Blvd, Ste. 109
Austin, TX 78729
www.gbateam.com

City of Leander, Texas

Collection System Master Plan

June 2024

Prepared for:

City of Leander, Texas

Prepared by:

GBA
TBPE Firm No. 4242
9601 Amberglen Blvd, Ste. 109
Austin, TX 78729

ETHAN R. VOYLES
LICENSED
27343
KANSAS
PROFESSIONAL ENGINEER

6/14/2024

STATE OF TEXAS
FRANK T. PHELAN
93874
LICENSED
PROFESSIONAL ENGINEER

6/14/2024

GBA PN: 15393.01

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List of Acronyms and Abbreviations

ADDF	Average Daily Dry-Weather Flow
CCI	Construction Cost Index
CCTV	Closed-Circuit Television
CIP	Capital Improvements Program
CIWEM	Chartered Institution of Water and Environmental Management
ENR	Engineering News-Record
ETJ	Extraterritorial Jurisdiction
fps	Feet Per Second
FM	Flow Meter or Force Main
GIS	Geographic Information System
I/I	Inflow and Infiltration
LF	Linear Foot
LS	Lift Station
LUE	Living Unit Equivalent
MG/MGD	Million Gallons/Million Gallons per Day
MUD	Municipal Utility District
O&M	Operations & Maintenance
OPCC	Opinion of Probable Construction Cost
OSSF	On-Site Septic Facilities
PCSWMM	Personal Computer Storm Water Management Model (EPA)
PDWF	Peak Dry Weather Flow
PVC	Polyvinyl Chloride
PWWF	Peak Wet Weather Flow
RDII	Rainfall Dependent Inflow and Infiltration
ROW	Right-of-Way
RM	Ranch-To-Market Road (as in RM2243)
SRTC	Sensitivity-Based Radio Tuning Calibration
SSO	Sanitary Sewer Overflow
TCEQ	Texas Commission on Environmental Quality
UCM	Austin Utilities Criteria Manual
WWTP	Wastewater Treatment Plant

0 EXECUTIVE SUMMARY

The City of Leander (City) retained GBA to prepare a Collection System Master Plan for the next 20-year period. Rapid growth has occurred since the City's most recent wastewater master plan completed in 2017, prompting the need for an updated plan. The purpose of this plan is to guide the City towards a wastewater collection system that supports and serves the City's evolving needs and continued growth. Objectives completed as part of this master planning project include the following:

- Collected manhole data in the field for sewers 12 inches or greater to develop the hydraulic model network and collect asset information.
- Identified growth areas and projected wastewater flows within the study area using City-provided population growth projections and development maps.
- Established planning-level design criteria for existing and future infrastructure.
- Developed a hydraulic model of the existing collection system in PCSWMM calibrated to Fall 2022 flow monitoring data.
- Conducted model simulations for existing conditions, 5-year, 10-year, and 20-year growth conditions to identify necessary improvements to meet established design criteria.
- Conceptualized sewer extensions to accommodate growth in the future service areas and developed estimated costs.
- Developed a list of projects to address existing and future wastewater infrastructure needs, along with estimated costs, for present day, 5-year, 10-year, and 20-year growth conditions.

Population projections provided by the City estimate Leander's population will grow by over 120,000 over the next 20 years. This growth is expected to occur throughout the City's extra-territorial jurisdiction (ETJ), particularly in areas with less existing development. For example, the City anticipates a significant portion of growth will be concentrated in the northwest region of the City (please see Chapter 6.10 for a conceptual plan for that area). To serve the anticipated growth, significant investment in wastewater infrastructure will be required throughout the City.

A 5-year, 6-hour storm event was utilized in the calibrated, hydraulic model to generate peak wet weather flows for existing infrastructure. The 5-year, 6-hour design storm method was selected based on established practices in modeling by the City of Austin and other nearby municipalities and to provide a balance of conservatism and practicality when estimating inflow and infiltration. Design criteria from the Austin Utility Criteria Manual (UCM) was used to estimate design flows for extension projects that would extend City sewer service beyond current service limits.

The hydraulic model developed for this plan was calibrated to Fall 2022 flow monitoring data, which demonstrated higher levels of inflow and infiltration (I/I) in certain basins within the City's existing sewer system. To address condition and capacity concerns in the existing sewers, it is recommended the City continue to engage in I/I mitigation efforts.

It is important to note that these I/I mitigation efforts have the potential to reduce peak wet weather flows in the existing system. If peak wet weather flows are reduced, then relief or upsizing projects may be delayed or avoided. However, the degree of I/I reduction that can be achieved is not certain. To determine if a relief project can be delayed or avoided, targeted pre- and post-rehabilitation flow monitoring will be required to confirm actual flow conditions after I/I reduction projects have been implemented.

Model simulations predict there are interceptors in the Block House Creek and Mason Creek basins not currently sized to adequately convey peak flows during 5-year, 6-hour design storm conditions. It is recommended that the City confirm and corroborate model results before embarking on large-scale relief or replacement projects. Targeted field investigations (e.g., manhole surcharge checks and flow monitoring) would help confirm the necessity and urgency of these relief projects.

Relief projects were prioritized considering factors such as the projected timeframe of concern, extent of flooding or surcharge predicted by the model, and how existing pipe capacities compared to 20-year flow conditions. Extension projects are primarily growth-driven and will be implemented in concert with development. More details regarding project recommendations can be found in Chapter 6 of the report.

Table ES-1 summarizes the collection system improvements identified from modeling and analysis for present day, 5-year, 10-year, and 20-year growth conditions. A detailed map and list of all identified improvements are provided in Figure ES-1 and Table ES-2, respectively.

Table ES-1: Summary of Recommended Projects

	Gravity Sewer		Lift Stations & Force Main		
Projects / Time Horizon	**Relief and Upsizing**	**Extensions for Growth**	**Lift Stations, Force Main**	**Decommission Lift Stations**	**Capital Costs ($M)**
Present Day	2 Projects, 22,000 LF	-	-	-	$28M Relief/Upsizing
5-year	1 Project, 3,700 LF	2 Projects, 2,600 LF	-	-	$5.6M Relief/Upsizing $1.2M Extensions (Gravity)
10-year	3 Projects, 20,600 LF	9 Projects, 37,900 LF	3 New LS, 25,500 LF FM	Decommission up to 3 LS	$29.2M Relief/Upsizing $69.7M Extensions (Gravity, LS, FM)
20-year	3 Projects, 13,900 LF	16 Projects, 50,400 LF	1 New LS, 2 LS Expansions, 9,300 LF FM	-	$24.2M Relief/Upsizing $107.4M Extensions (Gravity, LS, FM)
Total	*9 Projects, 60,200 LF*	*27 Projects, 90,900 LF*	*4 New LS, 34,800 LF FM*	*Decommission up to 3 LS*	***$267M Over 20 Years***

Note: Colors on table correspond to time horizons shown in in Figure ES-1 and Table ES-2.

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Leander, TX
Collection System Master Plan
Table ES-2: Overall Project List

Project ID	Infrastructure Type	Time Horizon	FY24 CIP Project ID	Project Name	Type of Improvement	Pipe Diameter (in)[1]	Total Length of Pipe (ft)	Lift Station Flow Rate (mgd)	Planning-Level Construction OPCC without Contingency	Construction Contingency (30%)	Planning-Level Construction OPCC with Contingency	Engineering & Survey (20%)	ROW Acquisition	Planning-Level Capital Cost (OPCC with Contingency + Engr./Survey + ROW Acq.)[2]
WW.00.01	Existing/Relief	Present Day	-	Block House Interceptor	Exist. Gravity Relief/Upsizing	21"-24"	13,020	-	$ 11,327,000	$ 3,398,000	$ 14,725,000	$ 2,945,000	$ -	$ 17,670,000
WW.00.02	Existing/Relief	Present Day	-	Mason Creek Interceptor	Exist. Gravity Relief/Upsizing	15"-24"	8,170	-	$ 6,597,000	$ 1,979,000	$ 8,576,000	$ 1,715,000	$ -	$ 10,291,000
WW.05.01	Existing/Relief	5-Year	-	Horizon Lake Interceptor	Exist. Gravity Relief/Upsizing	18"-36"	3,660	-	$ 3,617,000	$ 1,085,000	$ 4,702,000	$ 940,000	$ -	$ 5,642,000
WW.05.02	New/Extension	5-Year	-	Lonestar Landing WW Improvements	New Gravity to Serve Growth	8"	1,225	-	$ 620,000	$ 186,000	$ 806,000	$ 161,000	$ 124,000	$ 1,091,000
WW.05.03	New/Extension	5-Year	-	RM 2243 to Hero Way WW Improvements - East Segment Ph. 1	New Gravity to Serve Growth	12"	1,350	-	$ 810,000	$ 243,000	$ 1,053,000	$ 211,000	$ 136,000	$ 1,400,000
WW.10.01	Existing/Relief	10-Year	WW.41	Benbrook Interceptor (Under Design)	Exist. Gravity Relief/Upsizing	27"	8,460	-	$ 9,870,000	$ 2,961,000	$ 12,831,000	$ 2,566,000	$ -	$ 15,397,000
WW.10.02	Existing/Relief	10-Year	-	Collaborative Way	Exist. Gravity Relief/Upsizing	18"	5,780	-	$ 4,379,000	$ 1,314,000	$ 5,693,000	$ 1,139,000	$ -	$ 6,832,000
WW.10.03	Existing/Relief	10-Year	WW.25	South Brushy Creek Interceptor	Exist. Gravity Relief/Upsizing	15"-24"	6,400	-	$ 4,493,000	$ 1,348,000	$ 5,841,000	$ 1,168,000	$ -	$ 7,009,000
WW.10.04	New/Extension	10-Year	-	South Ronald Reagan Blvd. WW Improvements	New Gravity to Serve Growth	8"	2,000	-	$ 1,012,000	$ 304,000	$ 1,316,000	$ 263,000	$ 202,000	$ 1,781,000
WW.10.05	New/Extension	10-Year	-	Journey Pkwy and Ronald Reagan Blvd WW Improvements	New Gravity to Serve Growth	8"	4,675	-	$ 2,366,000	$ 710,000	$ 3,076,000	$ 615,000	$ 472,000	$ 4,163,000
WW.10.06	New/Extension	10-Year	-	US 183-A WW Improvements Ph. 1	New Gravity to Serve Growth	8"	450	-	$ 228,000	$ 68,000	$ 296,000	$ 59,000	$ 45,000	$ 400,000
WW.10.07	New/Extension	10-Year	-	US 183-A WW Improvements Ph. 2	New Gravity to Serve Growth	8"	875	-	$ 443,000	$ 133,000	$ 576,000	$ 115,000	$ 88,000	$ 779,000
WW.10.08	New/Extension	10-Year	-	Linda Hall WW Improvements	New Gravity to Serve Growth	12"	3,600	-	$ 2,160,000	$ 648,000	$ 2,808,000	$ 562,000	$ 363,000	$ 3,733,000
WW.10.09	New/Extension	10-Year	-	North Fork Brushy Creek WW Interceptor Improvements Ph. 1	New Gravity to Serve Growth	18"	4,630	-	$ 3,506,000	$ 1,052,000	$ 4,558,000	$ 912,000	$ 467,000	$ 5,937,000
WW.10.10	New/Extension	10-Year	-	North Brushy Creek WW Interceptor Improvements	New Gravity to Serve Growth	18"-21"	2,800	-	$ 2,250,000	$ 675,000	$ 2,925,000	$ 585,000	$ 282,000	$ 3,792,000
WW.10.11	New/Extension	10-Year	-	North Bagdad Rd. Lift Station Ph. 1	New Gravity/LS to Serve Growth	18"(G), 10"(F)	10,600(G/F)	1.15	$ 6,235,000	$ 1,871,000	$ 8,106,000	$ 1,621,000	$ 756,000	$ 10,483,000
WW.10.12	New/Extension	10-Year	-	San Gabriel East Regional Lift Station	New LS to Serve Growth	8" (F)	5,500(F)	0.90	$ 2,593,000	$ 778,000	$ 3,371,000	$ 674,000	$ 312,000	$ 4,357,000
WW.10.13	New/Extension	10-Year	-	San Gabriel River WW Interceptor Improvements Ph. 1	New Gravity to Serve Growth	15"-18"	5,140	-	$ 3,863,000	$ 1,159,000	$ 5,022,000	$ 1,004,000	$ 518,000	$ 6,544,000
WW.10.14	New/Extension	10-Year		San Gabriel West Regional Lift Station Ph. 1	New Lift Station	16"(F)	13,100(F)	3.60	$ 8,349,000	$ 2,505,000	$ 10,854,000	$ 2,171,000	$ 696,000	$ 13,721,000
WW.10.15	New/Extension	10-Year	-	Lift Station #15, #26, and #36 Decommission	New Gravity to Serve Growth	8"-21"	10,050	-	$ 8,331,000	$ 2,499,000	$ 10,830,000	$ 2,166,000	$ 1,014,000	$ 14,010,000
WW.20.01	Existing/Relief	20-Year	-	Devine Lake	Exist. Gravity Relief/Upsizing	27"	5,240	-	$ 5,625,000	$ 1,688,000	$ 7,313,000	$ 1,463,000	$ -	$ 8,776,000
WW.20.02	Existing/Relief	20-Year	WW.37/.38	North Brushy Creek Interceptor	Exist. Gravity Relief/Upsizing	33"-36"	6,150	-	$ 8,265,000	$ 2,480,000	$ 10,745,000	$ 2,149,000	$ -	$ 12,894,000
WW.20.03	Existing/Relief	20-Year	-	North Ronald Reagan	Exist. Gravity Relief/Upsizing	12"-15"	2,500	-	$ 1,640,000	$ 492,000	$ 2,132,000	$ 426,000	$ -	$ 2,558,000
WW.20.04	New/Extension	20-Year	-	RM 2243 to Hero Way WW Improvements - West Segment	New Gravity to Serve Growth	8"-12"	4,340	-	$ 2,356,000	$ 707,000	$ 3,063,000	$ 613,000	$ 437,000	$ 4,113,000
WW.20.05	New/Extension	20-Year	-	San Gabriel River WW Interceptor Improvements Ph. 2	New Gravity to Serve Growth	8"-15"	9,050	-	$ 5,402,000	$ 1,621,000	$ 7,023,000	$ 1,405,000	$ 913,000	$ 9,341,000
WW.20.06	New/Extension	20-Year	-	North Fork Brushy Creek WW Interceptor Improvements Ph. 2	New Gravity to Serve Growth	12"-15"	2,650	-	$ 1,708,000	$ 512,000	$ 2,220,000	$ 444,000	$ 268,000	$ 2,932,000
WW.20.07	New/Extension	20-Year	-	San Gabriel Pkwy. WW Interceptor Ph. 1	New Gravity to Serve Growth	18"	3,350	-	$ 2,540,000	$ 762,000	$ 3,302,000	$ 660,000	$ 338,000	$ 4,300,000
WW.20.08	New/Extension	20-Year	-	San Gabriel Pkwy. WW Interceptor Ph. 2	New Gravity to Serve Growth	12"	3,150	-	$ 1,890,000	$ 567,000	$ 2,457,000	$ 491,000	$ 318,000	$ 3,266,000
WW.20.09	New/Extension	20-Year	-	Lakeline Blvd. WW Improvements	New Gravity to Serve Growth	15"	5,030	-	$ 3,311,000	$ 993,000	$ 4,304,000	$ 861,000	$ 507,000	$ 5,672,000
WW.20.10	New/Extension	20-Year	-	Colorado Basin Lift Station	New LS to Serve Growth	10"(F)	3,750(F)	1.35	$ 2,782,000	$ 835,000	$ 3,617,000	$ 723,000	$ 224,000	$ 4,564,000
WW.20.11	New/Extension	20-Year	-	Lift Station #38 Decommission	New Gravity to Serve Growth	12"	400	-	$ 540,000	$ 162,000	$ 702,000	$ 140,000	$ 40,000	$ 882,000
WW.20.12	New/Extension	20-Year	-	Greatwood WW Collection System Improvements	New Gravity to Serve OSSF	-	-	-	$ 8,010,000	$ 2,403,000	$ 10,413,000	$ 2,083,000	$ -	$ 12,496,000
WW.20.13	New/Extension	20-Year	-	Whitt Ranch Collection System Improvements	New Gravity to Serve OSSF	-	-	-	$ 2,310,000	$ 693,000	$ 3,003,000	$ 601,000	$ -	$ 3,604,000
WW.20.14	New/Extension	20-Year	-	Sullivan Tract Collection System Improvements	New Gravity to Serve OSSF	-	-	-	$ 9,270,000	$ 2,781,000	$ 12,051,000	$ 2,410,000	$ -	$ 14,461,000
WW.20.15	New/Extension	20-Year	-	Leander Estates Collection System Improvements	New Gravity to Serve OSSF	-	-	-	$ 6,300,000	$ 1,890,000	$ 8,190,000	$ 1,638,000	$ -	$ 9,828,000
WW.20.16	New/Extension	20-Year	-	Hilltop Ranch Collection System Improvements	New Gravity to Serve OSSF	-	-	-	$ 3,150,000	$ 945,000	$ 4,095,000	$ 819,000	$ -	$ 4,914,000
WW.20.17	New/Extension	20-Year	-	North Bagdad Rd. Lift Station Ph. 2	New Pumps for Existing LS	-	-	1.44	$ 245,000	$ 74,000	$ 319,000	$ 64,000	$ 35,200	$ 418,000
WW.20.18	New/Extension	20-Year	-	San Gabriel West Regional Lift Station Ph. 2	Proposed LS Expansion	-	-	4.68	$ 586,000	$ 176,000	$ 762,000	$ 152,000	$ 35,000	$ 949,000
WW.20.19	New/Extension	20-Year	-	San Gabriel West WW Improvements	New Gravity to Serve Growth	8"-18"	3,860		$ 2,215,000	$ 665,000	$ 2,880,000	$ 576,000	$ 389,000	$ 3,845,000
WW.20.20	New/Extension	20-Year	-	San Gabriel East Regional Lift Station Ph. 2	Proposed LS Expansion	10" (F)	5,500(F)	2.30	$ 2,539,000	$ 762,000	$ 3,301,000	$ 660,000	$ 312,000	$ 4,273,000
WW.20.21	New/Extension	20-Year	-	RM 2243 to Hero Way WW Improvements - East Segment Ph. 2	New Gravity to Serve Growth	8"	5,925	-	$ 2,998,000	$ 899,000	$ 3,897,000	$ 779,000	$ 598,000	$ 5,274,000
WW.20.22	New/Extension	20-Year	-	CR 175 and RM 2243 WW Improvements	New Gravity to Serve Growth	8"-12"	5,160	-	$ 2,637,000	$ 791,000	$ 3,428,000	$ 686,000	$ 520,000	$ 4,634,000
WW.20.23	New/Extension	20-Year	-	CR 175 and CR 176 WW Improvements	New Gravity to Serve Growth	8"-12"	7,500	-	$ 4,402,000	$ 1,321,000	$ 5,723,000	$ 1,145,000	$ 757,000	$ 7,625,000

Notes:
1) For pipe diameters and lengths, gravity main is assumed, except where (F) indicates force main, and (G) indicates gravity main.
2) For new/extension projects not within the ROW or an existing easement, a unit cost of $87,900/acre was utilized for easement cost estimates.
The easement unit cost includes survey, easement acquisiton, engineering fees, condemnation/attorney fees, and ROW agent fees.
3) It is recommended that further on-site evaluation and data collection (e.g., checking manholes for evidence of surcharge, targeted flow monitoring) be conducted before initiating any project based on modeling results.

Subtotal, Existing/Relief Projects	$ 87,069,000
Subtotal, New/Extension Projects[2]	$ 179,582,000
Total, All Projects	**$ 266,651,000**

Time Horizon	Capital Cost
Present Day	$ 27,961,000
5-Year	$ 8,133,000
10-Year	$ 98,938,000
20-Year	$ 131,619,000
Total, All Projects	$ 266,651,000

1 INTRODUCTION

1.1 Purpose

The purpose of this report is to update the City of Leander's wastewater collection system master plan, providing a guide towards a wastewater system that beneficially supports and serves the City's evolving needs and continued growth. The existing master plan was developed in 2017 and was intended to forecast wastewater collection and treatment system needs for the City for the 20-year period from 2015-2035. However, growth within the City over the intervening period has occurred at a much more rapid rate than anticipated, hence the need to update the existing study and re-project flows for the next 20-year period.

This updated masterplan re-evaluates the demands for the next 20 years and will introduce alternative strategies and timelines for addressing the potential need for system capacity improvements. In addition, this report will provide planning-level estimates of the probable costs for the proposed alternatives. A flow monitoring and inflow and infiltration (I/I) study was performed in the Fall of 2022 as a separate project which culminated in a report titled *Fall 2022 Flow and Rainfall Monitoring Project*. The flow monitoring data and results from that study are used to model and evaluate the existing system's capacities for this master plan study.

1.2 Scope of Work

The scope of the collection system master planning project encompasses field data collection, hydraulic modeling, growth projections, and proposed infrastructure improvements to meet current and future demands. This Master Plan study and its recommendations are focused on sanitary sewers with a diameter of 12 inches or greater. The adequacy of existing sewer lines with diameters less than 12 inches will depend on the specifics of new developments that connect to them and may require analysis on a case-by-case basis.

The study began with a survey of manholes connected to pipes with diameters of 12 inches or greater. The manhole survey data was assembled in GIS and then used to develop a hydraulic model of the collection system using the PCSWMM software. The hydraulic model was used to evaluate both the current capacity of the existing infrastructure as well as options for system improvements. The City of Leander provided maps, reports, and other information necessary to create the new PCSWMM model, including pipe lengths, sizes, and locations. Wastewater models of the existing system and the five, ten, and twenty-year planning horizons were developed. These models were evaluated to determine infrastructure needs required to serve current and future flows. Finally, a list of proposed improvements, including anticipated timing and cost, was created based on the analysis. A summary of major tasks is provided below:

- Collected physical data in the field for sewers 12 inches or greater, with the exception of a few 8" lines specified by the City, to develop the hydraulic model network and collect asset information.
- Developed a hydraulic model of the existing collection system in PCSWMM and calibrated the model to align with actual flow data gathered during the Fall 2022 flow monitoring season.
- Developed growth projections for five, ten, and twenty-year time horizons based on City-provided population and land use projections.

- Performed model simulations for the existing, five, ten, and twenty-year growth conditions to identify needed sewer system improvements.
- With City staff input, selected design criteria consistent with current, local design requirements to be used for planning-level sizing and costing of improvements.
- Developed conceptual projects to both improve the existing system (i.e., relief or replacement sewers) and serve new growth outside the existing system (i.e., extension sewers, lift stations, and force main).
- Developed planning-level opinions of probable construction cost and capital cost for each identified project to assist the City with CIP budget planning.
- Presented a comprehensive report detailing the work completed, analyses, and recommended improvements to the City's sanitary sewer system.

2 PLANNING INFORMATION, DATA COLLECTION AND ASSUMPTIONS

2.1 Wastewater Service Area

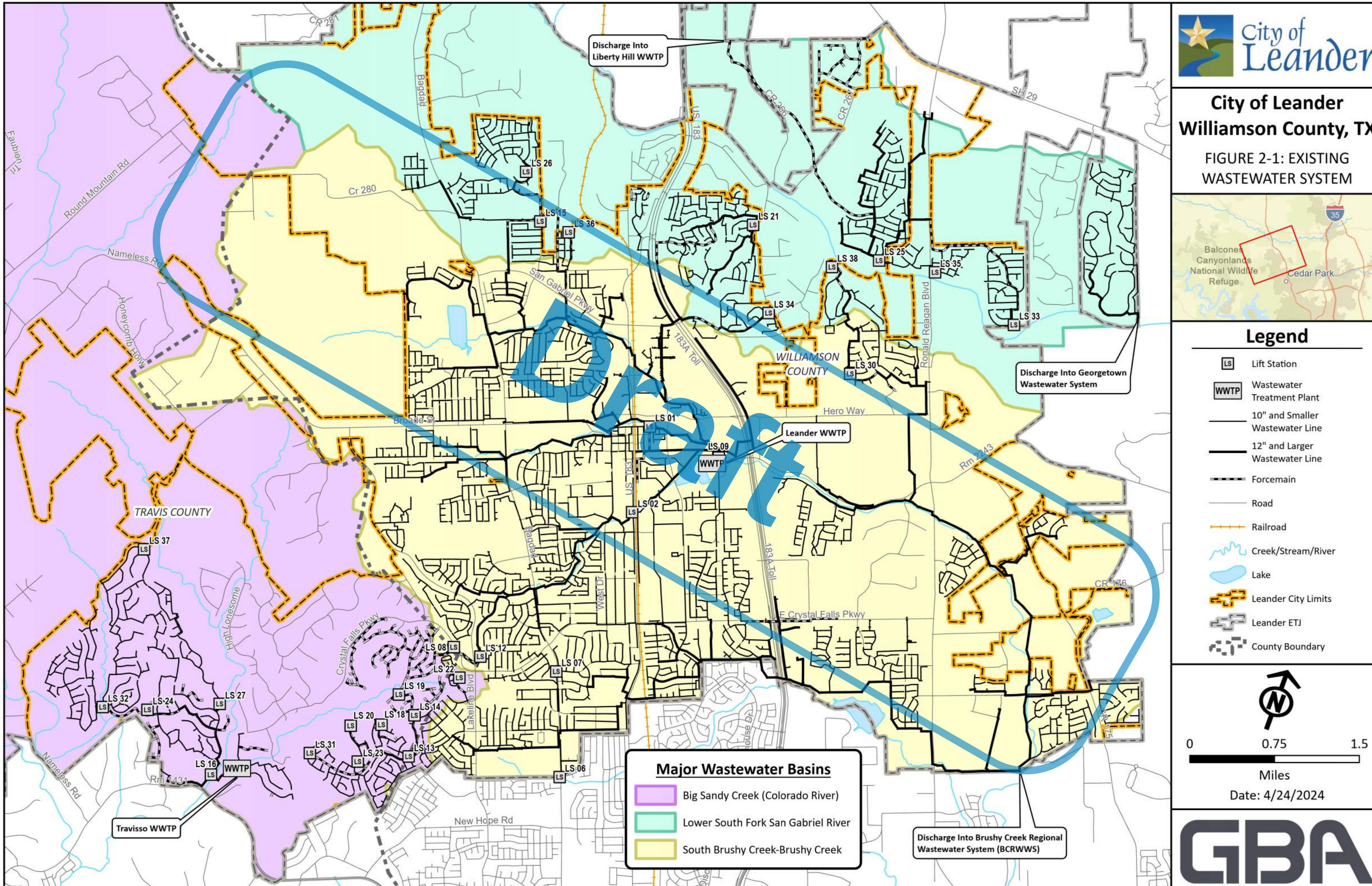
The City of Leander is situated along Highway 183, primarily in the western region of Williamson County, while the western side of the City extends into northwest Travis County. The City of Leander wastewater service area, shown in Figure 2-1, is limited to its current Certificate of Convenience and Necessity (CCN) boundaries, which generally includes areas within City limits, approximately 39 square miles, and portions of its Extra-Territorial Jurisdiction (ETJ). The study area generally follows the current sewer CCN boundary (shown in Figure 4-1 on page 24), with the addition of areas north and east of the San Gabriel River that fall within City limits and are served by City-owned collection systems. Per discussions with the City, this report primarily provides recommendations for portions of Leander's sewer CCN where flow monitoring data was collected in the Fall of 2022: south of the San Gabriel River and east of the Colorado River basin.

Most of the wastewater generated in the service area is currently treated at the Leander Wastewater Treatment Plant (WWTP), located on RM 2243 at Brushy Creek (referred to in this report as the RM2243 WWTP). The RM2243 WWTP discharges into Brushy Creek, east of downtown Leander. The plant is currently permitted for an average annual discharge of 2.25 MGD. A wastewater facilities master plan was performed concurrently with the wastewater collection system masterplan and will be delivered as a separate report. The collection system and facilities master plan address overall wastewater system needs over a 20-year planning period.

The areas that are generally located east of the 183A Toll highway and south of Crystal Falls Parkway are served by the Brushy Creek Regional Wastewater System (BCRWWS). The BCRWWS consists of two wastewater treatment plants and approximately 45 miles of regional collection lines, treating flows from the Cities of Round Rock, Cedar Park, Leander and Austin. While the City of Round Rock oversees operations and maintenance of the regional system, the system is owned jointly between the partner cities. The City of Leander owns 4.23 MGD of BCRWWS treatment capacity and leases any excess treatment capacity. The City of Leander is currently sending an average of 2 MGD to the BCRWWS through the Brushy Creek interceptor and is in the process of constructing a diversion line from the RM2243 WWTP to the Brushy Creek interceptor with a maximum capacity of 2 MGD to alleviate demands on the RM2243 WWTP.

The properties on the southwestern portion of the City within the Travisso development are part of the Travis County Municipal Utility District 21 (MUD 21) and are served by the Travisso Water Reclamation Plant (WRP), also referred to as the Crystal Falls West WRP. The Travisso collection system was conceptualized, designed and constructed over the past ten years in concert with the Travisso master-planned community. The City is currently engaged in expanding the Travisso WRP from its current capacity of 0.25 MGD to 0.52 MGD. Because Travisso's collection system was planned for and constructed recently, planning for Travisso's system was not included under the scope of this report.

Flow from the remaining service area north of the San Gabriel River is either pumped to the City of Liberty Hill to the west or sent by gravity to Georgetown to the east (Figure 2-1). Please refer to Section 2.2 for more information regarding the agreements with Liberty Hill and Georgetown.



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2.2 Interlocal and Development Agreements

Due to topographic and jurisdictional constraints, wastewater flows from the City of Leander are conveyed across jurisdictional boundaries. Interlocal agreements govern the exchange of wastewater flows between Leander and neighboring communities. Below are brief descriptions of the primary agreements impacting Leander's collection system and treatment works:

- **Brushy Creek Regional Wastewater System (BCRWWS):** Flows from the Brushy Creek basin (generally east of 183A) and the Block House Creek basin are conveyed to the BCRWWS. The interlocal agreement between the Cities of Austin, Cedar Park, Leander, and Round Rock, dated December 21, 2023, states that Leander owns 4.23 MGD of daily average treatment capacity at the BCRWWS treatment plants. Please refer to Section 2.1 for more information on Leander's involvement in the BRCWWS.
- **City of Georgetown:** The Lively Ranch subdivision collection system in the northeast of Leander's ETJ is maintained by Leander but conveys flow to the City of Georgetown for treatment (Figure 2-1). The interlocal agreement between the City of Georgetown and the City of Leander specifies a maximum sewer connection limit of 1,200 connections for the 437 acre tract. Georgetown is responsible for operating and maintaining their system as well as any necessary improvements to provide the wholesale wastewater service. Leander is responsible for operating and maintaining their collection system to convey flows to the Delivery Point near the southeast corner of the tract. Leander is also responsible for providing monthly reports to Georgetown listing the number of active connections within the Lively Tract.
- **City of Jonestown:** The agreement between City of Jonestown and the City of Leander states that Leander must receive, treat, and dispose of wastewater delivered by Jonestown in an amount up to the Annual Wastewater Entitlement, provided that only 50% (500 Living Unit Equivalents, or LUEs) of the Annual Wastewater Entitlement is available to Jonestown until improvements to the Crystal Falls West Water Reclamation Plant becomes operable. At the completion of Phase II of the WRP improvements, Leander must notify Jonestown of the number of additional LUEs (above 500 LUEs) available to Jonestown. Thereafter, Leander must notify Jonestown upon completion of Phase III and at such time the full Annual Wastewater Entitlement will be available. Jonestown agrees that it will not approve wastewater connections of its customers that would cause it to exceed the number of available LUEs. Jonestown may not deliver wastewater flows more than the Daily Average Flow Limit, a peak flow rate of 750 gpm, or wastewater in an amount that exceeds the Annual Wastewater Entitlement. Jonestown is solely responsible for collecting the wastewater from its customers and conveying the wastewater to the Points of Delivery. Upon completion and acceptance of the Master Meter and improvements, the Master Meter and improvements will be part of the Leander System, and Leander will repair, maintain, and replace the Master Meter and improvements as necessary.

- **City of Liberty Hill:** Wastewater from portions of Leander's ETJ north of the San Gabriel River (namely the Bar W Ranch subdivision) is pumped to Liberty Hill's South San Gabriel WWTP (Figure 2-1). The interlocal agreement establishes a phased wholesale service commitment of up to 8,100 LUEs total provided by the City of Liberty Hill to the City of Leander. The wholesale wastewater service is conveyed by Lift Station 25 to Liberty Hill's South San Gabriel WWTP where it is treated. The flow rate at the Point of Entry (South San Gabriel WWTP) may not exceed an average of 0.65 gpm per LUE served. Additionally, the agreement includes provisions regarding wastewater strength limitations, whereby the total daily Biological Oxygen Demand (BOD) loading may not exceed an average of 0.425 pounds per LUE. Leander is responsible for designing and constructing the internal facilities within their system, the connection point to Liberty Hill's network, and the metering of the wastewater flow. Liberty Hill is responsible for designing and constructing the interceptor lines and any necessary treatment upgrades to accommodate the wholesale wastewater service flows from Leander. Leander must keep the City of Liberty Hill apprised of developing properties and additional wastewater connections that may contribute additional flows to the Liberty Hill WWTP.

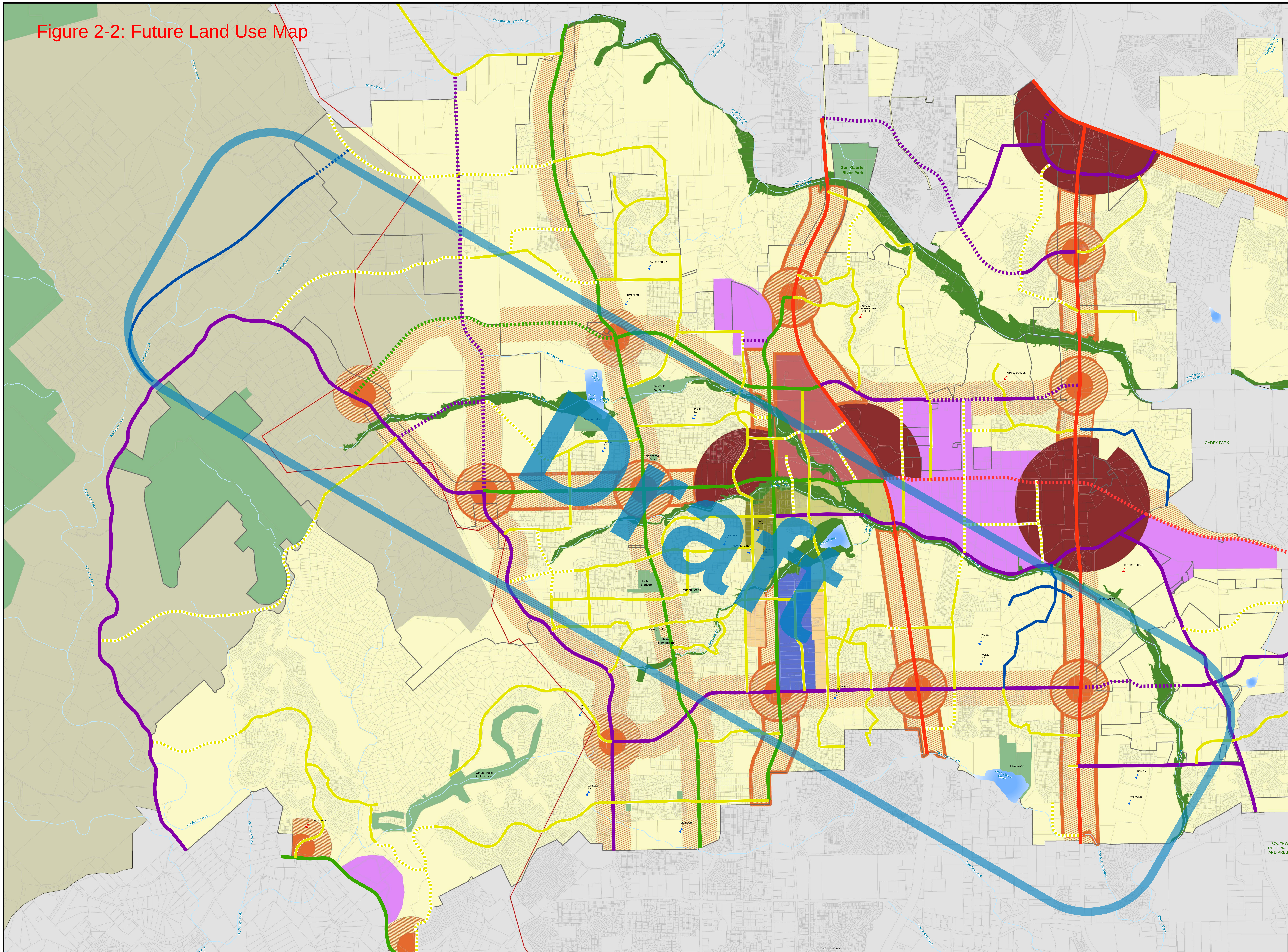
2.3 Future Land Use Assumptions

Future land use assumptions were used to develop projections of future flow contributions in the collection system model. Future land use assumptions were provided by the City in the form of a map shown in Figure 2-2. This map provides approximate locations of various land use types across the City of Leander. These land uses provide information on the types, potential densities, and locations of future development. The City also provided information regarding the planned and in-progress developments in the form of a map, a copy of which is provided in Figure 2-3. This map was used to estimate which parcels were most likely to develop within the 5-year time horizon.

Future land use assumptions are important factors for projecting future wastewater flows and identifying the required infrastructure to serve planned growth. Future land use assumptions do not represent zoning regulations or requirements, and actual future land use may vary from these assumptions. Rather, these land use assumptions are a best approximation of the types of developments and densities the City may support in the future.

Table 2-1 provides the development density assumptions agreed upon with the City, in terms of living unit equivalent (LUE) per acre for each land use type assigned. A LUE is a planning tool that estimates the typical flow of water or wastewater produced by a single-family residence. For the purposes of this study, one (1) LUE was assumed to represent 3 persons (or population equivalents) and produce 200 gallons per day (gpd) of wastewater. The 200 gpd/LUE wastewater production rate is an average rate developed based on flow monitoring. Table 2-1 was utilized to convert future growth areas into an estimated number of LUEs generating wastewater from each growth area.

Figure 2-2: Future Land Use Map



Future Land Use Map

Effective October 12, 2021

City of Leander

www.leandertx.gov

0 1,500 3,000 6,000 9,000
Feet

0 0.25 0.5 1 1.5
Miles

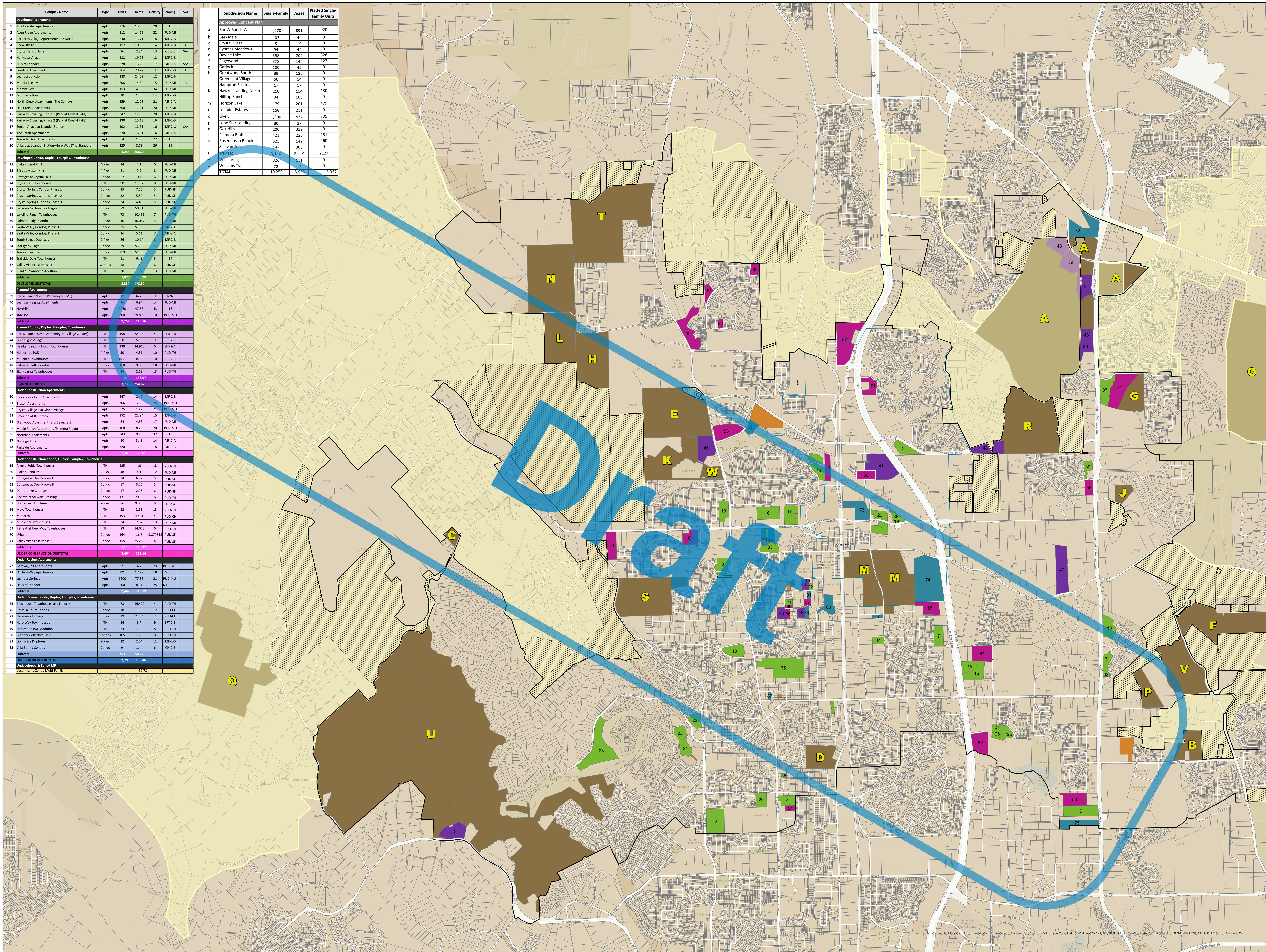
- Access Controlled, Existing
- Arterial 6 Lane, Existing
- Arterial 4 Lane, Existing
- Collector, Existing
- Rural, Existing
- Access Controlled, Proposed
- ARTERIAL 6, Proposed
- Arterial 4 Lane, Proposed
- Collector, Proposed
- Rural, Proposed
- Existing School
- Future School
- Lakes and Ponds
- Streams
- Rural
- Neighborhood Residential
- Transitional
- Neighborhood Center - Solid
- Neighborhood Center
- Multi-Use Corridor
- Multi-Use Corridor - Priority Corridor
- Neighborhood Center - Priority Corridor
- Activity Center
- Employment Center
- Industrial
- Old Town
- Urban Mixed Use
- Leander Central
- Greenway
- Parks and Preserves

Texas Local Government Code Section 213.005: A comprehensive plan shall not constitute zoning regulations or establish zoning district boundaries.

* Properties added to the ETJ after the adoption of this Future Land Use Map are designated as Neighborhood Residential.

	Complex Name	Type	Units	Acres	Density	Zoning	S/A
	Developed Apartments						
1	Alta Leander Apartments	Apts	276	13.96	20	T5	
2	Aven Ridge Apartments	Apts	312	14.19	22	PUD-MF	
3	Carneros Village Apartments (22 North)	Apts	240	13.71	18	MF-2-B	
4	Cedar Ridge	Apts	152	10.69	14	MF-2-B	A
5	Crystal Falls Village	Apts	36	2.84	13	GC-3-C	S/A
6	Hermosa Village	Apts	238	19.23	12	MF-2-B	
7	Hills at Leander	Apts	228	13.23	17	MF-2-A	S/A
8	Lakeline Apartments	Apts	264	29.27	9	MF-2-B	A
9	Leander Junction	Apts	288	24.09	12	MF-2-B	
10	Merritt Legacy	Apts	208	14.34	15	PUD-MF	A
11	Merritt Skye	Apts	153	4.56	34	PUD-MF	S
12	Montierra Ranch	Apts	20	1.38	14	MF-2-B	
13	North Creek Apartments (The Conley)	Apts	259	12.08	21	MF-2-A	
14	Oak Creek Apartments	Apts	360	17.81	20	PUD-MF	
15	Parkway Crossing, Phase 1 (Park at Crystal Falls)	Apts	242	12.03	20	MF-2-B	
16	Parkway Crossing, Phase 2 (Park at Crystal Falls)	Apts	238	15.13	16	MF-2-B	
17	Senior Village at Leander Station	Apts	192	12.31	16	MF-2-C	S/A
18	The Sarah Apartments	Apts	270	16.61	16	MF-2-A	
19	Trailside Oaks Apartments	Apts	54	1.99	27	T5	
20	Village at Leander Station–Hero Way (The Standard)	Apts	225	8.78	26	T5	
	Subtotal		4,255	258.23			
	Developed Condo, Duplex, Fourplex, Townhouse						
21	Blake's Bend Ph 1	4-Plex	24	4.1	6	PUD-MF	
22	Bliss at Mason Hills	4-Plex	81	9.9	8	PUD-MF	
23	Cottages at Crystal Falls	Condo	57	10.15	6	PUD-MF	
24	Crystal Falls Townhouse	TH	90	11.07	8	PUD-MF	
25	Crystal Springs Condos Phase 1	Condo	35	7.56	5	PUD-SF	
26	Crystal Springs Condos Phase 2	Condo	32	5.82	5	PUD-SF	
27	Crystal Springs Condos Phase 3	Condo	24	4.45	5	PUD-SF	
28	Fairways Section 6 Cottages	Condo	79	50.61	2	PUD-MF	
29	Lakeline Ranch Townhouses	TH	73	10.451	7	PUD-TH	
30	Palmera Ridge Condos	Condo	46	10.047	5	PUD-MF	
31	Sarita Valley Condos, Phase 1	Condo	35	5.105	7	MF-2-A	
32	Sarita Valley Condos, Phase 2	Condo	36	5.11	7	MF-2-A	
33	South Street Duplexes	2-Plex	86	10.14	8	MF-2-B	
34	Starlight Village	Condo	29	5.706	5	PUD-MF	
35	Trails at Leander	Condo	219	51.86	4	PUD-MF	
36	Trailside Oaks Townhouses	TH	51	6.49	8	T4	
37	Valley Vista East Phase 1	Condos	58	10.2	6	PUD-SF	
38	Village Townhome Addition	TH	20	1.52	13	PUD-MF	
	Subtotal		1,075	220.29			
	DEVELOPED SUBTOTAL		5,330	478.52			
	Planned Apartments						
39	Bar W Ranch West (Wedemeyer - MF)	Apts	301	34.23	9	N/A	
40	Leander Heights Apartments	Apts	96	6.94	14	PUD-MF	
41	Northline	Apts	2060	47.58	43	T6	
42	Travisso	Apts	300	29.809	10	PUD-MU	
	Subtotal		2,757	118.56			
	Planned Condo, Duplex, Fourplex, Townhouse						
43	Bar W Ranch West (Wedemeyer - Village Cluster)	TH	198	54.45	4	SFR-1-B	
44	Greenlight Village	TH	50	5.58	9	SFT-2-B	
45	Hawkes Landing North Townhouses	TH	139	24.915	6	SFT-2-A	
46	Horseshoe PUD	4-Plex	50	4.81	10	PUD-TH	
47	M Ranch Townhouses	TH	345.5	34.55	10	SFT-2-B	
48	Palmera Bluffs Condos	Condo	160	9.08	18	PUD-MF	
49	Sky Heights Townhouses	TH	36	2.68	13	PUD-TH	
	Subtotal		979	136.07			
	PLANNED SUBTOTAL		3,736	254.62			
	Under Construction Apartments						
50	Blockhouse Farm Apartments	Apts	347	24.2	14	MF-2-B	
51	Bryson Apartments	Apts	306	12.29	25	PUD-MU	
52	Crystal Village aka Global Village	Apts	375	18.2	21	PUD-MU	
53	Emerson at Benbrook	Apts	352	22.94	15	MF-2-B	
54	Glenwood Apartments aka Beaucrest	Apts	84	4.88	17	PUD-MF	
55	Maple Ranch Apartments (Palmera Ridge)	Apts	168	8.26	20	PUD-MU	
56	Northline Apartments	Apts	343	9.26	37	T6	
57	Nu Edge Apts	Apts	50	3.48	14	MF-2-A	
58	Parkside Apartments	Apts	320	17.3	18	MF-2-A	
	Subtotal		2,345	120.81			
	Under Construction Condo, Duplex, Fourplex, Townhouse						
59	Arroyo Roble Townhouses	TH	125	10	13	PUD-TH	
60	Blake's Bend Ph 2	4-Plex	48	4.1	12	PUD-MF	
61	Cottages at Deerbrooke I	Condo	34	6.72	5	PUD-SF	
62	Cottages at Deerbrooke II	Condo	17	3.26	5	PUD-SF	
63	Deerbrooke Cottages	Condo	17	2.95	6	PUD-SF	
64	Enclave at Stewart Crossing	Condo	131	20.69	6	PUD-TH	
65	Homestead Duplexes	2-Plex	86	9.085	9	TF-2-A	
66	Maya Townhouses	TH	32	2.53	13	PUD-TH	
67	Monarch	TH	193	49.81	4	PUD-CH	
68	Municipal Townhouses	TH	34	2.62	13	PUD-MF	
69	Retreat at Hero Way Townhouses	TH	83	14.673	6	PUD-TH	
70	Urbana	Condo	164	16.6	9.879518	PUD-SF	
71	Valley Vista East Phase 2	Condo	155	35.283	4	PUD-SF	
	Subtototal		1,119	178.32			
	UNDER CONSTRUCTION SUBTOTAL		3,464	299.14			
	Under Review Apartments						
72	Gateway 29 Apartments	Apts	321	14.23	23	PUD-GC	
73	LC Hero Way Apartments	Apts	321	17.99	18	T6	
74	Leander Springs	Apts	1600	77.86	21	PUD-MU	
75	Oaks of Leander	Apts	200	8.11	25	MF	
	Subtotal		2,442	118.19			
	Under Review Condo, Duplex, Fourplex, Townhouse						
75	Blockhouse Townhouses aka Lenox Hill	TH	73	16.422	4	PUD-TH	
76	Castella Court Condos	Condo	18	1.5	12	PUD-CH	
77	Hazelwood Village	Condo	19	2.764	7	PUD-CH	
78	Hero Way Townhouses	TH	84	9.7	9	SFT-2-B	
79	Horseshoe PUD Addition	TH	23	2.9	8	PUD-TH	
80	Leander Collective Ph 2	Condos	105	13.5	8	PUD-TH	
81	Lion Drive Duplexes	2-Plex	22	2.04	11	MF-2-B	
82	Villa Bonita Condos	Condo	9	1.44	6	CH-2-B	
	Subtotal		353	50.27			
	UNDER REVIEW SUBTOTAL		2,795	168.46			
	Undeveloped & Zoned MF						
	Vacant Land Zoned Multi-Family			50.78			

	Subdivision Name	Single-Family	Acres	Platted Single-Family Units
	Approved Concept Plan			
a	Bar W Ranch West	1,970	891	920
b	Barksdale	103	44	0
c	Crystal Mesa II	9	10	0
d	Cypress Meadows	94	44	0
e	Devine Lake	398	202	328
f	Edgewood	378	140	127
g	Garlock	100	45	0
h	Greatwood South	89	120	0
i	Greenlight Village	50	14	0
j	Hampton Estates	17	17	0
k	Hawkes Landing North	210	154	130
l	Hilltop Ranch	84	105	0
m	Horizon Lake	479	201	479
n	Leander Estates	158	211	0
o	Lively	1,200	437	705
p	Lone Star Landing	80	37	0
q	Oak Hills	200	339	0
r	Palmera Bluff	421	220	251
s	Rosenbusch Ranch	525	149	260
t	Sullivan Tract	147	308	0
u	Travisso	3,140	2,119	2127
v	Wildsprings	326	111	0
w	Williams Tract	72	17	0
	TOTAL	10,250	5,936	5,327



Residential Properties

Effective August 17th, 2023

City of Leander

www.leandertx.gov

0 0.3 0.6 1.2 1.8 2.4 Miles

N

Legend

City Limits

Future Annexation Per DA

Leander ETJ

TOD Boundary

Active Subdivision

Multi-Family Properties Status

Developed

Planned

Under Construction

Under Review

Not Built

Figure 2-3: Residential Properties Map

Table 2-1: Population Density Assumptions for Various Land Use Types

Land Use Category	Population Density Assumptions (LUE/acre)
Neighborhood Residential	4
Neighborhood Center	4
Employment Center	3
Urban Mixed Use	10
Greenway, Parks and Preserves	0

By applying both the LUE/acre density from Table 2-1 and the 200 gpd/LUE flow estimate to a given land area (in acres), an approximate wastewater production was estimated for land uses shown on the future land use map. The estimated wastewater production was then used in the hydraulic model of the collection system. Please refer to Section 4.2 for further discussion of the flow projections and distributions.

2.4 Population Projections

The citywide population projections used to develop wastewater flow projections were provided by the City. These population projections were developed as part of the 20-Year Water Capital Improvements Plan Memorandum, dated July 19, 2023. These projections were derived using annual growth rates which decreased over time and were subsequently converted into an equivalent number of LUEs. Table 2-2 shows the population forecasts for the time horizons considered in this analysis. Please refer to Section 4.2 for flow projections and distributions.

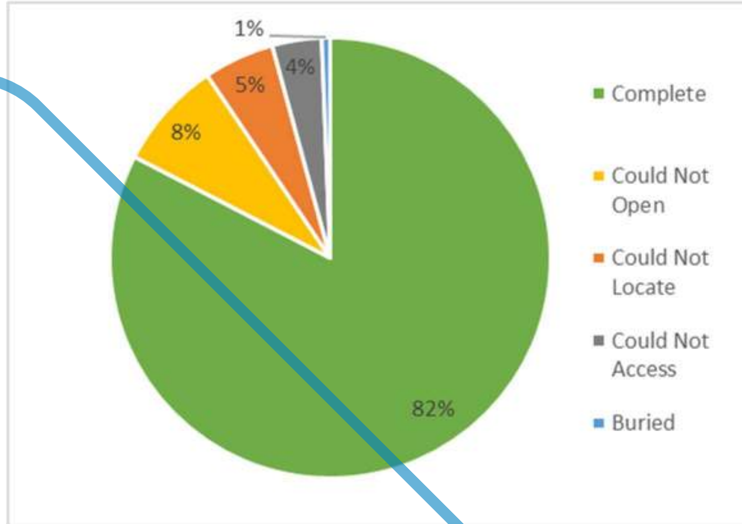
Table 2-2: Population Projections Provided by City

Year	Annual Growth Rate	Population	No. of LUEs
2022	9.7%	86,733	33,687
2027	7.5%	131,746	49,795
2032	3.0%	168,869	63,827
2042	1.0%	207,808	78,545

2.5 Manhole Survey

GBA field staff attempted inspection of 965 City-owned manholes to create a hydraulic model of the existing wastewater collection system. Among these 965 manholes with attempted inspections, 797 were completed successfully, 77 were unable to be opened, 50 manholes could not be located, 35 manholes were not accessible, and 6 manholes were buried (Figure 2-4). Manholes that were located but not able to be opened were considered partially inspected, as location and rim elevation data could still be collected. The data collected during manhole inspections include their X and Y coordinates, rim elevations, depths, and manhole cover sizes, as well as rim-to-invert depths and diameters of incoming and outgoing pipes. The manhole survey maps are provided in **Appendix A** and the GIS data will be provided as a separate submittal to the City.

Figure 2-4: Manhole Survey Summary



2.6 Planning-Level Design Criteria

To model, size, and plan for new wastewater infrastructure, planning-level design criteria were established for this study with input from City staff. It important to note that all sizing of improvements for this study are conceptual only; actual designs may vary from the conceptual designs presented in this report. Table 2-3 provides a summary of the criteria used to guide this study. This table is broken into three sections:

(1) Existing Infrastructure Flow Calculations (Modeled System),
(2) Future Infrastructure Flow Calculations (Extensions to Serve Growth Areas), and
(3) Conceptual Sizing of New Infrastructure (Relief, Replacement or Extensions).

2.6.1 Flow Calculations

The PCSWMM design storm model of the existing system was primarily used to identify necessary capacity improvements for the City's *existing sewers*, at the present, 5-year, 10-year and 20-year time horizons. In contrast, Austin Utilities Criteria Manual (UCM) guidance and GIS analysis were primarily used to conceptually size the *future sewer extensions* needed to serve growth areas outside of City limits, at the 5-year, 10-year and 20-year time horizons. Therefore, flow calculations for the existing infrastructure (interceptors and lift stations) modeled in PCSWMM differed from flow calculations for future infrastructure (sewer extensions), which were not modeled in PCSWMM.

Flows from future growth were still plugged into the PCSWMM model of the existing system for future growth scenario modeling in order to demonstrate impacts of growth on the existing sewers. To represent peak wet weather flows from future growth in the PCSWMM model, the synthetic unit hydrograph for flow meter basin 2 was assigned to future growth model nodes. Basin 2 was chosen as a representative basin for new growth areas because it demonstrated an average level of I/I for Leander's collection system.

2.6.2 Design Storm

The 5-year, 6-hour design storm was chosen because there is precedence for its use in modeling by the City of Austin and other cities in the metropolitan area. It also represents a moderately conservative storm event to plan for, particularly for systems demonstrating higher levels of I/I. Storm events with higher recurrence intervals (such as 10-year, 25-year, or 50-year) may be overly burdensome to ratepayers of systems with high I/I levels, but storms with lower recurrence intervals (such as 1-year or 2-year) may be insufficient for predicting areas at higher risk of sanitary overflows and backups.

2.6.3 Critical Surcharge

The calibrated PCSWWM model was used to identify locations in the existing system with potential for surcharge under design storm conditions. Not all surcharge of existing sewers requires immediate mitigation, however. To identify high risk surcharge, critical surcharge criteria were developed to help identify the need for capacity improvement projects. The two-part criteria used during this study is stated in terms of surcharge above the crown of pipe and in terms of minimum "freeboard" (or, the distance between maximum surcharge level and manhole rim). This criteria is based on similar criteria used by the Environmental Protection Agency (EPA) in recent sewer consent decrees. It is important to note that this is a criteria for judging the severity of surcharge, not a pipe sizing tool. New gravity sewers (relief, replacement, or extensions) will not be designed to surcharge under design flow conditions.

Surcharge of a sewer is typically defined as the situation in which the sewer entrance and exit are submerged, and the pipe is flowing full and under pressure. Levels of surcharge predicted by the hydraulic model will vary widely across the system and depend on factors such as design storm intensity, existing pipe capacities, projected upstream flows and infiltration and inflow (I/I), and downstream bottlenecks. Some sewer agencies allow surcharge in their systems to specified levels (e.g., "surcharge up to 100% of pipe diameter over the crown of pipes"), while other agencies do not allow any surcharge in their systems.

Surcharge may not be acceptable at locations where sewers are relatively shallow (e.g., less than 10 vertical feet from the surface) because of the increased risk of overflow. Surcharge may be more acceptable in locations with particularly deep sewers (e.g., 20 feet or more below the surface) because of the lower risk of overflow. Therefore, it is pragmatic to allow some surcharge in the existing system before relief sewers are deemed necessary. However, all new or relief sewers should be designed for no resulting surcharge during design flow conditions.

2.6.4 Conceptual Pipe Sizing

The Austin UCM Q65/Q85 method of pipe sizing requires pipes be sized to either reach a maximum of 65% of their full capacity during peak dry weather flows (PDWF), or 85% of their capacity during peak wet weather flows (PWWF). This method of sizing provides an adequate safety factor to account for higher than anticipated I/I during a storm event.

During peak wet weather storms, Austin UCM requires that pipes be designed such that the peak wet weather flow (PWWF) shall not exceed 85% of the capacity of the pipe flowing full for all pipes 15 inches in diameter and below, and 80% of the capacity for all pipes 18 inches and above.

This excess 15%-20% capacity helps to reduce risk of excessive surcharging and overflow. Designing the system with additional capacity provides flexibility for accommodating increased wastewater flows associated with population growth and denser development.

The City of Leander does not currently have a pipe sizing standard. Options were discussed with City engineering staff. Many cities size pipes to reach full flow (Q_{full}) capacity during peak wet weather events, but this is a less conservative method that will accommodate design flows without providing as much safety factor for growth or increased I/I. Allowing pipes to reach full capacity during the design flow reduces costs by requiring smaller pipe sizes but leaves less room for accommodating future growth and expansion. Backup and surcharging are a greater risk to a system sized using this method. Because of Leander's rapid growth and presence of I/I, the more conservative Austin UCM Q65/Q85 approach was preferred by the City for use during this study.

Table 2-3. Planning-Level Design Criteria

Criteria	Value or Range
Existing Infrastructure Flow Calculations (Modeled System)	
Average Daily Dry Weather Flow (ADDF)	Model Calibrated to Flow Meter Data
Peak Dry Weather Flows (PDWF)	Model Calibrated to Flow Meter Data
Modeled I/I for Existing System(1)	RTK Unit Hydrograph Calibrated to Respective Flow Meter Basin
Modeled I/I for Growth(2)	RTK Unit Hydrograph Calibrated to Flow Meter Basin 2 (representative of average I/I)
Peak Wet Weather Flows (PWWF)	Design Storm Model (PDWF + I/I)
Design Storm(3)	5-year, 6-hour Event (4.1 inches)
Critical Surcharge Criteria(4)	Flow Depths > 24” above crown of pipe Flow Depths ≤ 36” below manhole rim
Future Infrastructure Flow Calculations (Extensions to Serve Growth Areas)	
Average Daily Dry Weather Flow (ADDF)(5)	200 gpd/LUE (1 LUE ≈ 3 people)
Peak Dry Weather Flows (PDWF)(6)	$Q = \left[\frac{(18 + (0.0206 * ADDF)^{0.5})}{(4 + 0.0206 * ADDF)^{0.5})}\right] * ADDF$
Peak Wet Weather Flows (PWWF)(6)	Q = PDWF + 750 gpd/acre
Conceptual Sizing of New Infrastructure (Relief, Replacement or Extensions)	
Peak Flow Conveyance Criteria(7)	Austin UCM Q65/Q85
Gravity Pipe Capacity	Manning’s Equation
Manning’s Coefficient (n)	0.013
Gravity Pipe Velocity(8)	2-10 fps
Lift Station Capacity	Maximum 2-hr Peak Flow from Model
Force Main Velocity	3-6 fps

Notes:

1) Inflow and Infiltration (I/I) in the existing system was estimated using synthetic unit hydrographs (calibrated using the RTK method) for each flow meter basin.
2) Flows from new growth areas were plugged into the existing system during growth scenario modeling. To represent flows from growth in the model, flow meter basin 2’s synthetic unit hydrograph was used. Basin 2 was chosen because it is considered to have average rates of I/I relative to other parts of Leander.
3) Precipitation frequency estimates for design storm provided by NOAA Atlas 14.
4) Based on criteria used in recent EPA Consent Decrees. This criterion defines high risk (critical) surcharge levels in the existing sewer system and was used to define the necessity of capacity improvement projects for existing gravity sewers. It is important to note that new gravity sewers (relief, replacement or extensions) will NOT be designed to surcharge under design flow conditions.
5) Estimated from wastewater flow monitoring data.
6) Sourced from Austin Utilities Criteria Manual (UCM), which is commonly used and accepted throughout the Austin metropolitan area.
7) Sourced from Austin Utilities Criteria Manual (UCM). All gravity sewer projects were conceptually sized to reach a maximum of 80 to 85% of their capacity during peak wet weather flows (PWWF), depending on pipe diameter.
8) Texas Commission on Environmental Quality (TCEQ) design standards.

2.7 Cost Data

Planning level cost equations and tables were developed using past wastewater project data from the Austin metropolitan area and other commonly referenced guidance documents, such as those developed by the EPA. Costs should be considered planning-level only and may not reflect costs of actual construction. ENR Construction Cost Index (CCI) data were used for the Dallas metropolitan area (the closest metropolitan area to Leander with CCI indices) to adjust historical cost data for inflation to better reflect present-day costs. All referenced cost equations were adjusted to account for inflation using the February 2024 CCI for Dallas (CCI = 7824. Please see *enr.com/economics/historical_indices* for more information regarding ENR CCI values.)

The following cost equations were developed to estimate lump sum construction costs for most improvement projects and may not be representative of more unique situations. For example, the gravity sewer cost equation generally accounts for costs related to construction of new gravity sewer, such as excavation, pipe, ditch checks, manholes, erosion control, restoration and mobilization. The cost equations are representative of construction costs and do not include other soft costs or contingencies. To estimate a capital cost for each project, a 30% factor was applied to the construction cost to account for soft costs such as engineering design and survey, and then another 20% contingency factor was applied to account for unanticipated costs and scope changes. A summary of the cost equations is presented in Table 2-4 below.

Table 2-4: Planning-Level Construction Cost Equations

Project Type	**General Cost Equation**	**Units**
Gravity Sewer	$y = 322 * 1.038^x$	y is $/LF, x is diameter (in)
Steel Encasement	$y = 50x$	y is $/LF, x is casing diam. (in)
Force Main	$y = 18x$	y is $/LF, x is diameter (in)
Lift Station	$y = 1{,}500{,}000 * (x^{0.62})$	y is $, x is capacity (MGD)

3 EXISTING COLLECTION SYSTEM

3.1 Current Capacities and Projections

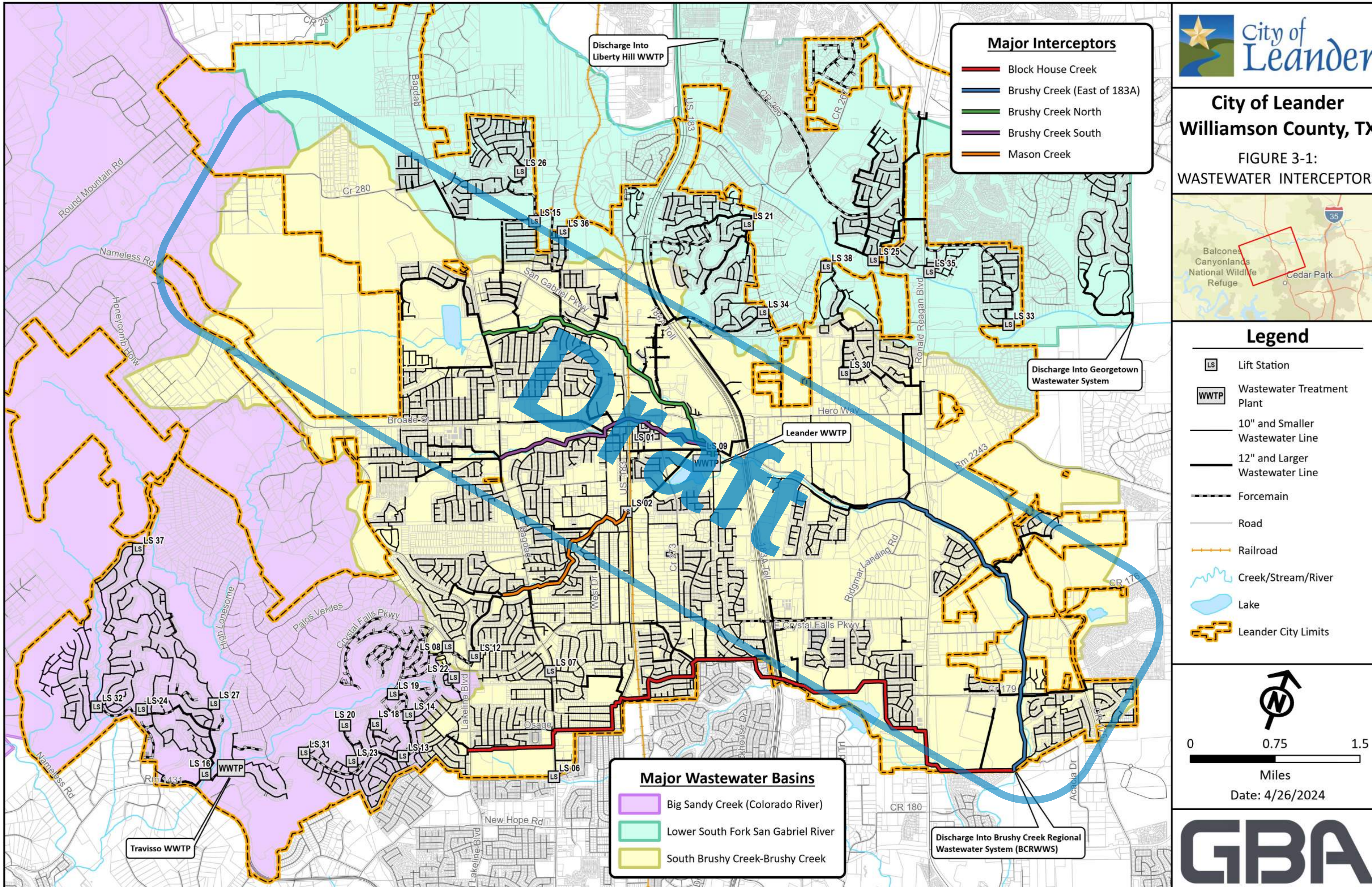
The Leander WWTP, located on RM 2243 at Brushy Creek, has a current treatment capacity of 2.25 MGD and treats most of the wastewater generated within the City. Leander's RM2243 WWTP is permitted to expand its ultimate treatment capacity to discharge 5.25 MGD. Additionally, the City possesses 4.23 MGD of treatment capacity at the BCRWWS, with no intentions to procure additional capacity in the future. Table 3-1 describes each main interceptor serving Leander and Table 3-2 provides all known information about the major lift stations in Leander. This table also contains information for lift stations that are included in the model. The major interceptors and lift stations are provided in Figure 3-1.

Table 3-1. Description of Major Interceptors

Interceptor	Pipe Diameter Range	Length (ft)	Description
Mason Creek	15"-18"	8,500	The existing Mason Creek Interceptor runs from Bagdad Road to Lift Station 2 along the alignment of Mason Creek, which pumps through a 12-inch force main to a 21-inch gravity main and finally to the RM2243 WWTP.
Block House Creek	12"-30"	34,100	The existing Block House Creek interceptor runs along Block House Creek from just south of the intersection between Lakeline Boulevard and Crystal Falls Parkway and ties into the Brushy Creek Interceptor at the interconnect with the BCRWWS.
Brushy Creek North	12"-27"	15,000	The existing Brushy Creek North Interceptor runs along the North Fork of Brushy Creek from Bagdad Road to the RM2243 WWTP.
Brushy Creek South	12"-18"	10,900	The existing Brushy Creek South Interceptor runs along the South Fork of Brushy Creek from Bagdad Road until it ties into the Brushy Creek North Interceptor.
Brushy Creek (East of 183A)	12"-36"	17,800	The existing Brushy Creek Interceptor runs along the main branch of Brushy Creek from the intersection of Ronald Regan Blvd and RM 2243 to the interconnect with the BCRWWS in the southeast portion of the City's ETJ.

Table 3-2. Lift Station Descriptions

Lift Station	No. of Pumps	Firm Capacity (gpm)	Force Main Diameter (in)	Force Main Length (ft)	Description
LS 1	2	-	6	1,140	Planned to be decommissioned as part of the East Street Project in FY2024 (CIP WW.49).
LS 2	3	3,600	18	3,050	Serves an area of Mason Creek, west of US 183.
LS 9	2	2,600	16	700	Serves as the main lift station feeding the RM2243 WWTP. This lift station is planned to be decommissioned and replaced with a master lift station to serve the ultimate WWTP buildout (CIP. WW.43).
LS 10	3	1,200	16	700	Serves as a secondary lift station feeding the RM2243 WWTP. This lift station is planned to be decommissioned and replaced with a master lift station to serve the ultimate WWTP buildout (CIP. WW.43).
LS 13	2	825	8	650	Serves as the main lift station for the Bluffs.
LS 14	2	190	4	1,740	Serves several neighborhoods in southwest Leander, including Gann Ranch and The Fairways at Crystal Falls.
LS 15	2	400	6	1,990	Primarily serves the Savannah Ranch subdivision.
LS 20	2	125	4	2,520	Serves the Bluffs at Crystal Falls.
LS 21	2	1,200	12	7,420	Serves the Bryson subdivision.
LS 23	2	265	6	780	Serves the Bluffs at Crystal Falls.
LS 25	4	5,785	10 & 18	29,000	Located at Bar W Ranch, outside of City limits but within City ETJ. In Spring 2024, received two new 2,400 gpm pumps in addition to the two original 985 gpm pumps. The 10" and 18" force mains run parallel from LS25 to Liberty Hill's WWTP.
LS 26	2	960	8	10,640	Serves the Deerbrooke neighborhood.
LS 30	2	565	8	1,690	Serves Palmera Ridge.
LS 31	2	135	4	3,430	Serves the Bluffs at Crystal Falls.
LS 33	2	204	6	8,710	Serves the Bluffview subdivision.
LS 34	2	700	8	4,020	Serves the Bryson subdivision.



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3.2 Flow Characteristics

To better understand the City's wastewater system a flow analysis was performed under the 2022 Flow Monitoring Project. The system was separated into a total of 14 interconnected drainage basins with a total length of gravity wastewater pipes of approximately 1,096,000 linear feet. Flow meters were strategically located to measure flows generated by these basins (Figure 3-2). The pipe sizes throughout the project area range from six (6) inches to thirty-six (36) inches with most of the pipes being poly-vinyl chloride (PVC).

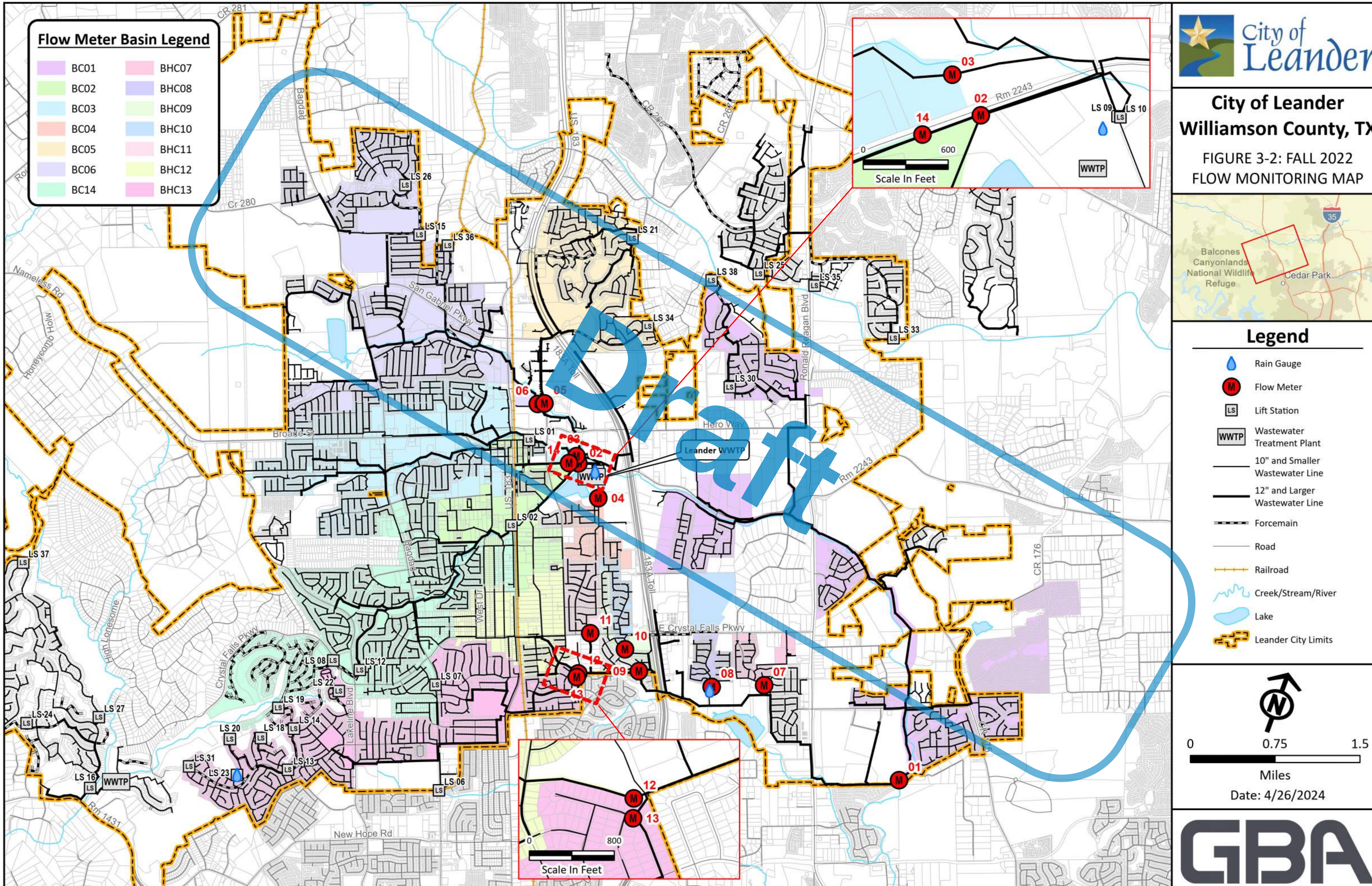
The flow monitoring period experienced overall rainfall that was slightly below historical averages, with only three out of the eight total storm events exceeding 1 inch of total rainfall. Surcharge issues were observed at Site 3 due to downstream restrictions, while Site 8 encountered nine dry weather surcharges, indicating potential under sizing of the servicing line or abnormal upstream discharges. Excessive infiltration was identified at Site 4, while excessive inflow was noted at Sites 1, 2, 3, 9, 13, and 14. Recommendations included CCTV inspections and smoke testing in Basins 1, 2, 3, 4, 9, 13, and 14 to address inflow and infiltration issues. Additionally, a lateral inspection program was recommended to address private sources of infiltration, particularly in Basin 4. A hydraulic capacity analysis was also recommended for potentially undersized lines, such as the 8-inch line serving Site 8 (Table 3-3).

The flow meter data and analysis results were used to assist in the calibration of the model developed for this project. The flow monitoring results of the City's sanitary sewer system provided useful data in respect to infiltration and inflow (I&I). The flow meter reactions were varied for the rainfall events, however all meters reacted to some of the rain events with increased flows indicating I&I. Since nearly half of the metering sites showed evidence of excessive inflow, but only one site had excessive infiltration, direct inflow sources are suspected to be a more significant problem than sources such as cracks or joint separations. The flow monitoring sites also provided insight into the capacity limitations of the system.

As will be noted in later chapters of the report, the two most urgent relief projects identified during modeling, the Block House Creek and Mason Creek Interceptor projects, are situated in Basins 13 and 14, respectively.

Table 3-3: Fall 2022 Flow Monitoring Results and Recommendations Summary

Basin ID	Excessive Infiltration?	Excessive Inflow?	Recommendations
1	-	Yes	CCTV and Smoke Testing
2	-	Yes	CCTV and Smoke Testing
3	-	Yes	CCTV and Smoke Testing
4	Yes	-	CCTV, Smoke Testing, and Lateral Inspections
5	-	-	-
6	-	-	-
7	-	-	-
8	-	-	Hydraulic Capacity Analysis
9	-	Yes	CCTV and Smoke Testing
10	-	-	-
11	-	-	-
12	-	-	-
13	-	Yes	CCTV and Smoke Testing
14	-	Yes	CCTV and Smoke Testing



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3.3 Review of Current Infrastructure Projects

Table 3-4 lists and describes all wastewater capital improvement projects (CIP) listed under the most recent FY2024 CIP document provided by the City. These projects were taken into consideration when analyzing the design storm model runs and identifying necessary projects.

Table 3-4. Wastewater Capital Improvement Projects from FY2024 CIP

Project Name	CIP #	Description	Status
Eagles Way, Mica Lane, Topaz Lane Wastewater Service	WW. 16	Provides wastewater service to residences in the area.	Complete
Wastewater Treatment Plant Sludge Processing and Aeration Improvements – Phase 2	WW.17, WW.18	Sludge processing and aeration upgrades to help the WWTP process waste more efficiently.	Complete
Falcon Oaks Wastewater Collection System	WW.20	Replace the onsite sanitary sewage facilities within the subdivision with direct connections to a wastewater collection system.	Under Construction
South Brushy Creek Wastewater Interceptor Improvements	WW.25	Increase capacity of interceptor to send the correct volumetric flow to RM2243 WWTP to comply with TCEQ.	Pending
North Brushy Creek Wastewater Interceptor Improvements – Segment 2	WW.37	Increase capacity of interceptor to improve flow conditions and conveyance to RM2243 WWTP.	Pending
North Brushy Creek Wastewater Interceptor Improvements – Segment 3	WW.38	Increase capacity of interceptor to improve flow conditions and conveyance to RM2243 WWTP.	Pending
North Brushy Creek Wastewater Interceptor Improvements – Benbrook Section	WW.41	Increase capacity of interceptor to improve flow conditions and conveyance to RM2243 WWTP.	Under Design
RM 2243 Wastewater Treatment Plant Lift Station and Gravity Relief Main	WW.43	Replacement of two existing lift stations with a new master lift station to serve ultimate WWTP build-out, including diversion facilities to convey flows up to 2.0 MGD to the Brushy Creek Interceptor to be ultimately treated by the BCRWWS.	Under Construction
Wastewater Lift Station Rehabilitations	WW.44	Improvements of six existing wastewater lift stations (LS 2, 6, 7, 8, 13, and 14).	Under Construction

Table 3-4 Continued:

Project Name	CIP #	Description	Status
Reclaimed Water System to Northline	WW.46	Install a phased reclaimed water system at RM2243 WWTP to supply reclaimed water for construction and other authorized uses.	Under Construction
Inflow and Infiltration Study	WW.47	Establish comprehensive plan to address inflow and infiltration (I/I) removal from the sanitary sewer collection system.	Initial Study Complete
East Street Utilities	WW.49	Add water and wastewater lines and eliminate an old wastewater lift station (LS01) to modernize East Street.	Pending

4 MODEL DEVELOPMENT

4.1 Introduction

A hydraulic model of the City's sanitary sewer network was developed using the PCSWMM modeling software by Computational Hydraulics International (CHI). The developed model was used to determine current needs within and impacts of growth on the existing sanitary sewer network. The future growth scenarios evaluated in this project were 5, 10, and 20-year time horizons. Section 4.2 provides further detail on the population growth projections for each time horizon that was utilized in the model.

As part of the scope of this study, copies of PCSWMM model scenarios of the existing conditions, 5-year, 10-year, and 20-year growth conditions will be provided to the City. It is recommended that regular model maintenance and re-calibration be performed to keep the model current and useful for analysis. It is generally recommended that sanitary sewer models be re-calibrated with new flow monitoring data at least once every five years. GBA can assist the City with model maintenance and re-calibration when needed.

4.2 Flow Projections

The overall goal for developing flow projections was to spatially assign growth across the City in a logical manner to align with the population projections provided by the City for the 5, 10, and 20-year time horizons (Table 2-1). As previously mentioned, growth projections were developed based on the residential development and future land use map supplied by the City (Figure 2-2 and Figure 2-3). The 5-year growth projections were developed assuming that all residential properties from the residential development map are to be constructed and populated by the end of 2027. The 10 and 20-year growth projections were established using the future land use map in conjunction with input from the City's planning department (Figure 4-1). It is important to note that a significant portion of the anticipated growth in Leander is projected to take place in the northwest region of the City. Overall, GBA's population projections are in alignment with the City-provided projections and were used to estimate wastewater generation from the future growth areas to be incorporated in the hydraulic model (Table 4-1). The acres and LUEs associated with the future growth areas for each land use type and time horizon are summarized in Table 4-2.

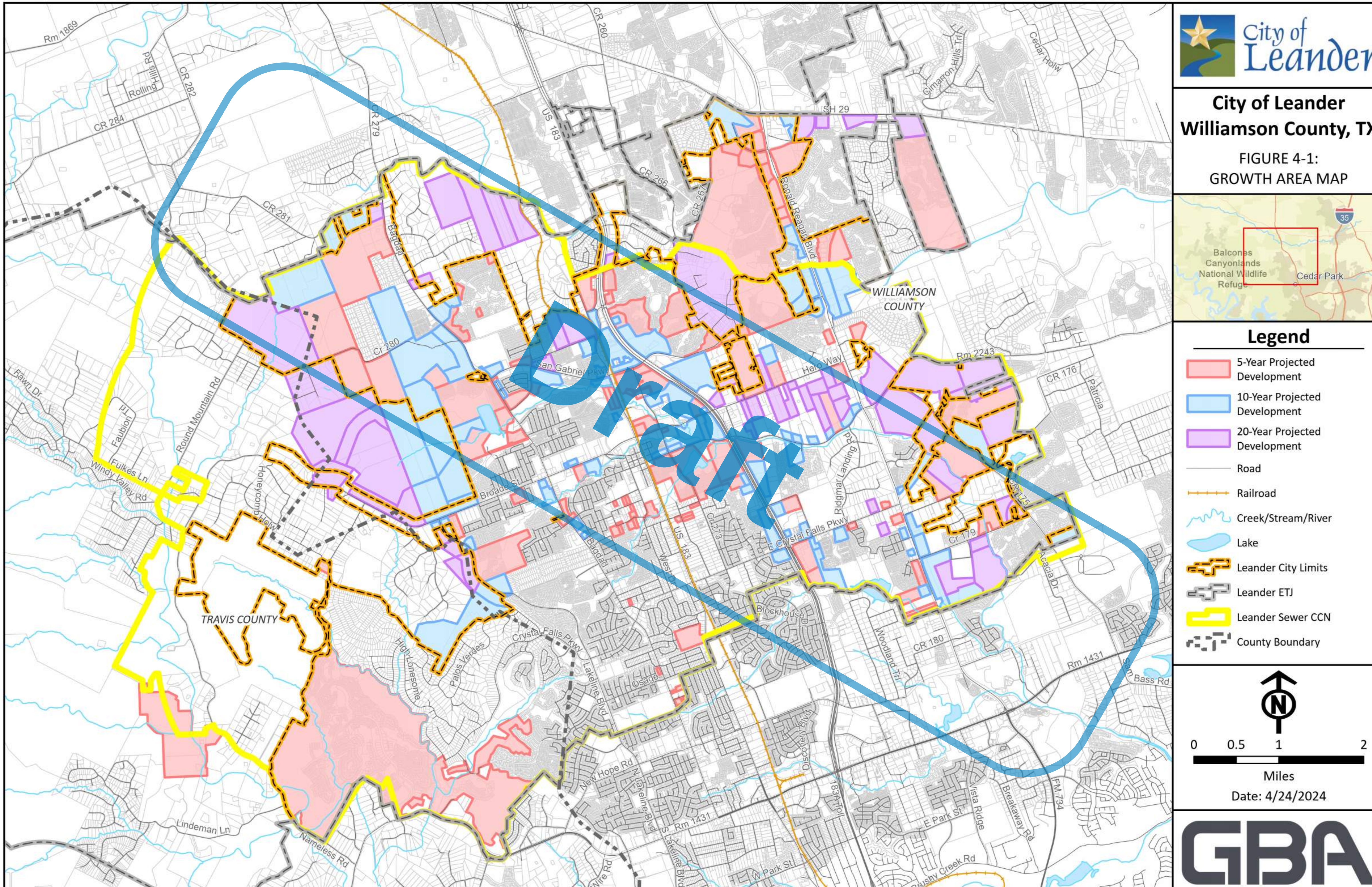

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Table 4-1: GBA Population and LUE Projections

	City		GBA	
Year	No. of LUEs	Population	No. of LUEs	Population
2022	33,687	86,733	-	-
2027	49,795	131,746	49,965	132,407
2032	63,827	168,869	64,035	169,692
2042	78,545	207,808	78,832	208,904

Table 4-2: Future Growth Areas Summary Table

Future Growth Summary Table			
5-year Growth			
Property Type	*LUE/unit*	*Units (Acreage)*	*LUEs (1)*
Single-Family	1	8,381 (5,790)	8,381
2-Plex	2	108 (30)	216
4-Plex	0.7	144 (8)	101
Condo	0.5	902 (134)	451
Apartments	0.5	7,448 (335)	3,724
Townhome	1	1,393 (234)	1,393
Property Type	*LUE/acre*	*Acreage*	*LUEs*
Employment Center	3	112	336
Commercial	4	267	1,082
School	10	59	594
5-yr Growth Total	-	**6,790 Ac** **18,376 Units**	**16,278 LUEs**
10-year Growth			
Property Type	*LUE/unit*	*Acreage*	*LUEs*
Neighborhood	4	1,694	6,786
Commercial	4	1,175	4,725
Community Mixed Use	10	211	2,116
Employment	3	147	443
10-yr Growth Total	-	**3,227 Ac**	**14,070 LUEs**
20-year Growth			
Property Type	*LUE/unit*	*Acreage*	*LUEs*
Neighborhood	4	2,505	10,029
Commercial	4	731	2,938
Employment	3	607	1,830
Parks/Open Space	0	71	0
20-yr Growth Total	**-**	**3,914 Ac**	**14,797 LUEs**
Growth Total (Cumulative)	**-**	**73,930 Ac**	**45,145 LUEs**

(1) A LUE is a planning tool that estimates the typical flow of water or wastewater produced by a single-family residence. For the purposes of this study, one (1) LUE was assumed to represent 3 persons (or population equivalents) and produce 200 gallons per day (gpd) of wastewater. The 200 gpd/LUE wastewater production rate is an average rate developed based on flow monitoring. (See section 2.3).

4.3 Existing System Model Network Development and Flow Assignment

The model was developed using the data collected from survey, GIS data from the City, and the 2022 flow monitoring project. In cases of missing data, values were retrieved from City-provided GIS data, record drawings, or interpolated between known data points. Only pipes 12 inches or greater in diameter were included in this model, except for several 8-inch lines that were specified by the City during scoping. A map of the modeled system can be found in Figure 4-2.

The fourteen flow meter locations from the 2022 I/I Reduction project were imported into the appropriate manholes in the model, as well as their respective basins. Parcels encompassed in the flow metering basins were imported into the model as subcatchments. Every parcel was assigned a receiving manhole and a living unit equivalent (LUE) count, resulting in each receiving manhole being assigned a total LUE count. The LUE count was utilized to account for variations in wastewater generation from single-family homes, apartments, schools, restaurants, retail properties, and other property types. The sewershed areas for each flow meter basin were distributed among the manholes based on a weighted system, accounting for the number of LUEs assigned to each manhole.

In summary, the model network included 960 manholes, 261,740 linear feet of gravity sewer, 78,830 linear feet of force main, and 16 lift stations (Figure 4-2). The lengths of gravity sewers are summarized according to diameter and corresponding flow metering basin in Table 4-3.

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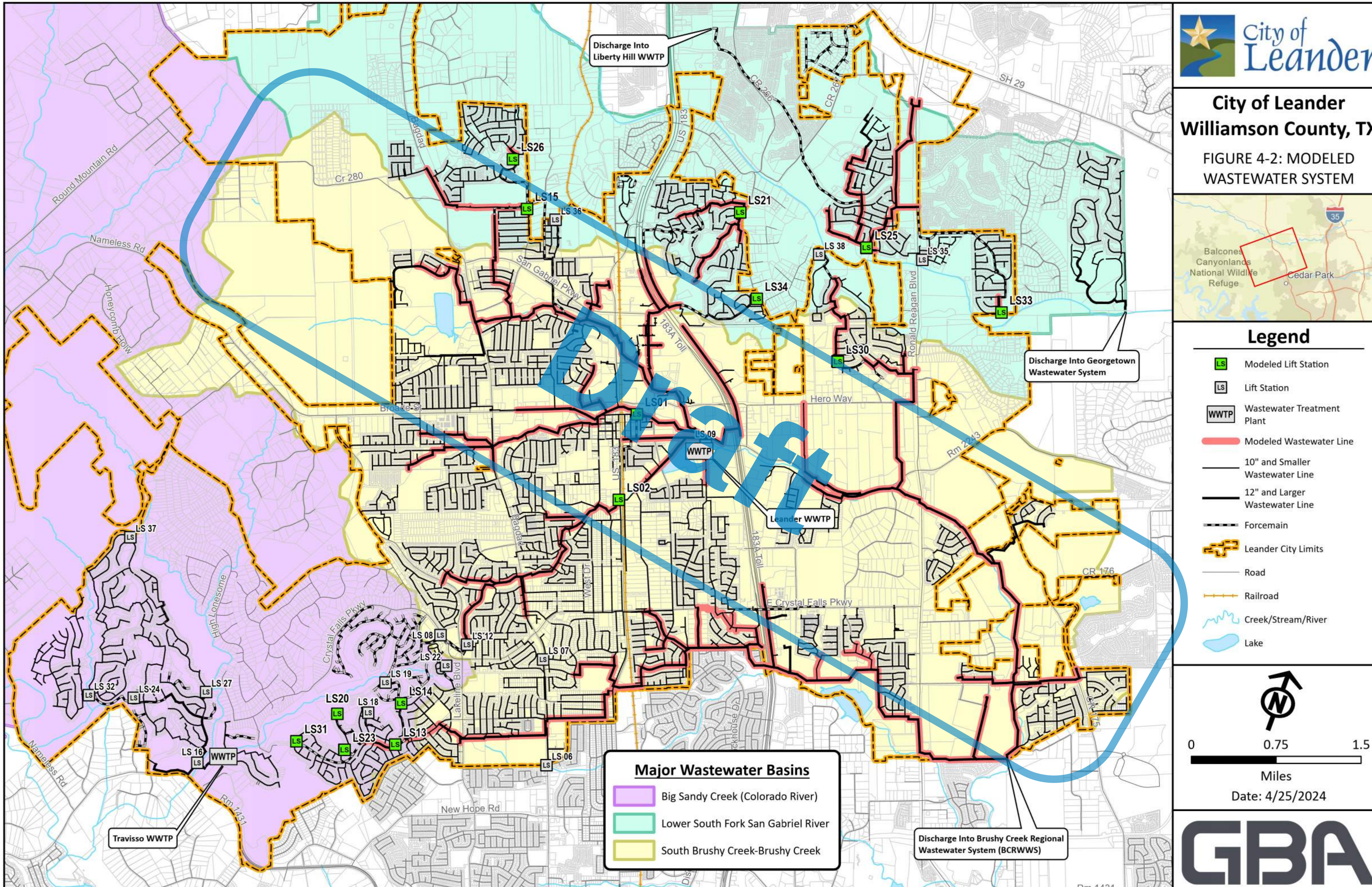

City of Leander
Williamson County, TX

FIGURE 4-2: MODELED WASTEWATER SYSTEM

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Table 4-3: Summary of Modeled Pipes by Diameter

	Gravity Main									**Force Main**						
Flow Meter Basin ID	<12"	12"	15"	18"	21"	24"	30"	36"	Totals	4"	6"	8"	10"	12"	18"	Totals
1	3385	16947	2998	7280		1745	5537	10983	48875					1690		1690
2	1830	3456							5286							
3		22656		4516					27172							
4	502								502							
5		13525	7456						20981			4100		7637		11737
6	4386	11720	6557		10236				32899		1988		10711			12699
7	2050								2050							
8	477								477							
9	3861	746	152	627					5386							
10	429								429							
11																
12		288	3666		302				4256							
13	426	8621	10186	4007					23240	8204	1293	669		83		10249
14		9123	5244	2279	4657				21303		1628			3100		4728
Liberty Hill(1)		9850	7668	239	2409	199			20365				14508	8707	14515	37730
Other (2)	2376	11773	5777	3277	6879	13513	4392	532	48519							
Totals	19722	108705	49704	22225	24483	15457	9929	11515	*261740*	8204	4909	4769	25219	21217	14515	*78833*

* - *All units in linear feet*

(1) - Includes piping north of the South Fork San Gabriel River and East of Highway 183A going to Liberty Hill WWTP

(2) - Includes all piping that is downstream of a flow meter (Areas going to RM2243 WWTP and Brushy Creek Interceptor)

4.4 Model Calibration

4.4.1 Dry Weather Calibration

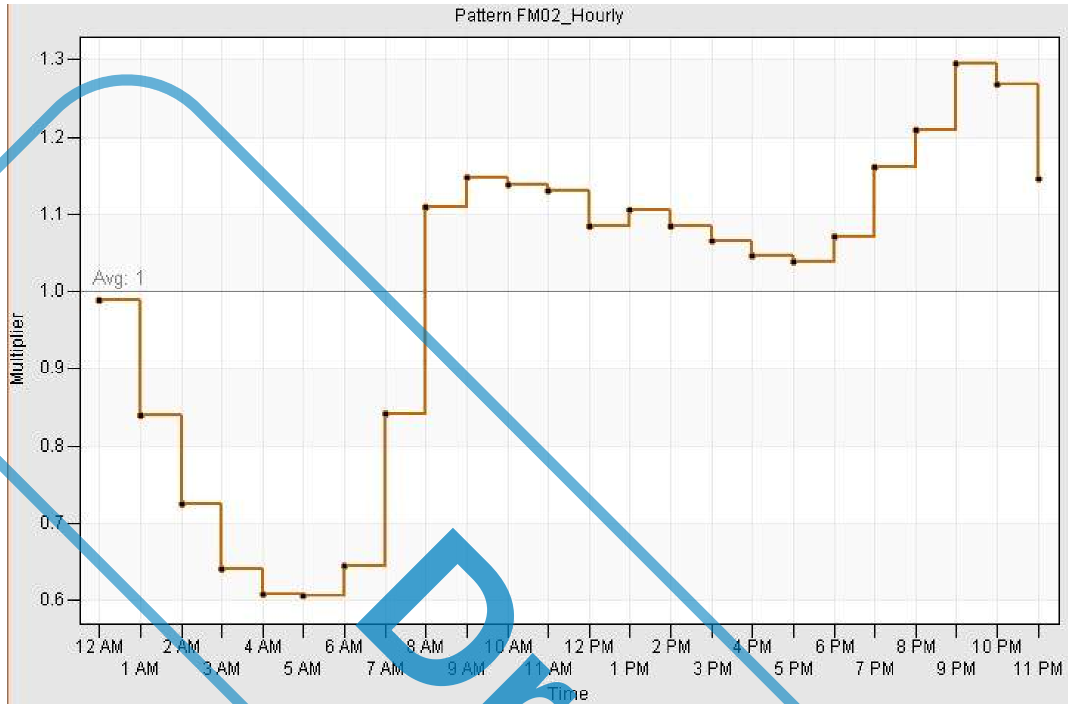
Average daily dry weather flow (ADDF) for each flow monitoring basin was retrieved from the 2022 Flow Monitoring Report by averaging the flows from Sep 29, 2022 - Oct 15, 2022, which was the driest, two-week period of the flow monitoring duration (See Figure 3-2 for flow meter locations). The ADDF was then normalized by dividing by the total number of Living Unit Equivalents (LUEs) within each respective basin, yielding a unit flow per LUE value for each flow metering basin (Table 4-4). To distribute flows throughout the system, the average flow entering each manhole was determined by multiplying the unit flow per LUE by the number of estimated LUEs served by that particular manhole.

Table 4-4: Unit Flow per LUE

Flow Metering Basin	Estimated No. of LUEs Upstream of Meter	Avg. Daily Dry Weather Flow (MGD)	Estimated ADDF/LUE (gpd/LUE)
1	2148	0.846	394
2	371	0.219	590
3	3350	0.890	266
4	272	0.098	342
5	1117	0.178	159
6	4428	0.365	82
7	248	0.059	238
8	426	0.056	130
9	337	0.327	970
10	334	0.054	162
11	500	0.149	298
12	821	0.168	205
13	2641	0.929	352
14	3424	0.491	143

Time patterns were created by using the Time Pattern Creator tool in PCSWMM. Hourly and weekend time patterns were generated based off the dry weather period used for calibration. The outputs of the time pattern creator are hourly multipliers, in which the hourly time pattern has hourly multipliers that are applied to weekdays, while the weekend time pattern has hourly multipliers which are utilized on the weekend. Figure 4-3 shows an example of an hourly time pattern created by PCSWMM. The hourly and weekend time patterns were created for each flow metering basin and assigned to the manholes within their respective flow metering basins.

Figure 4-3: Example Hourly Time Pattern



The model was run after inputting the average flows and time patterns to the manholes, and the model results were compared to the flow meter data. ADDF retrieved from the flow meter data was compared against the ADDF the model calculated, as well as the total volumes for the dry weather period (Table 4-5). The hydrographs showing modeled versus metered flow for the dry weather period for each flow meter are provided in **Appendix B: Dry Weather Calibration** .

Table 4-5: Dry Weather Calibration Results

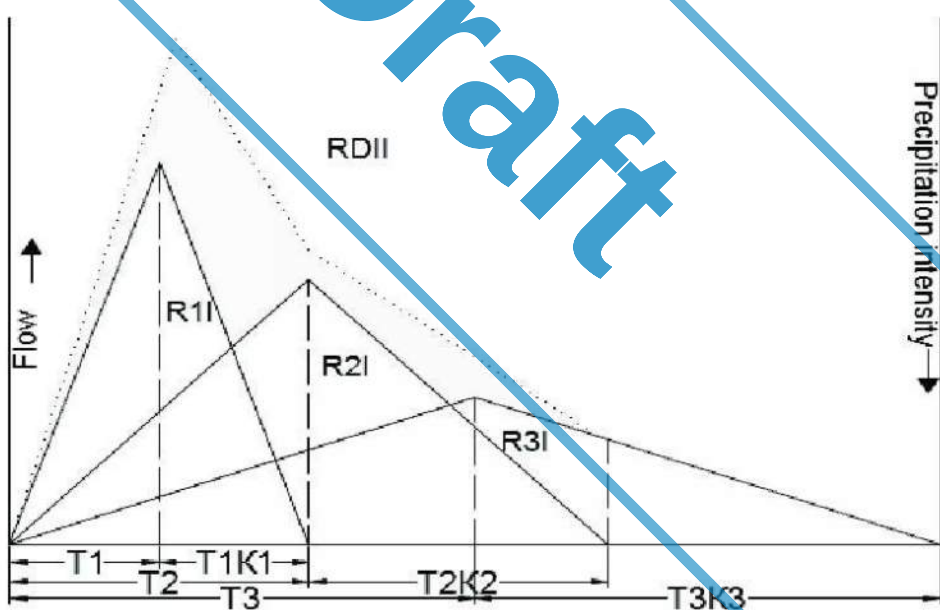
FM	Metered ADDF (MGD)	Modeled ADDF (MGD)	Difference (MGD)	% Difference	Metered Total Volume (MG)	Modeled Total Volume (MG)	Difference (MG)	% Difference
1	0.983	0.982	-0.001	-0.1%	15.750	16.700	0.950	6.0%
2	0.255	0.255	0.000	0.1%	4.097	4.340	0.243	5.9%
3	0.919	0.929	0.011	1.2%	14.450	15.8	1.350	9.3%
4	0.090	0.090	0.000	-0.2%	1.442	1.530	0.088	6.1%
5	0.197	0.187	-0.010	-5.2%	3.087	3.180	0.093	3.0%
6	0.365	0.357	-0.009	-2.4%	5.838	6.060	0.222	3.8%
7	0.078	0.077	-0.001	-0.9%	1.230	1.310	0.080	6.5%
8	0.049	0.049	-0.001	-1.0%	0.794	0.828	0.034	4.3%
9	0.406	0.409	0.004	1.0%	6.486	6.960	0.474	7.3%
10	0.064	0.065	0.001	1.7%	1.065	1.100	0.035	3.3%
11[1]	0.165	0.222	0.058	35.1%[(1)]	2.620	3.780	1.160	44.3%
12	0.193	0.189	-0.003	-1.7%	3.100	3.220	0.120	3.9%
13	1.061	1.065	0.004	0.4%	16.890	18.100	1.210	7.2%
14	0.548	0.549	0.001	0.1%	8.678	9.330	0.652	7.5%
Total/ Avg.	5.371	5.426	0.065	**1.02%**	85.527	92.238	6.711	**7.85%**

Note 1) Dry weather flows for the FM11 basin were increased in the model to improve FM09 dry weather calibration, since FM09 is downstream of FM11. Because FM11 is a small basin and there are no interceptors modeled upstream of the FM11 meter location, the dry weather calibration was considered acceptable and conservative for the purposes of this analysis.

4.4.2 Wet Weather Calibration

The RTK Hydrograph method was chosen to model rainfall dependent inflow and infiltration (RDII) in PCSWMM. RDII is produced as groundwater and stormwater enter through defects in the sanitary network. A RTK unit hydrograph was used to define the proportion of rainfall falling on the basin that enters the sewer system as RDII and the timeframe this rainfall enters the system during and after the storm event. The RTK unit hydrograph is a combination of three separate unit hydrograph triangles which represent slow, medium, and fast responses of flow entering a sanitary network (Figure 4-4). Each response represents RDII that enters a system during and after a rainfall event. The R value symbolizes the fraction of rainfall that is entering the system, which is shown in the figure as the magnitude of the peak, T is the time to peak, and K is the falling limb ratio, which predicts how long the system will respond to a storm event. The slow response can be associated with slow infiltration, which occurs immediately following a rain event and can persist for several hours or even days. The medium response is associated with moderate infiltration that occurs during and soon after an event, when soil surrounding a pipe becomes saturated and starts infiltrating. The fast response time is associated with rapid inflow that enters the system through more direct connections and pathways (such as cracks or holes in manhole frames and covers).

Figure 4-4: RTK Hydrograph Schematic



A unit hydrograph was developed for each flow monitoring basin, featuring unique sets of short-, medium-, and long-term R, T, and K values, along with an assigned rain gage. The City of Leander has a total of three rain gages, as illustrated in Figure 3-2. The Thiessen polygon method was utilized to establish an estimate of rainfall for each flow monitoring basin during the calibration period, determined by the proximity of the basin to the nearest rain gages.

The Sensitivity-based Radio Tuning Calibration (SRTC) tool in PCSWMM was applied to calibrate modeled data with observed flow meter data. The SRTC tool establishes sensitivity gradients for short, medium, and long-term R, T, K values, allowing for simultaneous observation of effects across multiple wet weather events. Initial unit hydrographs were generated by estimating R, T, K values based on computed and observed data from the dry weather calibrated model results. Subsequently, an iterative approach was adopted, adjusting R, T, and K values for each flow meter until the weighted averages of the peaks and total volumes for all the observed wet weather responses were within the ranges suggested by the Chartered Institution of Water and Environmental Management (CIWEM): -15% to +25% for peak flow, and -10% to +20% for total volume (Table 4-6). In addition, 45-degree plots were prepared to visually depict how the modeled flows align with metered flow data (Appendix C: Wet Weather Calibration).

Table 4-6: Wet Weather Calibration Results

FM	Basin Area (Acres)	No. of Storm Events with Observable I/I Responses	Weighted Avg. % Difference, Volume	Weighted Avg. % Difference, Peak Flow
1	1638	7	10%	-1%
2	452	8	7%	-1%
3	1301	9	5%	1%
4	140	7	9%	-4%
5	747	6	17%	8%
6	1561	7	9%	14%
7	98	9	-4%	13%
8	87	7	3%	-1%
9	418	6	8%	-1%
10	197	7	8%	7%
11	125	9	19%	7%
12	410	11	-3%	13%
13	1285	9	16%	12%
14	1569	5	6%	14%
Acceptable Range (CIWEM), % Difference			-10% to +20%	-15% to +25%

4.5 Future Growth Model Development

The future growth projections were incorporated into the model by importing the number of LUEs and the sewershed area into the nearest downstream, modeled manhole. The nearest downstream manhole was determined by the future growth area's location and topography. Future interceptor lines were drafted and included in the final plan as future interceptor projects to serve new growth and tie into the existing infrastructure. The exhibits in **Appendix D: Future Growth Exhibits** illustrate the estimated number of LUEs and sewershed area (acres) tying into the system for each location at each time horizon. The locations where future growth is anticipated to connect are indicated by blue triangles in the design storm modeling results (**Appendix E: Design Storm Modeling Results**). The future growth models did not factor in any planned or anticipated improvements; however, all known improvements were considered when developing recommendations.

5 MODEL RESULTS ANALYSIS

5.1 Overview of Modeling Results

The existing model and future growth models (5, 10, and 20-year time horizons) were simulated with the 5-year, 6-hour design storm (see Section 2.6 for more information regarding the design storm). This chapter provides an analysis of the outcomes derived from these simulations. Figure 5-1 provides a summary map of design storm results. In this figure, the colored circles denote manholes experiencing flooding during the simulation period. While the model might indicate flooding, it does not imply that the system will actually flood. It is recommended that further on-site evaluation and data collection (e.g., checking manholes for evidence of surcharge, targeted flow monitoring) be conducted before initiating any project based on modeling results.

A more detailed set of maps showing model results from PCSWMM is provided in Appendix E. In those maps, orange symbolizes pipes undergoing surcharge due to backup, indicative of downstream bottlenecks such as undersized pipes or lift stations. Pipes appearing as red are representing pipes experiencing surcharge due to capacity limitations, indicative of undersized pipes. These pipes can be considered bottlenecks to flow in the collection system. When evaluating projects, pipes surcharging due to backup are generally of lesser concern compared to those surcharging due to capacity limitations.

5.2 Existing System Design Storm Model Results

The analysis of the existing system under 5-year design storm conditions reveals two primary areas of concern:

- **Block House Interceptor**, which is situated in southwest Leander near Leander High School and flows northeast from west of Lakeline Blvd to Highway 183. The design storm model predicts that this section of pipe may currently be experiencing excessive surcharging and potential flood loss under 5-year storm conditions.
- **Mason Creek Interceptor**, located in central west Leander and flowing northeastward towards Lift Station 2, is predicted to experience excessive surcharge with some minimal flood loss according to the existing system model.

Other areas of lesser concern include a pipe segment in southeast Leander, near Lakewood Park, which is forecasted to experience surcharge due to capacity limitations. However, the level of surcharge is not considered critical. Manholes downstream of Lift Station 2 appear as flooded in the existing system modeling results. However, there are recent and ongoing upgrades at LS02 and its force main, and modeling of this area may be fine-tuned once upgrades are complete. There are also no known SSO issues in this vicinity; therefore, this area is not considered an area of concern for the present-day time horizon (Figure 5-1).

5.3 5-year Growth Design Storm Model Results

The results from the 5-year growth model simulation conducted with the design storm are presented in Figure 5-1. The previously identified areas of concern (Block House and Mason Creek Interceptors) exhibit exacerbated surcharge and flooding. In addition, it is anticipated that the **pipes near the RM2243 WWTP** and along the Horizon Park Interceptor will surcharge under 5-year growth conditions during the design storm. The **Horizon Park Interceptor** is an older 12-inch line (circa 1986) with new developments recently tying into it, which is likely exacerbating the predicted surcharge conditions.

5.4 10-year Growth Design Storm Model Results

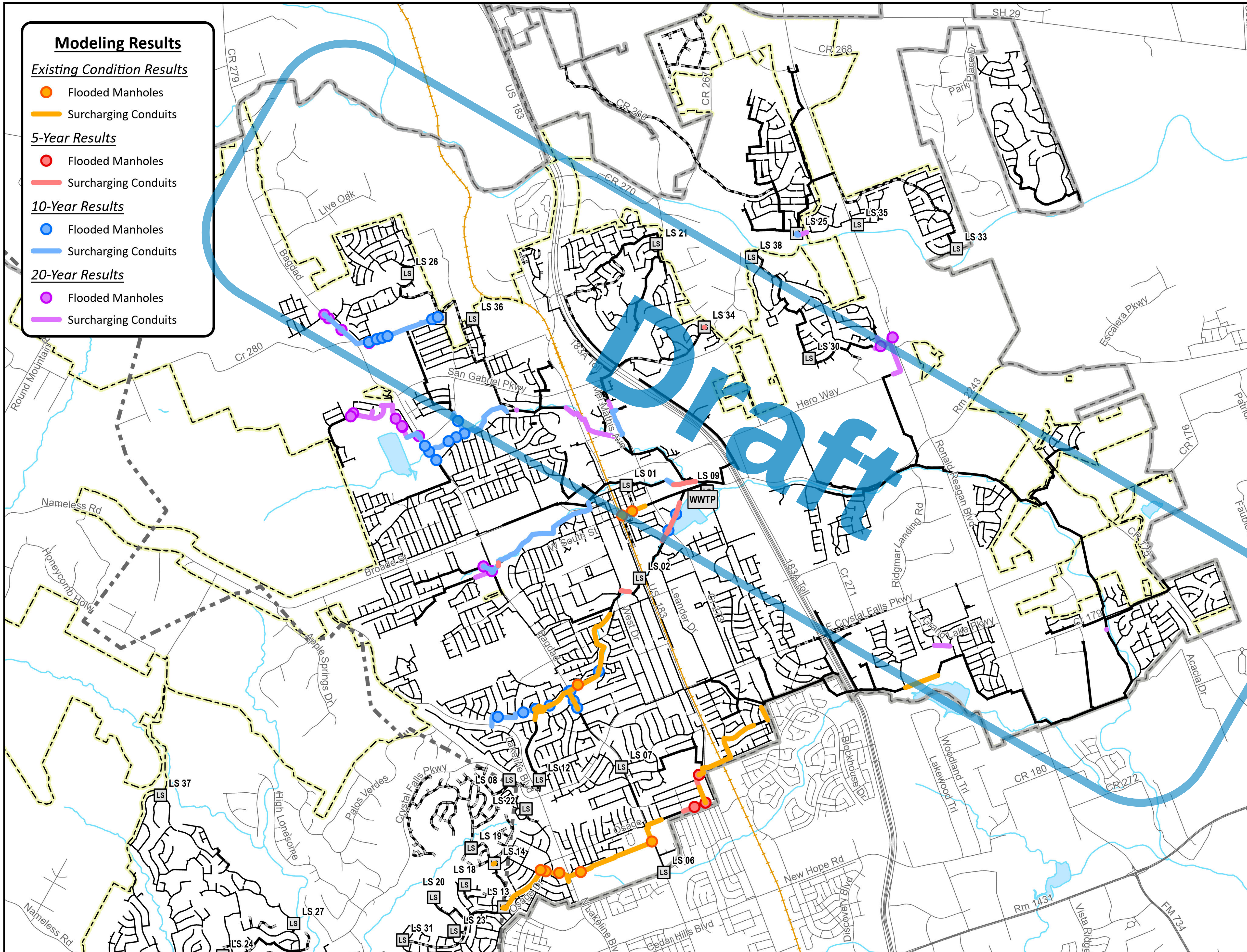
Like the 5-year growth model findings, the previously identified areas of concern show worsened surcharging and flooding. With the integration of the 10-year growth projection into the model, excessive surcharge and flooding is anticipated in the following locations (please also refer to Figure 5-1):

- **Benbrook Interceptor**, where there is a project currently listed in the City's Capital Improvement Plan (CIP) under WW.41 and is under design by GBA. Although this interceptor is not expected to become a concern until the 10-year time horizon, the City is taking proactive measures to address this interceptor.
- **Collaborative Way** sewers are another area of concern. Located in northwest Leander, these sewers flow southeast along Bagdad Rd and Collaborative Way, upstream of LS15. Growth was assumed to tie into these sewers upstream of Collaborative Way, although the actual tie-in locations may differ in the future. A conceptual plan of this area is presented in Section 6.10.
- **South Brushy Creek Interceptor**, which is situated in central west Leander, is projected to experience surcharge in the design storm simulation of the 10-year growth model.

5.5 20-year Growth Design Storm Model Results

The integration of the 20-year growth projection into the model, caused excessive surcharge and flooding is anticipated in the following locations (please also refer to Figure 5-1):

- Sewers near **Devine Lake**, upstream of the Benbrook Interceptor are forecasted to undergo significant flooding and surcharging. Although this pipe is relatively newly constructed, most of the growth expected in the northwest area of town is anticipated to connect to this stretch of pipe.
- The sewers flowing south along **N Ronald Reagan Blvd**, at the near the intersection of Hero Way, are projected to experience flooding and surcharging under the conditions of 20-year growth and a 5-year design storm event.



City of Leander

City of Leander Williamson County, TX

FIGURE 5-1: DESIGN STORM MODELING RESULTS

Balcones Canyonlands National Wildlife Refuge

Cedar Park

35

Legend

- LS Lift Station
- WWTP Wastewater Treatment Plant
- 10" and Smaller Wastewater Line
- 12" and Larger Wastewater Line
- Forcemain
- Road
- Railroad
- Creek/Stream/River
- Lake
- Leander City Limits
- Leander ETJ
- County Boundary

N

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Miles

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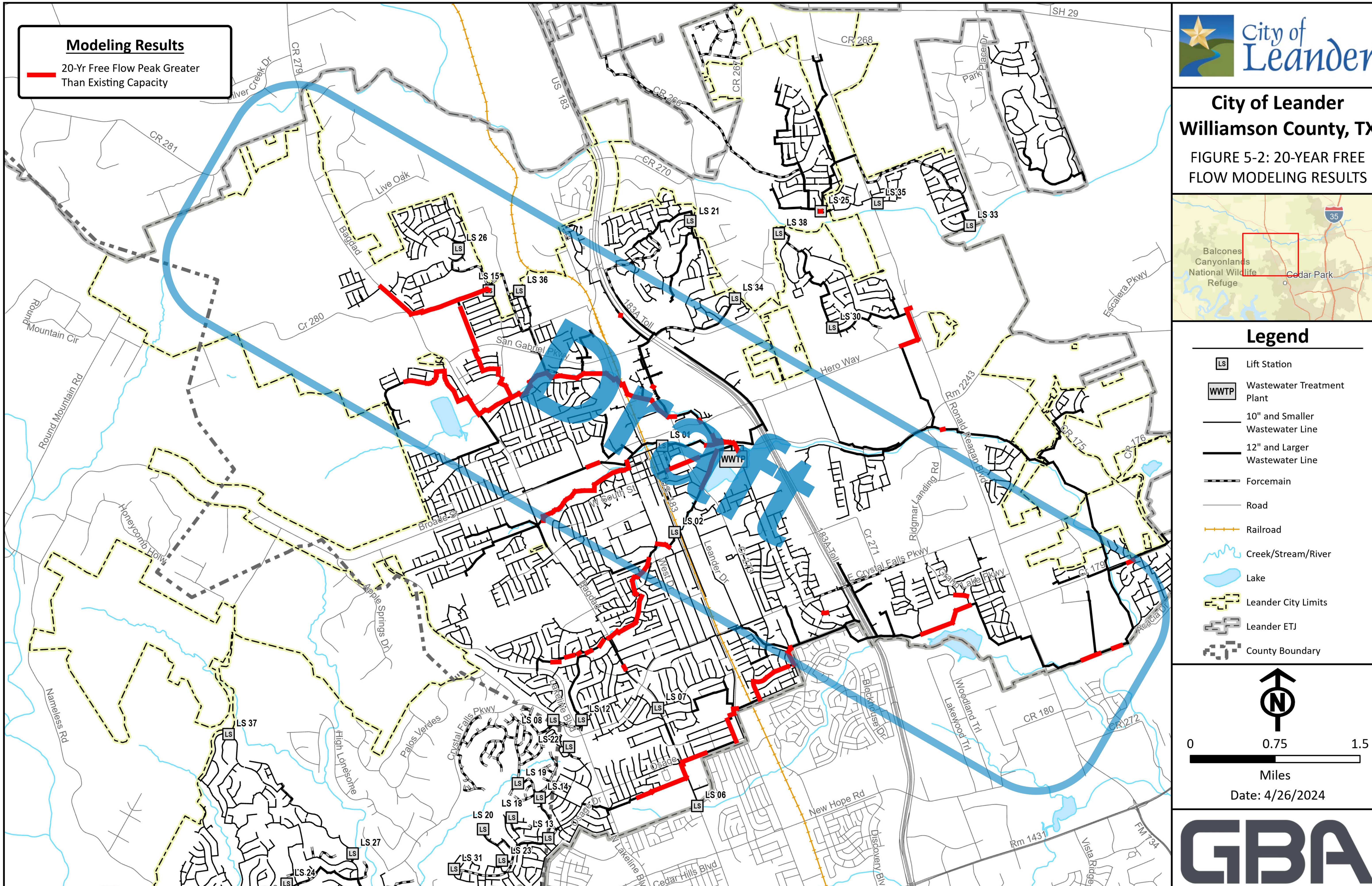
5.6 Free Flow Model Results

A free flow model scenario was developed for the 20-year growth conditions whereby pipe capacities were increased until no surcharging or flooding was predicted in the model under 5-year, 6-hour design storm conditions. In the previous non-free flow design storm models, flood loss and surcharging diminish peak flows progressing downstream of any bottlenecks. The free flow analysis assumes that any flow entering the system will flow through the system and to the outfall without encountering restrictions or flood loss. This model scenario enables a comparison between a) the maximum 20-year free flow peaks that could be experienced without upstream flow restrictions and b) the existing full flow capacity of every modeled pipe. Additionally, this analysis facilitates the identification of capacity concerns not highlighted in the non-free flow design storm models, either due to flood loss, surcharging, or other flow restrictions upstream.

The findings from the free flow analysis significantly influence the identification and delineation of necessary projects and their extents. Figure 5-2 denotes pipes (shown in red) where the maximum 20-year free flow peak exceeds the existing pipe's full flow capacity. The pipe segments which are under capacity for the 20-yr free flow conditions generally align with the areas of concern previously identified from the design storm modeling results, with the addition of a few areas in southeast Leander at the downstream end of the Block House Creek interceptors (Figure 5-2). After further modeling of the recommended improvements, these pipes in southeast Leander, while still slightly under-sized for the 20-year free flow peak, do not flood or meet critical surcharge criteria when upstream flow restrictions are removed. Therefore, these pipes at the downstream end of the Block House Creek interceptors east of 183A (including the Lakewood Park area) are not of concern and likely do not require a project within the 20-year planning window.



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5.7 Lift Station Modeling

Lift stations were modeled in PCSWMM with the information available during model development. Several modeled lift stations were missing information regarding pump curves, capacities, start up and shut off depths, and wet well dimensions. Where information was missing or model calibration required it, an "ideal" pump assumption was used. Lift stations missing current pump curves (Lift Stations 01, 26, and 31) were modeled as "ideal" pumps, whereby outgoing flows are assumed to be equivalent to incoming flows. Other lift stations were better represented by ideal pumps during dry weather flow calibration (Lift Stations 02, 21, and 34). Further investigation, such as draw down testing, is recommended for fine-tuning of lift station modeling. However, conclusions can still be drawn regarding several crucial lift stations.

Table 5-1 summarizes the modeled flows reaching those lift stations with significant growth anticipated upstream over the next 20 years. Only modeled lift stations with anticipated upstream growth are included in Table 5-1 because smaller lift stations with limited growth upstream should primarily require O&M rather than significant capacity upgrade projects. Free flow peaks reaching each lift station at each time horizon are provided, along with the lift station's estimated firm capacity and maximum (or emergency) capacity. As discussed previously, free flow peaks represent a conservative estimate of maximum peak flows that could be experienced, assuming all upstream flow restrictions are removed.

Cells shaded yellow indicate a flow rate that exceeds the lift station's firm capacity, and cells shaded red indicate a flow rate that exceeds the lift station's maximum capacity. LS02 and LS15 indicate need for capacity upgrades by the 10-year time horizon. However, as described in the next chapter, LS15 may be decommissioned if flows are sent to a new regional LS instead.

Table 5-1: Modeled Lift Stations With Growth Anticipated Upstream

Lift Station	Existing Sys. Free Flow Peak (MGD)	5-year Free Flow Peak (MGD)	10-year Free Flow Peak (MGD)	20-year Free Flow Peak (MGD)	Existing LS Firm Capacity (MGD)[1]	Existing LS Max Capacity (MGD)[2]	Ideal Pump in Model[3]?
LS 02	6.8	6.6	8.0	8.0	5.2	7.8	Yes
LS 15	0.4	0.4	2.1	3.4	0.6	1.2	No
LS 21	1.3	1.9	1.9	1.9	1.7	3.5	Yes
LS 25	1.2	1.2	1.5	1.8	8.3	9.7	No[4]
LS 26	0.5	1.0	1.2	1.2	1.4	2.8	Yes
LS 30	0.4	0.8	0.8	0.8	0.8	1.6	No

Notes:
1) Firm capacity represents the capacity of the lift station assuming one pump is not running.
2) Max. capacity represents the capcity of the lift station assuming all available pumps are running.
3) Lift stations were modeled as "ideal" pumps (Qin=Qout) when pump curves were unavailable. It is advised that further investigations be conducted on these lift stations before considering improvements.
4) LS25 (Bar W Ranch) received two new 2,400 gpm pumps in Spring 2024 which tie into the 18" force main, in addition to the existing two 985 gpm pumps that tie into the 10" force main. During model development, only the two 985 gpm pumps were present, and this is how LS25 is represented in the model.

Yellow shading indicates free-flow peak exceeds firm capacity of lift station (one pump not running).
Red shading indicates free-flow peak exceeds maximum capacity of lift station (all pumps running).

6 PROJECT RECOMMENDATIONS AND COSTS

This section outlines the conceptual projects identified from modeling, as well as the planning-level costs estimated for each identified project.

6.1 Development of Planning-Level Costs

All planning-level costs of projects are in February 2024 dollars and include the opinion of probable construction cost (OPCC), along with a 20% construction contingency, a 30% factor for engineering and other soft costs (survey, public coordination, permitting, etc.), and an additional 10% contingency for projects involving railroad crossings. The inclusion of the railroad crossing contingency is due to additional engineering costs for obtaining permits and additional construction costs due to longer bores.

The estimated unit cost for acquiring easements for new infrastructure projects outside of existing right-of-way (ROW) or pre-existing easements was approximately $88,000 per acre. This unit cost was determined by averaging the expenses of recent utility infrastructure easements in Central Texas for both developed and undeveloped areas and includes easement survey costs, engineering, ROW agent, condemnation, attorney fees, and easement acquisition costs.

All OPCCs are considered planning-level, and actual costs may vary significantly depending on final design, project scope and bidding environment. Planning-level construction cost estimates for both new and existing infrastructure projects were estimated based on the following assumptions:

- Gravity Lines: Gravity pipe construction costs generally cover excavation, pipe, ditch checks, manholes, extra depth, erosion control, restoration, and mobilization. The gravity pipe construction estimates also assume that 10% of gravity line length will be encased with a steel casing to account for roadway and stream crossings.
- Lift Stations: The cost for lift station construction generally covers erosion control, site work, wet well, pumps, site piping, electrical work, controls, jib crane, hoist, fencing, access road, restoration, and appurtenances. The lift station unit costs were calculated based on averaging construction costs from past lift station projects.
- Force Mains: Force main construction costs generally cover excavation, pipe, erosion control, and restoration. The force main construction estimates also assume that 10% of force main length will be encased with a steel casing to account for roadway and stream crossings.
- Conversion of On-Site Septic Facilities: A unit cost of $30,000/acre was estimated for future projects providing wastewater service to existing on-site septic facilities (OSSF) and includes infrastructure necessary to connect septic areas to City sewer. The unit cost is sourced from an average cost of converting OSSF to City sewer service in the Falcon Oaks subdivision.

6.2 Field Investigations Prior to Design

In order to confirm a relief project's urgency and necessity, field investigations and targeted flow metering are recommended before initiating design and construction. The hydraulic model is most accurate nearest the meter locations used for model calibration. Locations in the model that are relatively far upstream or downstream from a meter location are more likely to be imprecise in terms of flow predictions. Many site-specific factors in the collection system can impact flow conditions at a particular location that may not be readily apparent from flow data collected far downstream of that location (such as branching interceptors or diversions). Also, timing and scale of future growth may vary from growth projections assumed in this report, which may drastically change the necessity of projects listed below under future time horizons. Therefore, it is in the City's best interest to confirm and corroborate model results and project necessity before embarking on a costly relief or replacement project.

Table 6-1 describes the primary benefits and costs of performing targeted field investigations and flow monitoring prior to relief project implementation. Overall, these investigations are highly recommended and can help confirm the necessity and urgency of a project identified from modeling.

Table 6-1: Benefits and Costs of Targeted Investigations Prior to Relief Design

Benefits	**Costs**
+ Verify site-specific flow conditions necessitate a project at all, potentially saving City budget if a project is eliminated, postponed, or reduced in scope + Determine level of risk of postponing a project if flow conditions are not as concerning as originally predicted/modeled + Verify presence or absence of surcharge evidence (rags, high water marks, high water levels) + Verify site-specific hydraulics for fine-tuned modeling, such as diameters or pipe inverts that could not be collected during initial manhole inspections	- Additional costs of performing field investigations, flow monitoring and any supplementary modeling - Delays timeline toward project completion if project is essential

6.3 Project Summary

Table 6-2 and Figure 6-1 present a summary of all projects identified as part of the collection system master planning project. Further description of the recommended projects are provided in the sections below. IDs for each project (e.g., "WW.00.01") are formatted such that the middle two digits represent the time horizon by which the project becomes necessary ("00" for present day, "05" for 5-year growth conditions, etc.), and the second two digits represent a unique project number for that time horizon. Though parts of the existing system are overloaded and need relief prior to the 20 year growth horizon, all sizing recommendations are based on the 20 year future growth flows.

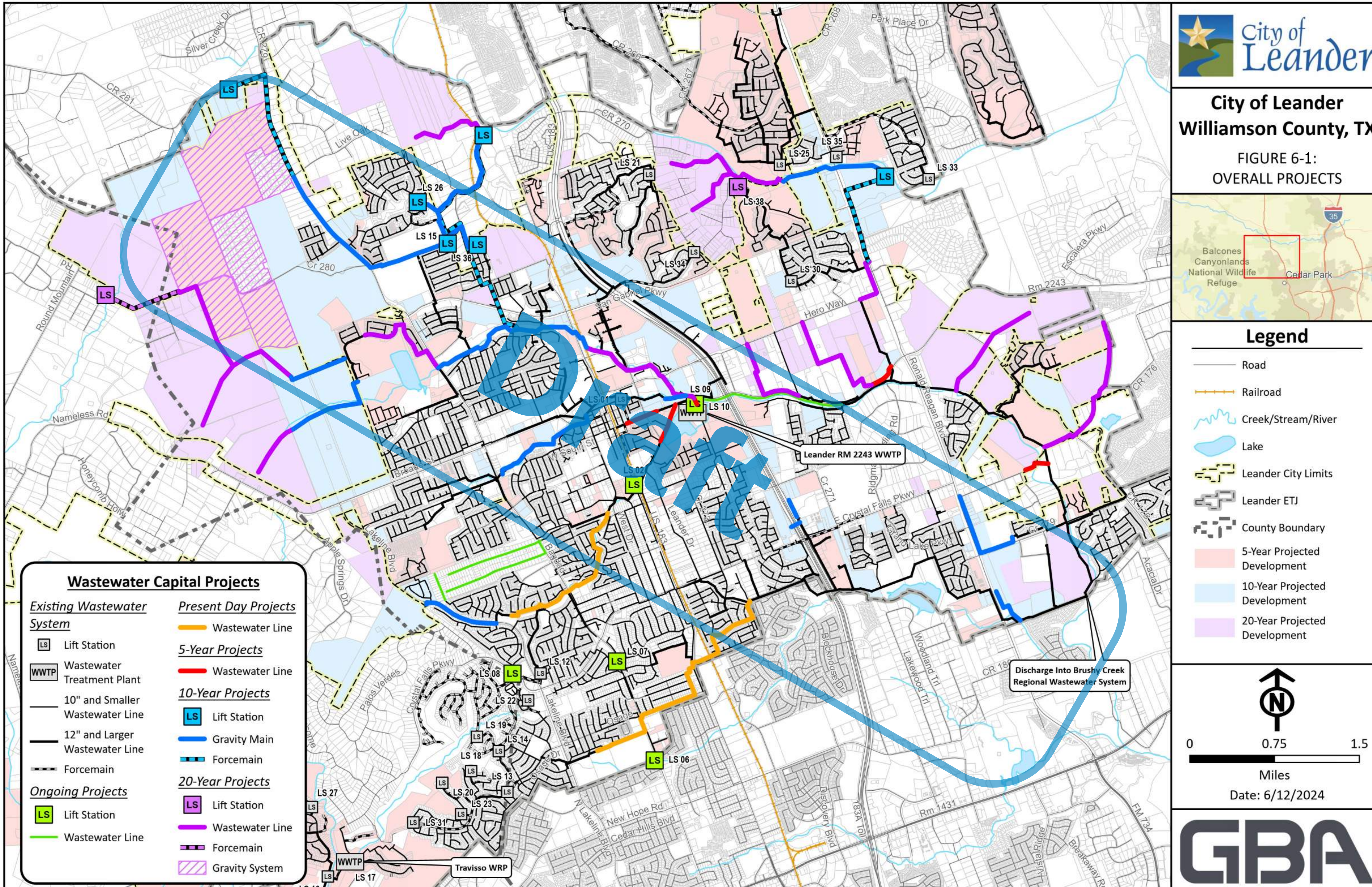
Leander, TX
Collection System Master Plan
Table 6-2: Overall Project List

Project ID	Infrastructure Type	Time Horizon	FY24 CIP Project ID	Project Name	Type of Improvement	Pipe Diameter (in)[1]	Total Length of Pipe (ft)	Lift Station Flow Rate (mgd)	Planning-Level Construction OPCC without Contingency	Construction Contingency (30%)	Planning-Level Construction OPCC with Contingency	Engineering & Survey (20%)	ROW Acquisition	Planning-Level Capital Cost (OPCC with Contingency + Engr./Survey + ROW Acq.)[2]
WW.00.01	Existing/Relief	Present Day	-	Block House Interceptor	Exist. Gravity Relief/Upsizing	21"-24"	13,020	-	$ 11,327,000	$ 3,398,000	$ 14,725,000	$ 2,945,000	$ -	$ 17,670,000
WW.00.02	Existing/Relief	Present Day	-	Mason Creek Interceptor	Exist. Gravity Relief/Upsizing	15"-24"	8,170	-	$ 6,597,000	$ 1,979,000	$ 8,576,000	$ 1,715,000	$ -	$ 10,291,000
WW.05.01	Existing/Relief	5-Year	-	Horizon Lake Interceptor	Exist. Gravity Relief/Upsizing	18"-36"	3,660	-	$ 3,617,000	$ 1,085,000	$ 4,702,000	$ 940,000	$ -	$ 5,642,000
WW.05.02	New/Extension	5-Year	-	Lonestar Landing WW Improvements	New Gravity to Serve Growth	8"	1,225	-	$ 620,000	$ 186,000	$ 806,000	$ 161,000	$ 124,000	$ 1,091,000
WW.05.03	New/Extension	5-Year	-	RM 2243 to Hero Way WW Improvements - East Segment Ph. 1	New Gravity to Serve Growth	12"	1,350	-	$ 810,000	$ 243,000	$ 1,053,000	$ 211,000	$ 136,000	$ 1,400,000
WW.10.01	Existing/Relief	10-Year	WW.41	Benbrook Interceptor (Under Design)	Exist. Gravity Relief/Upsizing	27"	8,460	-	$ 9,870,000	$ 2,961,000	$ 12,831,000	$ 2,566,000	$ -	$ 15,397,000
WW.10.02	Existing/Relief	10-Year	-	Collaborative Way	Exist. Gravity Relief/Upsizing	18"	5,780	-	$ 4,379,000	$ 1,314,000	$ 5,693,000	$ 1,139,000	$ -	$ 6,832,000
WW.10.03	Existing/Relief	10-Year	WW.25	South Brushy Creek Interceptor	Exist. Gravity Relief/Upsizing	15"-24"	6,400	-	$ 4,493,000	$ 1,348,000	$ 5,841,000	$ 1,168,000	$ -	$ 7,009,000
WW.10.04	New/Extension	10-Year	-	South Ronald Reagan Blvd. WW Improvements	New Gravity to Serve Growth	8"	2,000	-	$ 1,012,000	$ 304,000	$ 1,316,000	$ 263,000	$ 202,000	$ 1,781,000
WW.10.05	New/Extension	10-Year	-	Journey Pkwy and Ronald Reagan Blvd WW Improvements	New Gravity to Serve Growth	8"	4,675	-	$ 2,366,000	$ 710,000	$ 3,076,000	$ 615,000	$ 472,000	$ 4,163,000
WW.10.06	New/Extension	10-Year	-	US 183-A WW Improvements Ph. 1	New Gravity to Serve Growth	8"	450	-	$ 228,000	$ 68,000	$ 296,000	$ 59,000	$ 45,000	$ 400,000
WW.10.07	New/Extension	10-Year	-	US 183-A WW Improvements Ph. 2	New Gravity to Serve Growth	8"	875	-	$ 443,000	$ 133,000	$ 576,000	$ 115,000	$ 88,000	$ 779,000
WW.10.08	New/Extension	10-Year	-	Linda Hall WW Improvements	New Gravity to Serve Growth	12"	3,600	-	$ 2,160,000	$ 648,000	$ 2,808,000	$ 562,000	$ 363,000	$ 3,733,000
WW.10.09	New/Extension	10-Year	-	North Fork Brushy Creek WW Interceptor Improvements Ph. 1	New Gravity to Serve Growth	18"	4,630	-	$ 3,506,000	$ 1,052,000	$ 4,558,000	$ 912,000	$ 467,000	$ 5,937,000
WW.10.10	New/Extension	10-Year	-	North Brushy Creek WW Interceptor Improvements	New Gravity to Serve Growth	18"-21"	2,800	-	$ 2,250,000	$ 675,000	$ 2,925,000	$ 585,000	$ 282,000	$ 3,792,000
WW.10.11	New/Extension	10-Year	-	North Bagdad Rd. Lift Station Ph. 1	New Gravity/LS to Serve Growth	18"(G), 10"(F)	10,600(G/F)	1.15	$ 6,235,000	$ 1,871,000	$ 8,106,000	$ 1,621,000	$ 756,000	$ 10,483,000
WW.10.12	New/Extension	10-Year	-	San Gabriel East Regional Lift Station	New LS to Serve Growth	8" (F)	5,500(F)	0.90	$ 2,593,000	$ 778,000	$ 3,371,000	$ 674,000	$ 312,000	$ 4,357,000
WW.10.13	New/Extension	10-Year	-	San Gabriel River WW Interceptor Improvements Ph. 1	New Gravity to Serve Growth	15"-18"	5,140	-	$ 3,863,000	$ 1,159,000	$ 5,022,000	$ 1,004,000	$ 518,000	$ 6,544,000
WW.10.14	New/Extension	10-Year		San Gabriel West Regional Lift Station Ph. 1	New Lift Station	16"(F)	13100	3.60	$ 8,349,000	$ 2,505,000	$ 10,854,000	$ 2,171,000	$ 696,000	$ 13,721,000
WW.10.15	New/Extension	10-Year	-	Lift Station #15, #26, and #36 Decommission	New Gravity to Serve Growth	8"-21"	10,050	-	$ 8,331,000	$ 2,499,000	$ 10,830,000	$ 2,166,000	$ 1,014,000	$ 14,010,000
WW.20.01	Existing/Relief	20-Year	-	Devine Lake	Exist. Gravity Relief/Upsizing	27"	5,240	-	$ 5,625,000	$ 1,688,000	$ 7,313,000	$ 1,463,000	$ -	$ 8,776,000
WW.20.02	Existing/Relief	20-Year	WW.37/.38	North Brushy Creek Interceptor	Exist. Gravity Relief/Upsizing	33"-36"	6,150	-	$ 8,265,000	$ 2,480,000	$ 10,745,000	$ 2,149,000	$ -	$ 12,894,000
WW.20.03	Existing/Relief	20-Year	-	North Ronald Reagan	Exist. Gravity Relief/Upsizing	12"-15"	2,500	-	$ 1,640,000	$ 492,000	$ 2,132,000	$ 426,000	$ -	$ 2,558,000
WW.20.04	New/Extension	20-Year	-	RM 2243 to Hero Way WW Improvements - West Segment	New Gravity to Serve Growth	8"-12"	4,340	-	$ 2,356,000	$ 707,000	$ 3,063,000	$ 613,000	$ 437,000	$ 4,113,000
WW.20.05	New/Extension	20-Year	-	San Gabriel River WW Interceptor Improvements Ph. 2	New Gravity to Serve Growth	8"-15"	9,050	-	$ 5,402,000	$ 1,621,000	$ 7,023,000	$ 1,405,000	$ 913,000	$ 9,341,000
WW.20.06	New/Extension	20-Year	-	North Fork Brushy Creek WW Interceptor Improvements Ph. 2	New Gravity to Serve Growth	12"-15"	2,650	-	$ 1,708,000	$ 512,000	$ 2,220,000	$ 444,000	$ 268,000	$ 2,932,000
WW.20.07	New/Extension	20-Year	-	San Gabriel Pkwy. WW Interceptor Ph. 1	New Gravity to Serve Growth	18"	3,350	-	$ 2,540,000	$ 762,000	$ 3,302,000	$ 660,000	$ 338,000	$ 4,300,000
WW.20.08	New/Extension	20-Year	-	San Gabriel Pkwy. WW Interceptor Ph. 2	New Gravity to Serve Growth	12"	3,150	-	$ 1,890,000	$ 567,000	$ 2,457,000	$ 491,000	$ 318,000	$ 3,266,000
WW.20.09	New/Extension	20-Year	-	Lakeline Blvd. WW Improvements	New Gravity to Serve Growth	15"	5,030	-	$ 3,311,000	$ 993,000	$ 4,304,000	$ 861,000	$ 507,000	$ 5,672,000
WW.20.10	New/Extension	20-Year	-	Colorado Basin Lift Station	New LS to Serve Growth	10"(F)	3,750	1.35	$ 2,782,000	$ 835,000	$ 3,617,000	$ 723,000	$ 224,000	$ 4,564,000
WW.20.11	New/Extension	20-Year	-	Lift Station #38 Decommission	New Gravity to Serve Growth	12"	400	-	$ 540,000	$ 162,000	$ 702,000	$ 140,000	$ 40,000	$ 882,000
WW.20.12	New/Extension	20-Year	-	Greatwood WW Collection System Improvements	New Gravity to Serve OSSF	-	-	-	$ 8,010,000	$ 2,403,000	$ 10,413,000	$ 2,083,000	$ -	$ 12,496,000
WW.20.13	New/Extension	20-Year	-	Whitt Ranch Collection System Improvements	New Gravity to Serve OSSF	-	-	-	$ 2,310,000	$ 693,000	$ 3,003,000	$ 601,000	$ -	$ 3,604,000
WW.20.14	New/Extension	20-Year	-	Sullivan Tract Collection System Improvements	New Gravity to Serve OSSF	-	-	-	$ 9,270,000	$ 2,781,000	$ 12,051,000	$ 2,410,000	$ -	$ 14,461,000
WW.20.15	New/Extension	20-Year	-	Leander Estates Collection System Improvements	New Gravity to Serve OSSF	-	-	-	$ 6,300,000	$ 1,890,000	$ 8,190,000	$ 1,638,000	$ -	$ 9,828,000
WW.20.16	New/Extension	20-Year	-	Hilltop Ranch Collection System Improvements	New Gravity to Serve OSSF	-	-	-	$ 3,150,000	$ 945,000	$ 4,095,000	$ 819,000	$ -	$ 4,914,000
WW.20.17	New/Extension	20-Year	-	North Bagdad Rd. Lift Station Ph. 2	New Pumps for Existing LS	-	-	1.44	$ 245,000	$ 74,000	$ 319,000	$ 64,000	$ 35,200	$ 418,000
WW.20.18	New/Extension	20-Year	-	San Gabriel West Regional Lift Station Ph. 2	Proposed LS Expansion	-	-	4.68	$ 586,000	$ 176,000	$ 762,000	$ 152,000	$ 35,000	$ 949,000
WW.20.19	New/Extension	20-Year	-	San Gabriel West WW Improvements	New Gravity to Serve Growth	8"-18"	3,860		$ 2,215,000	$ 665,000	$ 2,880,000	$ 576,000	$ 389,000	$ 3,845,000
WW.20.20	New/Extension	20-Year	-	San Gabriel East Regional Lift Station Ph. 2	Proposed LS Expansion	10" (F)	5,500	2.30	$ 2,539,000	$ 762,000	$ 3,301,000	$ 660,000	$ 312,000	$ 4,273,000
WW.20.21	New/Extension	20-Year	-	RM 2243 to Hero Way WW Improvements - East Segment Ph. 2	New Gravity to Serve Growth	8"	5,925	-	$ 2,998,000	$ 899,000	$ 3,897,000	$ 779,000	$ 598,000	$ 5,274,000
WW.20.22	New/Extension	20-Year	-	CR 175 and RM 2243 WW Improvements	New Gravity to Serve Growth	8"-12"	5,160	-	$ 2,637,000	$ 791,000	$ 3,428,000	$ 686,000	$ 520,000	$ 4,634,000
WW.20.23	New/Extension	20-Year	-	CR 175 and CR 176 WW Improvements	New Gravity to Serve Growth	8"-12"	7,500	-	$ 4,402,000	$ 1,321,000	$ 5,723,000	$ 1,145,000	$ 757,000	$ 7,625,000

Subtotal, Existing/Relief Projects	$ 87,069,000
Subtotal, New/Extension Projects[2]	$ 179,582,000
Total, All Projects	**$ 266,651,000**

Notes:
1) For pipe diameters and lengths, gravity main is assumed, except where (F) indicates force main, and (G) indicates gravity main.
2) For new/extension projects not within the ROW or an existing easement, a unit cost of $87,900/acre was utilized for easement cost estimates.
The easement unit cost includes survey, easement acquisiton, engineering fees, condemnation/attorney fees, and ROW agent fees.
3) It is recommended that further on-site evaluation and data collection (e.g., checking manholes for evidence of surcharge, targeted flow monitoring) be conducted before initiating any project based on modeling results.

Time Horizon	Capital Cost
Present Day	$ 27,961,000
5-Year	$ 8,133,000
10-Year	$ 98,938,000
20-Year	$ 131,619,000
Total, All Projects	$ 266,651,000



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6.4 Present Day (Existing Conditions) Projects

Present day projects (those requiring attention under existing conditions) are presented in Figure 6-2, along with projects from the 5-year time horizon. Further description of projects is provided below.

Block House Interceptor (WW.00.01)

The western section of the Block House Interceptor, spanning from Leander High School to Highway 183, was predicted to have flooding and excessive surcharging under the existing system model conditions and was in turn recommended as the top priority project in the project recommendations list (Refer to Section 6.8 for more information outlining the methodology in prioritizing projects). Modeling results show that upon upsizing this upstream section, the downstream section of the Block House Interceptor, spanning from Highway 183 to Fall Creek Dr., is then predicted to undergo flooding and surcharging (Figure 6-2). Therefore, both segments of the Block House Interceptor are proposed to be upsized from pipes ranging from 8”-18” in diameter currently up to 21”-24” pipes.

The Block House Interceptor is downstream of several lift stations (including Lift Station 13) and approximately 9,000 feet of total force main serving the Bluffs subdivision. During model calibration, LS13 generated significant flow peaks when its provided pump curve was used. These peaks led to surcharging in the gravity sewer segment upstream of the Block House Interceptor project extents when utilizing the provided pump curve. However, this issue was resolved when the pump was set to an ideal pump configuration. The ideal pump configuration also allowed for a more consistent dry weather calibration. Therefore, it was believed that these anomalous peaks did not represent reality based on downstream flow monitoring data, and an ideal pump configuration was retained at LS13.

The tributary flows to the lift stations upstream of the Block House Creek interceptors also significantly impact the maximum flow downstream. Further investigation such as flow monitoring and analysis of lift station performance during wet weather events is recommended for the Block House Interceptor. Flow monitoring for the Block House Interceptor is recommended directly downstream of Lift Station 13, west of Lakeline Blvd, to confirm flow conditions created by the lift stations. Further investigation should confirm design flows and relief sewer sizing.

Mason Creek Interceptor (WW.00.02)

The Mason Creek Interceptor was predicted to experience surcharging and minimal flooding during the existing system model. The stretch of pipe that is proposed to be improved is approximately 8,200 ft in length and ranges from the intersection of Sonny Dr. and Lakeline Blvd. flowing northeast until it approaches West Dr (Figure 6-2). The existing pipe segment has diameters ranging from 12”-18” and is proposed to be upsized to pipe diameters ranging from 15”-24”. Once again, further investigation such as flow monitoring and field checks are recommended before design initiation.

The Block House Creek and Mason Creek Interceptor projects are situated in Flow Meter Basins 13 and 14, respectively. These two basins were shown to have excessive inflow during wet weather. Therefore, it should be noted that peak wet weather flows in these basins could potentially be reduced by I/I mitigation efforts, thus reducing capacity concerns along these interceptors. However, the extent of I/I reduction that is possible is unknown.

6.5 5-year Projects

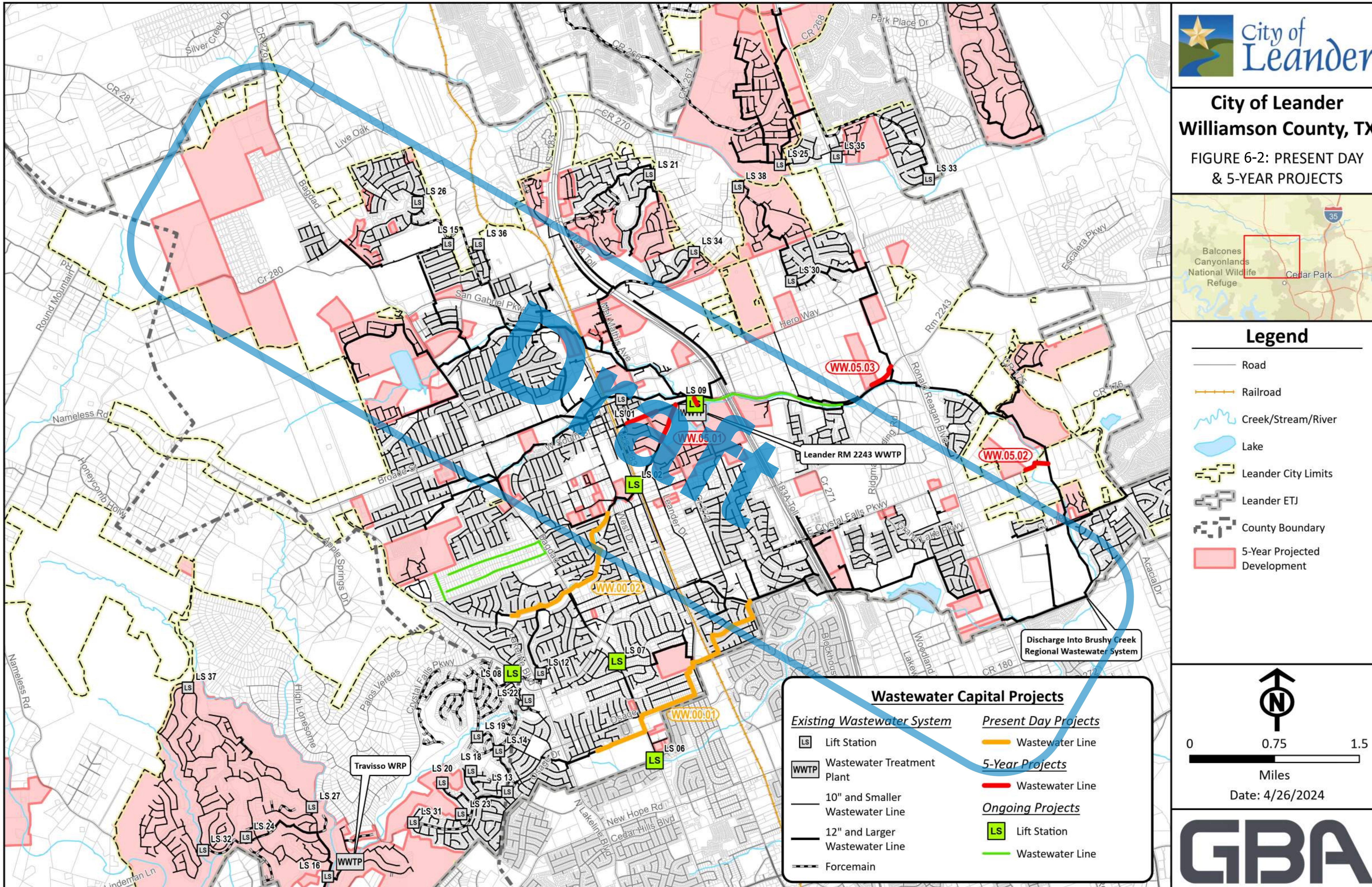
5-year projects (those projects requiring attention under 5-year growth conditions) are presented in Figure 6-2, along with projects from the present day time horizon. Further description of projects is provided below.

Horizon Lake Interceptor (WW.05.01)

The Horizon Lake Interceptor project includes three distinct segments of pipe located upstream of the RM2243 WWTP (Figure 6-2). Analysis based on the five-year growth model identified these pipes as meeting critical surcharge criteria, while the free flow analysis revealed their undersized capacity for serving 20-year free flow capacities. The total length of pipes selected to be upsized is roughly 1,850 ft and the existing pipe diameters are 12", 15", and 21". It is proposed to upgrade the existing 12" and 15" segments to 18", while the 21" pipe segments are recommended to be upsized to a diameter of 36".

5-year Extension Projects Summary

Two subdivisions are anticipated to undergo development and necessitate wastewater service by the five-year time horizon, projected for 2027. The Lonestar Landing subdivision is planned for the southeast area of Leander, with a proposed 8" line intended to connect the subdivision to the Brushy Creek Interceptor (WW.05.02). Similarly, the M Ranch Townhouses, also situated in southeast Leander, are slated to be served by a proposed 12" gravity line extension running on the north side of RM2243 to connect to the Brushy Creek Interceptor (WW.05.03, Figure 6-2). For further information on 5-year extension projects, refer to Table 6-4.



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6.6 10-year Projects

10-year projects (those projects requiring attention under 10-year growth conditions) are presented in Figure 6-3. Further description of key 10-year projects is provided below.

<u>Benbrook Interceptor (WW.10.01)</u>

The Benbrook Interceptor line is a segment of the North Brushy Creek Interceptor that is approximately 8,500 ft in length and is located in northwest Leander, from Bagdad Rd to the east of Highway 183 and the railroad tracks. This project is already identified as a CIP project in Leander's FY2024 CIP as WW.41. This interceptor is predicted to experience flooding and surcharging in the 10-year growth model, due to heavily concentrated growth anticipated in the northwest area of Leander by that time horizon. This region of Leander anticipates significant growth over the next 20 years, with development extending upstream of the Benbrook Interceptor. A portion of this growth is conservatively estimating that on-site septic facilities (OSSF) will be integrated into the City's service network over the next 20 years. The interceptor currently has 15" and 21" lines, and it is recommended to upsize to a pipe diameter range of 27"-33".

<u>Collaborative Way (WW.10.02) and N Bagdad Rd Lift Station (WW.10.11)</u>

In the northwest area of Leander, there are anticipated 10- and 20-year growth areas, located west of N Bagdad Rd. The proposed N Bagdad Lift Station is intended to accommodate this future growth and convey flow through a force main running south along Bagdad Road to connect to the existing line flowing east along Collaborative Way (Figure 6-3). The section of existing gravity pipe extending to Lift Station 15 along Collaborative Way is proposed to be upsized from 8-12" pipes to 18" pipe. The true timing and necessity of these projects will heavily depend on actual growth to the north and west of Collaborative Way and N Bagdad Rd.

<u>San Gabriel West Regional Lift Station Ph 1 (WW.10.14) and Decommissioning of Lift Station #15, #26, #36 (WW.10.15)</u>

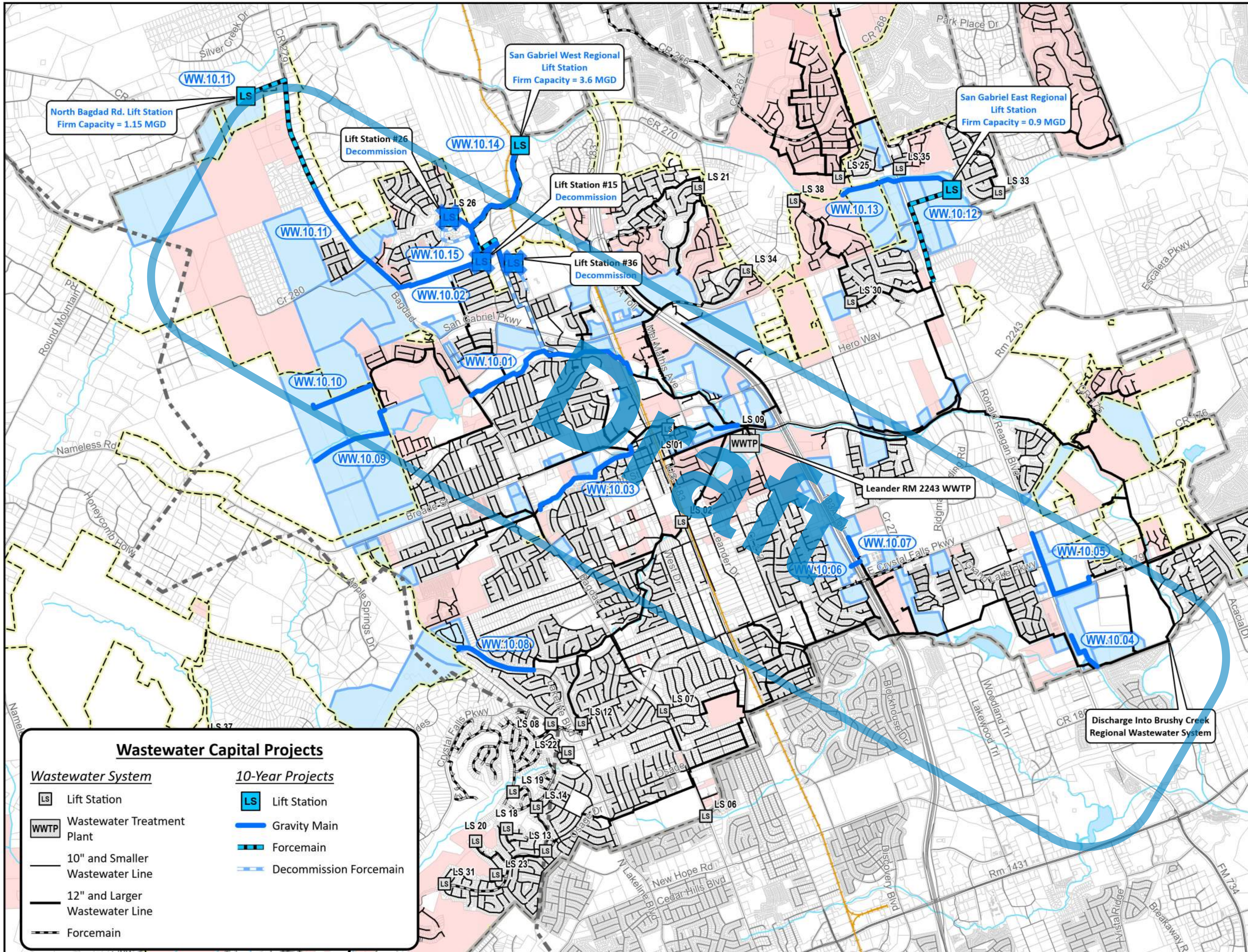
Lift stations #15, #26, and #36 are recommended for decommissioning, and their flow redirected by gravity to the proposed San Gabriel West Regional Lift Station. This regional lift station is designed to accommodate the anticipated growth over both 10 and 20 years, with an estimated maximum two-hour peak flow of 1.15 MGD. An 8-inch force main would be necessary to meet the force main velocity requirements outlined by the Texas Commission on Environmental Quality (TCEQ). Twenty-year growth is also expected to be served by the LS and would therefore require pump upgrades and force-main upsizing in the 20-yr time horizon.

<u>South Brushy Creek Interceptor (WW.10.03)</u>

The South Brushy Creek Interceptor is located in central Leander and flows to the east along the Brushy Creek south of Hero Way and north of South St. A segment of the South Brushy Creek Interceptor met critical surcharge criteria in the 10-year design storm results and worsened to flooding by the 20-yr design storm. The segment of pipe proposed to be upsized to 15"-24" pipe begins to the east of Bagdad Rd and ends when it reaches Broade St.

10-year Extension Projects Summary

Growth is expected throughout Leander by the 10-year time horizon, and several 8" gravity lines are proposed to tie future growth into the system (WW.10.04 -WW.10.07). A 12" gravity extension is proposed to service new growth in southwest Leander near the Mason Hills neighborhood (WW.10.08). Due to the heavily concentrated growth anticipated in northwest Leander, 18"-21" gravity extensions were proposed to cater to that growth (WW.10.09 & WW.10.10). In northeast Leander, the San Gabriel East Regional Lift Station and the associated gravity line and force main are proposed to serve 10-year growth (WW.10.12 & WW.10.13). For further information on extension projects, refer to Table 6-4.



City of Leander

City of Leander
Williamson County, TX

FIGURE 6-3:
10-YEAR PROJECTS

Balcones Canyonlands National Wildlife Refuge
Cedar Park

Legend

- Road
- Railroad
- Creek/Stream/River
- Lake
- Leander City Limits
- Leander ETJ
- County Boundary
- 5-Year Projected Development
- 10-Year Projected Development

N

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6.7 20-year Projects

20-year projects (those projects requiring attention under 20-year growth conditions) are presented in Figure 6-4. Further description of these projects is provided below.

Devine Lake (WW.20.01)

The Devine Lake project proposes upgrading the pipe segment preceding the Benbrook Interceptor from 18 inches to 27 inches in diameter. This stretch of pipe was predicted to undergo flooding and excessive surcharging in the 20-year time horizon (Table 6-3) due to high rates of upstream growth and relatively flat slopes along this section of sewer. It is advised to analyze the actual extent of upstream growth during the design phase to verify project necessity and to confirm that the unmodeled upstream pipes can adequately fulfill capacity requirements.

North Brushy Creek Interceptor (WW.20.02)

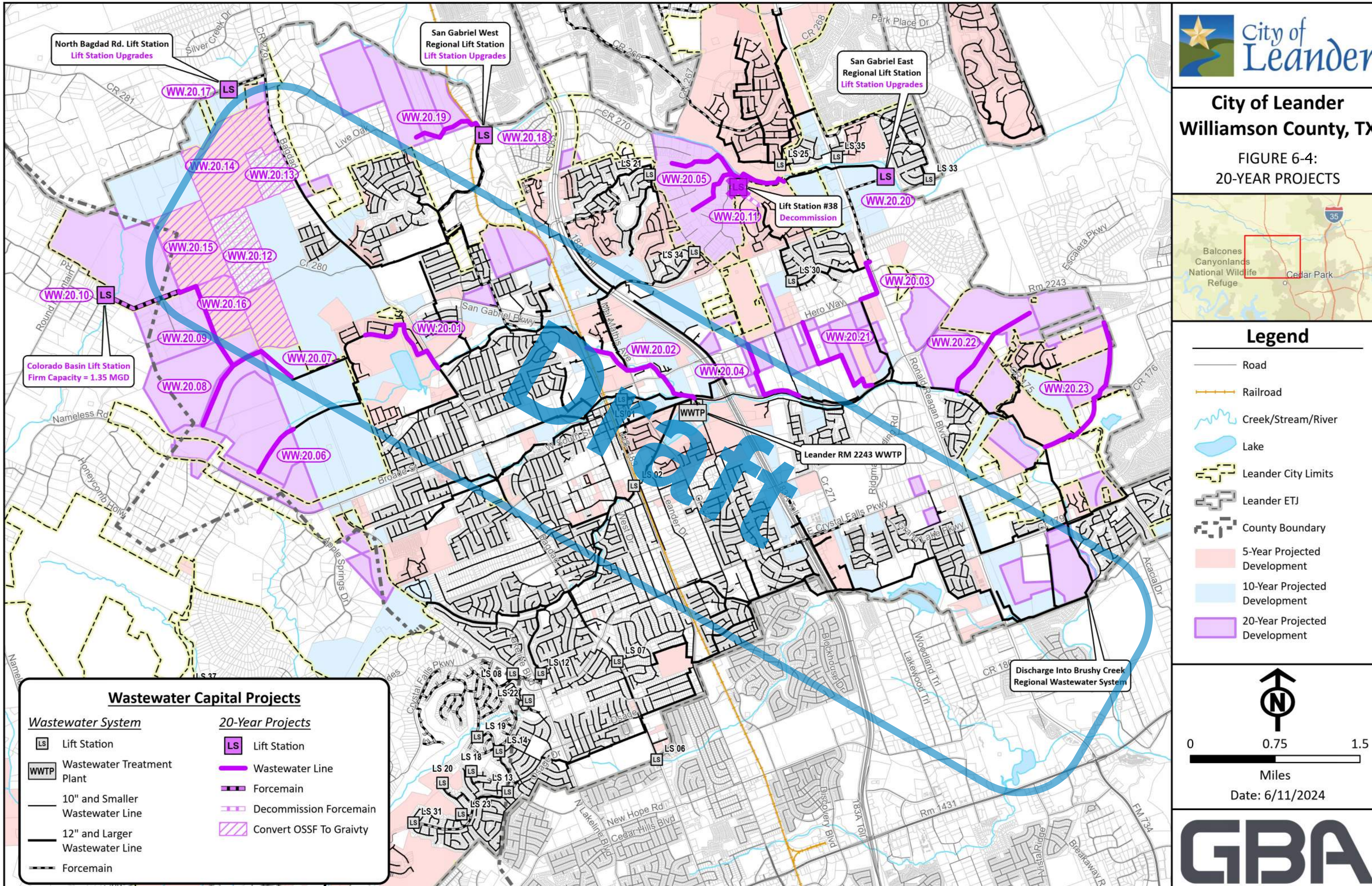
The segment of the North Brushy Creek Interceptor downstream of the Benbrook Interceptor, extending all the way to the RM2243 WWTP, is proposed to be upsized within the 20-year timeframe. Currently, this 6,000 ft pipe segment has diameters ranging from 21” - 30”, and it is recommended to increase sizes to 33” - 36”. Although this pipe segment was not initially identified as a concern area in the growth model, it has been selected for upgrade due to the existing pipes' inability to handle the anticipated 20-year free flow peaks. This implies that upon completion of the upstream projects such as the Devine Lake, Benbrook Interceptor and other future extension projects in northwest Leander, a greater volume of flow will be directed to the North Brushy Creek Interceptor. It is recommended that targeted flow metering be performed closer to this time horizon to confirm necessity of this project.

North Ronald Reagan (WW.20.03)

Flooding and surcharging in northeast Leander, particularly near the intersection of Ronald Reagan Blvd and Hero Way, resulted during the 20-year growth model run. The N Ronald Reagan project will address these concerns and will span from directly downstream of the proposed San Gabriel East Regional Lift Station force main to the point where the interceptor crosses Hero Way. This 2,500 ft pipe segment currently ranges from 8” to 12” in diameter and is recommended to be upgraded to a diameter of 12” to 15”.

20-year Extension Projects Summary

The 20-year extension projects mainly consist of gravity line extensions to serve future growth in northwest and northeast Leander, where a majority of 20-year growth is anticipated. Refer to Table 6-4 for further description of the 20-year extension projects. In northeast Leander, Lift Station #38 is proposed to be decommissioned to flow by gravity to the proposed San Gabriel East Regional LS (WW.20.13). There are several on-site septic facilities (OSSF) in northwest Leander that are conservatively assumed to be serviced by City sewer by the 20-year time horizon.



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6.8 Relief Project Prioritization

Relief-type projects for existing interceptors were prioritized based on various factors, such as the number of manholes meeting critical surcharge criteria, total flood loss, and the maximum ratio of 20-year free flow capacity to the existing pipe's full flow capacity. Table 6-3 presents these factors for each relief-type project, which were then ranked within each time horizon. Future extension projects were not prioritized in this way because they were not modeled and are heavily driven by development demands. Relief-type projects are more dependent on modeling results and the condition and capacity of existing interceptors. Extension-type projects should proceed as development requires them, while relief-type projects should proceed after modeling and monitoring confirm increasing capacity risks in the existing sewers.

Table 6-3: Relief Project Prioritization

Project ID	Project Name	Time Horizon	No. of MHs Exceeding Surcharge Criteria[1]	Total Flood Volume[1] (MG)	Max. Ratio 20-yr Free Flow Peak: Exist. Capacity	Relief Project Priority Rank
WW.00.01	Block House Interceptor Ph. 1	Present Day	38	0.44	9.45	1
WW.00.02	Mason Creek Interceptor	Present Day	14	0.01	2.01	2
WW.05.01	Horizon Lake Interceptor	5-yr	3	0	3.27	3
WW.10.01	Benbrook Interceptor	10-yr	20	0.24	4.77	4
WW.10.02	Collaborative Way	10-yr	20	0.12	4.23	5
WW.10.03	South Brushy Creek Interceptor	10-yr	7	0	1.97	6
WW.20.01	Devine Lake	20-yr	33	1.36	9.55	7
WW.20.02	North Brushy Creek Interceptor	20-yr	N/A	N/A	2.37	8
WW.20.03	North Ronald Reagan	20-yr	5	0.01	1.23	9

1) Data presented is derived from the model corresponding to the designated time horizon for each project.

6.9 Extension Projects Summary

Table 6-4 provides further description of all extension-type projects conceptualized for the plan. Extension-type projects are those that extend City sewer service out beyond current service limits with new interceptors, lift stations, and force main. The projects are primarily development and growth-driven.

Table 6-4: Extension Projects Summary

Project Name	Project ID	Time Horizon	Project Description
Lonestar Landing WW Improvements	WW.05.02	5-year	This project provides wastewater service to the Lonestar Landing subdivision which includes an 8" Gravity Main extension that connects to the Brushy Creek Interceptor.
RM 2243 to Hero Way WW Improvements - East Segment Ph. 1	WW.05.03	5-year	This project provides wastewater service to the M Ranch Townhouses along with future developments. It will include a 12" Gravity Main extension on the north ROW side of RM 2243 that will connect to the Brushy Creek Interceptor.
South Ronald Reagan Blvd. WW Improvements	WW.10.04	10-year	This project provides wastewater service to Multi-Use Corridor developments. It will include an 8" Gravity Main extension on the east ROW side of Ronald Reagan Blvd. that will connect to the Block House Creek Interceptor.
Journey Pkwy and Ronald Reagan Blvd WW Improvements	WW.10.05	10-year	This project includes a 8" Gravity Main extension on the north ROW side of Journey Pkwy. and along the east ROW side of Ronald Reagan Blvd that will connect to the Catalina Ranch subdivision wastewater system.
US 183-A WW Improvements Ph. 1	WW.10.06	10-year	This project provides wastewater service to Multi-Use Corridor developments. It will include an 8" Gravity Main extension that will be bored under US 183-A.
US 183-A WW Improvements Ph. 2	WW.10.07	10-year	This project provides wastewater service to Multi-Use Corridor developments. It will include an 8" Gravity Main extension along the east ROW side of US 183-A.
Linda Hall WW Improvements	WW.10.08	10-year	This project provides wastewater service to the Linda Hall subdivision in western Leander which includes a 12" Gravity Main connecting to the Mason Creek Interceptor.
North Fork Brushy Creek WW Interceptor Improvements Ph. 1	WW.10.09	10-year	This project provides wastewater service to Neighborhood Residential developments in the western part of town. This interceptor includes a 18" Gravity Main that will connect to the North Brushy Creek Wastewater Interceptor.
North Brushy Creek WW Interceptor Improvements	WW.10.10	10-year	This project provides wastewater service to Neighborhood Residential developments in the western part of town. This interceptor includes a 18" Gravity Main that will connect to the North Brushy Creek Wastewater Interceptor.
North Bagdad Rd. Lift Station Ph. 1	WW.10.11	10-year	This project includes a 1.15 MGD Lift Station, a 10" Force main and 18" Gravity Main that will serve Neighborhood Residential developments on the north side of town along with future septic system slated to be converted to conventional wastewater systems in the future. The new Lift Station and Force main will pump to the proposed Gravity Main. Pumps will need to be replaced to accommodate 1.44 MGD by the 20-Year Time Horizon.
San Gabriel East Regional Lift Station	WW.10.12	10-year	This project includes a 0.9 MGD Lift Station and an 8" Force main that will serve Neighborhood Center and Residential developments on the north side of town. The new Lift Station and Force main will pump to the Brushy Creek Interceptor. Pumps will need to be replaced to accommodate 2.3 MGD by the 20-Year Time Horizon.
San Gabriel River WW Interceptor Improvements Ph. 1	WW.10.13	10-year	This project provides wastewater service to Neighborhood Center and Residential developments in the northern part of town. This interceptor includes a 15" and 18" Gravity Main that will connect to the proposed Ronald Reagan Blvd. Lift Station.
San Gabriel West Regional Lift Station Ph. 1	WW.10.14	10-year	This project includes a 1.15 MGD Lift Station and an 8" Force main that will serve Neighborhood Residential developments on the north side of town. The new Lift station and Force main will pump to the North Brushy Creek Wastewater Interceptor.
Lift Station #15, #26, and #36 Decommission	WW.10.15	10-year	This project includes the decommissioning of Lift Station #15, #26, #36, and 8", 12", and 21" Gravity Mains connecting to the proposed San Gabriel Creek West Lift Station.
RM 2243 to Hero Way WW Improvements - West Segment	WW.20.04	20-year	This project provides wastewater service to Employment Center developments north of RM 2243 up to Hero Way. It will include a 8"-12" Gravity Main extension on the north ROW side of RM 2243 that will connect to the Brushy Creek Interceptor.
San Gabriel River WW Interceptor Improvements Ph. 2	WW.20.05	20-year	This project provides wastewater service to Neighborhood Residential developments in the northern part of town. This interceptor includes a 15" Gravity Main that will connect to the San Gabriel River Wastewater Interceptor, along with two branches to serve residential areas west of Palmera Ridge.
North Fork Brushy Creek WW Interceptor Improvements Ph. 2	WW.20.06	20-year	This project provides wastewater service to Multi-Use Corridor and Neighborhood Residential developments in the western part of town. This interceptor includes a 12" and 15" Gravity Main that will connect to the North Fork Brushy Creek Wastewater Interceptor.
San Gabriel Pkwy. WW Interceptor Ph. 1	WW.20.07	20-year	This project provides wastewater service to Multi-Use Corridor and Neighborhood Center developments in the western part of town. This interceptor includes a 18" Gravity Main that will connect to the North Brushy Creek Wastewater Interceptor.
San Gabriel Pkwy. WW Interceptor Ph. 2	WW.20.08	20-year	This project provides wastewater service to Multi-Use Corridor and Neighborhood Center developments in the western part of town. This interceptor includes a 12" Gravity Main that will connect to the San Gabriel Pkwy. Wastewater Interceptor Phase 1.
Lakeline Blvd. WW Improvements	WW.20.09	20-year	This project provides wastewater service to Neighborhood Residential developments in the western part of town. This interceptor includes a 15" Gravity Main that will connect to the San Gabriel Pkwy Wastewater Interceptor Phase 1.
Colorado Basin Lift Station	WW.20.10	20-year	This project includes a 1.35 MGD Lift Station and a 10" Force main that will serve Neighborhood Residential developments on the north side of town. The new Lift station and Force main will pump to the proposed Lakeline Blvd. Wastewater Interceptor.
Lift Station #38 Decommission	WW.20.11	20-year	This project includes the decommissioning of Lift Station #38 and a 12" Gravity Main connecting to the proposed San Gabriel Creek Wastewater Interceptor.
Greatwood WW Collection System Improvements	WW.20.12	20-year	Design and installation of wastewater gravity sewer lines, manholes, and stub-outs to each lot within the Greatwood subdivision.
Whitt Ranch Collection System Improvements	WW.20.13	20-year	Design and installation of wastewater gravity sewer lines, manholes, and stub-outs to each lot within the Whitt Ranch subdivision.
Sullivan Tract Collection System Improvements	WW.20.14	20-year	Design and installation of wastewater gravity sewer lines, manholes, and stub-outs to each lot within the Sullivan Tract subdivision.
Leander Estates Collection System Improvements	WW.20.15	20-year	Design and installation of wastewater gravity sewer lines, manholes, and stub-outs to each lot within the Leander Estates subdivision.
Hilltop Ranch Collection System Improvements	WW.20.16	20-year	Design and installation of wastewater gravity sewer lines, manholes, and stub-outs to each lot within the Hilltop Ranch subdivision.
North Bagdad Rd. Lift Station Ph. 2	WW.20.17	20-year	This project includes two replacements pumps to meet the 20-year capacity of 1.44 MGD.
San Gabriel West Regional Lift Station Ph. 2	WW.20.18	20-year	This project includes lift station upgrades to accommodate 4.68 MGD.
San Gabriel West WW Improvements	WW.20.19	20-year	This project provides wastewater service to Neighborhood Residential developments in the northern part of town. This interceptor includes a 8" and 18" Gravity Main that will connect to the San Gabriel West Regional Lift Station.
San Gabriel East Regional Lift Station Ph. 2	WW.20.20	20-year	This project includes lift station upgrades and 10" Force main to accommodate 2.30 MGD.
RM 2243 to Hero Way WW Improvements - East Segment Ph. 2	WW.20.21	20-year	This project provides wastewater service to Employment Center developments north of RM 2243 up to Hero Way. It will include a 8"-12" Gravity Main extension on the north ROW side of RM 2243 that will connect to the RM 2243 to Hero Way WW Improvements - East Segment Phase 1.
CR 175 and RM 2243 WW Improvements	WW.20.22	20-year	This project provides wastewater service to neighborhood residential, employment center, and activity center developments north of Brushy Creek in the vicinity of the intersection of County Road 175 and RM 2243. It will include a 8"-12" Gravity Main extension north of Brushy Creek that will connect to the existing Brushy Creek interceptor.
CR 175 and CR 176 WW Improvements	WW.20.23	20-year	This project provides wastewater service to neighborhood residential and employment center developments north of Brushy Creek in the vicinity of the intersection of County Road 175 and County Road 176. It will include a 8"-12" Gravity Main extension north of Brushy Creek that will connect to the existing Brushy Creek interceptor.

6.10 Conceptual Plan for the Northwest Region of Leander

A conceptual plan was developed for the northwest region of Leander due to significant growth being anticipated for this region. The varied terrain and topography of this region necessitates the construction of several lift stations and interceptors to facilitate City wastewater service.

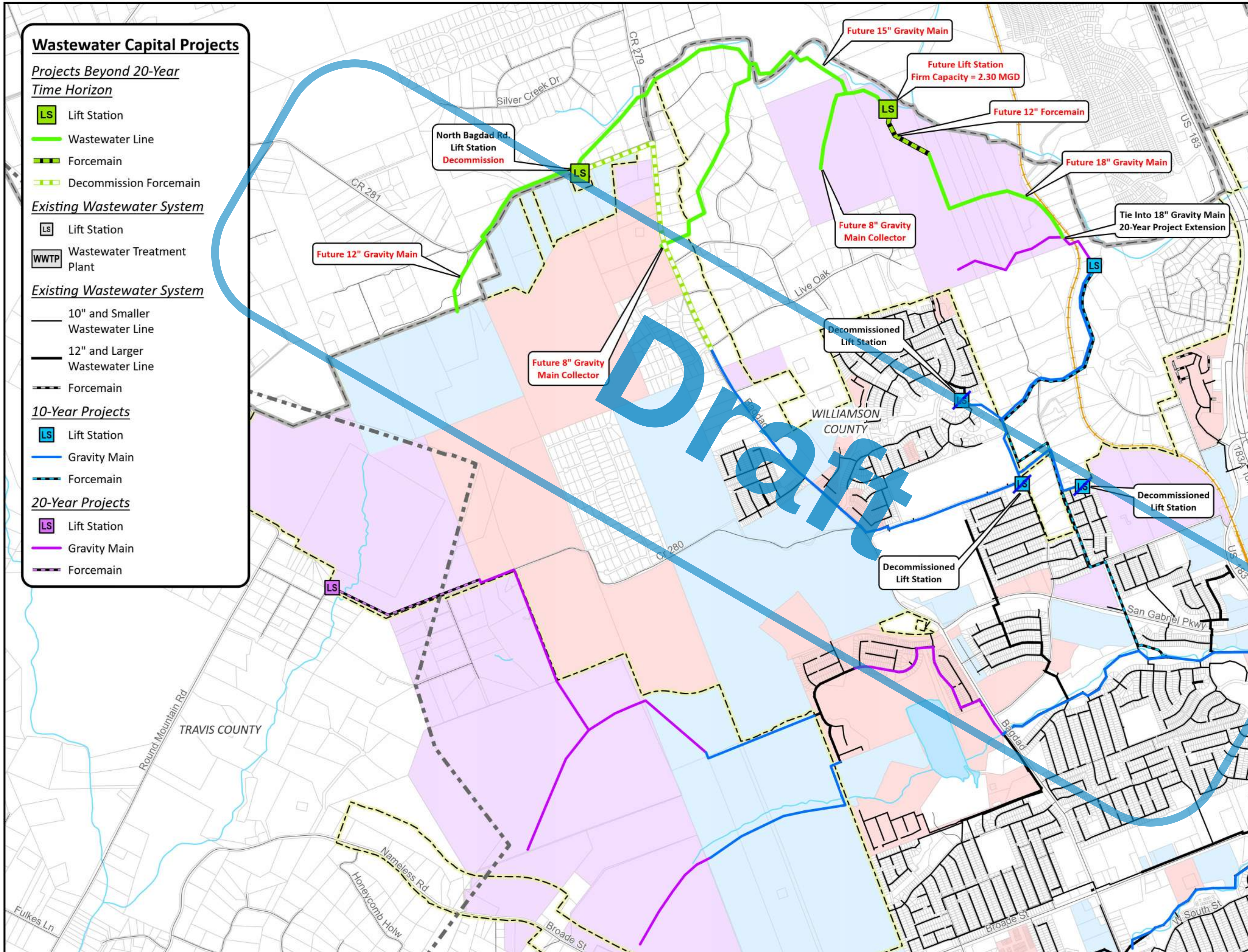
The conceptual plan is summarized in Figure 6-5 below. As part of the conceptual plan, three existing lift stations (LS 15, 26, and 36) are slated for decommissioning, allowing for gravity flow to a new regional lift station, the San Gabriel West Regional Lift Station. The decommissioning of lift stations helps reduce the City's long-term operation and maintenance costs. The timing and necessity of the San Gabriel West Regional LS will depend on several factors, including:

1) *Development interest west of N Bagdad Rd:* If there is increasing development interest in this area, then improvements along Collaborative Way and LS15 become more necessary. If improvements along Collaborative Way are necessary, it may be in the City's best interest to build a regional lift station at that time to avoid costly upgrades at LS15, which could then be decommissioned. But if demands for sewer service west of N Bagdad Rd are lower than projected for this report, then upgrades along Collaborative Way may not be necessary for a long time.
2) *Development interest west of the San Gabriel West Regional LS:* This area north/northeast of the Deerbrooke development (served by LS26) may or may not be served by City sewers, especially if any parcels are developed to be served by OSSF. If those properties are served by OSSF, it may be a long time until they wish to convert to City sewer service.

As part of the conceptual plan, another Regional LS and set of interceptors were conceptualized that would likely be needed beyond the 20-year planning horizon. Although this infrastructure was not included in the 20-year project list provided in this chapter, some capital costs were estimated. This infrastructure is represented by green lines in Figure 6-5 below, and planning-level costs are summarized in Table 6-5. These conceptual projects that fall outside the 20-year planning window offer the City a flexible plan in case growth is more than anticipated in this area and these projects are needed sooner than 20 years from now.

Table 6-5: Northwest Region Conceptual Project Costs Beyond 20-year Planning Window

Element	Pipe Size	Pipe Length (ft)	Lift Station Capacity	Estimated Capital Cost
Gravity Sewer	8"-18"	26,345		$27,751,000
Regional Lift Station	-	-	2.3 MGD	$3,957,000
Force Main	12"	1,150	-	$446,000
Total		27,495		$32,154,000



City of Leander
Williamson County, TX

FIGURE 6-5:
NORTHWEST CONCEPT PLAN

Legend

- Road
- Railroad
- Creek/Stream/River
- Lake
- Leander City Limits
- Leander ETJ
- County Boundary
- 5-Year Projected Development
- 10-Year Projected Development
- 20-Year Projected Development

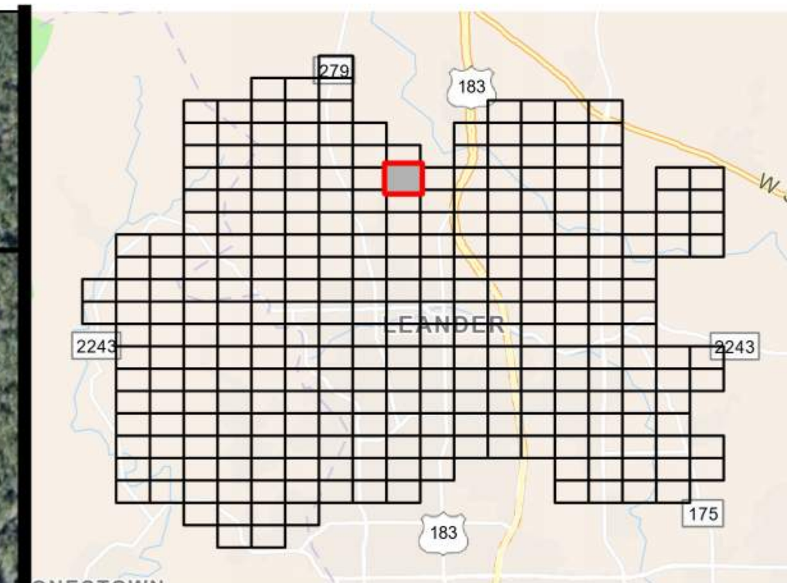
N
0 0.2 0.4 0.8
Miles

Date: 5/16/2024

GBA

G:\15393.01\GIS\LeanderWWMP_ReportFigures.aprx

Appendix A: Manhole Survey Summary Maps



LEANDER MANHOLE SURVEY STATUS MAP
GRID NO.: F-12

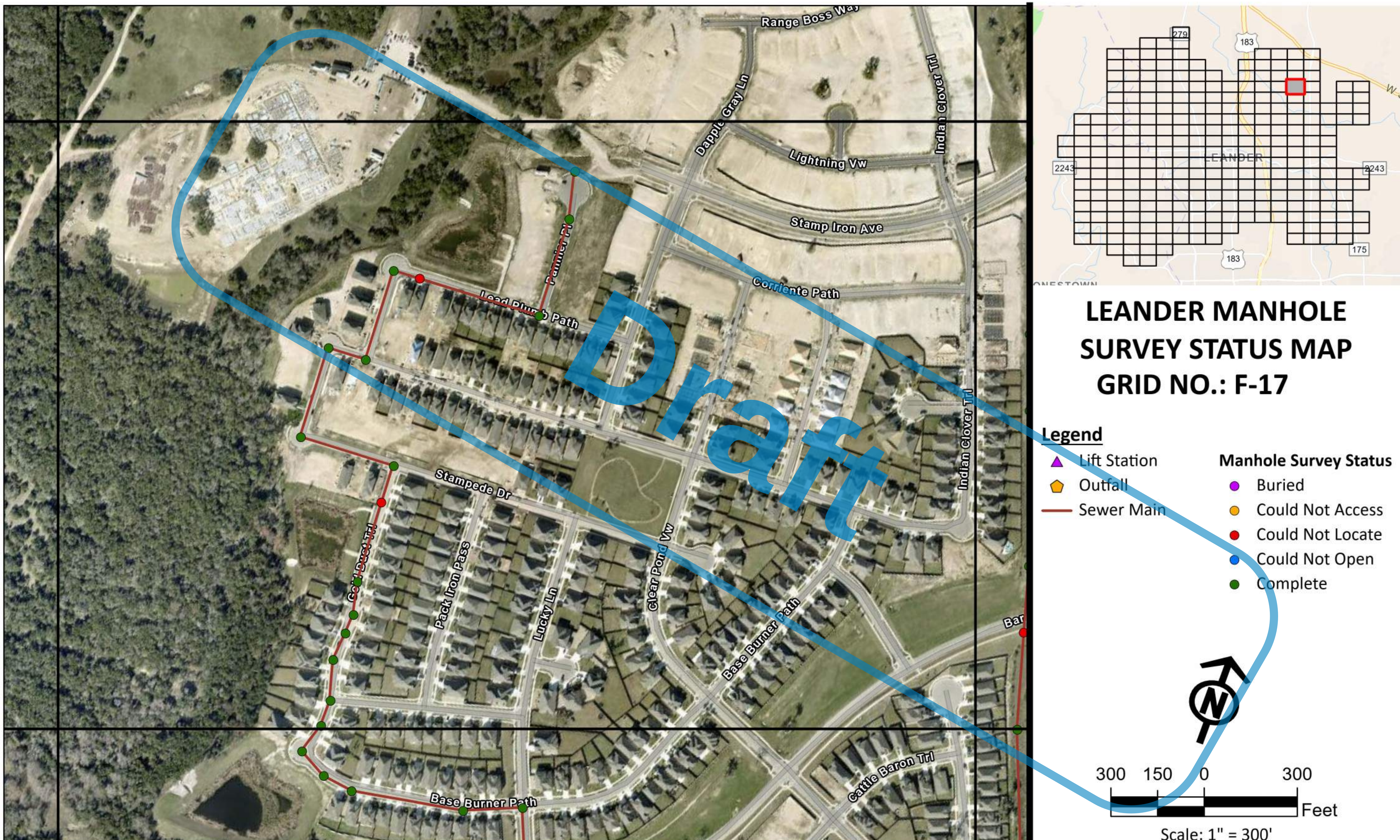
Legend

Lift Station
Outfall
Sewer Main

Manhole Survey Status

Buried
Could Not Access
Could Not Locate
Could Not Open
Complete

300 150 0 300
Feet
Scale: 1" = 300'



LEANDER MANHOLE SURVEY STATUS MAP GRID NO.: F-17

Legend

- Lift Station
- Outfall
- Sewer Main

Manhole Survey Status

- Buried
- Could Not Access
- Could Not Locate
- Could Not Open
- Complete

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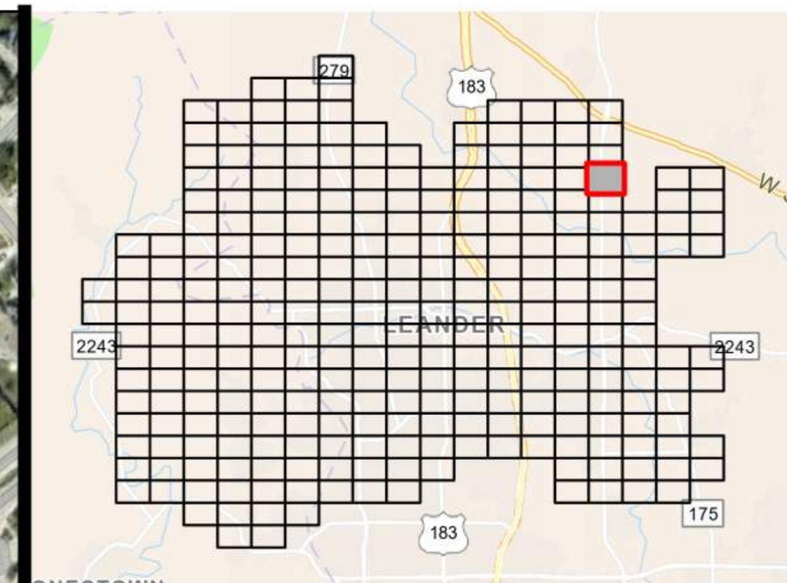
Scale: 1" = 300'



LEANDER MANHOLE SURVEY STATUS MAP
GRID NO.: F-18

Legend

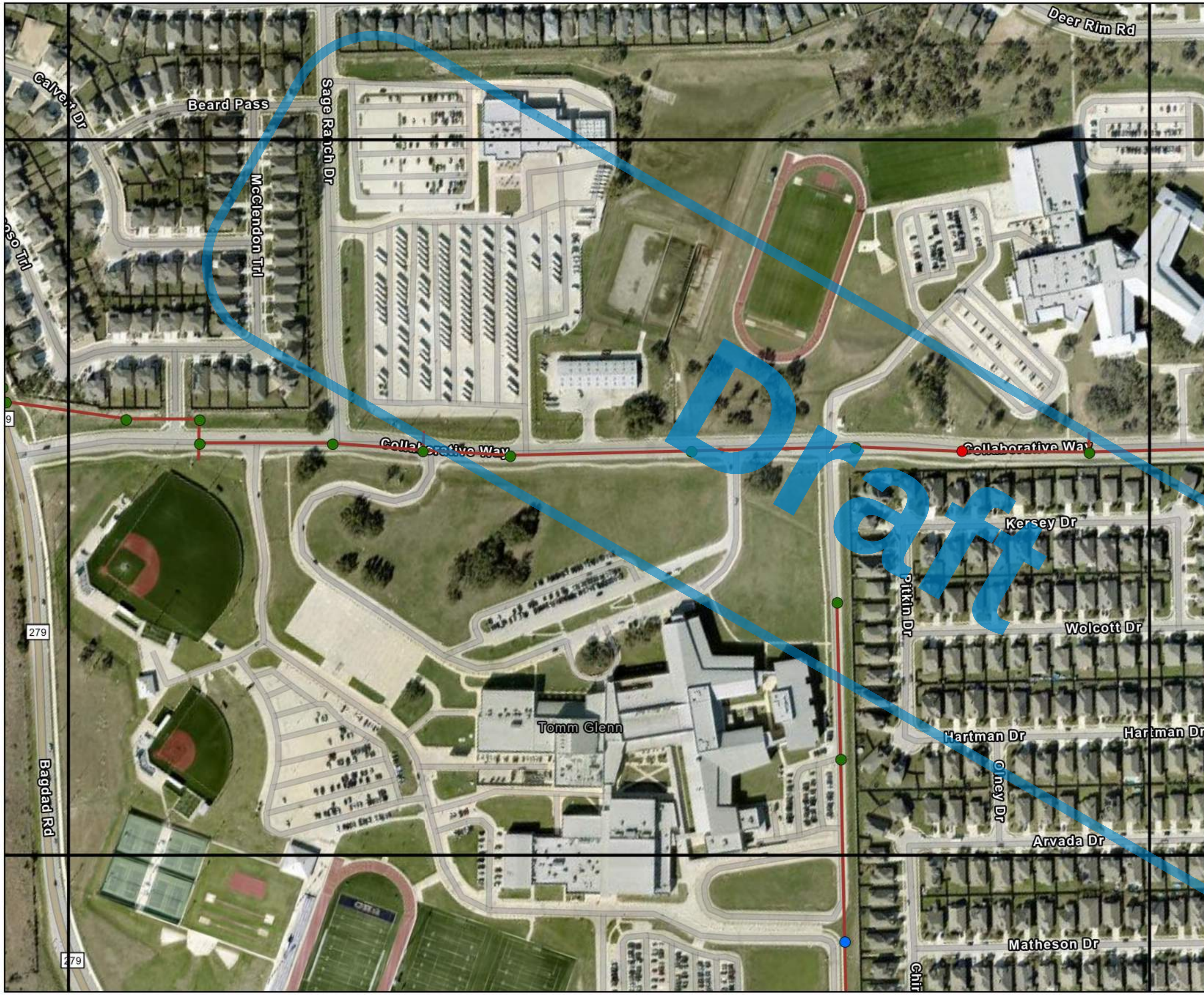
- Lift Station
- Outfall
- Sewer Main

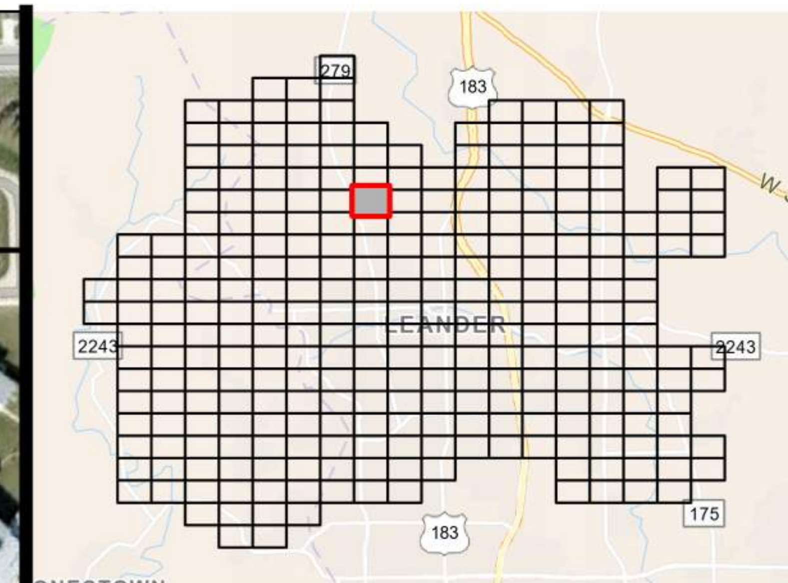
Manhole Survey Status

- Buried
- Could Not Access
- Could Not Locate
- Could Not Open
- Complete

300 150 0 300 Feet

Scale: 1" = 300'





LEANDER MANHOLE SURVEY STATUS MAP GRID NO.: G-11

Legend

- Lift Station
- Outfall
- Sewer Main

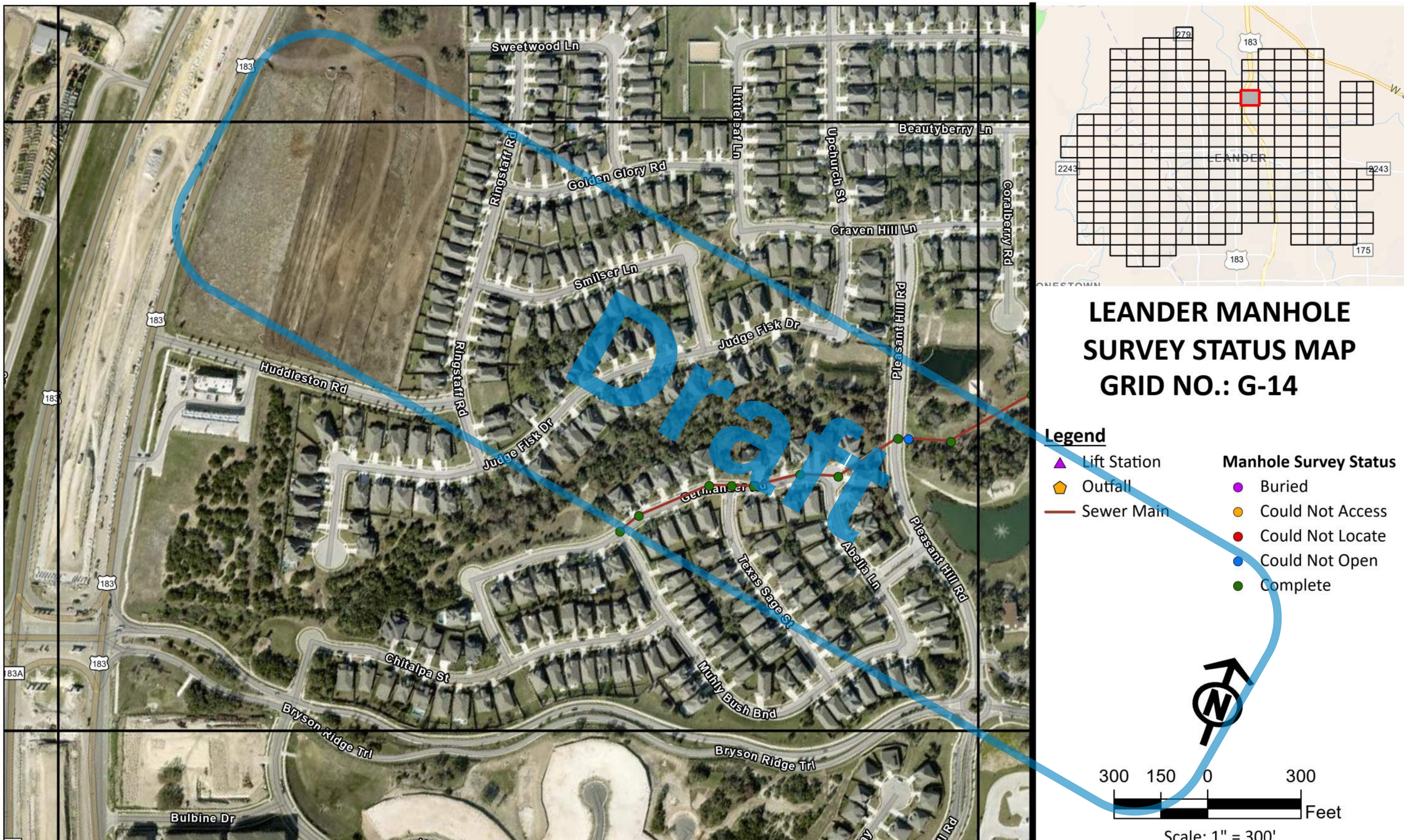
Manhole Survey Status

- Buried
- Could Not Access
- Could Not Locate
- Could Not Open
- Complete

300 150 0 300
Feet

Scale: 1" = 300'

LEANDER MANHOLE SURVEY STATUS MAP
GRID NO.: G-14



Legend

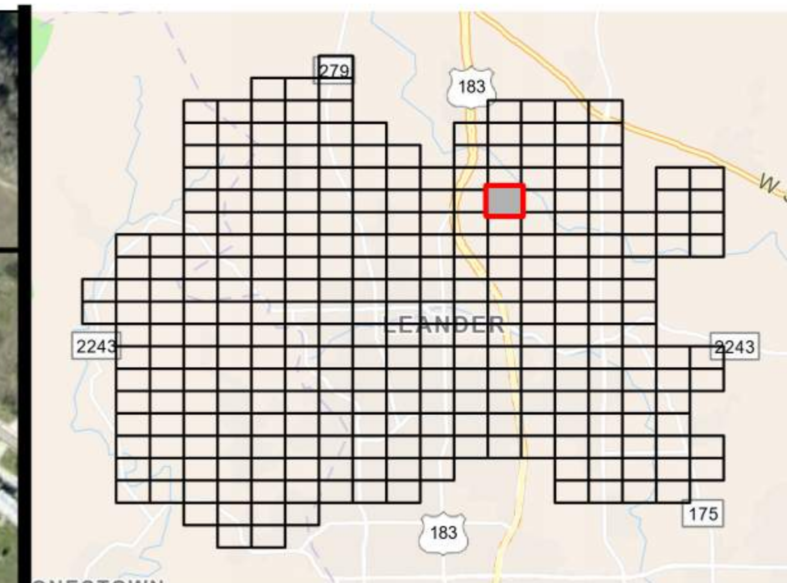
Lift Station
Outfall
Sewer Main

Manhole Survey Status

Buried
Could Not Access
Could Not Locate
Could Not Open
Complete

300 150 0 300 Feet

Scale: 1" = 300'



LEANDER MANHOLE SURVEY STATUS MAP
GRID NO.: G-15

Legend

Lift Station
Outfall
Sewer Main

Manhole Survey Status

Buried
Could Not Access
Could Not Locate
Could Not Open
Complete

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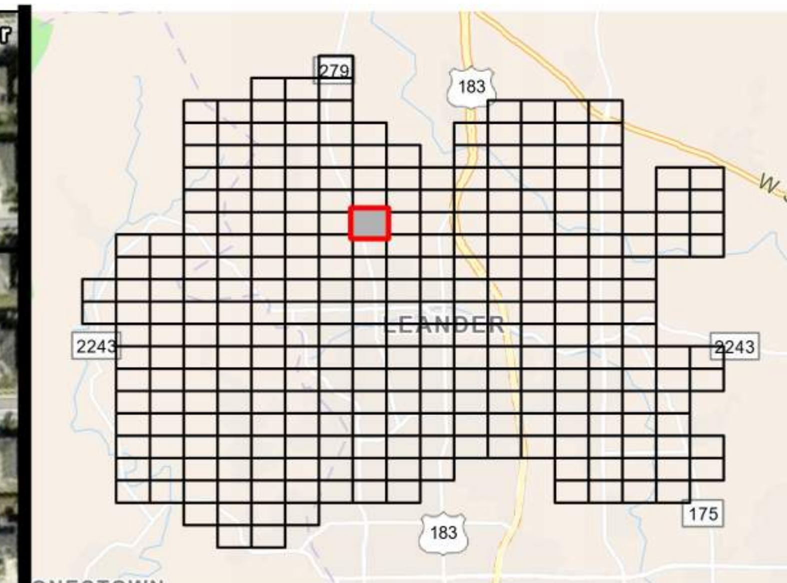
Scale: 1" = 300'



LEANDER MANHOLE SURVEY STATUS MAP
GRID NO.: H-11

Legend

- Lift Station
- Outfall
- Sewer Main

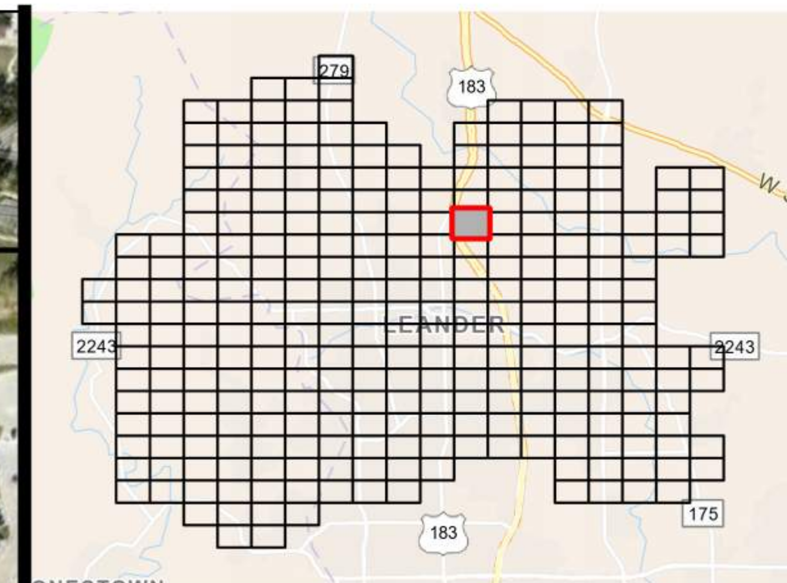
Manhole Survey Status

- Buried
- Could Not Access
- Could Not Locate
- Could Not Open
- Complete

N

300 150 0 300 Feet

Scale: 1" = 300'



LEANDER MANHOLE SURVEY STATUS MAP GRID NO.: H-14

Legend

Lift Station
Outfall
Sewer Main

Manhole Survey Status

Buried
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Could Not Locate
Could Not Open
Complete

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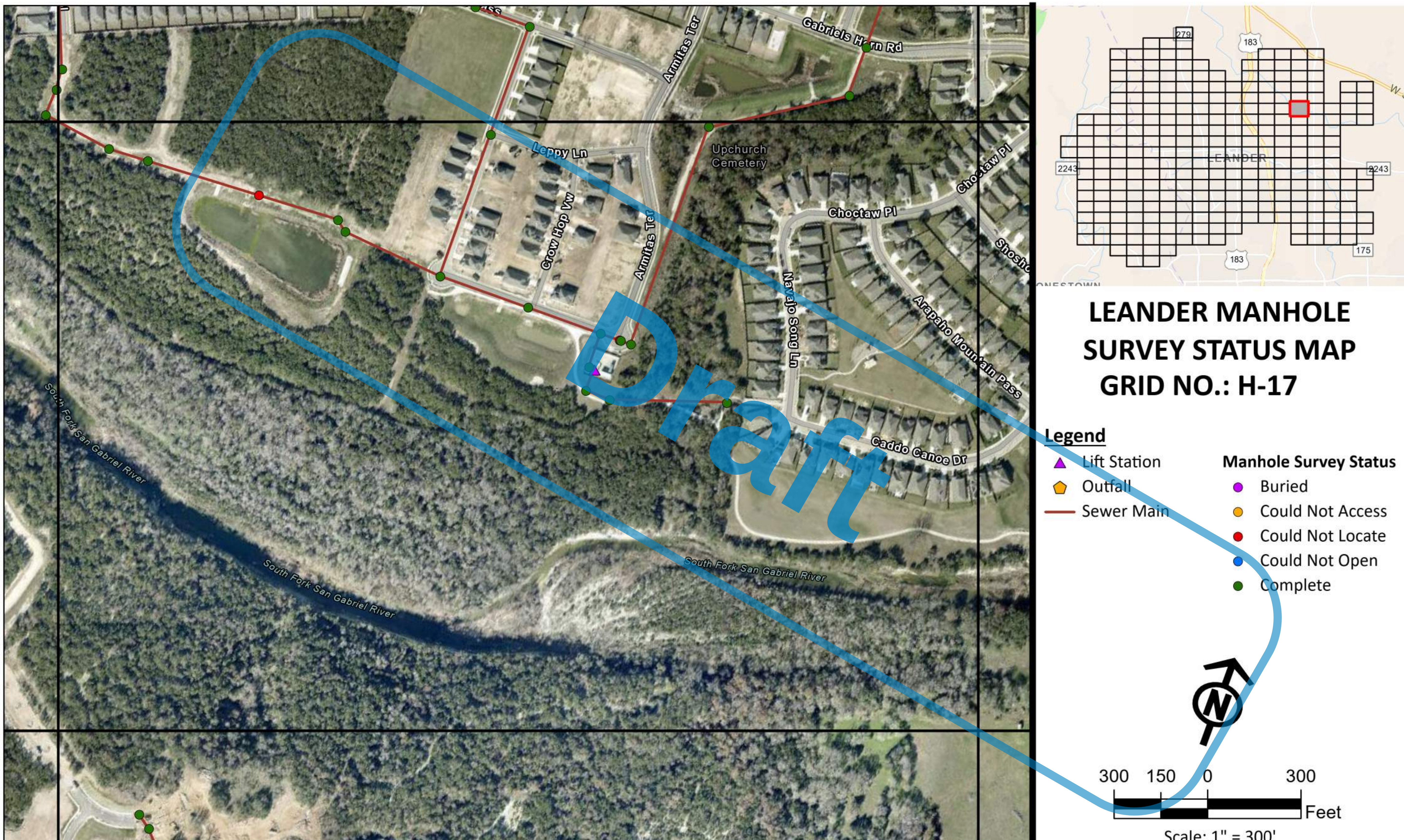
Scale: 1" = 300'



LEANDER MANHOLE SURVEY STATUS MAP
GRID NO.: H-17

Legend

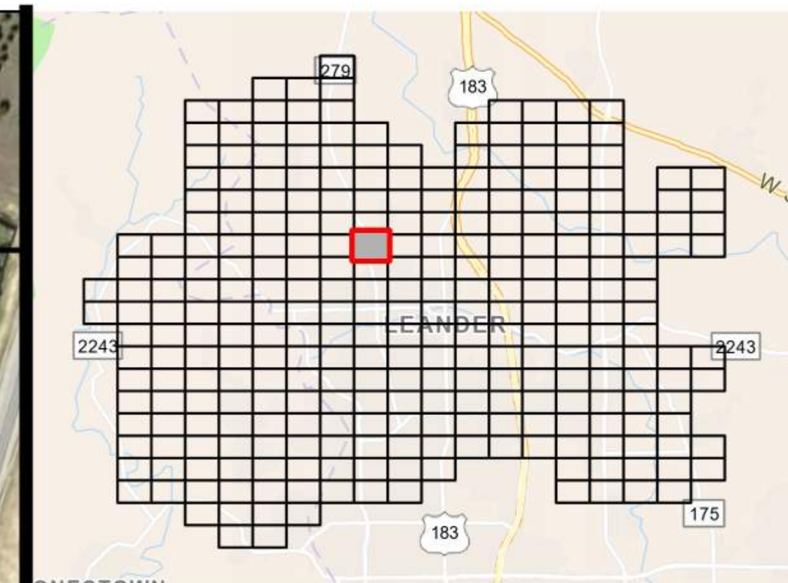
- Lift Station
- Outfall
- Sewer Main

Manhole Survey Status

- Buried
- Could Not Access
- Could Not Locate
- Could Not Open
- Complete

300 150 0 300 Feet

Scale: 1" = 300'



LEANDER MANHOLE SURVEY STATUS MAP
GRID NO.: I-11

Legend

- Lift Station
- Outfall
- Sewer Main

Manhole Survey Status

- Buried
- Could Not Access
- Could Not Locate
- Could Not Open
- Complete

N

300 150 0 300 Feet

Scale: 1" = 300'

LEANDER MANHOLE SURVEY STATUS MAP
GRID NO.: I-12

Legend

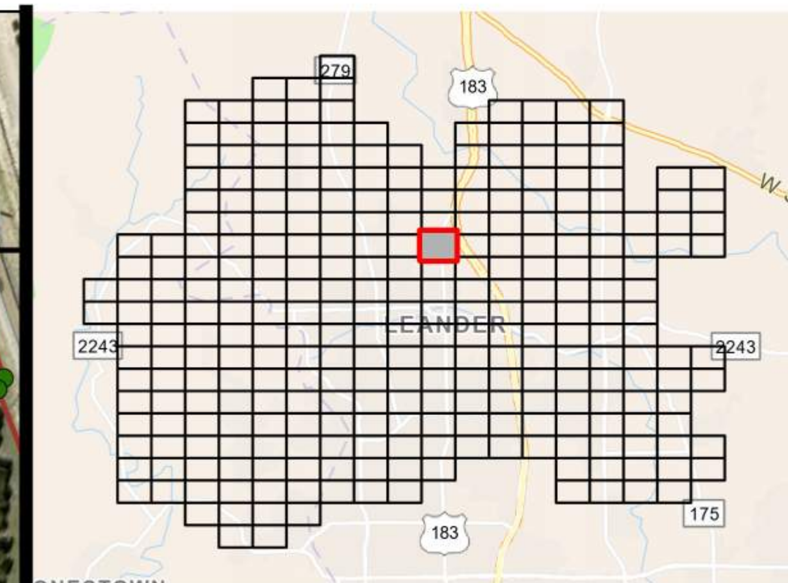
- Lift Station
- Outfall
- Sewer Main

Manhole Survey Status

- Buried
- Could Not Access
- Could Not Locate
- Could Not Open
- Complete

300 150 0 300 Feet

Scale: 1" = 300'



LEANDER MANHOLE SURVEY STATUS MAP
GRID NO.: I-13

Legend

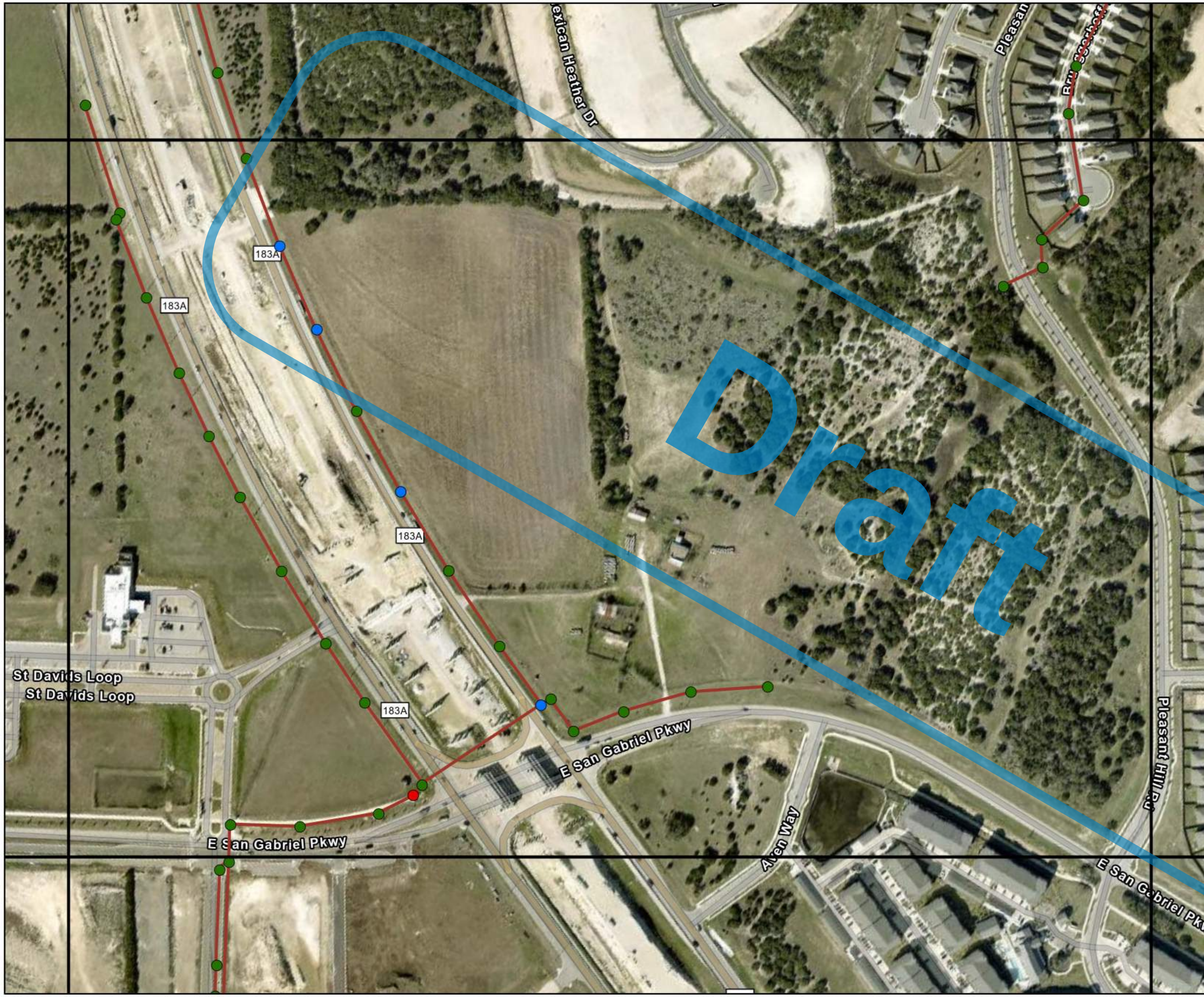
- Lift Station
- Outfall
- Sewer Main

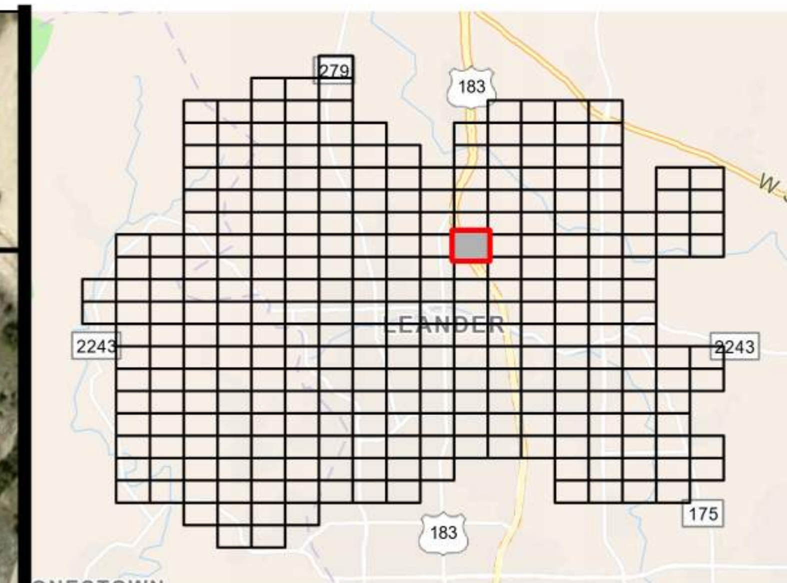
Manhole Survey Status

- Buried
- Could Not Access
- Could Not Locate
- Could Not Open
- Complete

300 150 0 300 Feet

Scale: 1" = 300'





LEANDER MANHOLE SURVEY STATUS MAP
GRID NO.: I-14

Legend

Lift Station
Outfall
Sewer Main

Manhole Survey Status

Buried
Could Not Access
Could Not Locate
Could Not Open
Complete

N

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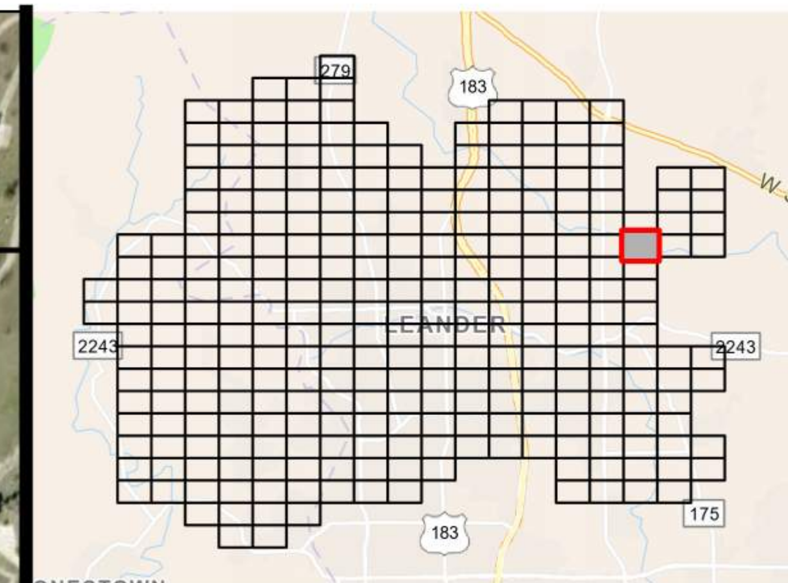
Feet

Scale: 1" = 300'



LEANDER MANHOLE SURVEY STATUS MAP
GRID NO.: I-19

Legend

- Lift Station
- Outfall
- Sewer Main

Manhole Survey Status

- Buried
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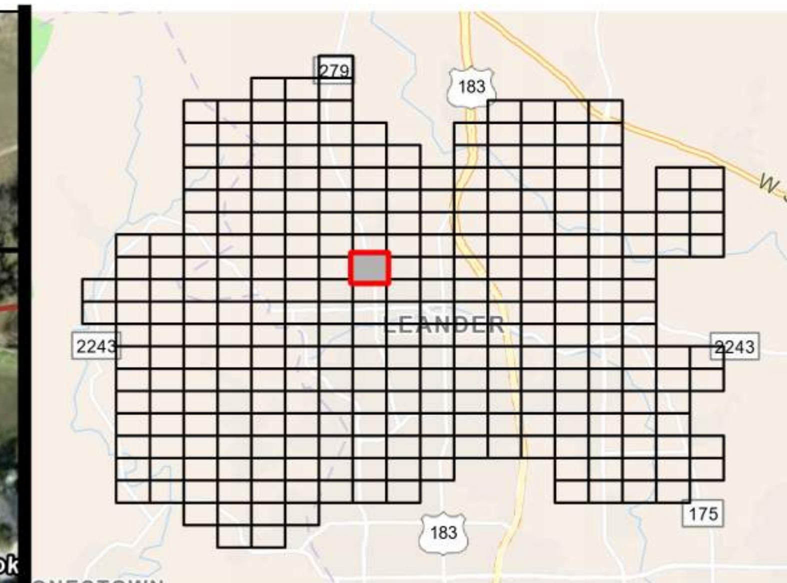
- Could Not Locate
- Could Not Open
- Complete

300 150 0 300 Feet

Scale: 1" = 300'



LEANDER MANHOLE SURVEY STATUS MAP
GRID NO.: J-11

Legend

Lift Station
Outfall
Sewer Main

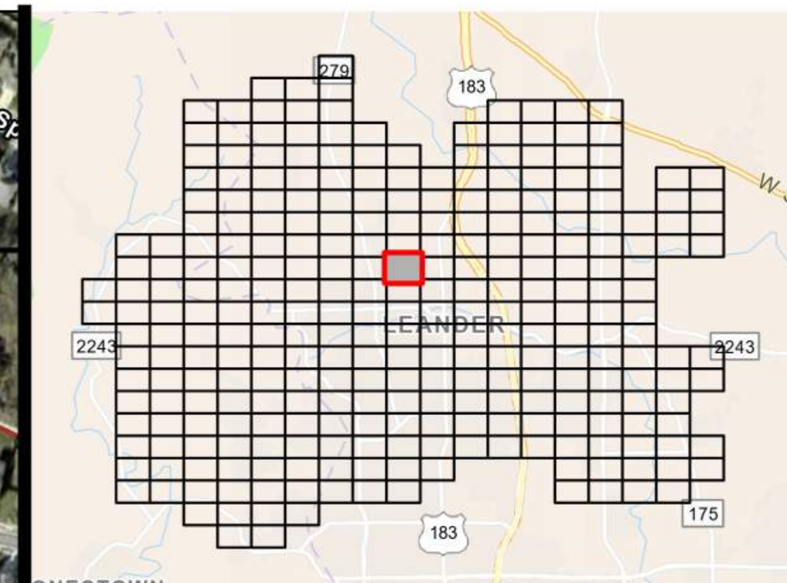
Manhole Survey Status

Buried
Could Not Access
Could Not Locate
Could Not Open
Complete

N

300 150 0 300 Feet

Scale: 1" = 300'



LEANDER MANHOLE SURVEY STATUS MAP

GRID NO.: J-12

Legend

- Lift Station
- Outfall
- Sewer Main

Manhole Survey Status

- Buried
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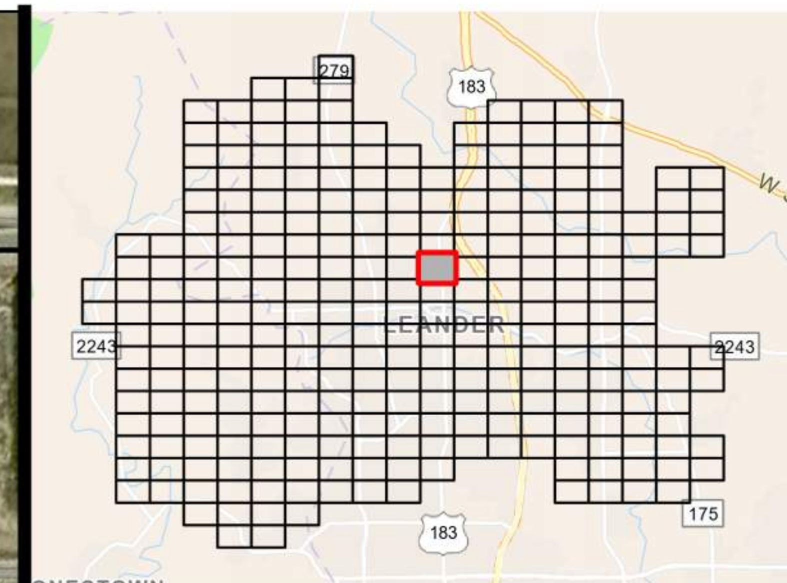
- Could Not Locate
- Could Not Open
- Complete

300 150 0 300

Feet

Scale: 1" = 300'



LEANDER MANHOLE SURVEY STATUS MAP
GRID NO.: J-13

Legend

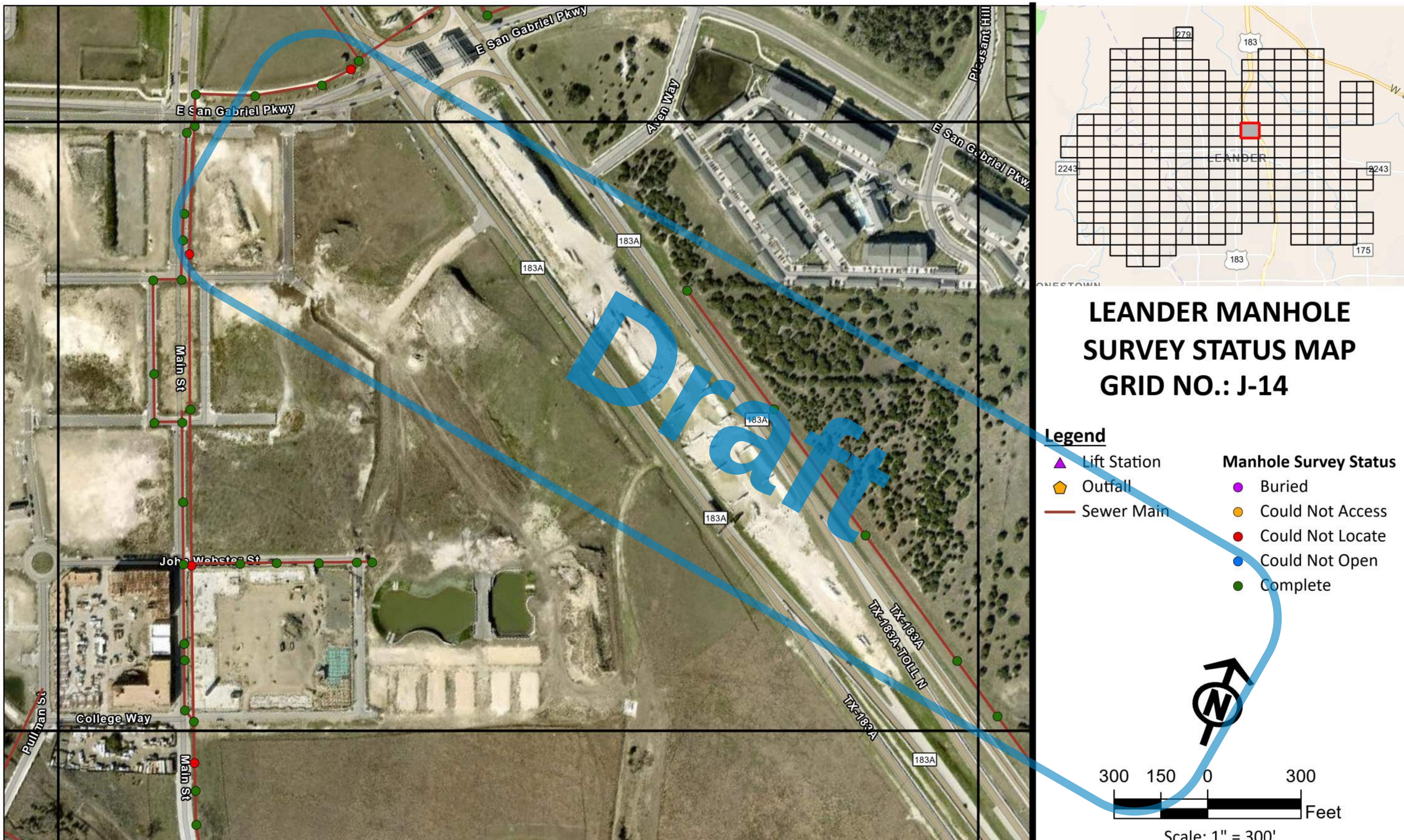
- Lift Station
- Outfall
- Sewer Main

Manhole Survey Status

- Buried
- Could Not Access
- Could Not Locate
- Could Not Open
- Complete

300 150 0 300 Feet

Scale: 1" = 300'



LEANDER MANHOLE SURVEY STATUS MAP GRID NO.: J-14

Legend

- Lift Station
- Outfall
- Sewer Main

Manhole Survey Status

- Buried
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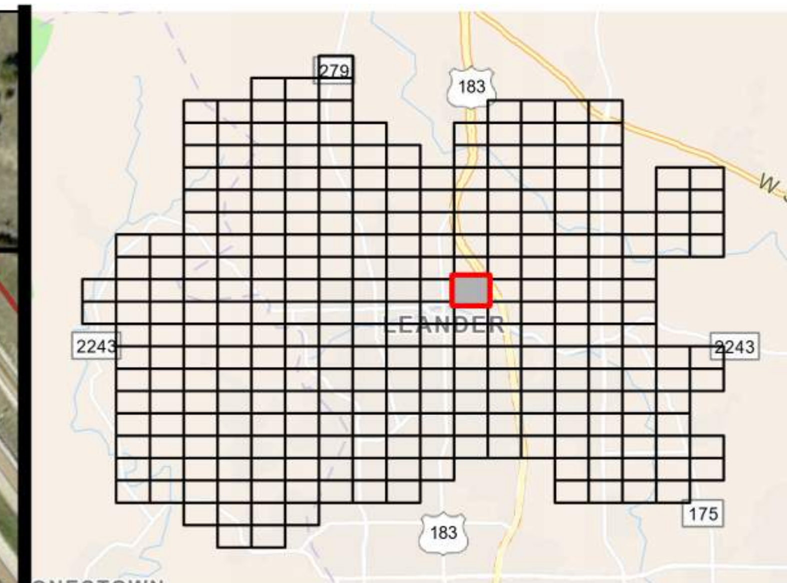
- Could Not Locate
- Could Not Open
- Complete

300 150 0 300
Feet

Scale: 1" = 300'



LEANDER MANHOLE SURVEY STATUS MAP GRID NO.: K-14

Legend

- Lift Station
- Outfall
- Sewer Main

Manhole Survey Status

- Buried
- Could Not Access
- Could Not Locate
- Could Not Open
- Complete

N

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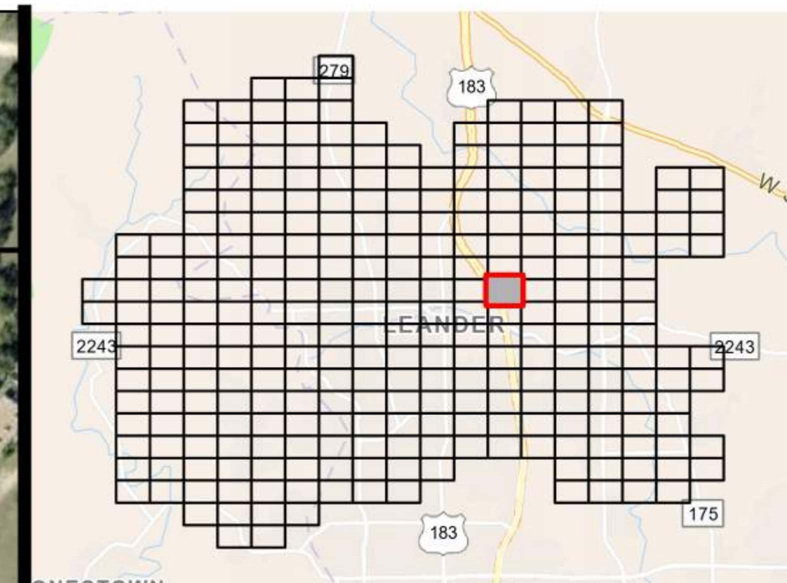
Scale: 1" = 300'



LEANDER MANHOLE SURVEY STATUS MAP
GRID NO.: K-15

Legend

- Lift Station
- Outfall
- Sewer Main

Manhole Survey Status

- Buried
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- Could Not Locate
- Could Not Open
- Complete

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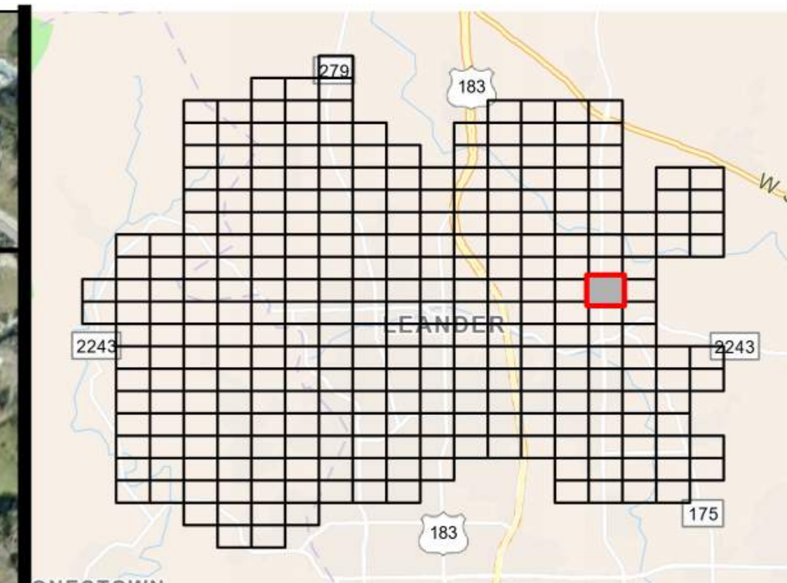
Feet

Scale: 1" = 300'

Draft



LEANDER MANHOLE SURVEY STATUS MAP
GRID NO.: K-18

Legend

- Lift Station
- Outfall
- Sewer Main

Manhole Survey Status

- Buried
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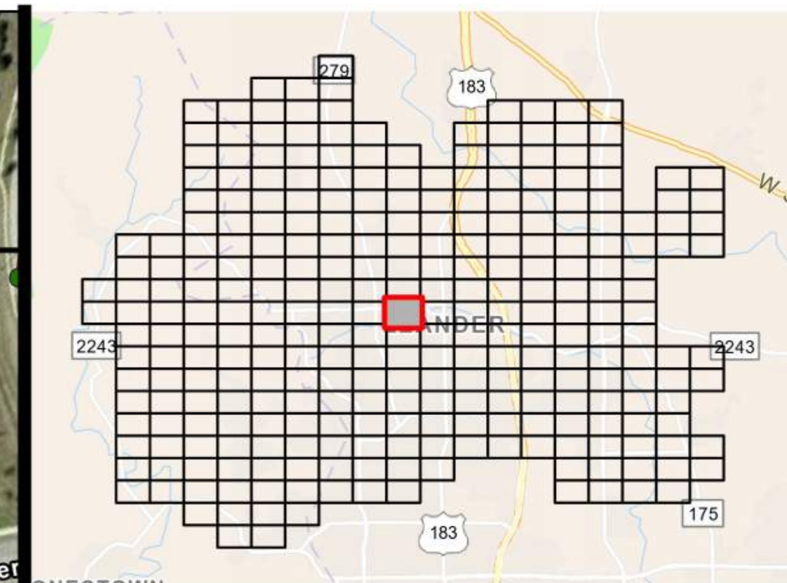
- Could Not Locate
- Could Not Open
- Complete

300 150 0 300 Feet

Scale: 1" = 300'



LEANDER MANHOLE SURVEY STATUS MAP
GRID NO.: L-12

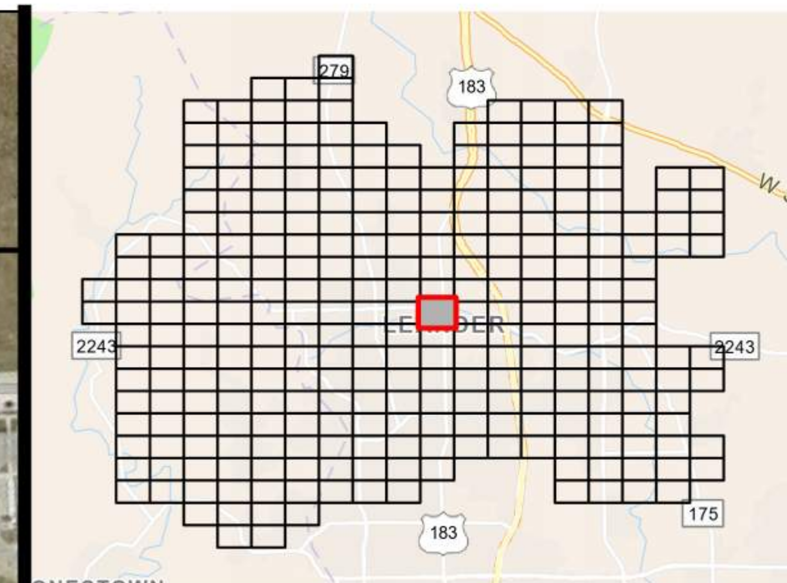
Legend

Lift Station
Outfall
Sewer Main

Manhole Survey Status

Buried
Could Not Access
Could Not Locate
Could Not Open
Complete

300 150 0 300
Feet
Scale: 1" = 300'



LEANDER MANHOLE SURVEY STATUS MAP GRID NO.: L-13

Legend

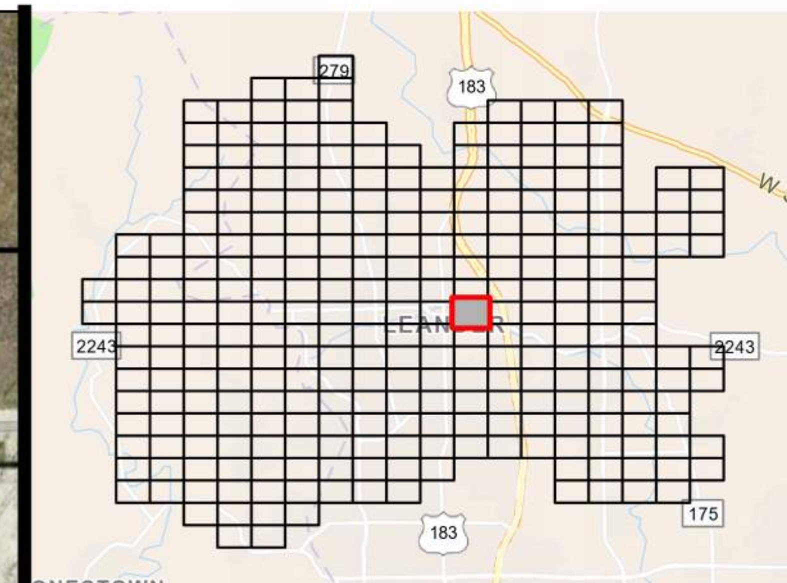
- Lift Station
- Outfall
- Sewer Main

Manhole Survey Status

- Buried
- Could Not Access
- Could Not Locate
- Could Not Open
- Complete

300 150 0 300 Feet

Scale: 1" = 300'



LEANDER MANHOLE SURVEY STATUS MAP
GRID NO.: L-14

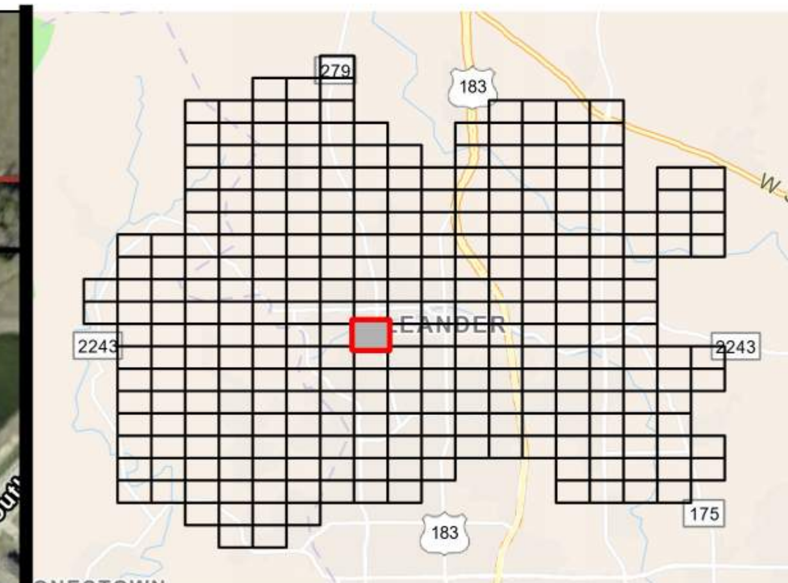
Legend

Lift Station
Outfall
Sewer Main

Manhole Survey Status

Buried
Could Not Access
Could Not Locate
Could Not Open
Complete

300 150 0 300
Feet
Scale: 1" = 300'



LEANDER MANHOLE SURVEY STATUS MAP GRID NO.: M-11

Legend

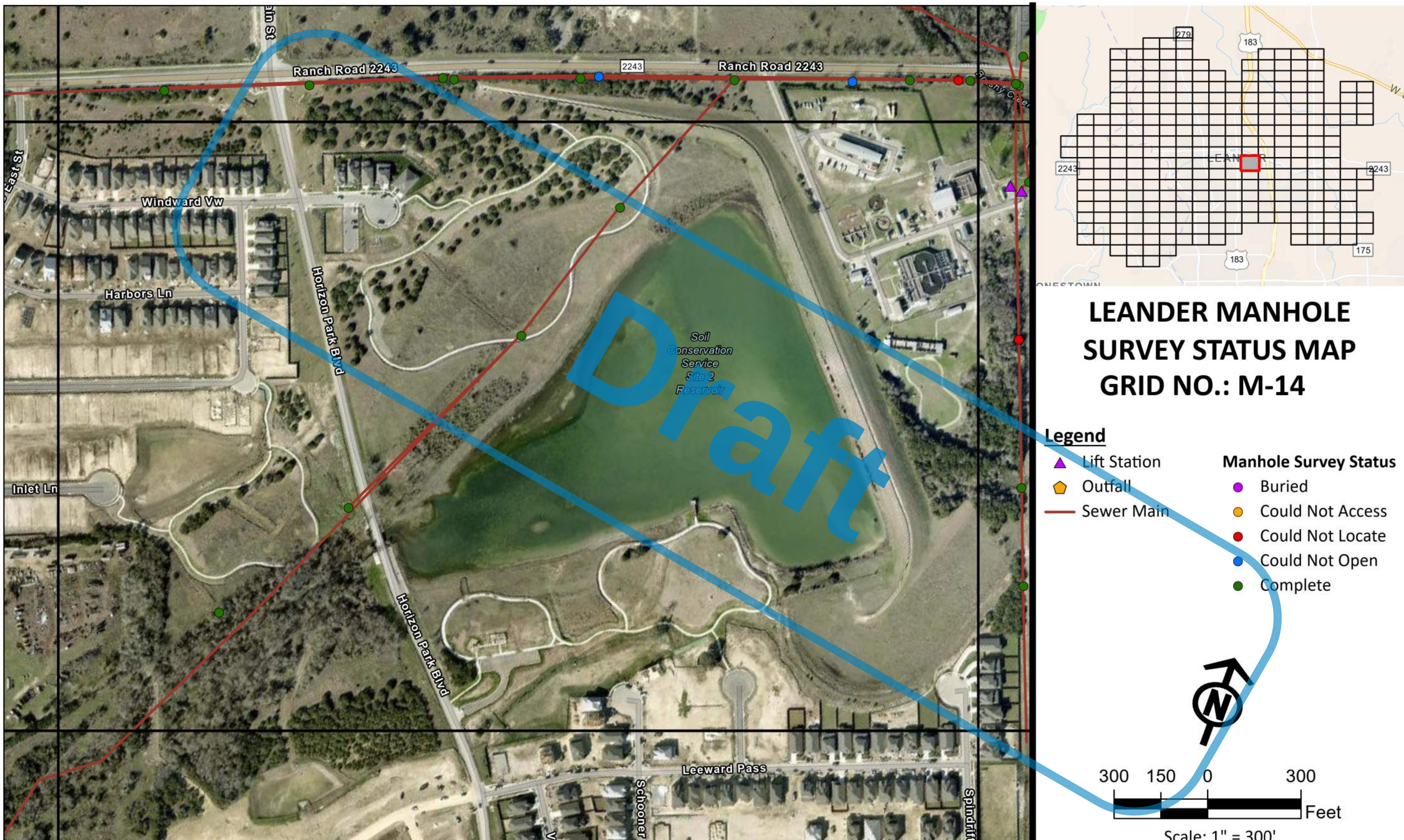
- Lift Station
- Outfall
- Sewer Main

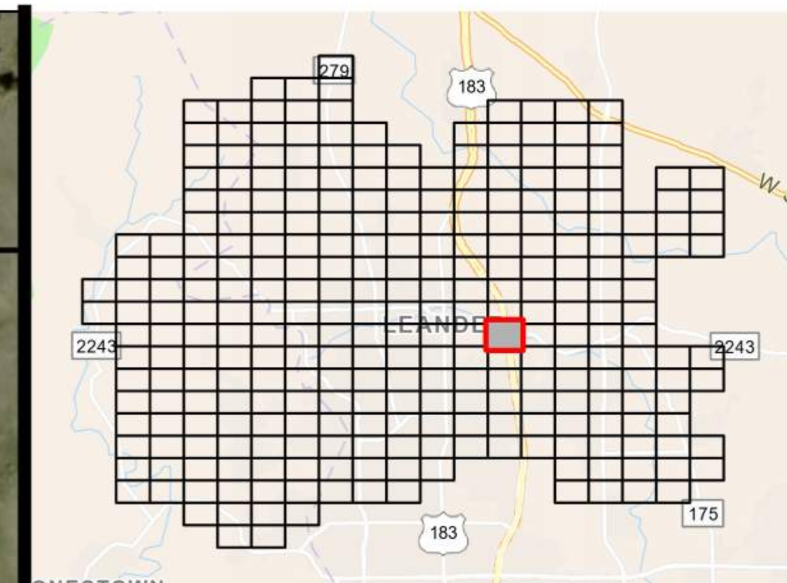
Manhole Survey Status

- Buried
- Could Not Access
- Could Not Locate
- Could Not Open
- Complete

300 150 0 300 Feet

Scale: 1" = 300'


Ranch Road 2243
2243
Ranch Road 2243
Windward Vw
Harbors Ln
Horizon Park Blvd
Inlet Ln
Soil Conservation Service Site 2 Reservoir
Horizon Park Blvd
Leeward Pass
Schooner
Spindrift
Draft
183
279
2243
2243
183
175
LEANDER MANHOLE
SURVEY STATUS MAP
GRID NO.: M-14
Legend
Lift Station
Outfall
Sewer Main
Manhole Survey Status
Buried
Could Not Access
Could Not Locate
Could Not Open
Complete
N
300 150 0 300
Feet
Scale: 1" = 300'



LEANDER MANHOLE SURVEY STATUS MAP
GRID NO.: M-15

Legend

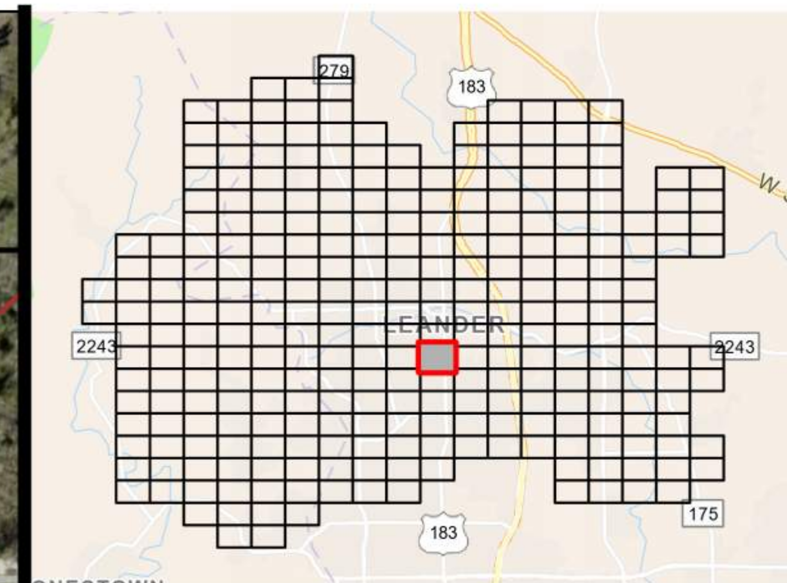
- Lift Station
- Outfall
- Sewer Main

Manhole Survey Status

- Buried
- Could Not Access
- Could Not Locate
- Could Not Open
- Complete

300 150 0 300 Feet

Scale: 1" = 300'



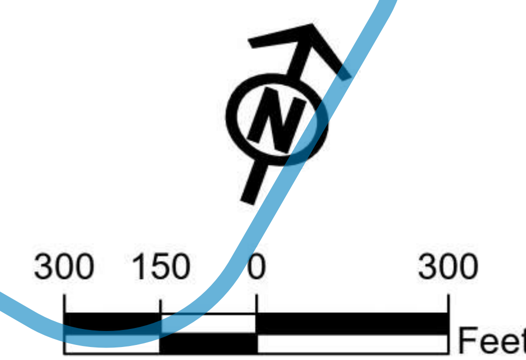
LEANDER MANHOLE SURVEY STATUS MAP
GRID NO.: N-13

Legend

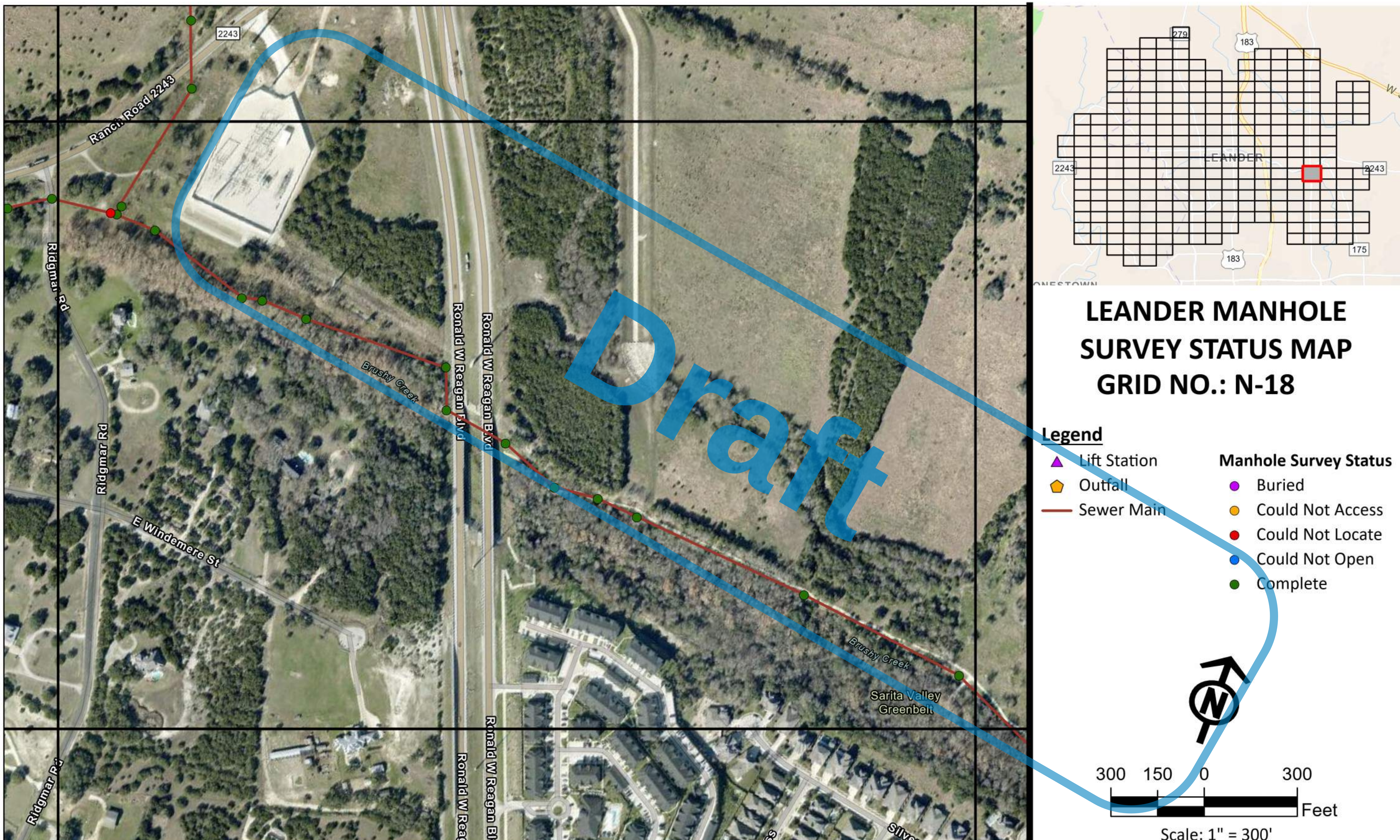
- Lift Station
- Outfall
- Sewer Main

Manhole Survey Status

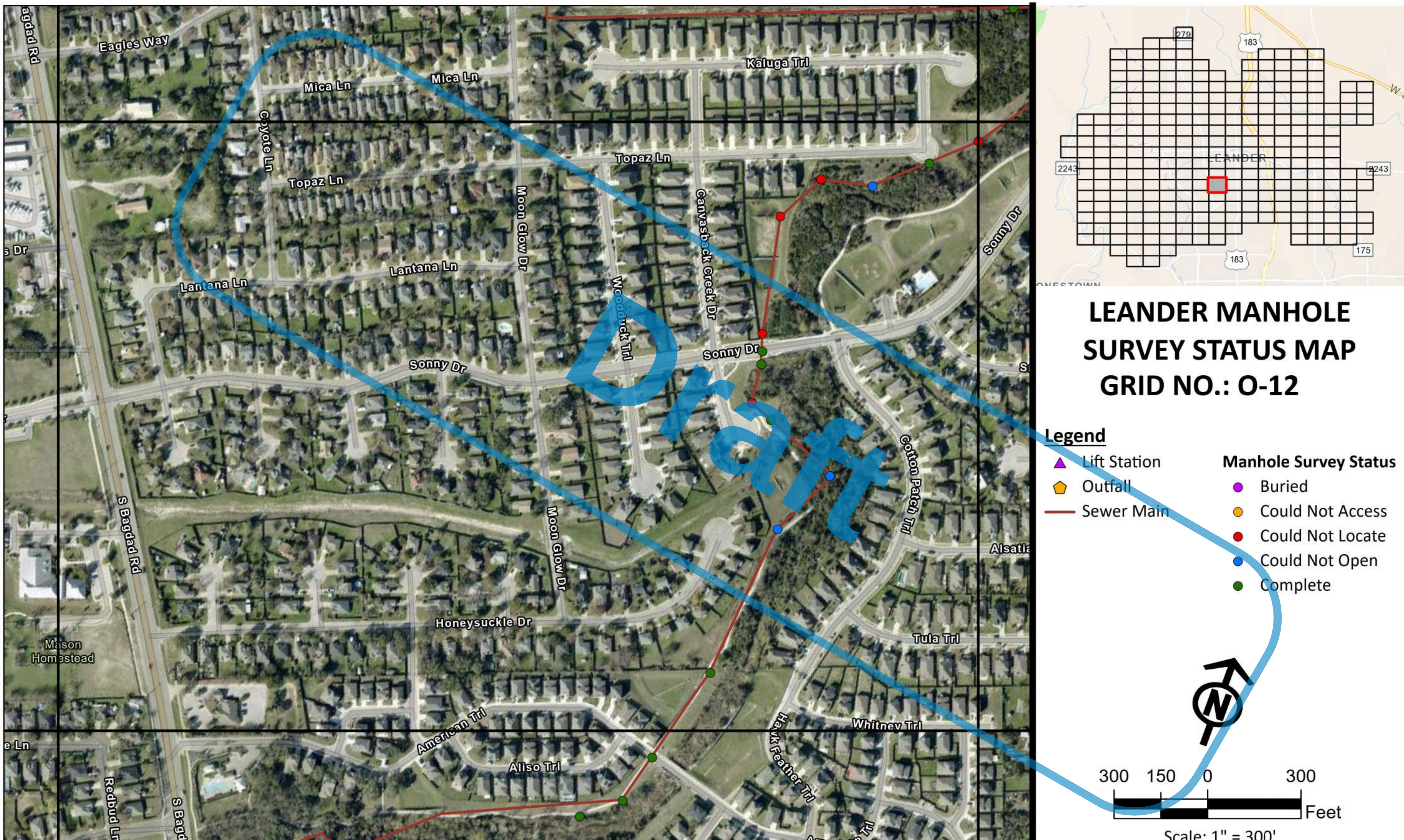
- Buried
- Could Not Access
- Could Not Locate
- Could Not Open
- Complete



Scale: 1" = 300'



2243
Ranch Road 2243
Ridgmar Rd
E Windemere St
Brushy Creek
Ronald W Reagan Blvd
Sarita Valley Greenbelt
Draft
279
183
2243
LEANDER
175
LEANDER MANHOLE SURVEY STATUS MAP
GRID NO.: N-18
Legend
Lift Station
Outfall
Sewer Main
Manhole Survey Status
Buried
Could Not Access
Could Not Locate
Could Not Open
Complete
N
300 150 0 300
Feet
Scale: 1" = 300'



LEANDER MANHOLE SURVEY STATUS MAP
GRID NO.: O-12

Legend

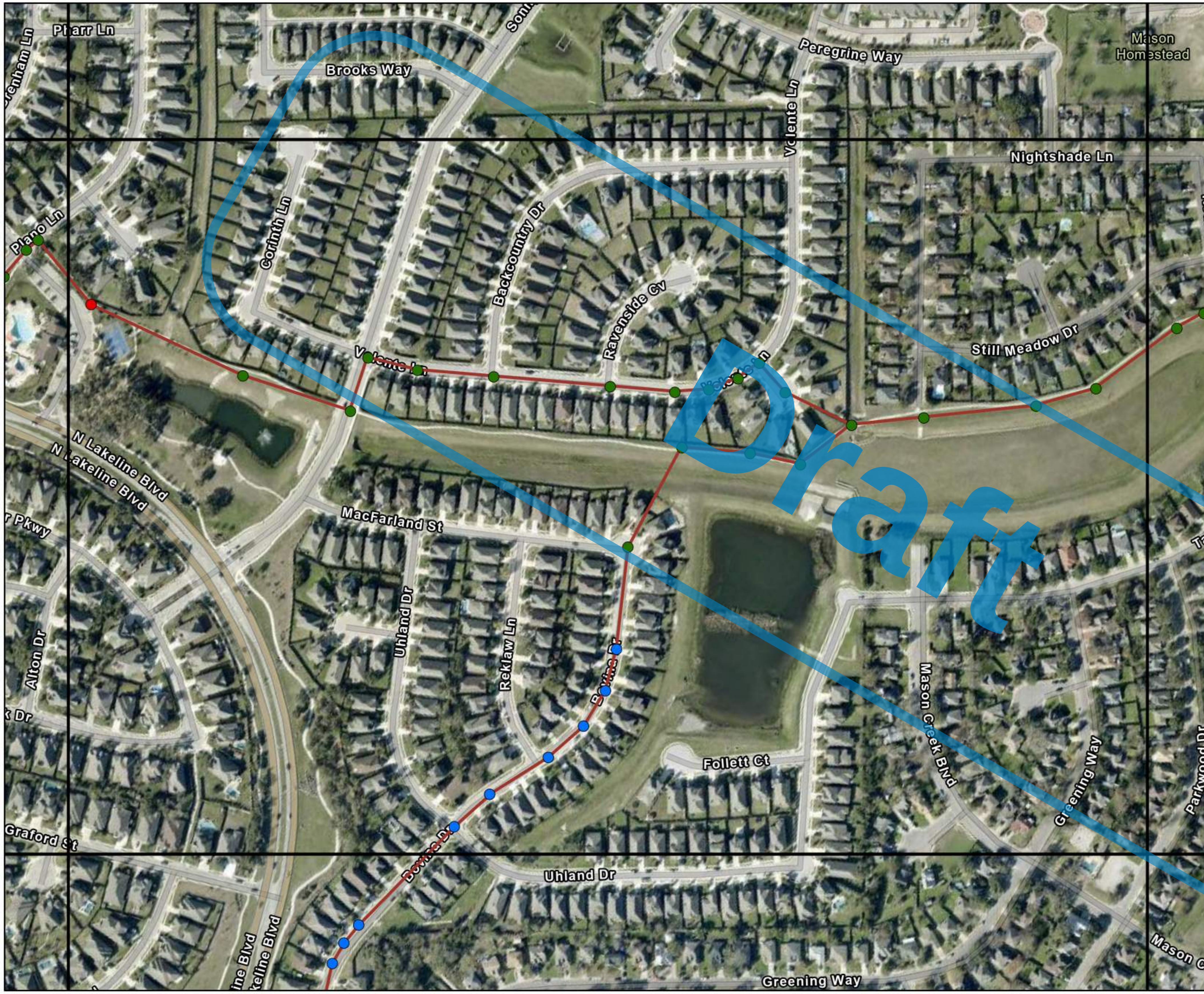
- Lift Station
- Outfall
- Sewer Main

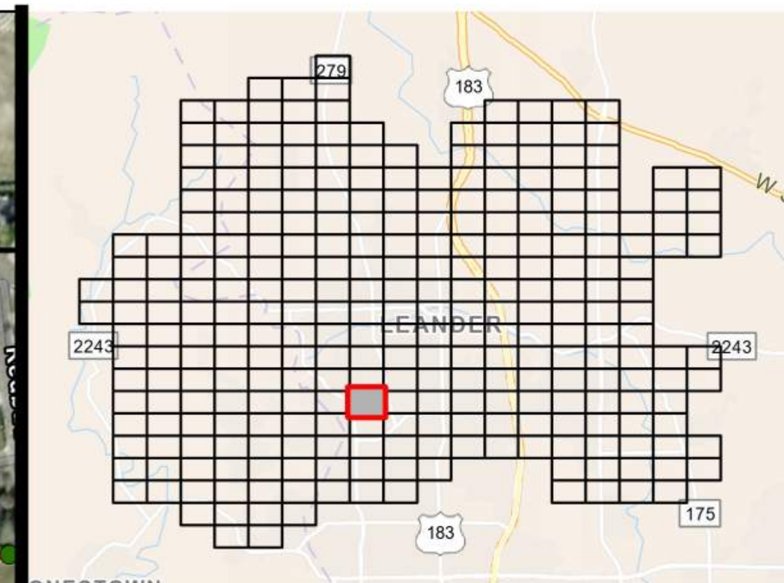
Manhole Survey Status

- Buried
- Could Not Access
- Could Not Locate
- Could Not Open
- Complete

300 150 0 300 Feet

Scale: 1" = 300'





LEANDER MANHOLE SURVEY STATUS MAP GRID NO.: P-11

Legend

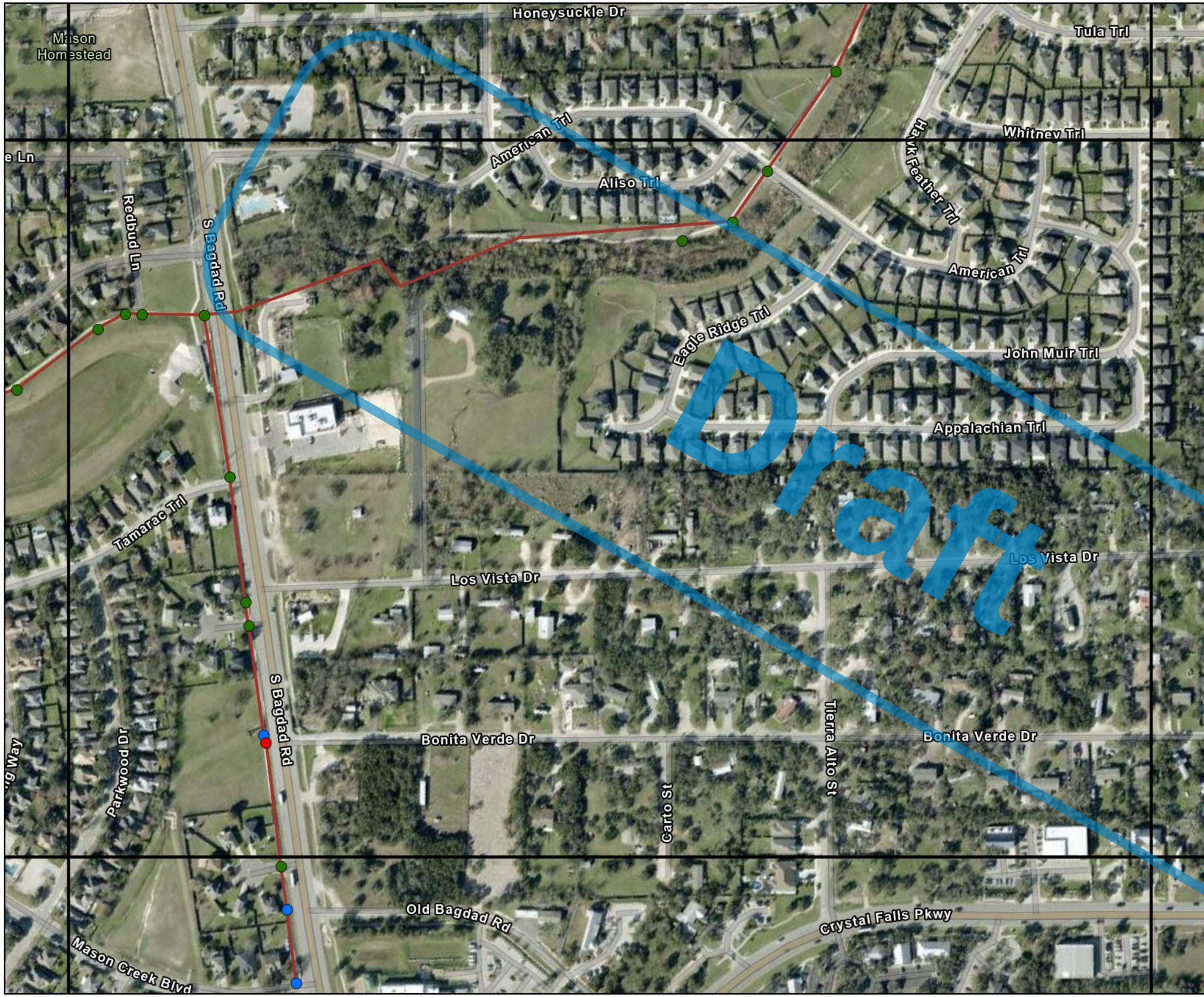
- Lift Station
- Outfall
- Sewer Main

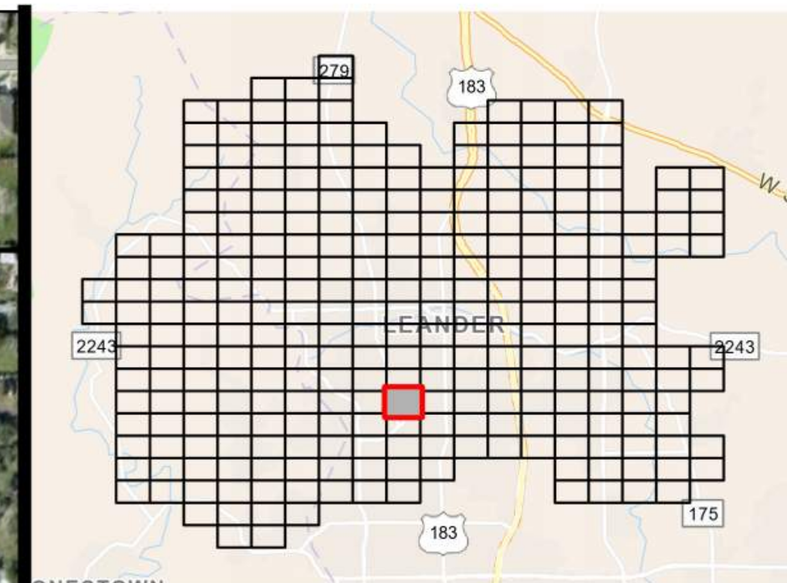
Manhole Survey Status

- Buried
- Could Not Access
- Could Not Locate
- Could Not Open
- Complete

300 150 0 300 Feet

Scale: 1" = 300'





LEANDER MANHOLE SURVEY STATUS MAP
GRID NO.: P-12

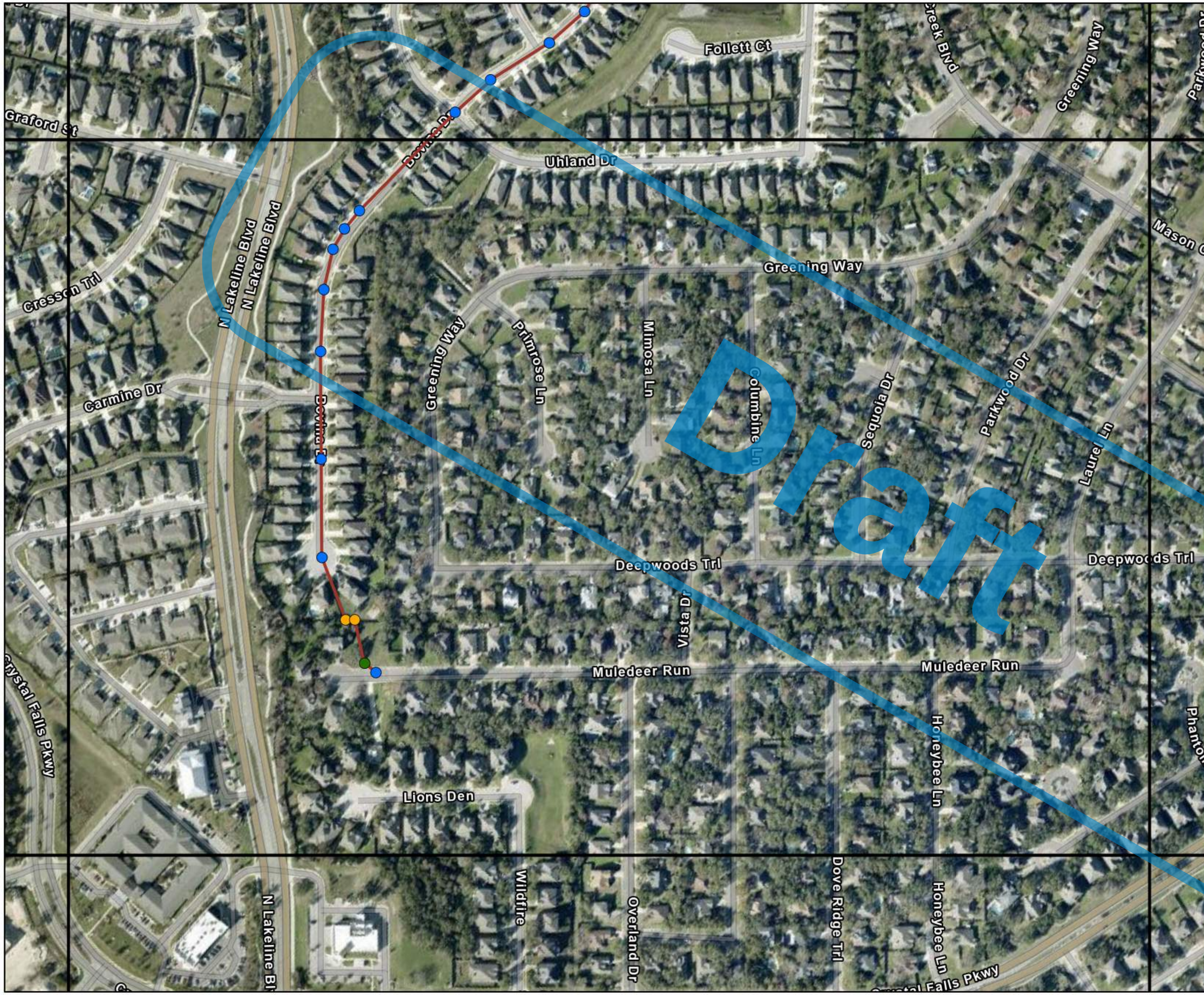
Legend

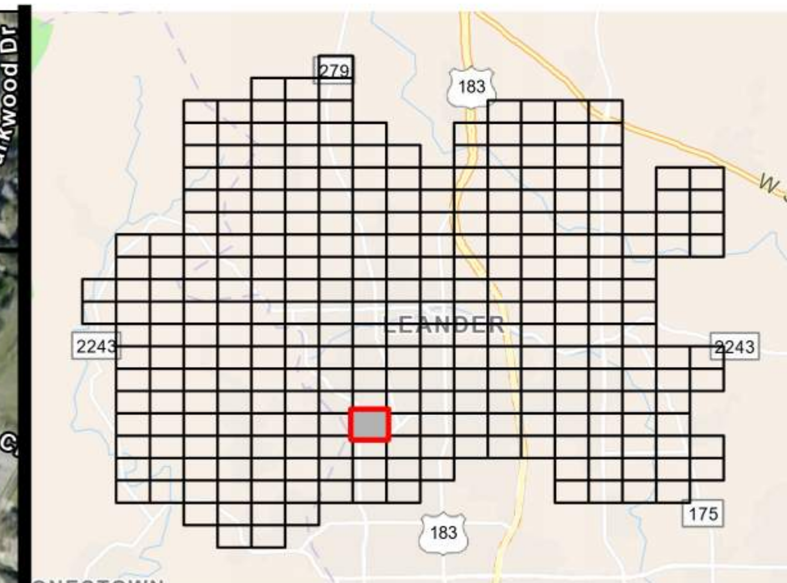
- Lift Station
- Outfall
- Sewer Main

Manhole Survey Status

- Buried
- Could Not Access
- Could Not Locate
- Could Not Open
- Complete

300 150 0 300
Feet
Scale: 1" = 300'





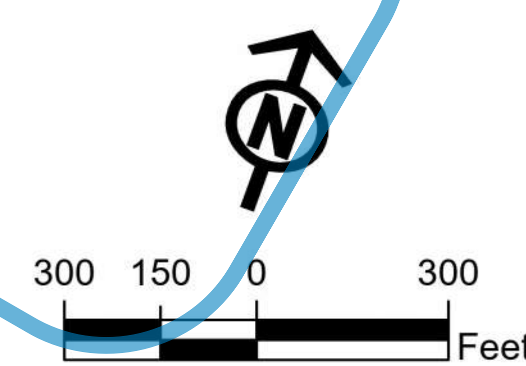
LEANDER MANHOLE SURVEY STATUS MAP GRID NO.: Q-11

Legend

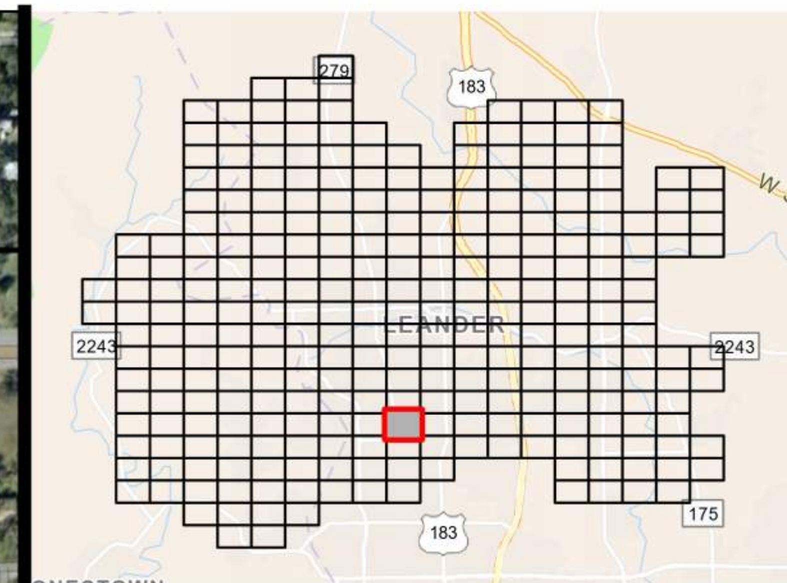
- Lift Station
- Outfall
- Sewer Main

Manhole Survey Status

- Buried
- Could Not Access
- Could Not Locate
- Could Not Open
- Complete



Scale: 1" = 300'



LEANDER MANHOLE SURVEY STATUS MAP GRID NO.: Q-12

Legend

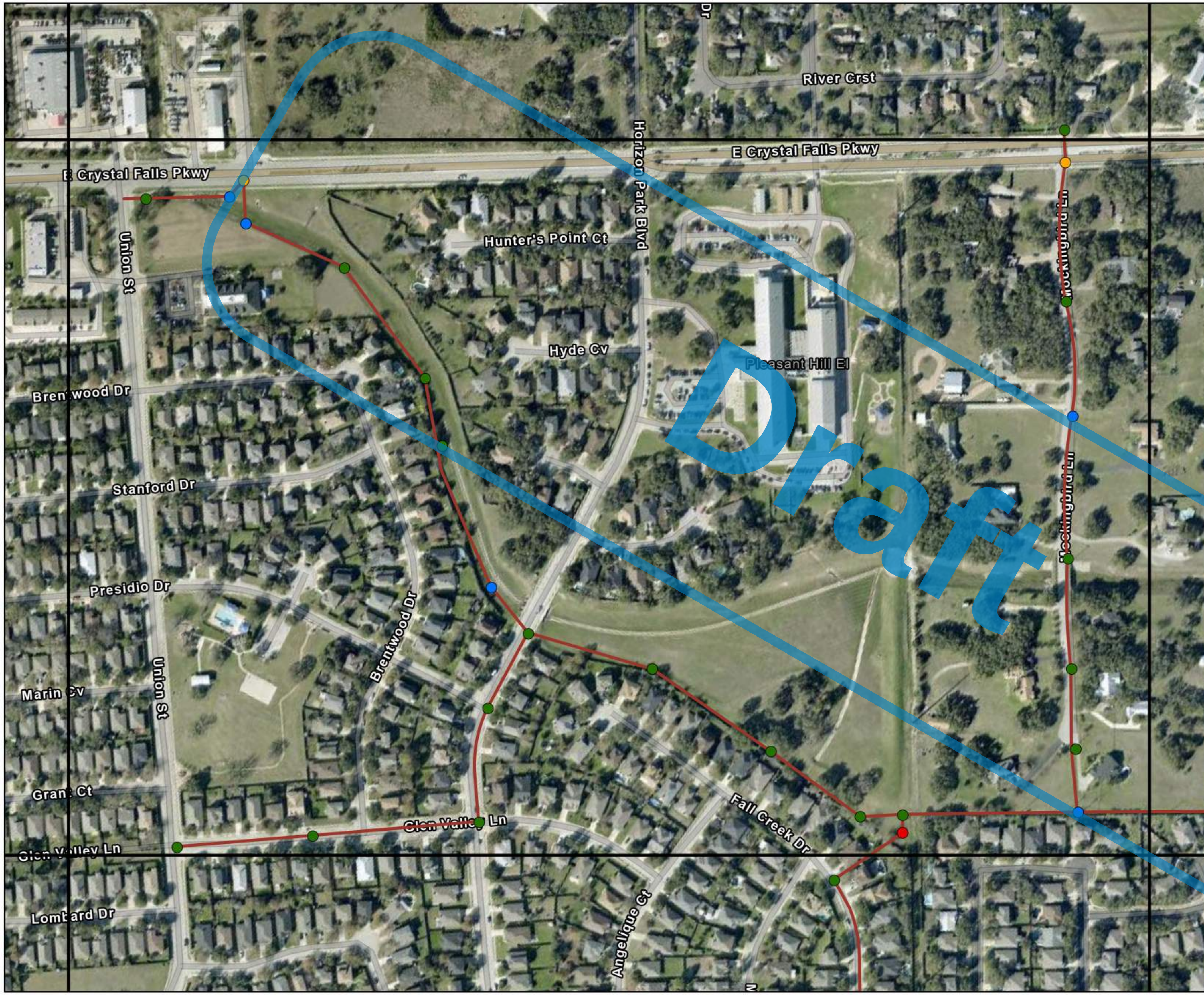
- Lift Station
- Outfall
- Sewer Main

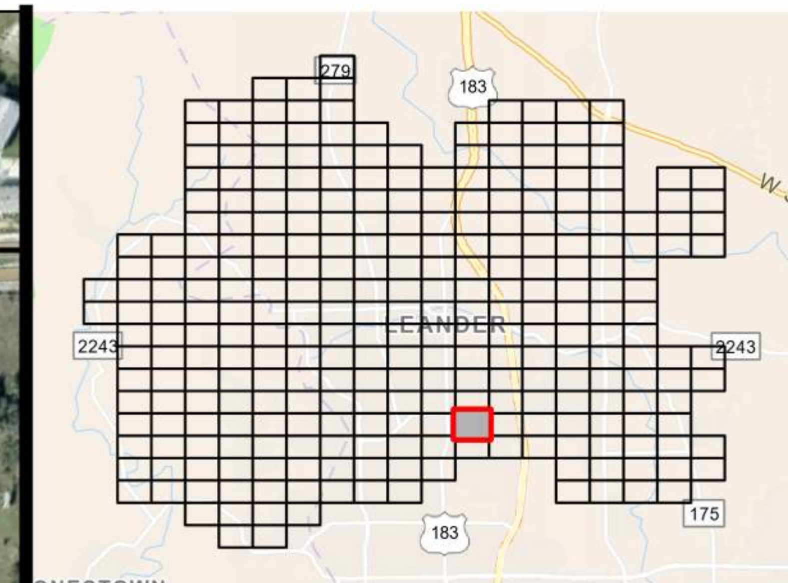
Manhole Survey Status

- Buried
- Could Not Access
- Could Not Locate
- Could Not Open
- Complete

300 150 0 300 Feet

Scale: 1" = 300'





LEANDER MANHOLE SURVEY STATUS MAP GRID NO.: Q-14

Legend

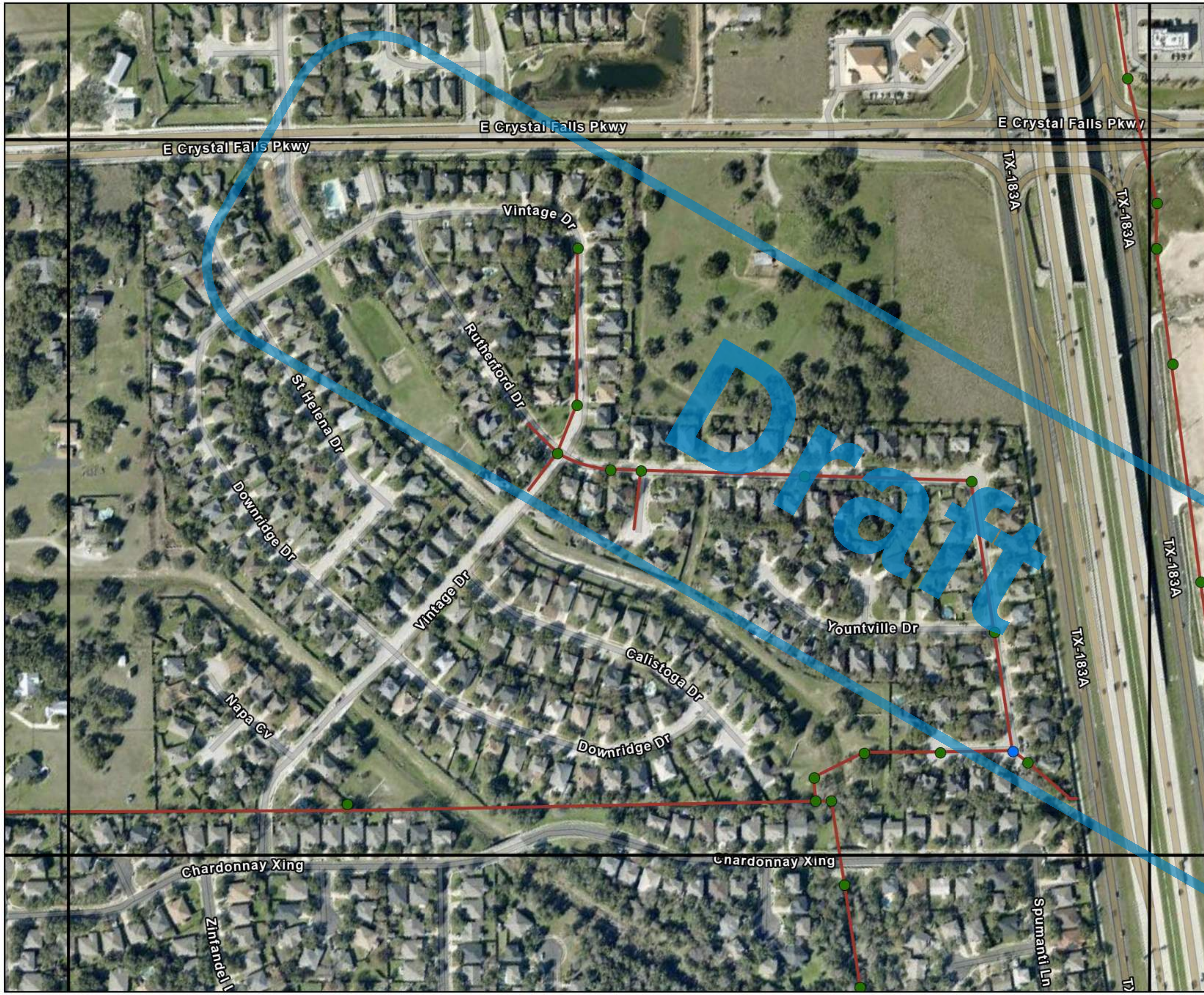
- Lift Station
- Outfall
- Sewer Main

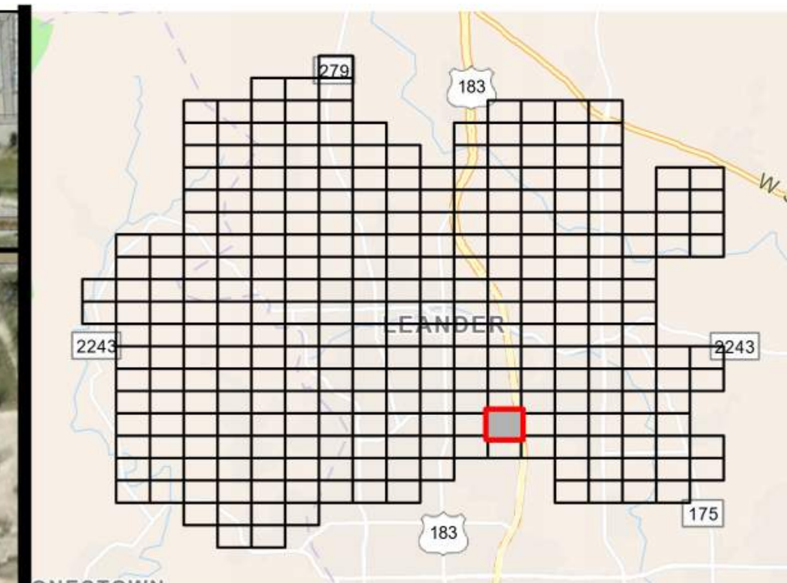
Manhole Survey Status

- Buried
- Could Not Access
- Could Not Locate
- Could Not Open
- Complete

300 150 0 300 Feet

Scale: 1" = 300'





LEANDER MANHOLE SURVEY STATUS MAP
GRID NO.: Q-15

Legend

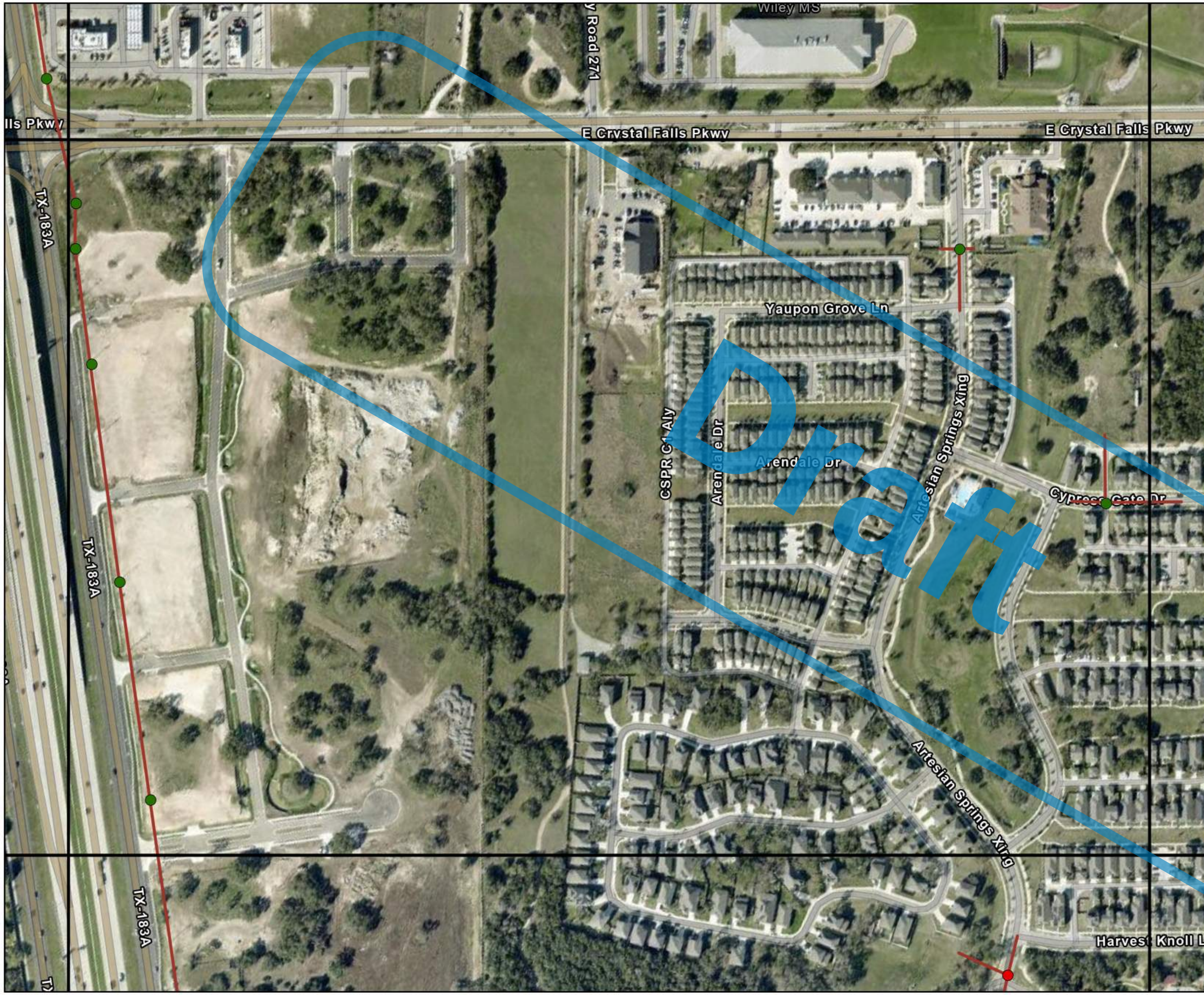
- Lift Station
- Outfall
- Sewer Main

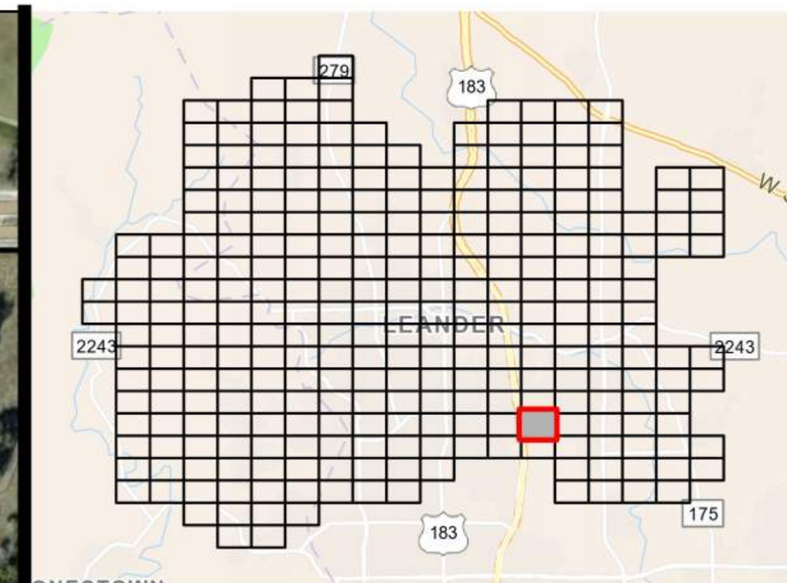
Manhole Survey Status

- Buried
- Could Not Access
- Could Not Locate
- Could Not Open
- Complete

300 150 0 300 Feet

Scale: 1" = 300'





LEANDER MANHOLE SURVEY STATUS MAP
GRID NO.: Q-16

Legend

- Lift Station
- Outfall
- Sewer Main

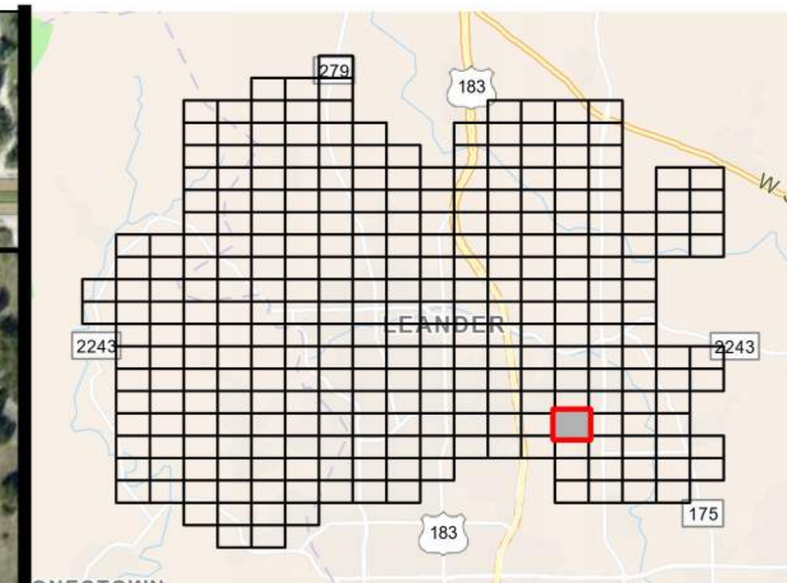
Manhole Survey Status

- Buried
- Could Not Access
- Could Not Locate
- Could Not Open
- Complete

N

300 150 0 300 Feet

Scale: 1" = 300'



LEANDER MANHOLE SURVEY STATUS MAP
GRID NO.: Q-17

Legend

Lift Station
Outfall
Sewer Main

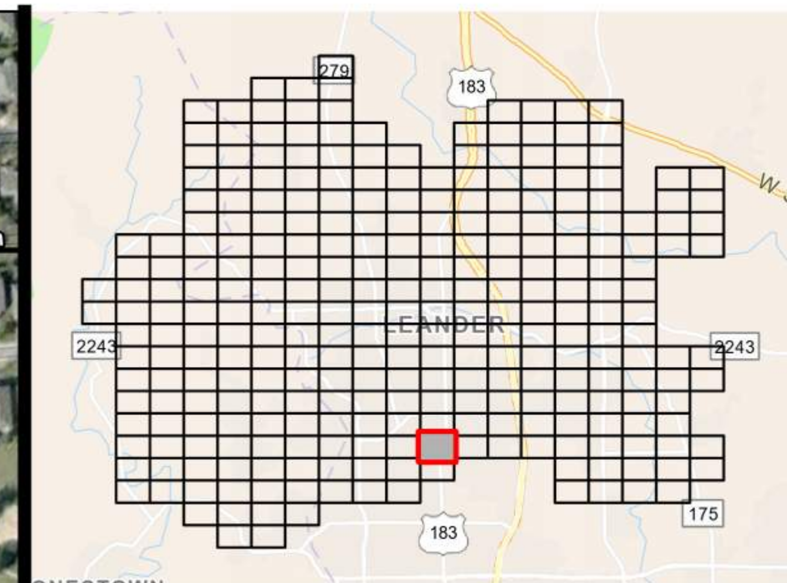
Manhole Survey Status

Buried
Could Not Access
Could Not Locate
Could Not Open
Complete

N

300 150 0 300
Feet

Scale: 1" = 300'



LEANDER MANHOLE SURVEY STATUS MAP
GRID NO.: R-13

Legend

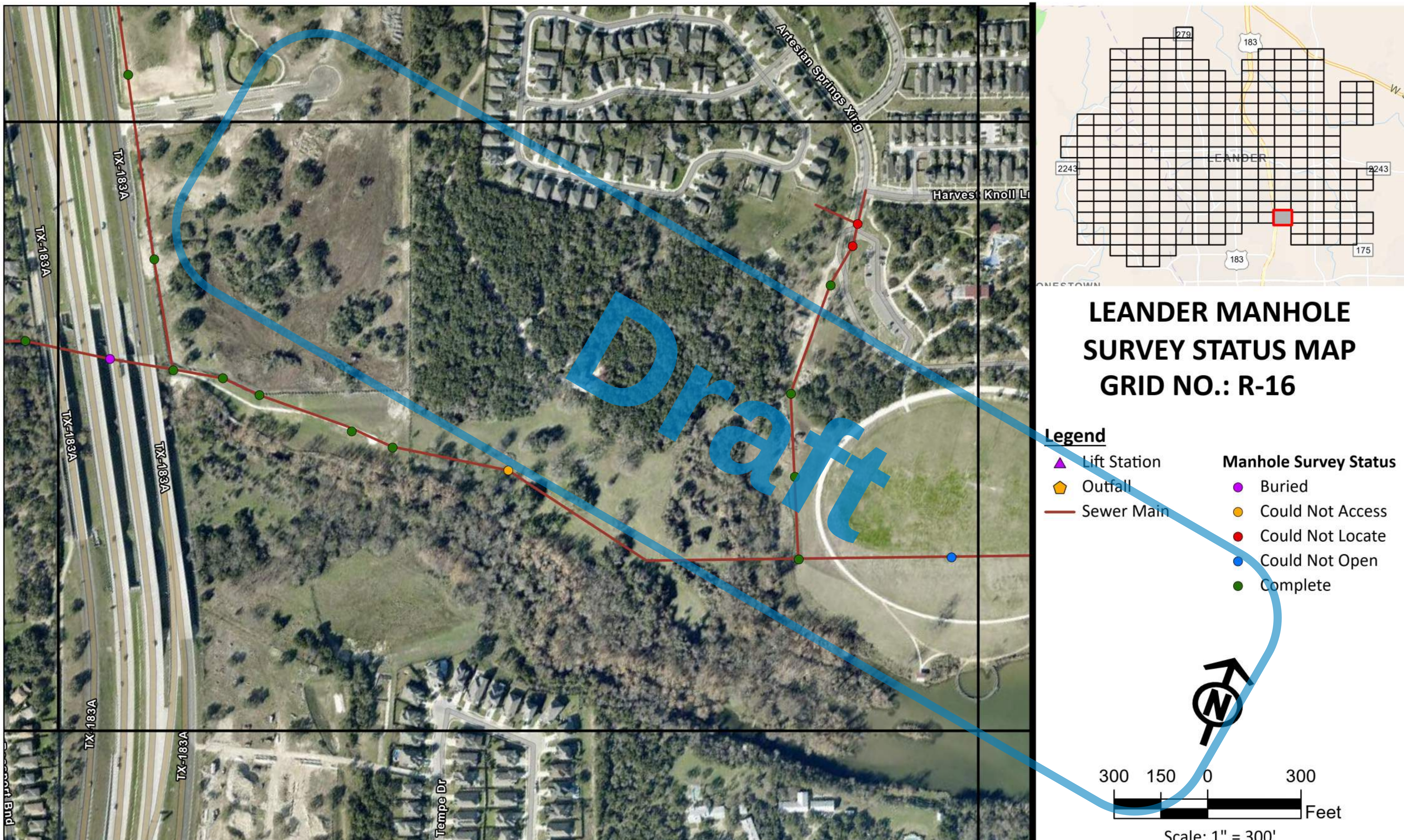
- Lift Station
- Outfall
- Sewer Main

Manhole Survey Status

- Buried
- Could Not Access
- Could Not Locate
- Could Not Open
- Complete

300 150 0 300 Feet

Scale: 1" = 300'



LEANDER MANHOLE SURVEY STATUS MAP
GRID NO.: R-16

Legend

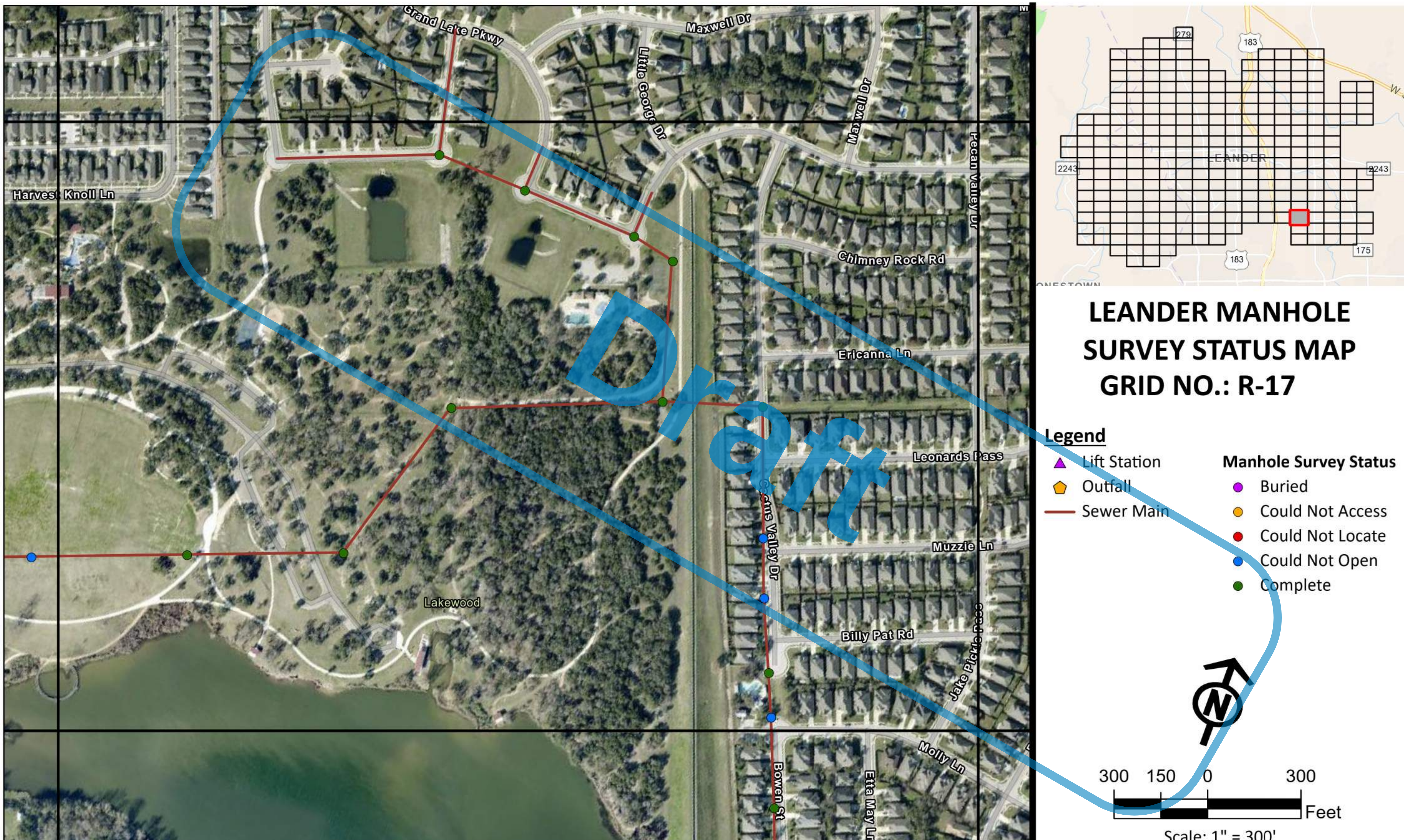
- Lift Station
- Outfall
- Sewer Main

Manhole Survey Status

- Buried
- Could Not Access
- Could Not Locate
- Could Not Open
- Complete

300 150 0 300 Feet

Scale: 1" = 300'



LEANDER MANHOLE SURVEY STATUS MAP

GRID NO.: R-17

Legend

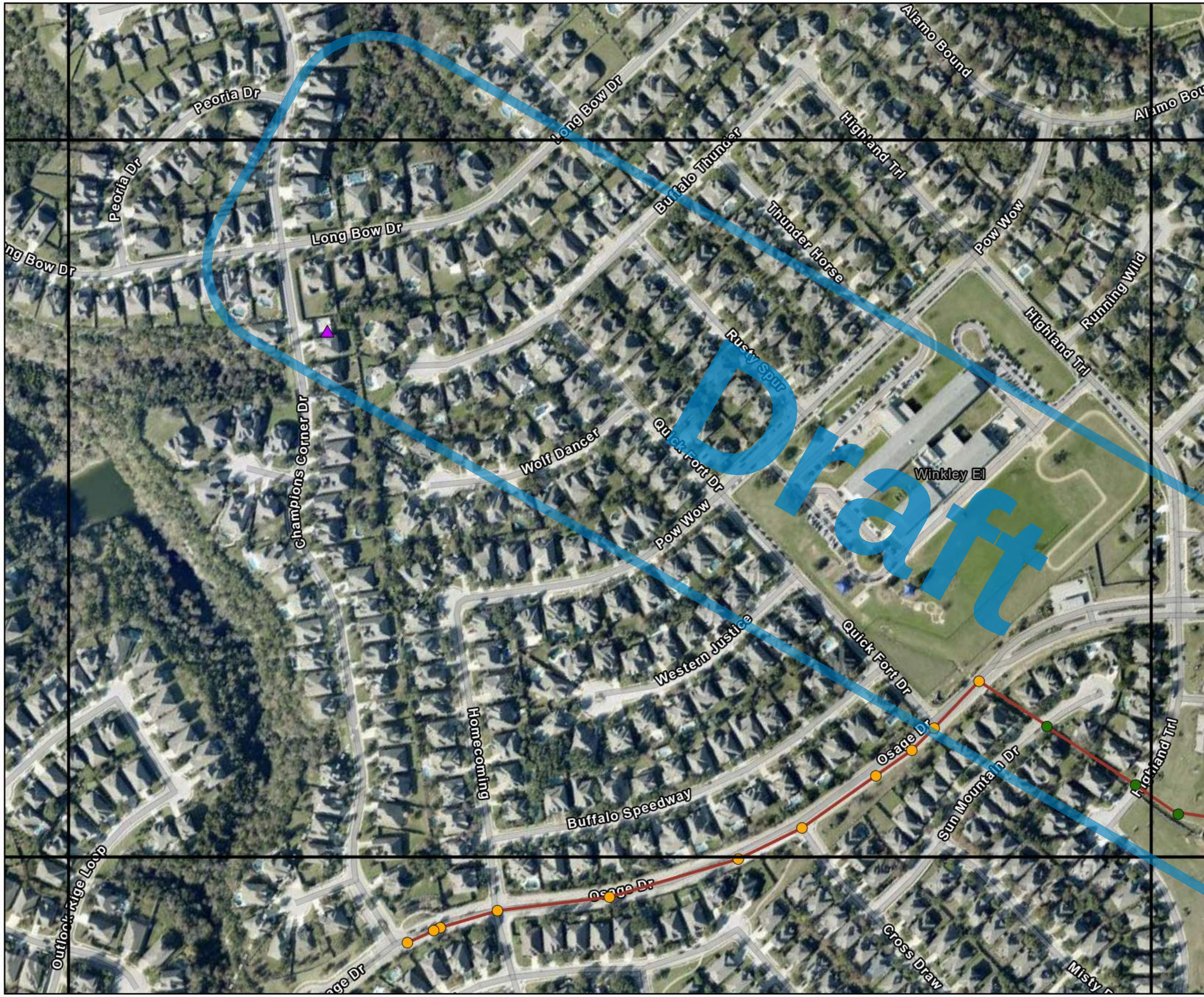
- Lift Station
- Outfall
- Sewer Main

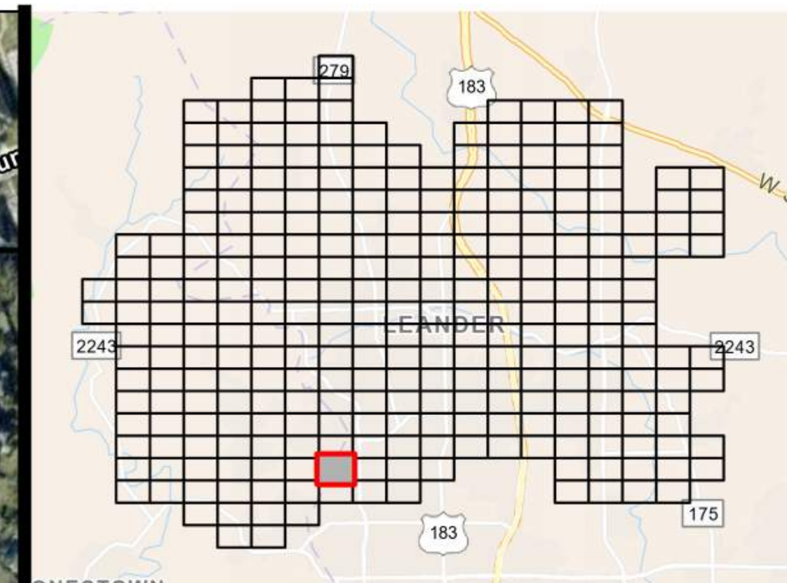
Manhole Survey Status

- Buried
- Could Not Access
- Could Not Locate
- Could Not Open
- Complete

300 150 0 300 Feet

Scale: 1" = 300'





LEANDER MANHOLE SURVEY STATUS MAP
GRID NO.: S-10

Legend

- Lift Station
- Outfall
- Sewer Main

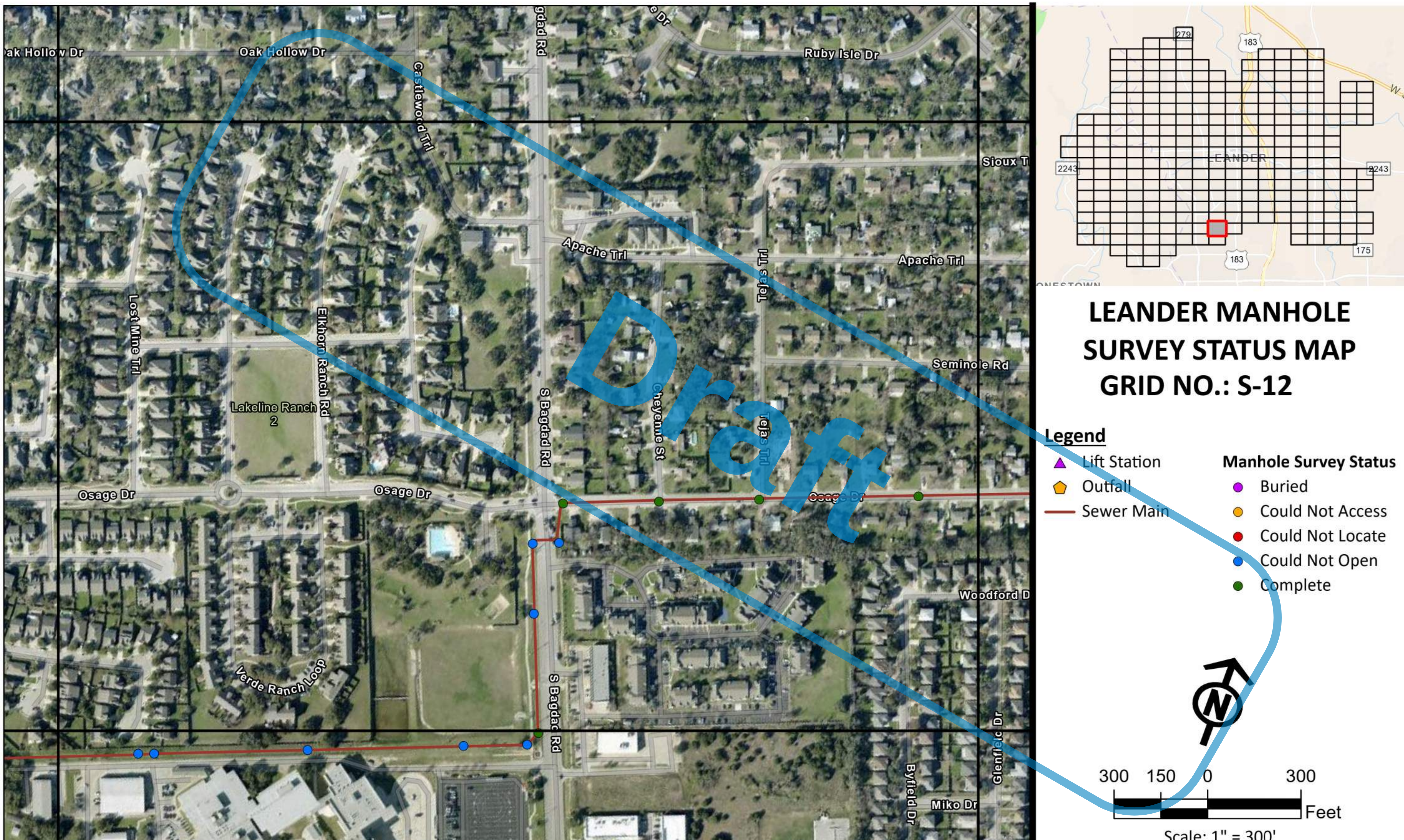
Manhole Survey Status

- Buried
- Could Not Access
- Could Not Locate
- Could Not Open
- Complete

N

300 150 0 300 Feet

Scale: 1" = 300'



LEANDER MANHOLE SURVEY STATUS MAP GRID NO.: S-12

Legend

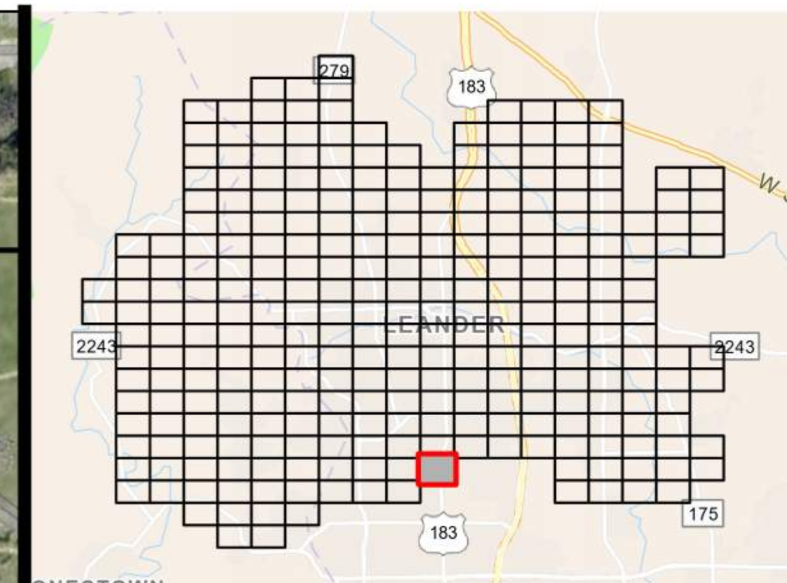
- Lift Station
- Outfall
- Sewer Main

Manhole Survey Status

- Buried
- Could Not Access
- Could Not Locate
- Could Not Open
- Complete

300 150 0 300 Feet

Scale: 1" = 300'



LEANDER MANHOLE SURVEY STATUS MAP
GRID NO.: S-13

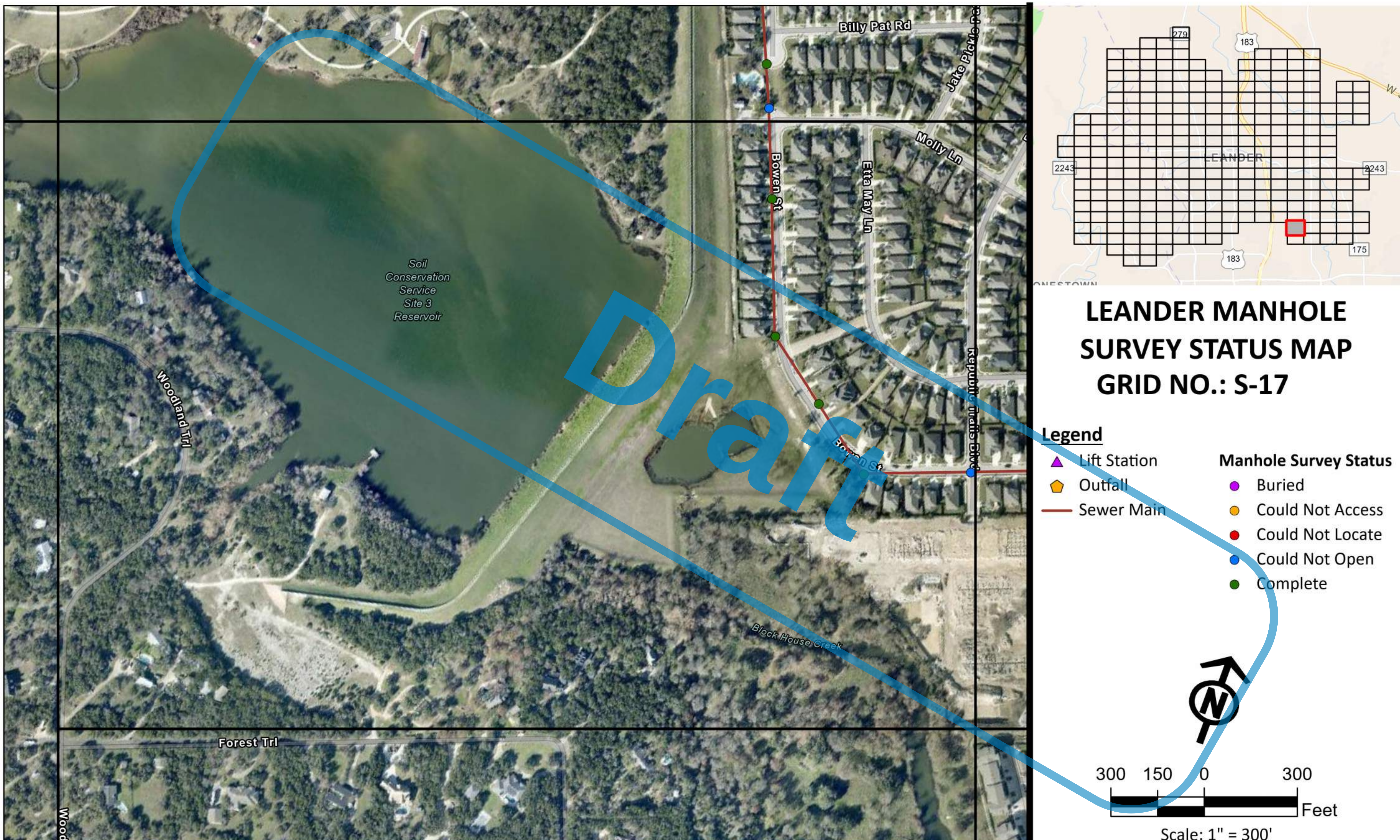
Legend

Lift Station
Outfall
Sewer Main

Manhole Survey Status

Buried
Could Not Access
Could Not Locate
Could Not Open
Complete

300 150 0 300
Feet
Scale: 1" = 300'



LEANDER MANHOLE SURVEY STATUS MAP
GRID NO.: S-17

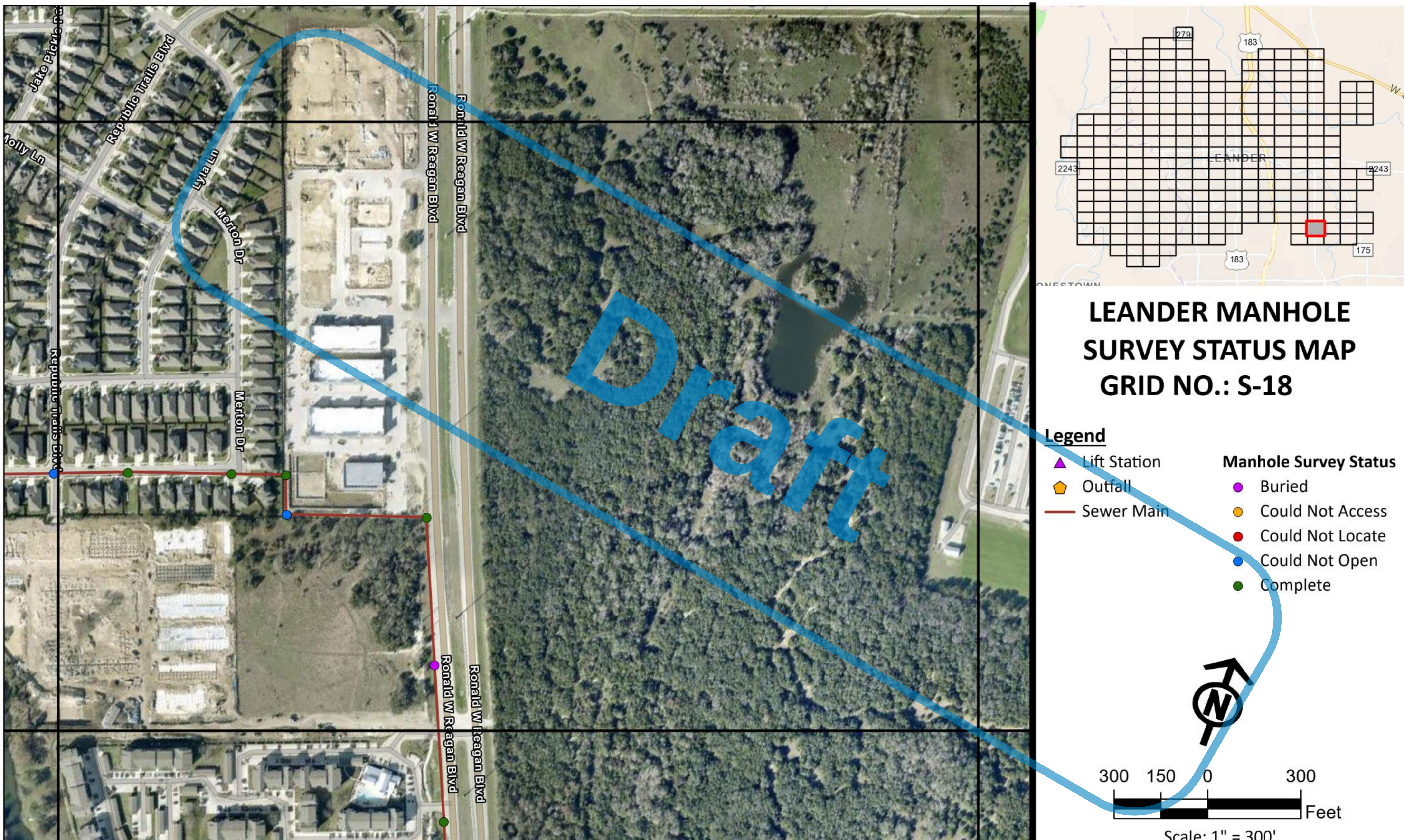
Legend

Lift Station
Outfall
Sewer Main

Manhole Survey Status

Buried
Could Not Access
Could Not Locate
Could Not Open
Complete

300 150 0 300
Feet
Scale: 1" = 300'



LEANDER MANHOLE SURVEY STATUS MAP GRID NO.: S-18

Legend

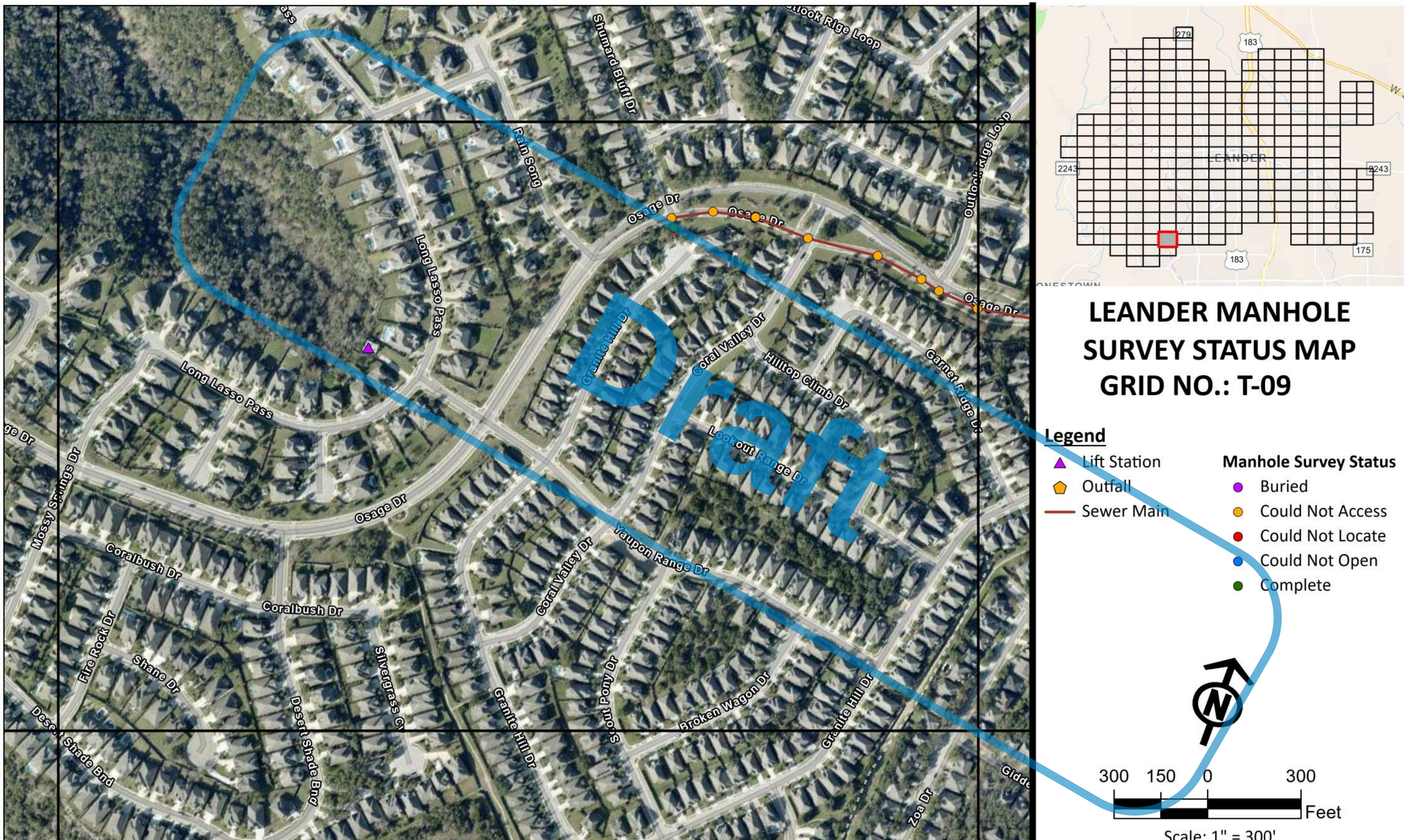
- Lift Station
- Outfall
- Sewer Main

Manhole Survey Status

- Buried
- Could Not Access
- Could Not Locate
- Could Not Open
- Complete

300 150 0 300 Feet

Scale: 1" = 300'



LEANDER MANHOLE SURVEY STATUS MAP
GRID NO.: T-09

Legend

- Lift Station
- Outfall
- Sewer Main

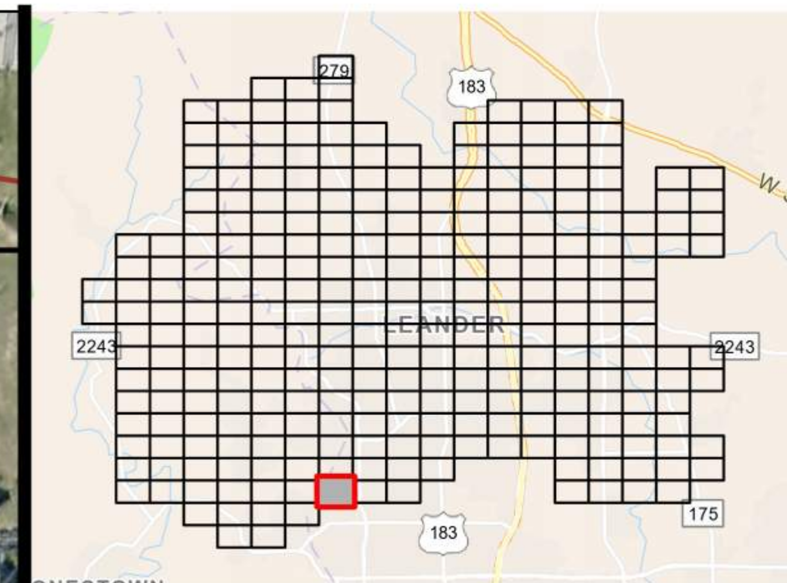
Manhole Survey Status

- Buried
- Could Not Access
- Could Not Locate
- Could Not Open
- Complete

300 150 0 300

Feet

Scale: 1" = 300'



LEANDER MANHOLE SURVEY STATUS MAP
GRID NO.: T-10

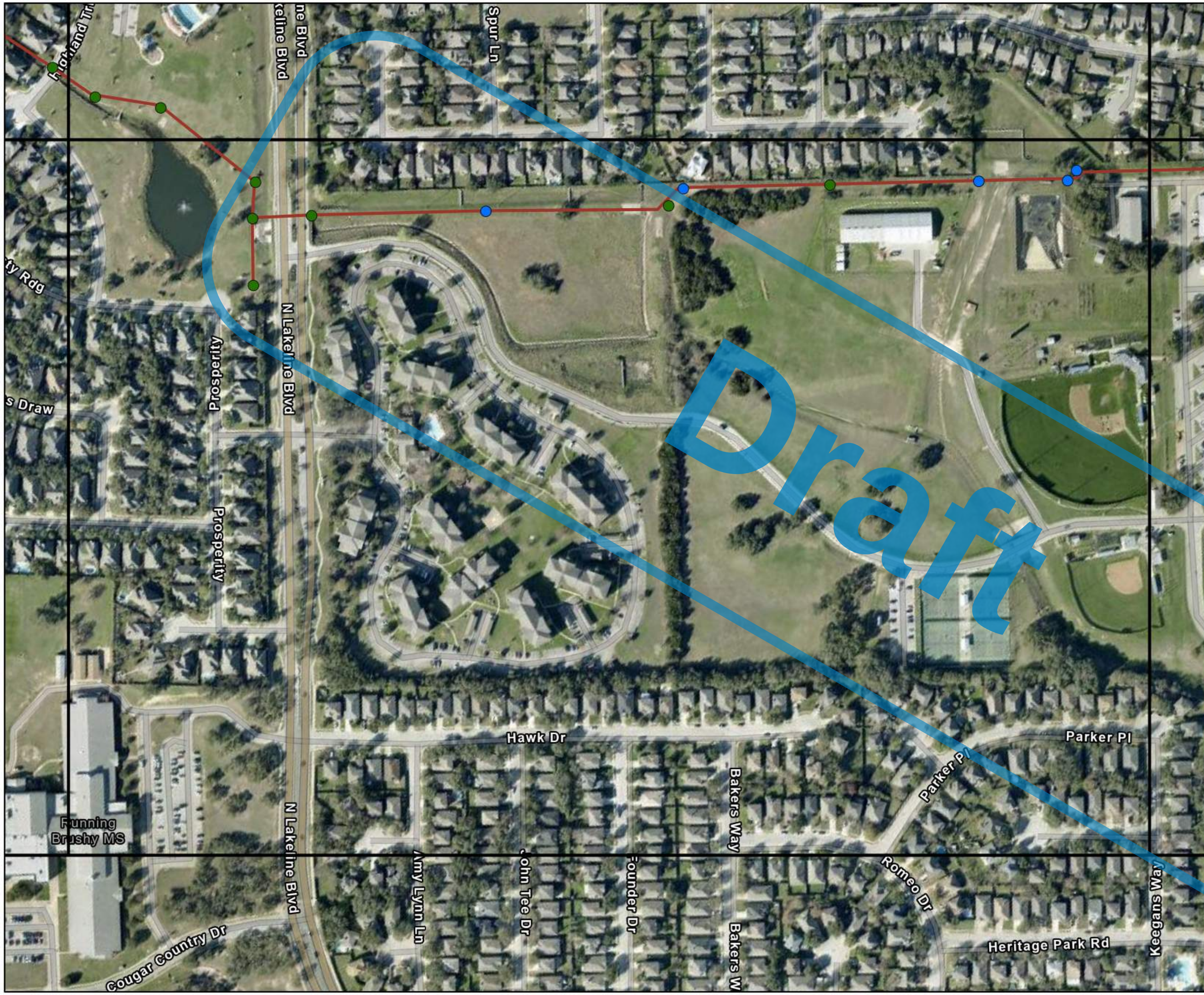
Legend

- Lift Station
- Outfall
- Sewer Main

Manhole Survey Status

- Buried
- Could Not Access
- Could Not Locate
- Could Not Open
- Complete

300 150 0 300
Feet
Scale: 1" = 300'



LEANDER MANHOLE SURVEY STATUS MAP
GRID NO.: T-11

Legend

- Lift Station
- Outfall
- Sewer Main

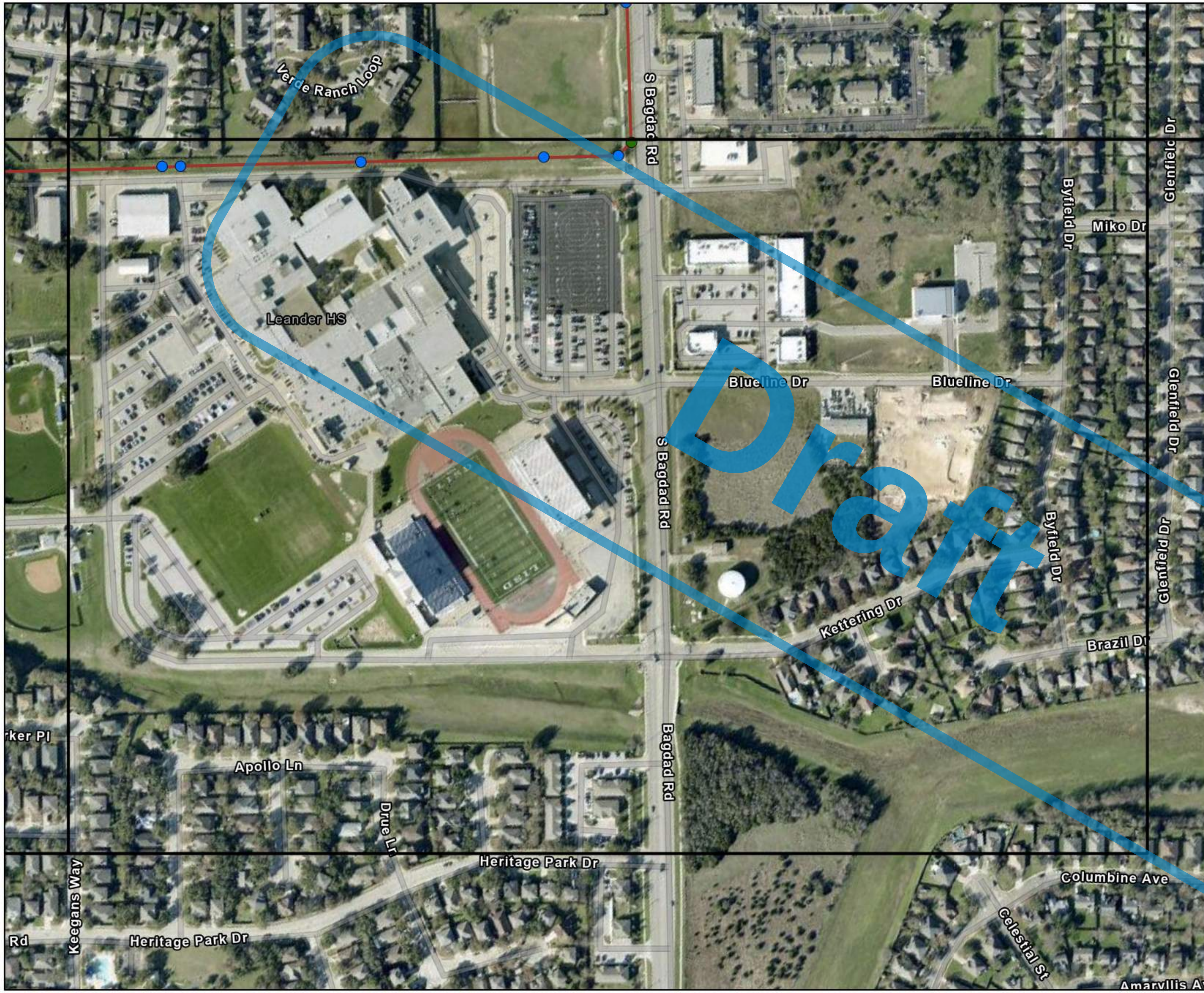
Manhole Survey Status

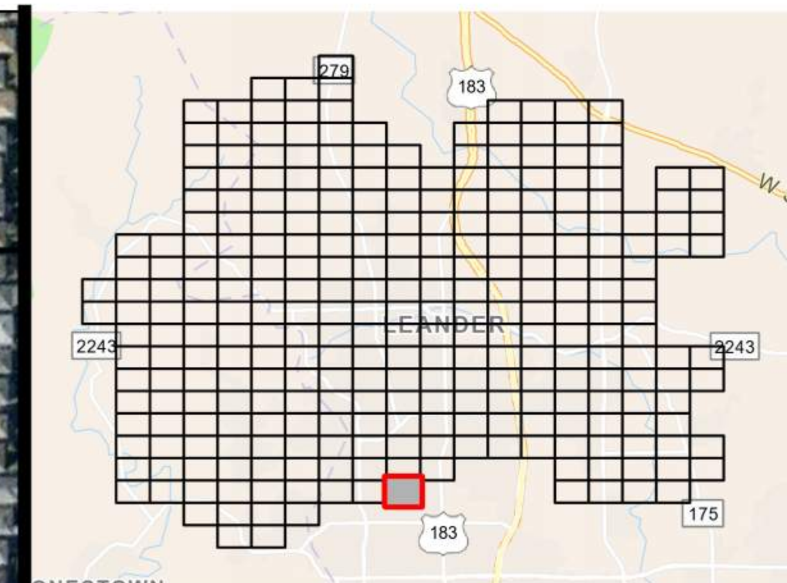
- Buried
- Could Not Access
- Could Not Locate
- Could Not Open
- Complete

300 150 0 300

Feet

Scale: 1" = 300'





LEANDER MANHOLE SURVEY STATUS MAP

GRID NO.: T-12

Legend

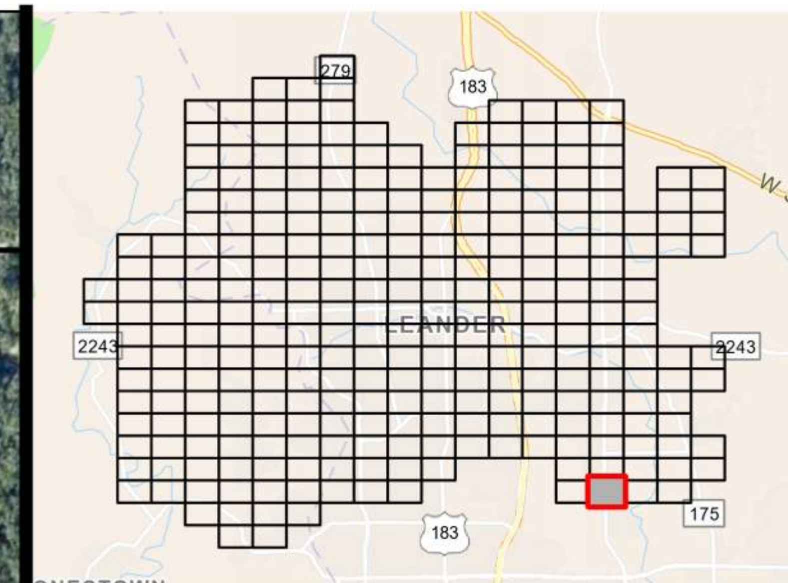
- Lift Station
- Outfall
- Sewer Main

Manhole Survey Status

- Buried
- Could Not Access
- Could Not Locate
- Could Not Open
- Complete

300 150 0 300 Feet

Scale: 1" = 300'



LEANDER MANHOLE SURVEY STATUS MAP
GRID NO.: T-18

Legend

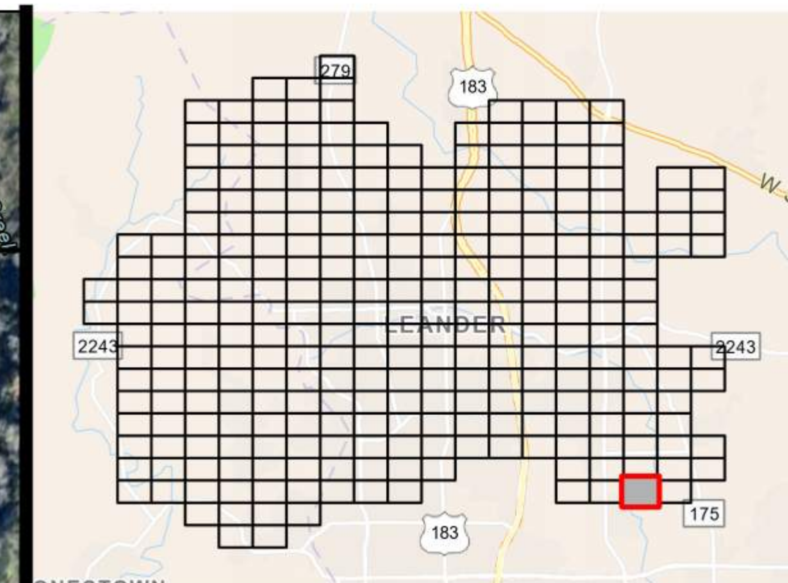
- Lift Station
- Outfall
- Sewer Main

Manhole Survey Status

- Buried
- Could Not Access
- Could Not Locate
- Could Not Open
- Complete

300 150 0 300 Feet

Scale: 1" = 300'



LEANDER MANHOLE SURVEY STATUS MAP

GRID NO.: T-19

Legend

- Lift Station
- Outfall
- Sewer Main

Manhole Survey Status

- Buried
- Could Not Access
- Could Not Locate
- Could Not Open
- Complete

300 150 0 300

Feet

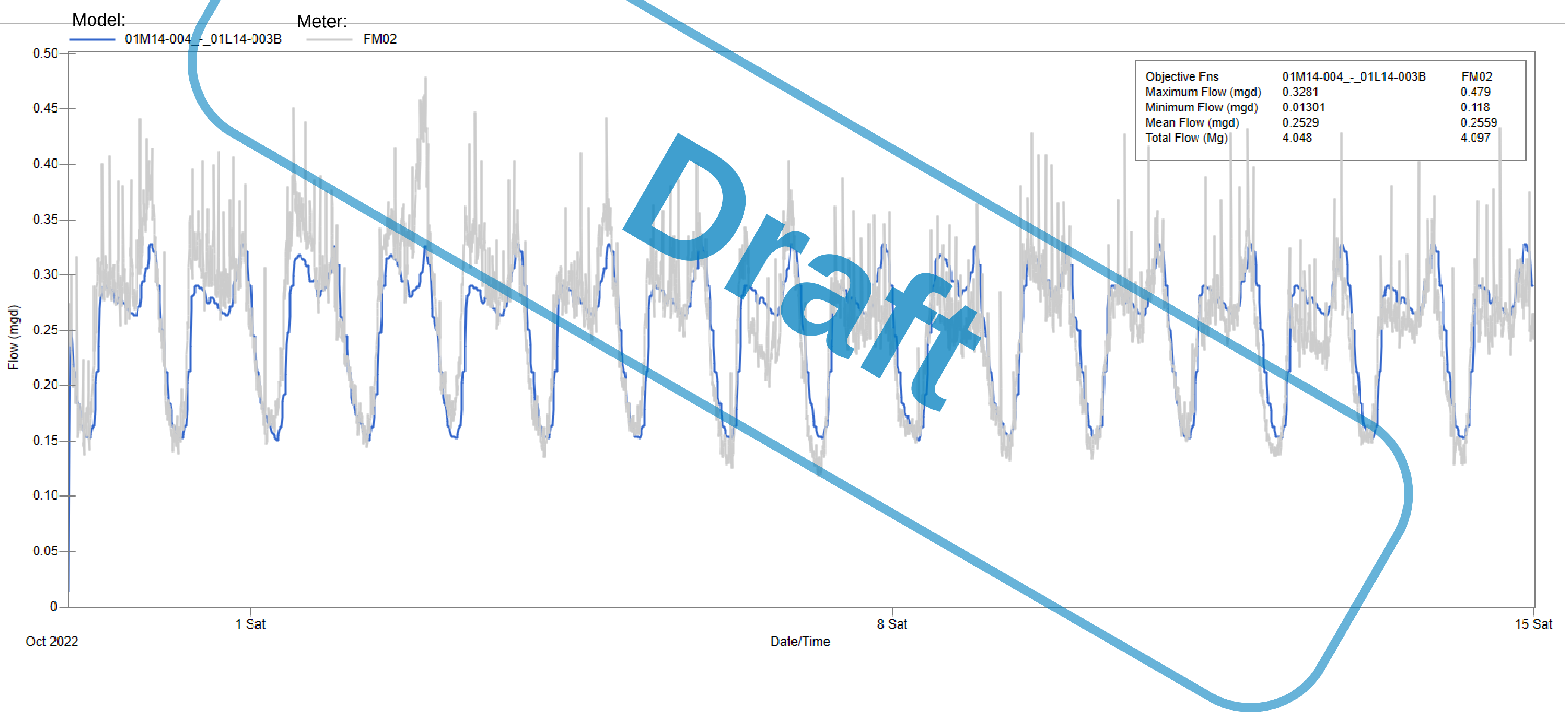
Scale: 1" = 300'

Appendix B: Dry Weather Calibration Summary

FM 01

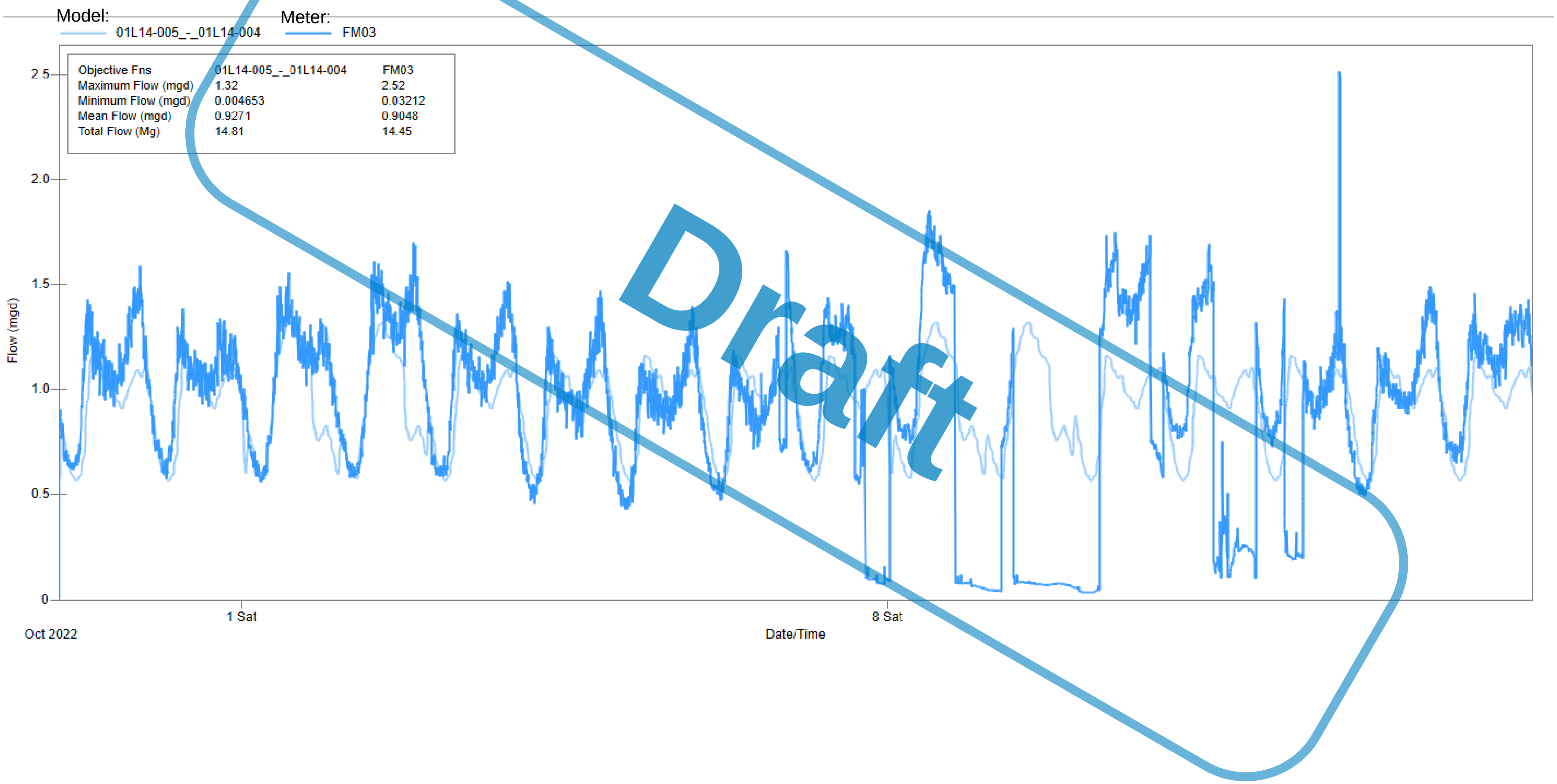
Model:
02T19-004_-_02T19-003
Meter:
FM01
Objective Fns 02T19-004_-_02T19-003 FM01
Maximum Flow (mgd) 1.707 2.19
Minimum Flow (mgd) 0.1273 0.183
Mean Flow (mgd) 0.9805 0.9835
Total Flow (Mg) 15.69 15.75
Flow (mgd)
2.2
2.0
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
1 Sat
8 Sat
15 Sat
Oct 2022
Date/Time
Draft

FM 02

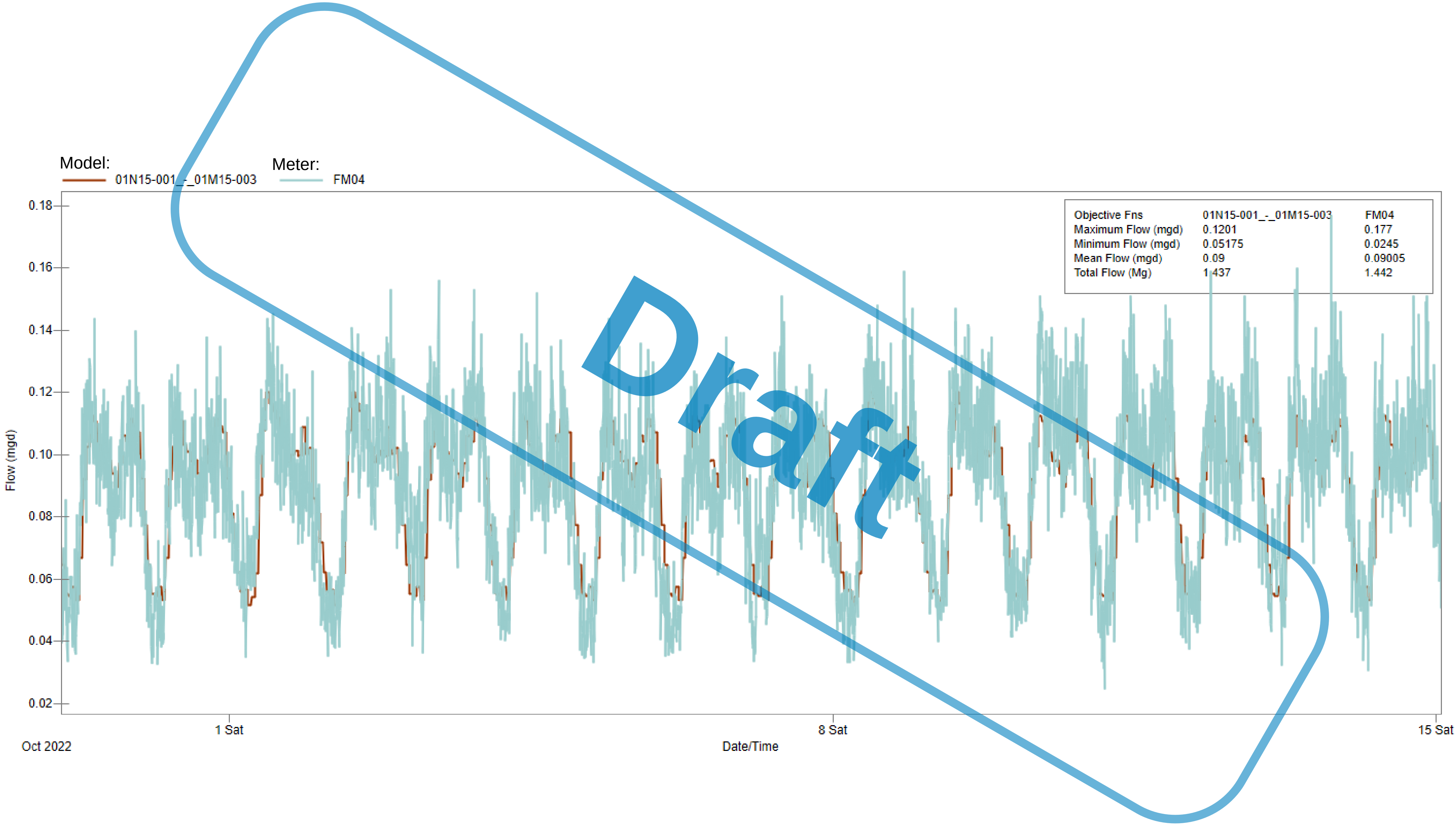


Model:
Meter:
01M14-004_-_01L14-003B
FM02
Objective Fns | 01M14-004_-_01L14-003B | FM02
Maximum Flow (mgd) | 0.3281 | 0.479
Minimum Flow (mgd) | 0.01301 | 0.118
Mean Flow (mgd) | 0.2529 | 0.2559
Total Flow (Mg) | 4.048 | 4.097
Flow (mgd)
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0
1 Sat
8 Sat
15 Sat
Oct 2022
Date/Time
Draft

FM 03

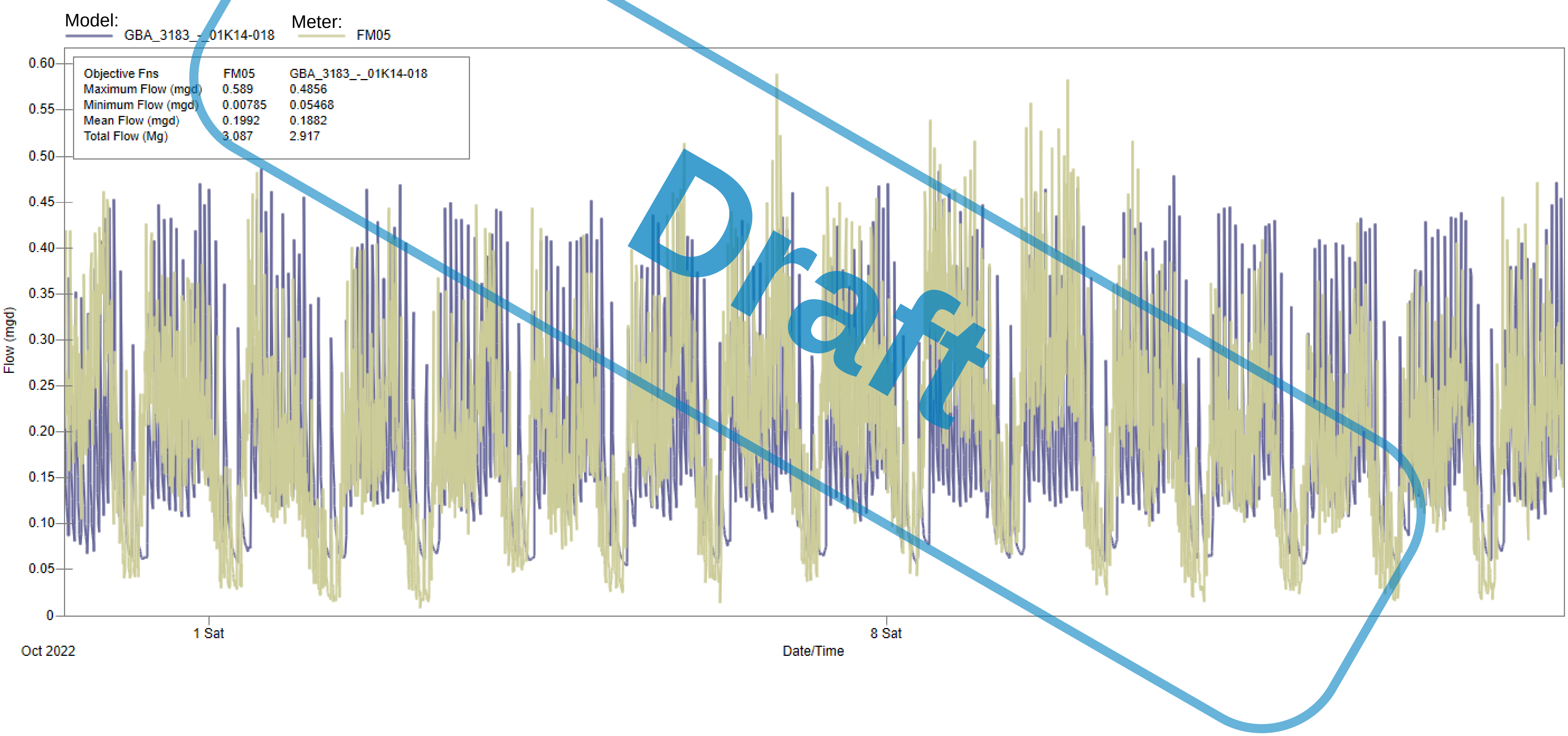

Model:
01L14-005_-_01L14-004
Meter:
FM03
Objective Fns
01L14-005_-_01L14-004
FM03
Maximum Flow (mgd) 1.32 2.52
Minimum Flow (mgd) 0.004653 0.03212
Mean Flow (mgd) 0.9271 0.9048
Total Flow (Mg) 14.81 14.45
Flow (mgd)
2.5
2.0
1.5
1.0
0.5
0
1 Sat
8 Sat
Oct 2022
Date/Time
Draft

FM 04



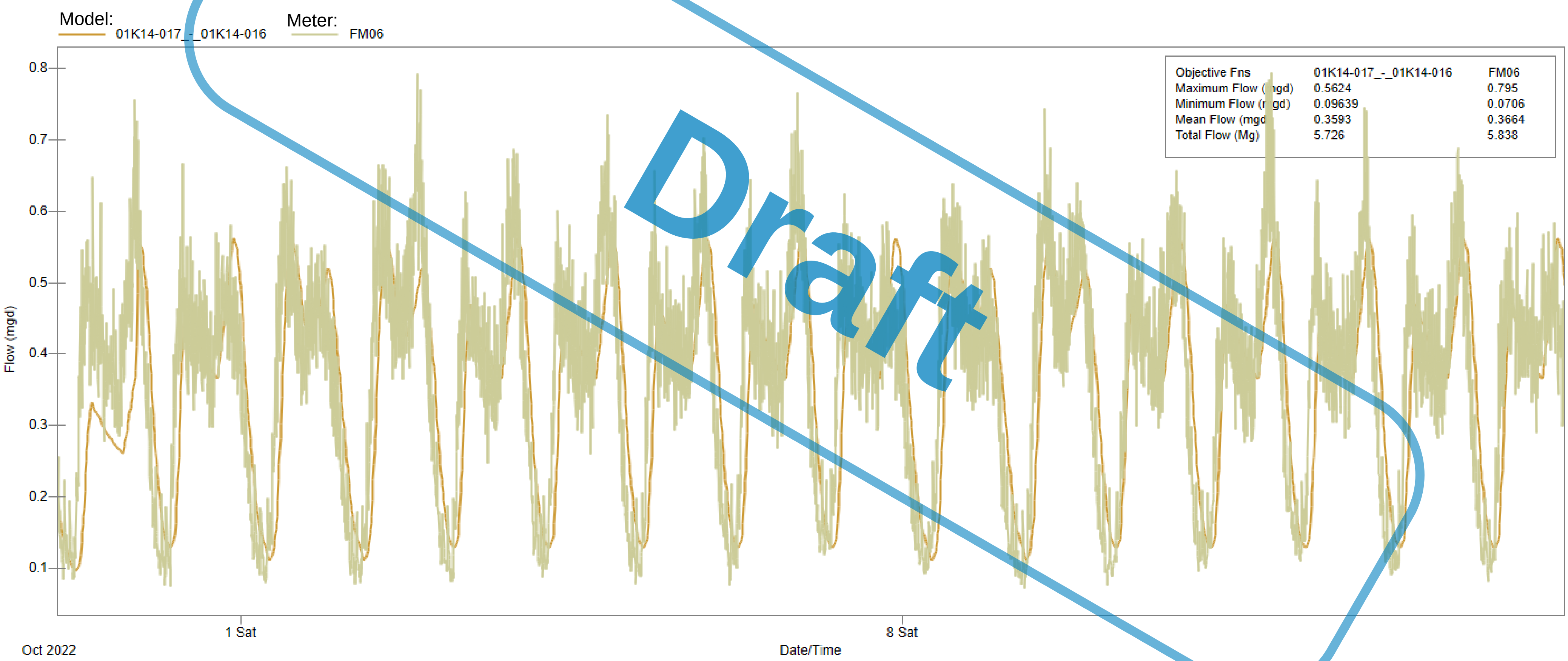
Model:
01N15-001_-_01M15-003
Meter:
FM04
Objective Fns
01N15-001_-_01M15-003
FM04
Maximum Flow (mgd)
0.1201
0.177
Minimum Flow (mgd)
0.05175
0.0245
Mean Flow (mgd)
0.09
0.09005
Total Flow (Mg)
1.437
1.442
Flow (mgd)
0.18
0.16
0.14
0.12
0.10
0.08
0.06
0.04
0.02
1 Sat
8 Sat
15 Sat
Oct 2022
Date/Time
Draft

FM 05



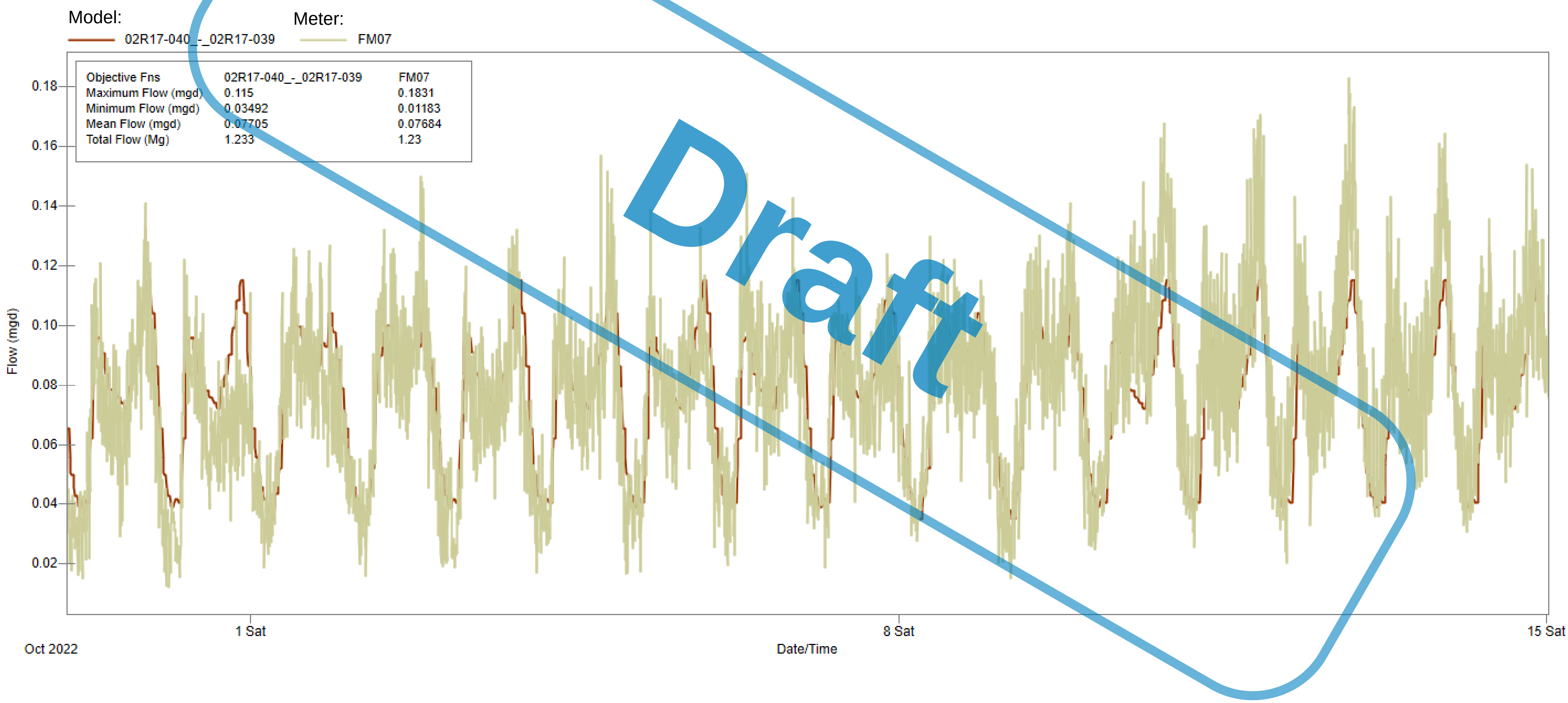
Model:
GBA_3183_-_01K14-018
Meter:
FM05
Objective Fns
FM05
GBA_3183_-_01K14-018
Maximum Flow (mgd)
0.589
0.4856
Minimum Flow (mgd)
0.00785
0.05468
Mean Flow (mgd)
0.1992
0.1882
Total Flow (Mg)
3.087
2.917
Flow (mgd)
0.60
0.55
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0
1 Sat
8 Sat
Oct 2022
Date/Time
Draft

FM 06



Model:
01K14-017_-_01K14-016
Meter:
FM06
Objective Fns
01K14-017_-_01K14-016
FM06
Maximum Flow (gd)
0.5624
0.795
Minimum Flow (r gd)
0.09639
0.0706
Mean Flow (mgd
0.3593
0.3664
Total Flow (Mg)
5.726
5.838
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
Flow (mgd)
1 Sat
8 Sat
Oct 2022
Date/Time
Draft

FM 07

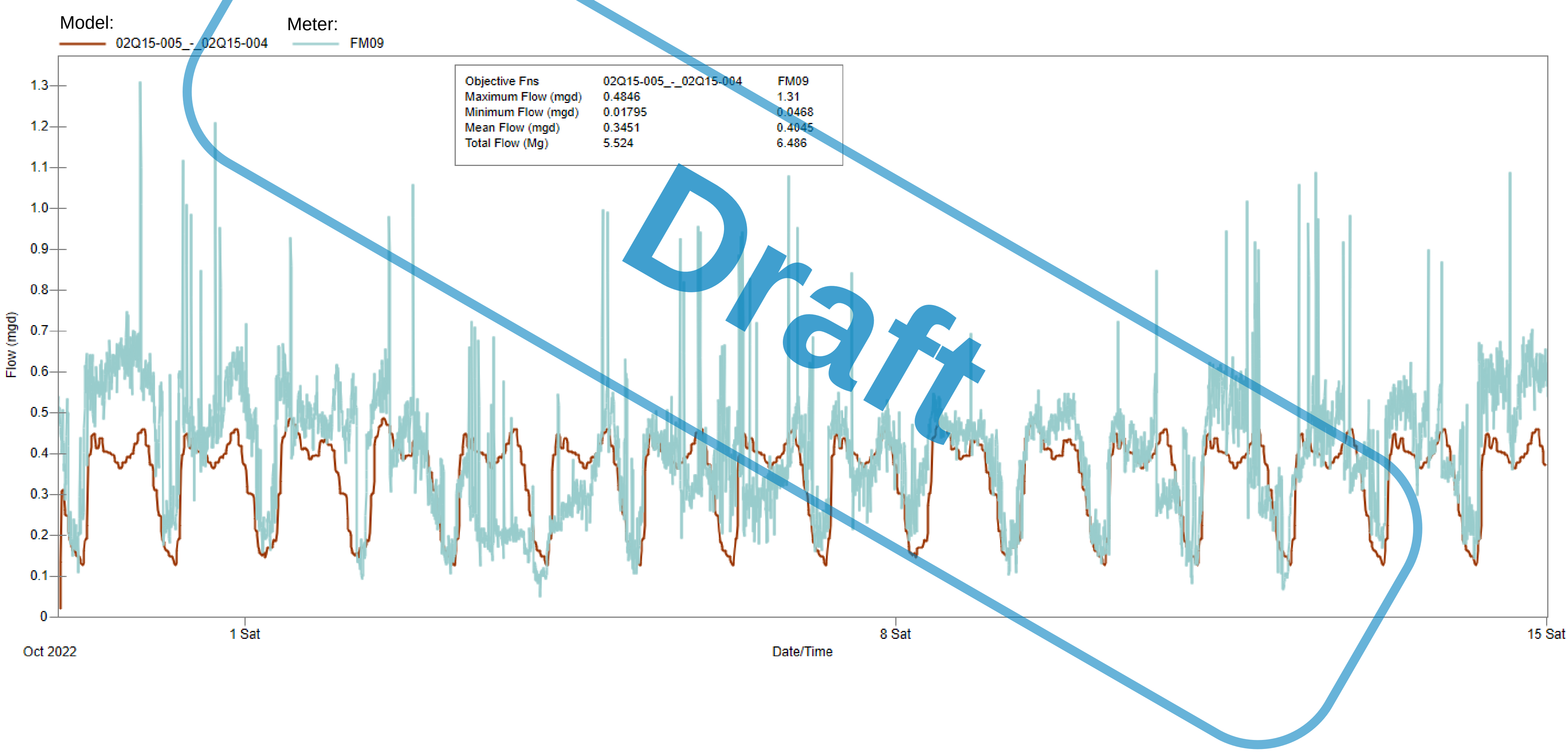


Model:
02R17-040_-_02R17-039
Meter:
FM07
Objective Fns
02R17-040_-_02R17-039
FM07
Maximum Flow (mgd)
0.115
0.1831
Minimum Flow (mgd)
0.03492
0.01183
Mean Flow (mgd)
0.07705
0.07684
Total Flow (Mg)
1.233
1.23
0.18
0.16
0.14
0.12
0.10
0.08
0.06
0.04
0.02
Flow (mgd)
1 Sat
8 Sat
15 Sat
Oct 2022
Date/Time
Draft

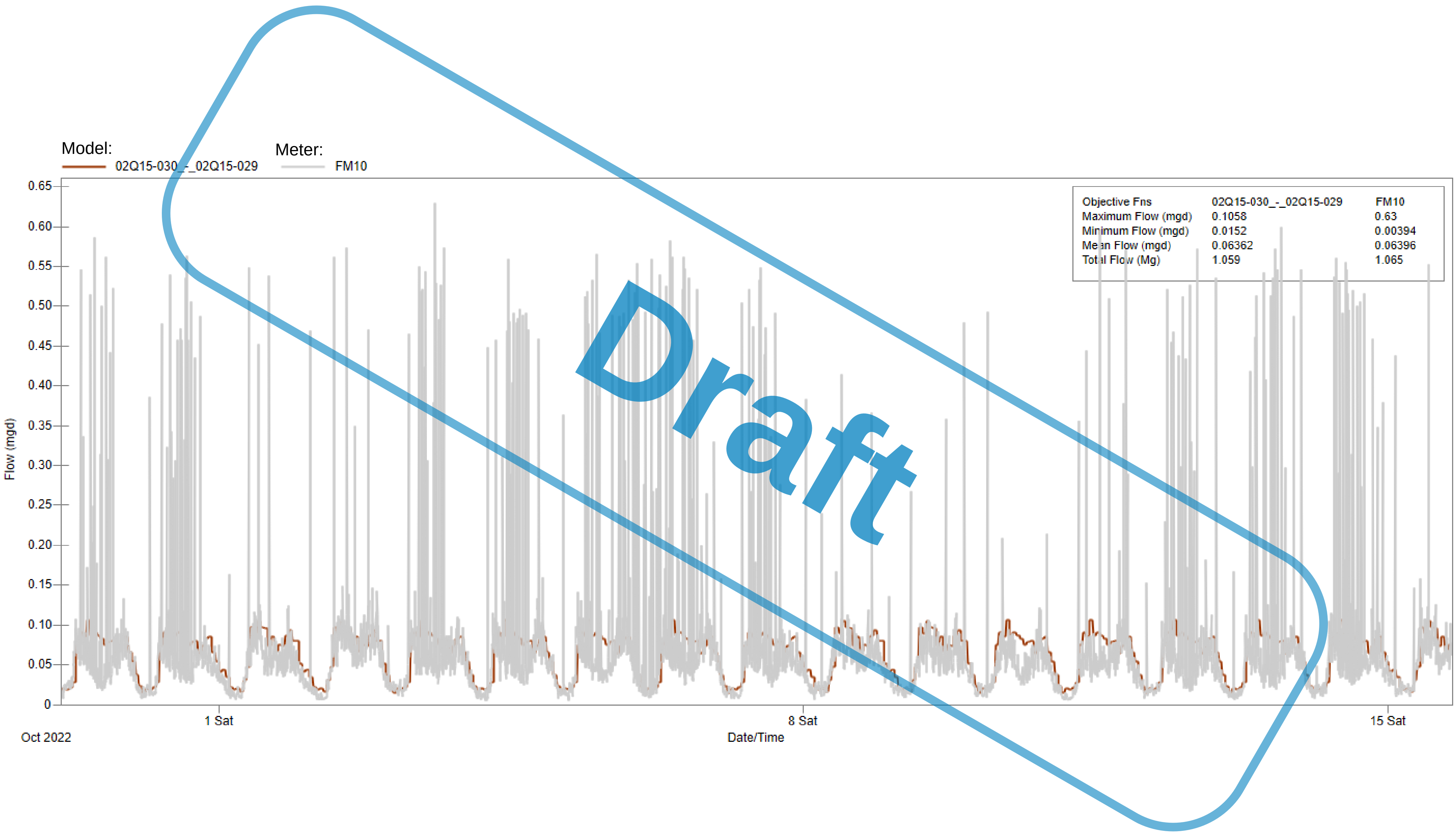
FM 08

Model:
02R16-015_-_02R16-014
Meter:
FM08
Objective Fns
02R16-015_-_02R16-014
FM08
Maximum Flow (mgd)
0.0689
0.679
Minimum Flow (mgd)
0.02157
0.00128
Mean Flow (mgd)
0.04869
0.0497
Total Flow (Mg)
0.7777
0.7936
Draft
Flow (mgd)
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
1 Sat
8 Sat
Oct 2022
Date/Time

FM 09

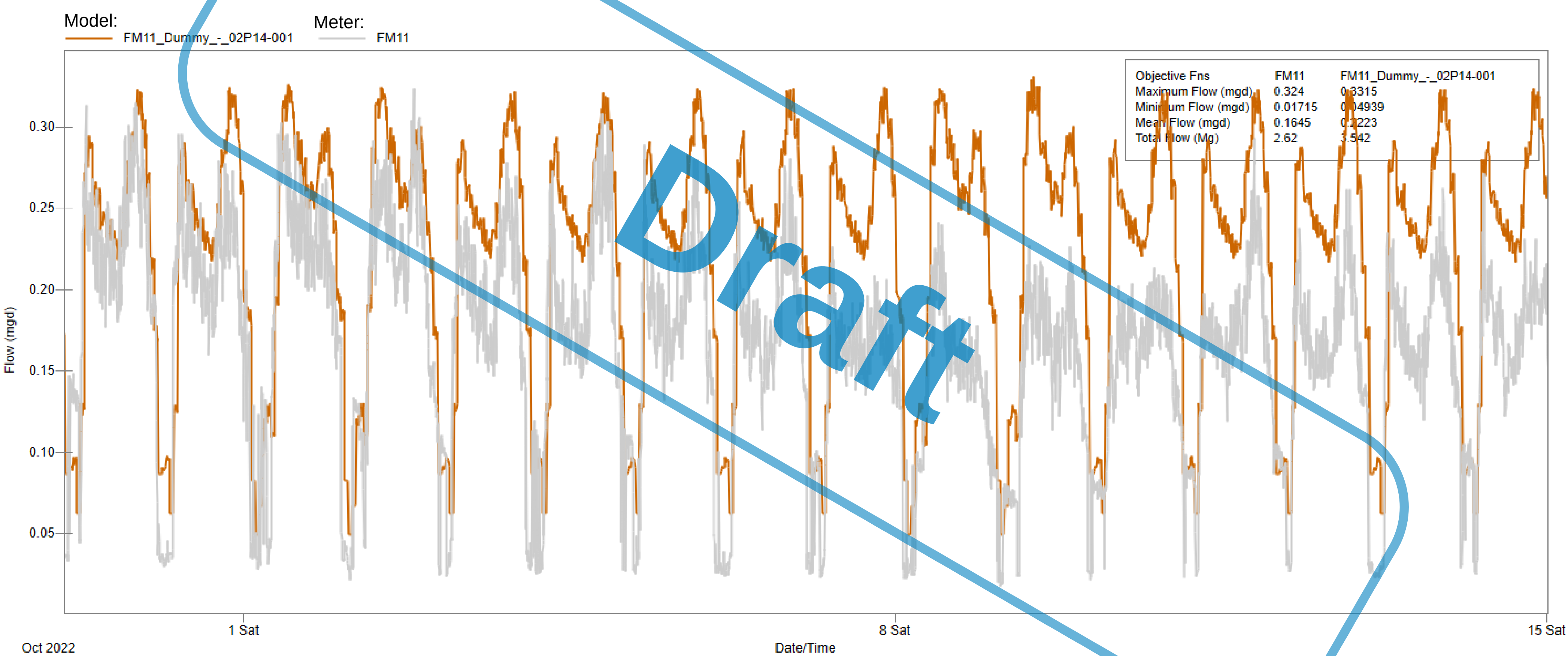

Model:
02Q15-005_-_02Q15-004
Meter:
FM09
Objective Fns 02Q15-005_-_02Q15-004 FM09
Maximum Flow (mgd) 0.4846 1.31
Minimum Flow (mgd) 0.01795 0.0468
Mean Flow (mgd) 0.3451 0.4045
Total Flow (Mg) 5.524 6.486
Flow (mgd)
1.3
1.2
1.1
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
1 Sat
8 Sat
15 Sat
Oct 2022
Date/Time
Draft

FM 10



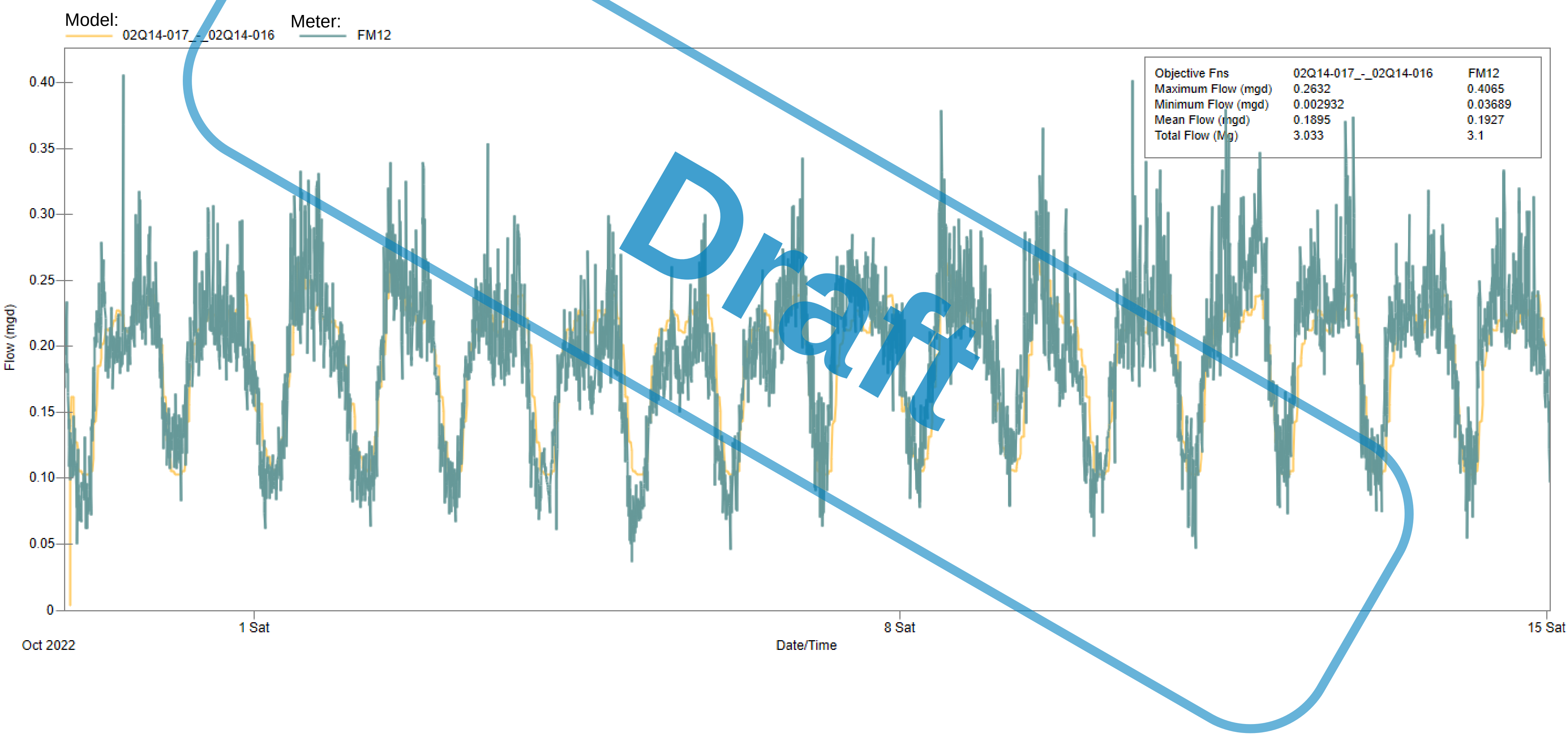
Model:
02Q15-030_-_02Q15-029
Meter:
FM10
Objective Fns
02Q15-030_-_02Q15-029
FM10
Maximum Flow (mgd)
0.1058
0.63
Minimum Flow (mgd)
0.0152
0.00394
Mean Flow (mgd)
0.06362
0.06396
Total Flow (Mg)
1.059
1.065
Flow (mgd)
0.65
0.60
0.55
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0
1 Sat
8 Sat
15 Sat
Oct 2022
Date/Time
Draft

FM 11



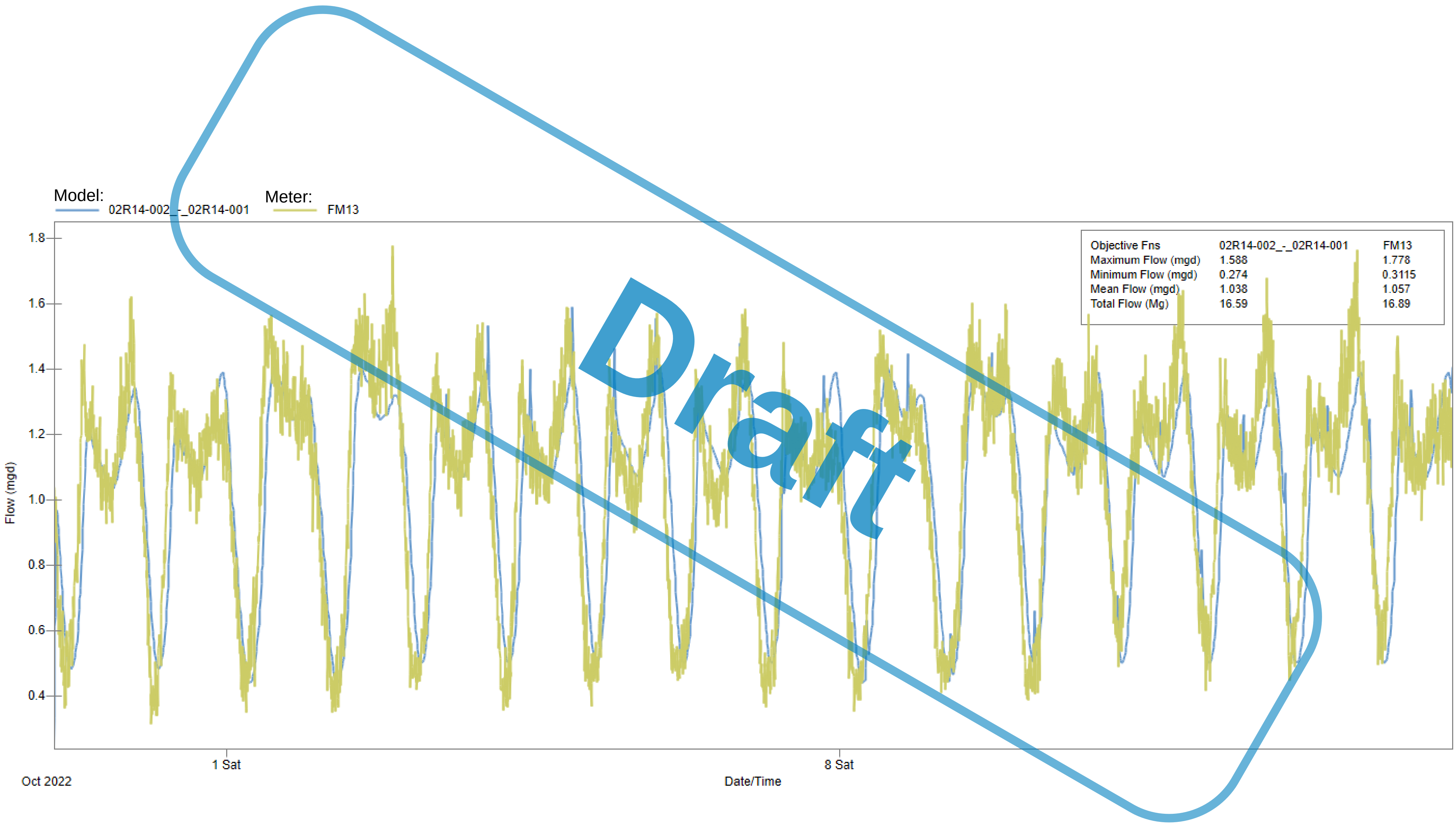
Model:
FM11_Dummy_-_02P14-001
Meter:
FM11
Objective Fns | FM11 | FM11_Dummy_-_02P14-001
Maximum Flow (mgd) | 0.324 | 0.3315
Minimum Flow (mgd) | 0.01715 | 0.04939
Mean Flow (mgd) | 0.1645 | 0.2223
Total Flow (Mg) | 2.62 | 3.542
Flow (mgd)
0.30
0.25
0.20
0.15
0.10
0.05
1 Sat
8 Sat
15 Sat
Oct 2022
Date/Time
Draft

FM 12



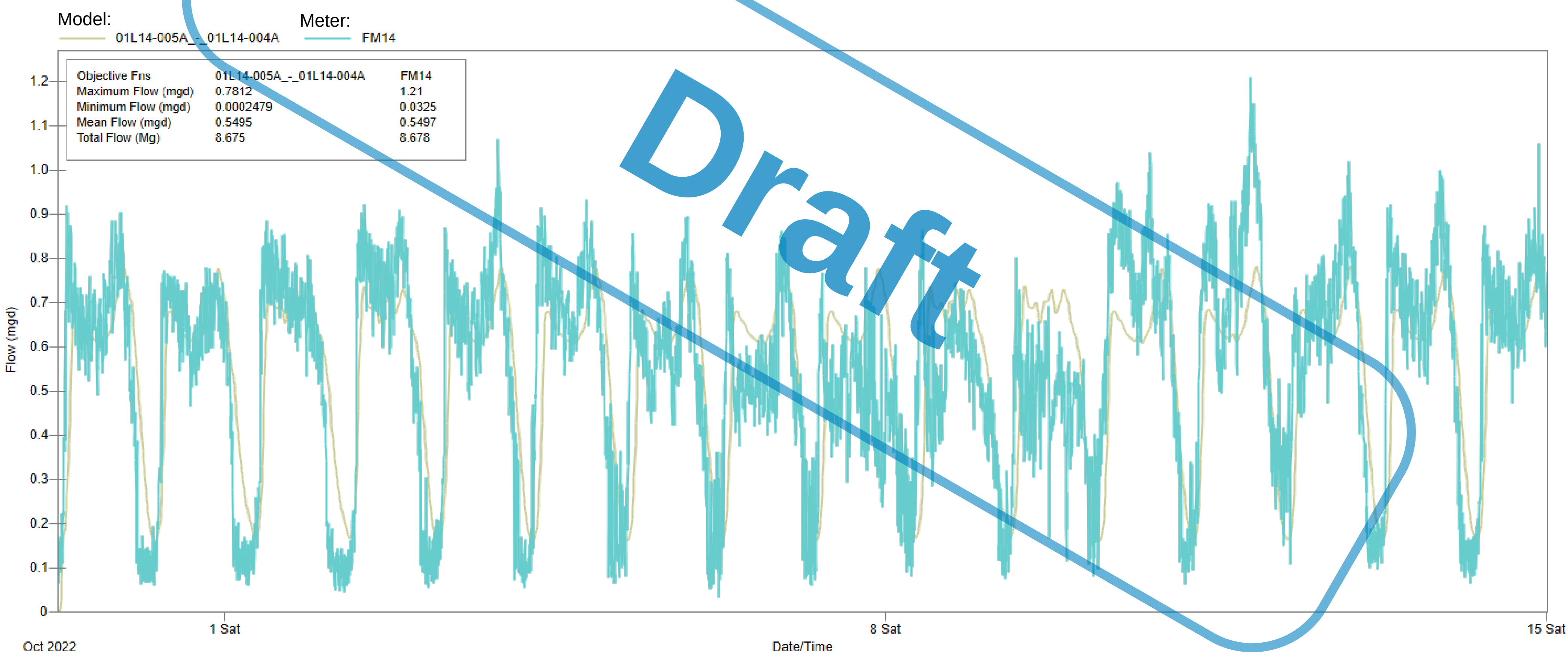
Model:
02Q14-017_-_02Q14-016
Meter:
FM12
Objective Fns
02Q14-017_-_02Q14-016
FM12
Maximum Flow (mgd)
0.2632
0.4065
Minimum Flow (mgd)
0.002932
0.03689
Mean Flow (mgd)
0.1895
0.1927
Total Flow (Mg)
3.033
3.1
Flow (mgd)
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0
1 Sat
8 Sat
15 Sat
Oct 2022
Date/Time
Draft

FM 13



Model:
02R14-002_-_02R14-001
Meter:
FM13
Objective Fns | 02R14-002_-_02R14-001 | FM13
Maximum Flow (mgd) | 1.588 | 1.778
Minimum Flow (mgd) | 0.274 | 0.3115
Mean Flow (mgd) | 1.038 | 1.057
Total Flow (Mg) | 16.59 | 16.89
Flow (mgd)
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
1 Sat
8 Sat
Oct 2022
Date/Time
Draft

FM 14



Model:
01L14-005A_-_01L14-004A
Meter:
FM14
Objective Fns 01L14-005A_-_01L14-004A FM14
Maximum Flow (mgd) 0.7812 1.21
Minimum Flow (mgd) 0.0002479 0.0325
Mean Flow (mgd) 0.5495 0.5497
Total Flow (Mg) 8.675 8.678
Flow (mgd)
Date/Time
Oct 2022
1 Sat
8 Sat
15 Sat
Draft

Appendix C: Wet Weather Calibration Summary

Weighted Averages % Differences

FM Basin	Basin Area (ac)	No. of Storm Events with Responses	Weighted Avg. % Difference, Volume	Weighted Avg. % Difference, Peak Flow
FM01	1638	7	10%	-1%
FM02	452	8	7%	-1%
FM03	1301	9	5%	1%
FM04	140	7	9%	-4%
FM05	747	6	17%	8%
FM06	1561	7	9%	14%
FM07	98	9	-4%	13%
FM08	87	7	3%	-1%
FM09*	418	6	8%	-1%
FM10*	197	7	8%	7%
FM11	125	9	19%	7%
FM12	410	11	-3%	13%
FM13	1285	9	16%	12%
FM14	1569	5	6%	14%

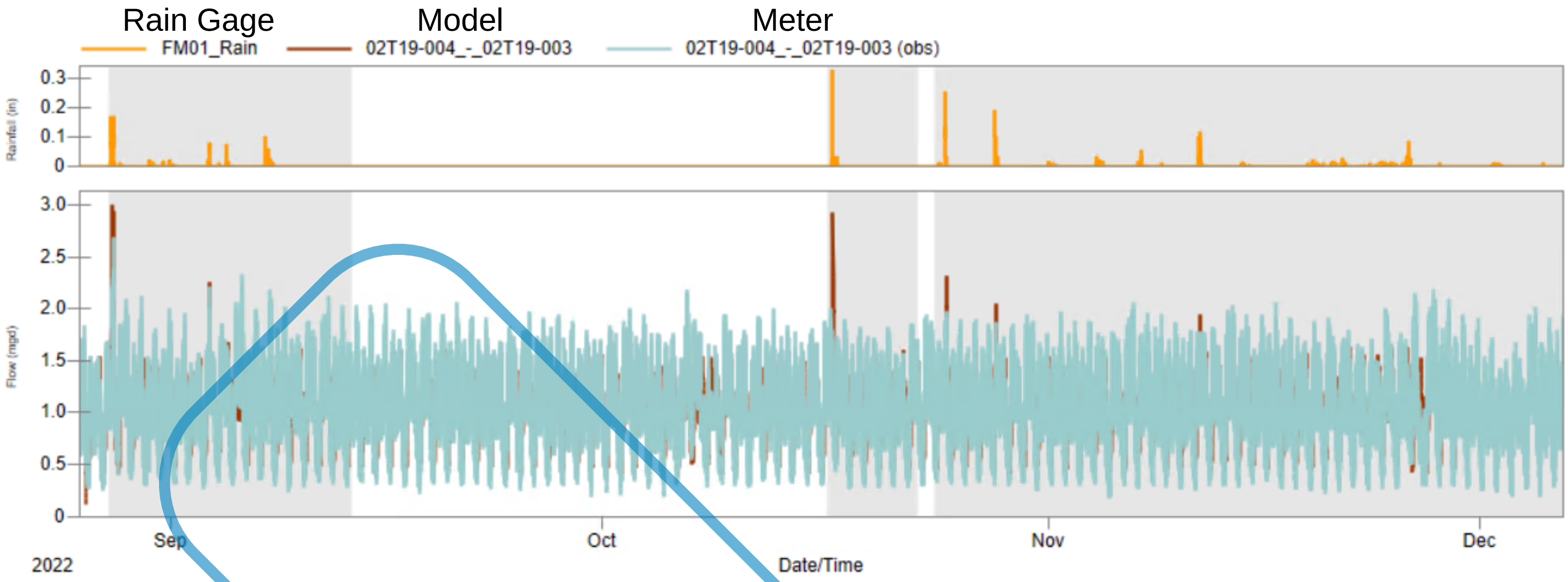
** random peaks in flow meter data not included in peak flow comparisons*

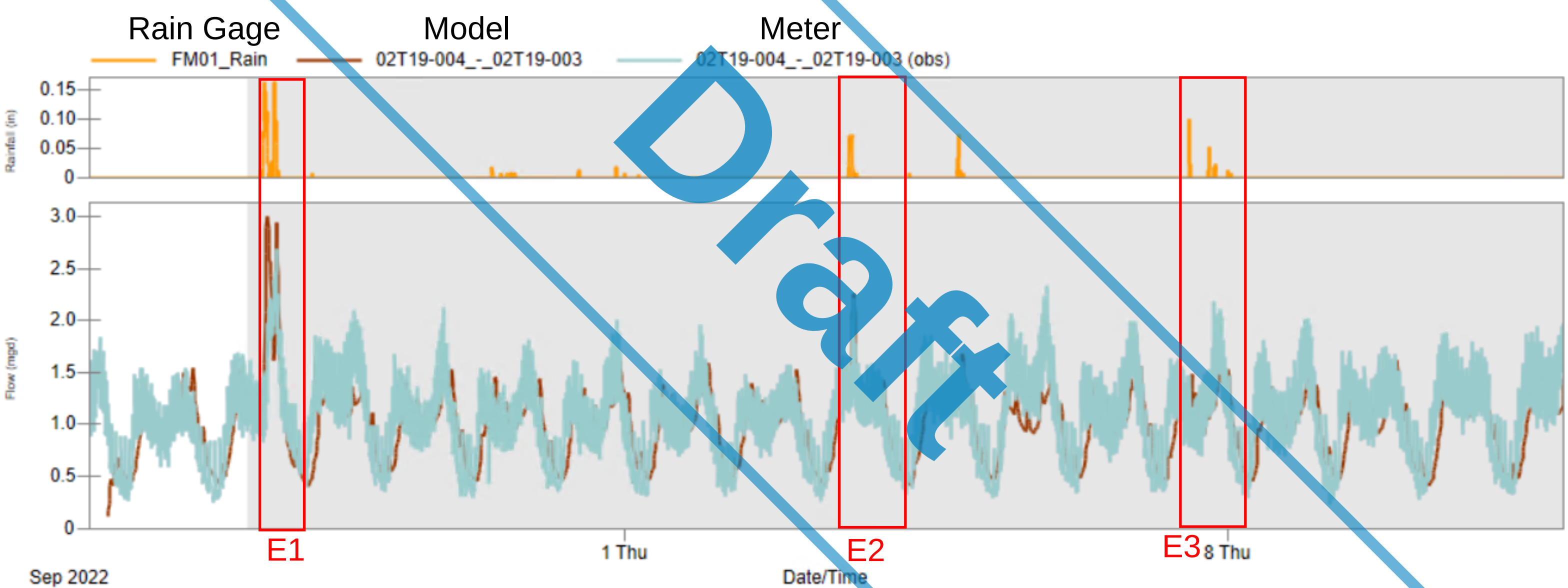
Draft

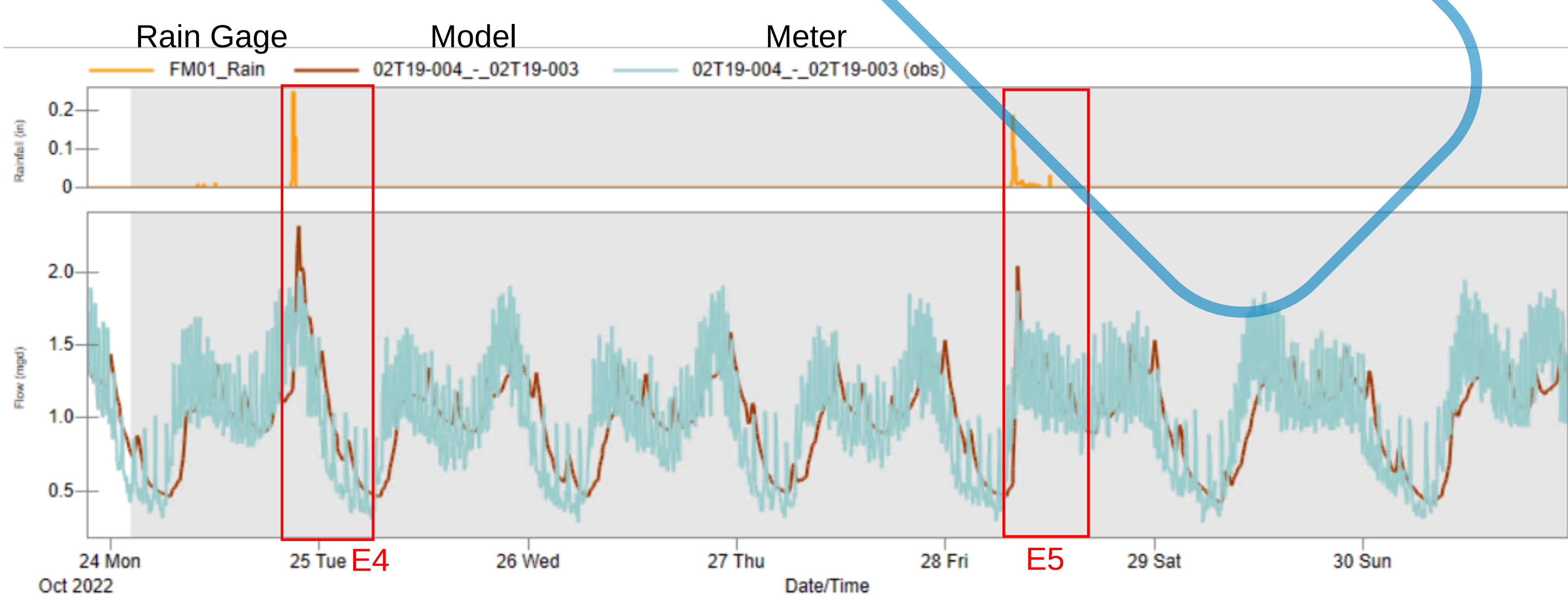
R,T,K Values

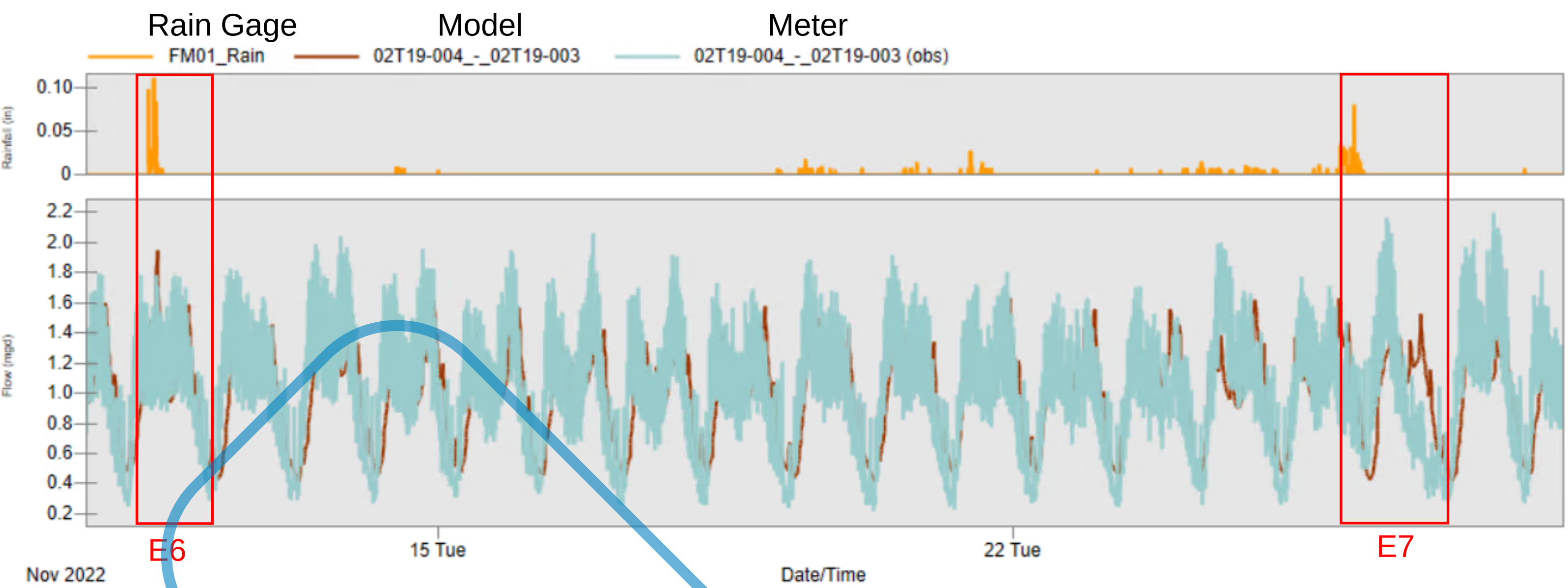
	Short Term			**Medium Term**			**Long Term**		
	R	T	K	R	T	K	R	T	K
FM01	1.61E-03	0.00	121.68	6.15E-05	7.56	8.25	1.22E-04	46.66	5.59
FM02	6.13E-03	0.18	52.00	1.44E-04	20.88	10.00	9.00E-06	48.00	4.24
FM03	7.42E-03	0.25	30.45	1.00E-05	10.00	10.00	1.00E-05	26.16	2.00
FM04	1.09E-02	0.25	182.00	3.75E-02	12.46	13.44	1.67E-01	96.00	7.89
FM05	1.34E-03	0.03	30.50	4.92E-05	22.40	8.42	7.20E-05	24.00	4.00
FM06	1.46E-03	0.10	37.91	1.61E-05	2.04	3.38	4.36E-04	36.75	15.02
FM07	2.62E-03	0.03	37.12	1.12E-04	31.44	10.00	9.00E-04	45.28	2.00
FM08	5.41E-03	0.06	44.96	5.65E-03	24.38	6.25	5.27E-03	96.00	2.00
FM09	5.03E-02	1.12	33.30	5.05E-03	46.80	1.54	6.50E-04	120.00	2.83
FM10	8.64E-04	0.13	52.00	7.59E-04	53.76	20.00	6.40E-04	24.00	4.00
FM11	5.00E-06	0.05	197.94	2.00E-04	56.27	9.70	1.00E-04	14.52	2.00
FM12	2.87E-03	0.02	54.10	1.81E-04	1.07	10.00	3.63E-04	26.88	4.29
FM13	7.98E-03	0.02	416.00	3.46E-04	15.45	35.40	1.73E-04	96.00	3.09
FM14	4.21E-03	0.03	91.21	8.38E-04	29.74	19.00	6.75E-04	245.76	7.00

FM01


Rain Gage
Model
Meter
FM01_Rain
02T19-004_-_02T19-003
02T19-004_-_02T19-003 (obs)
Rainfall (in)
Flow (mgd)
Sep
Oct
Nov
Dec
2022
Date/Time

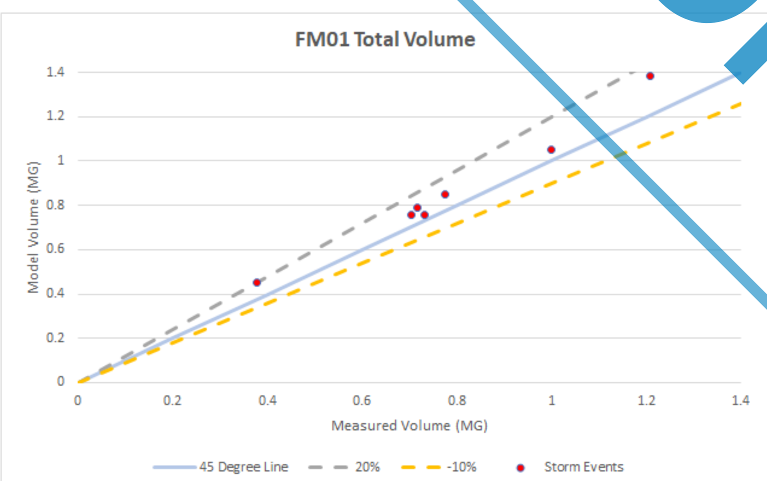

Rain Gage
Model
Meter
FM01_Rain
02T19-004_-_02T19-003
02T19-004_-_02T19-003 (obs)
Rainfall (in)
Flow (mgd)
E1
E2
E3
1 Thu
8 Thu
Sep 2022
Date/Time

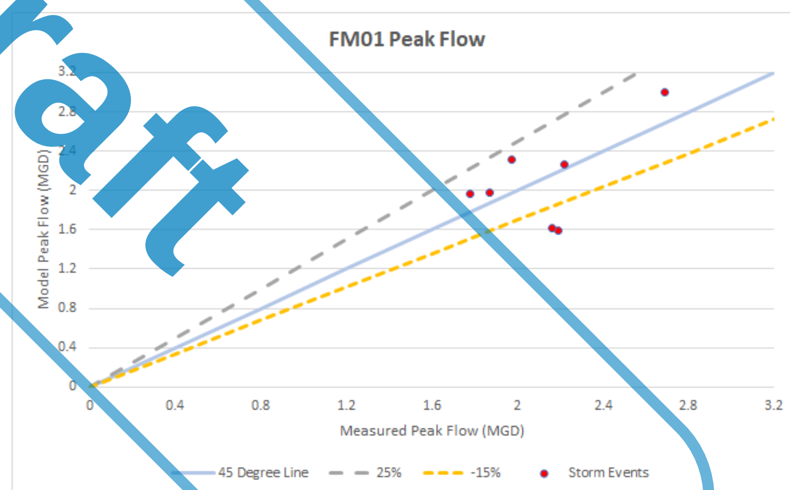

Rain Gage
Model
Meter
FM01_Rain
02T19-004_-_02T19-003
02T19-004_-_02T19-003 (obs)
Rainfall (in)
Flow (mgd)
24 Mon
25 Tue
E4
26 Wed
27 Thu
28 Fri
E5
29 Sat
30 Sun
Oct 2022
Date/Time



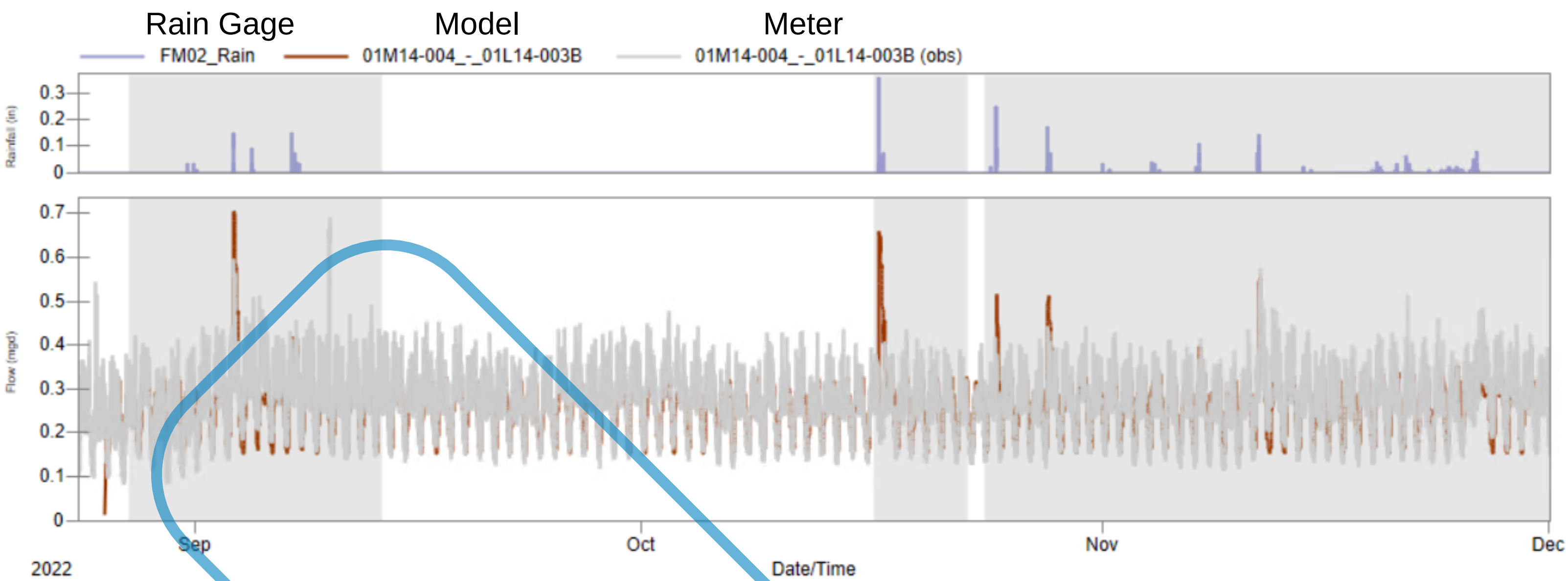
FM01			
Event	Model Volume (MG)	Meter Volume (MG)	% Difference
1	0.7567	0.7042	7%
2	0.7897	0.7158	10%
3	0.7583	0.7319	4%
4	0.4522	0.3786	19%
5	1.05	0.999	5%
6	0.852	0.7747	10%
7	1.382	1.209	14%

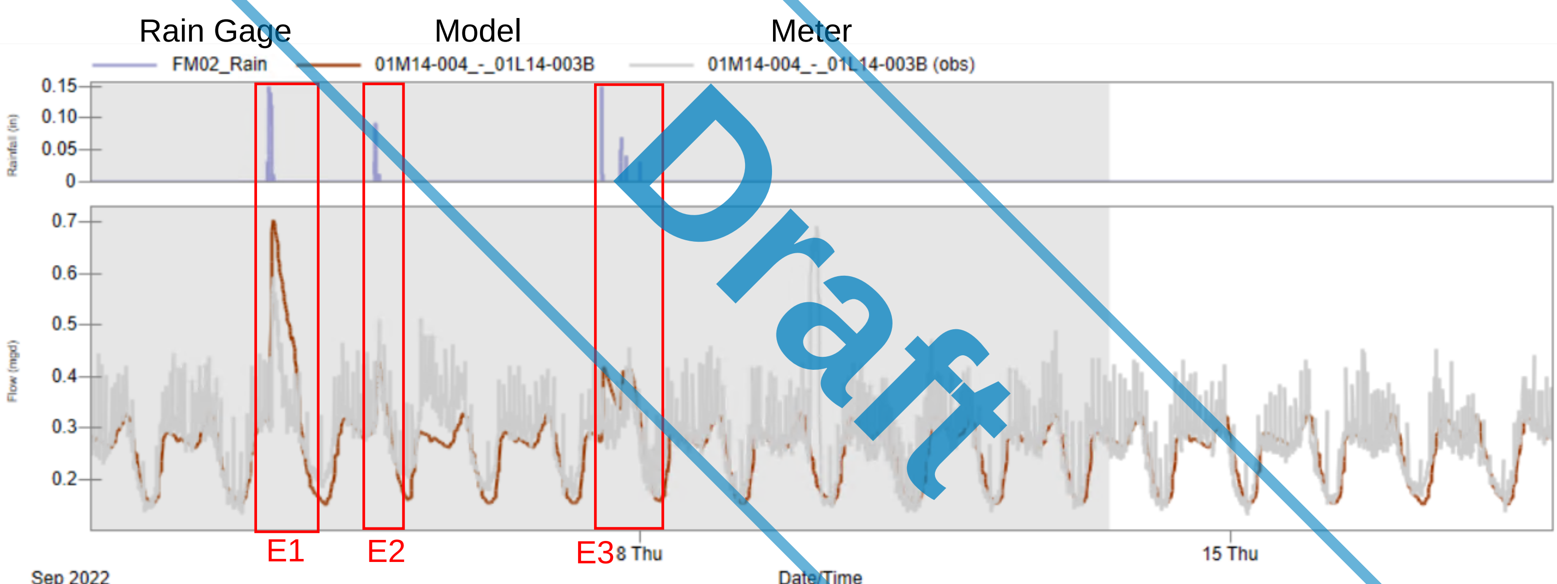
FM01			
Event	Model Peak Flow (MGD)	Meter Peak Flow (MGD)	% Difference
1	3.001	2.69	12%
2	2.259	2.22	2%
3	1.587	2.19	-28%
4	2.316	1.97	18%
5	1.984	1.87	6%
6	1.962	1.78	10%
7	1.615	2.16	-25%

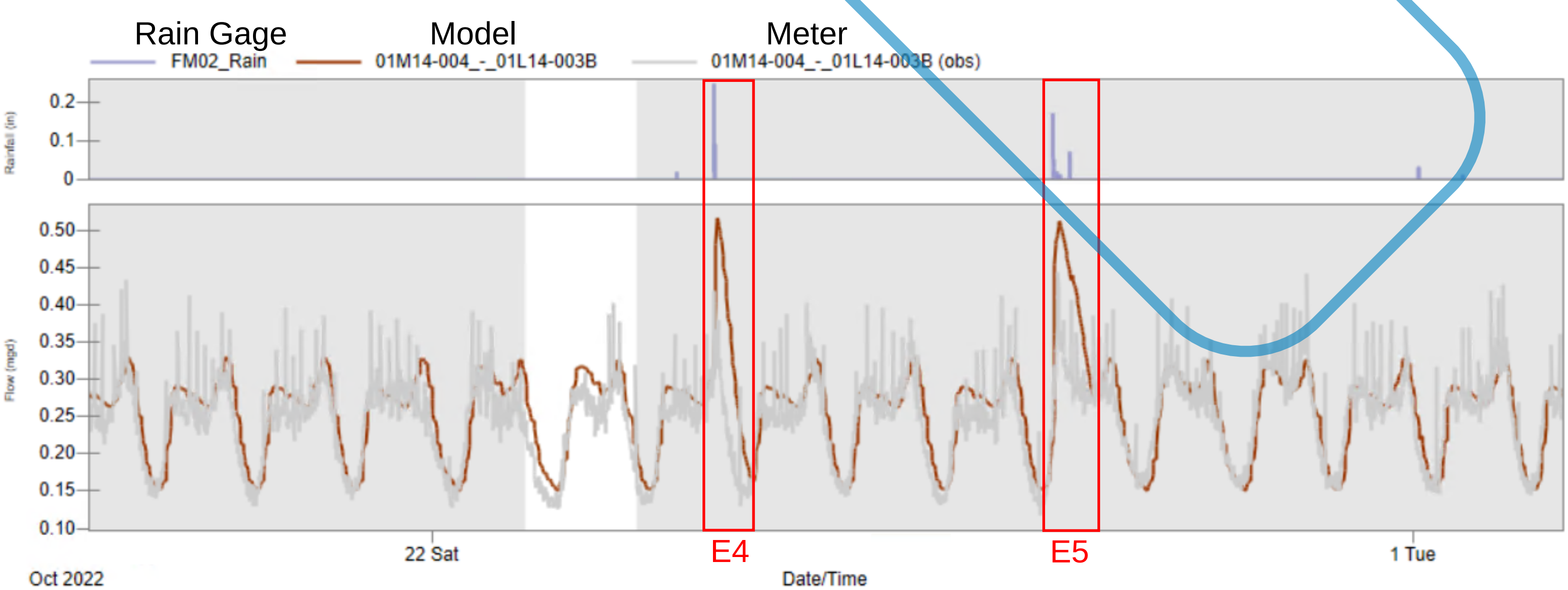


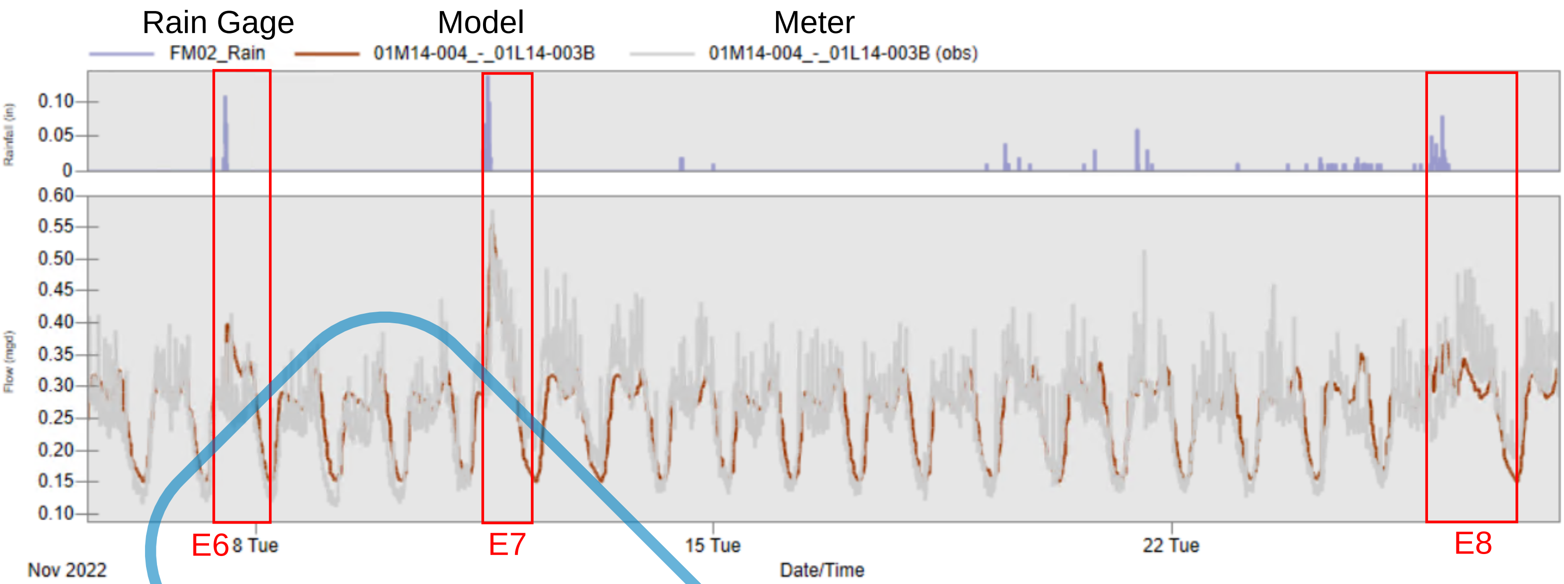


FM02


Rain Gage
Model
Meter
FM02_Rain
01M14-004_-_01L14-003B
01M14-004_-_01L14-003B (obs)
Rainfall (in)
Flow (mgd)
Sep
Oct
Nov
Dec
2022
Date/Time

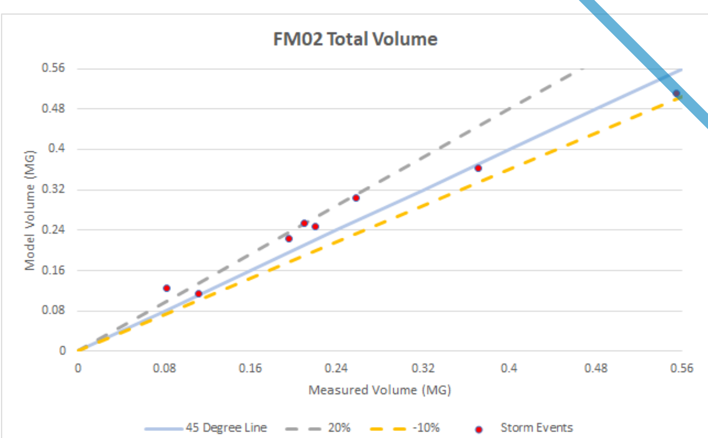

Rain Gage
Model
Meter
FM02_Rain
01M14-004_-_01L14-003B
01M14-004_-_01L14-003B (obs)
Rainfall (in)
Flow (mgd)
E1
E2
E3
8 Thu
15 Thu
Sep 2022
Date/Time

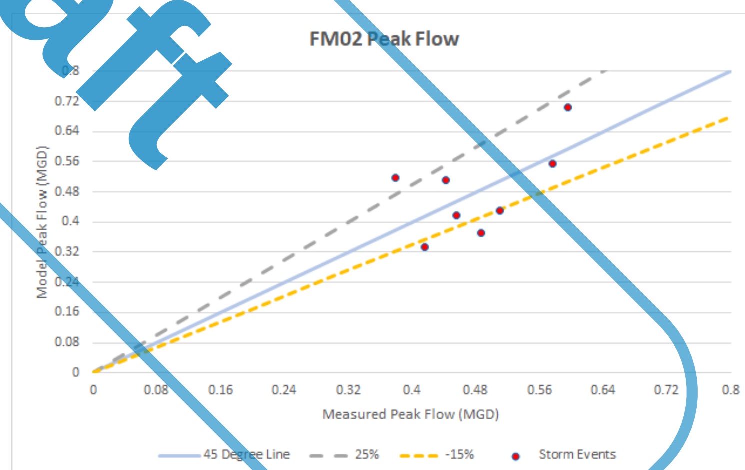

Rain Gage
Model
Meter
FM02_Rain
01M14-004_-_01L14-003B
01M14-004_-_01L14-003B (obs)
Rainfall (in)
Flow (mgd)
E4
E5
22 Sat
1 Tue
Oct 2022
Date/Time



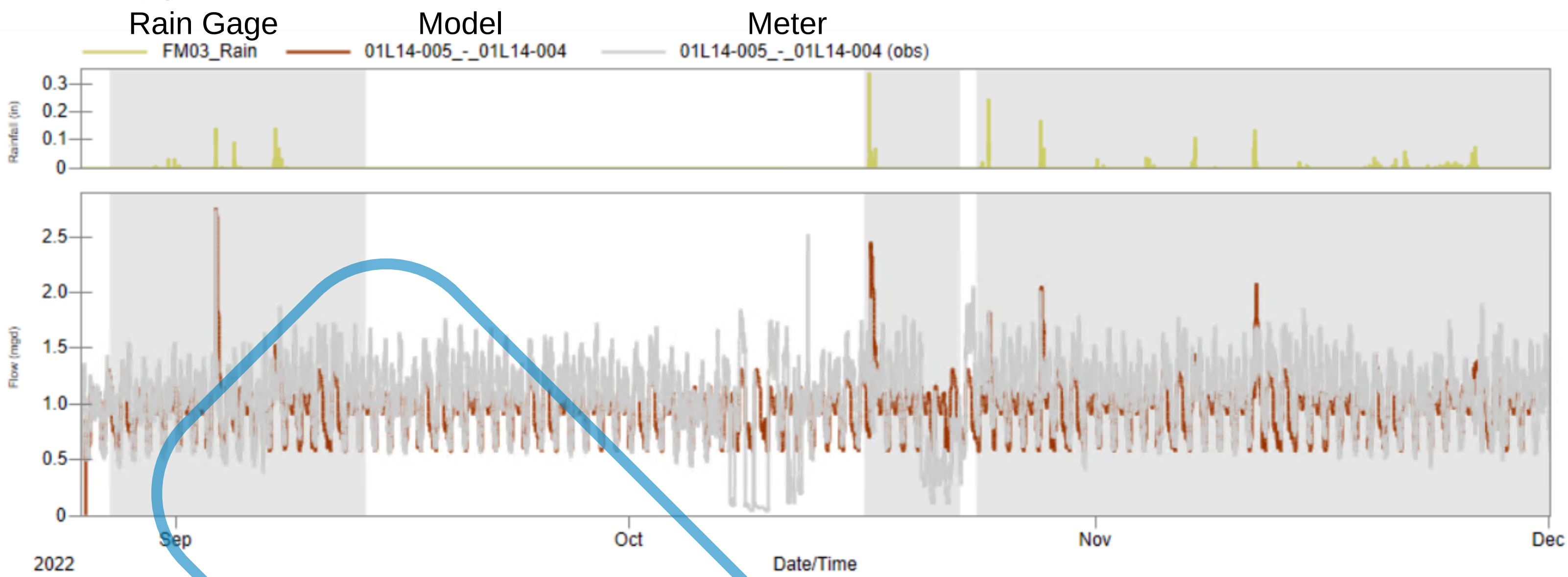
FM02			
Event	Model Volume (MG)	Meter Volume (MG)	% Difference
1	0.2543	0.2097	21%
2	0.1131	0.1119	1%
3	0.2227	0.1954	14%
4	0.1254	0.08241	52%
5	0.3031	0.258	17%
6	0.2465	0.2204	12%
7	0.5108	0.555	-8%
8	0.3625	0.3716	-2%

FM02			
Event	Model Peak Flow (MGD)	Meter Peak Flow (MGD)	% Difference
1	0.7038	0.595	18%
2	0.4301	0.51	-16%
3	0.4167	0.456	-9%
4	0.5162	0.38	36%
5	0.5115	0.443	15%
6	0.334	0.416	-20%
7	0.5545	0.577	-4%
8	0.3723	0.486	-23%

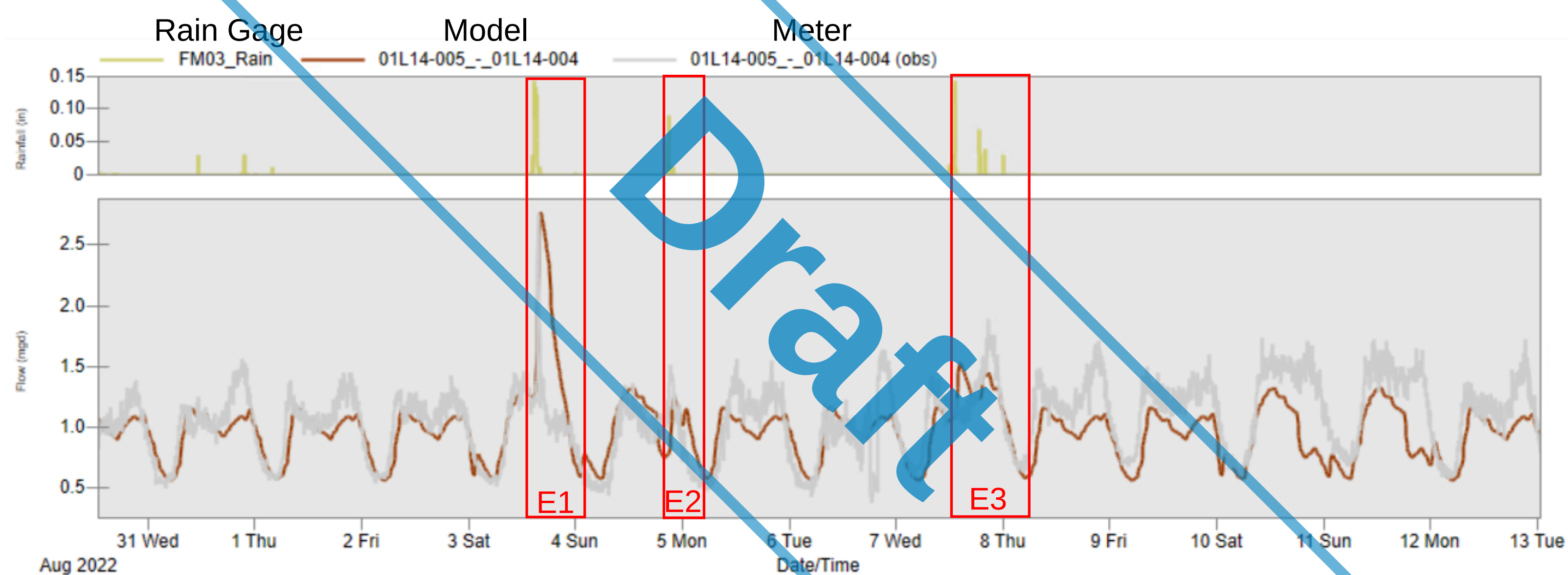




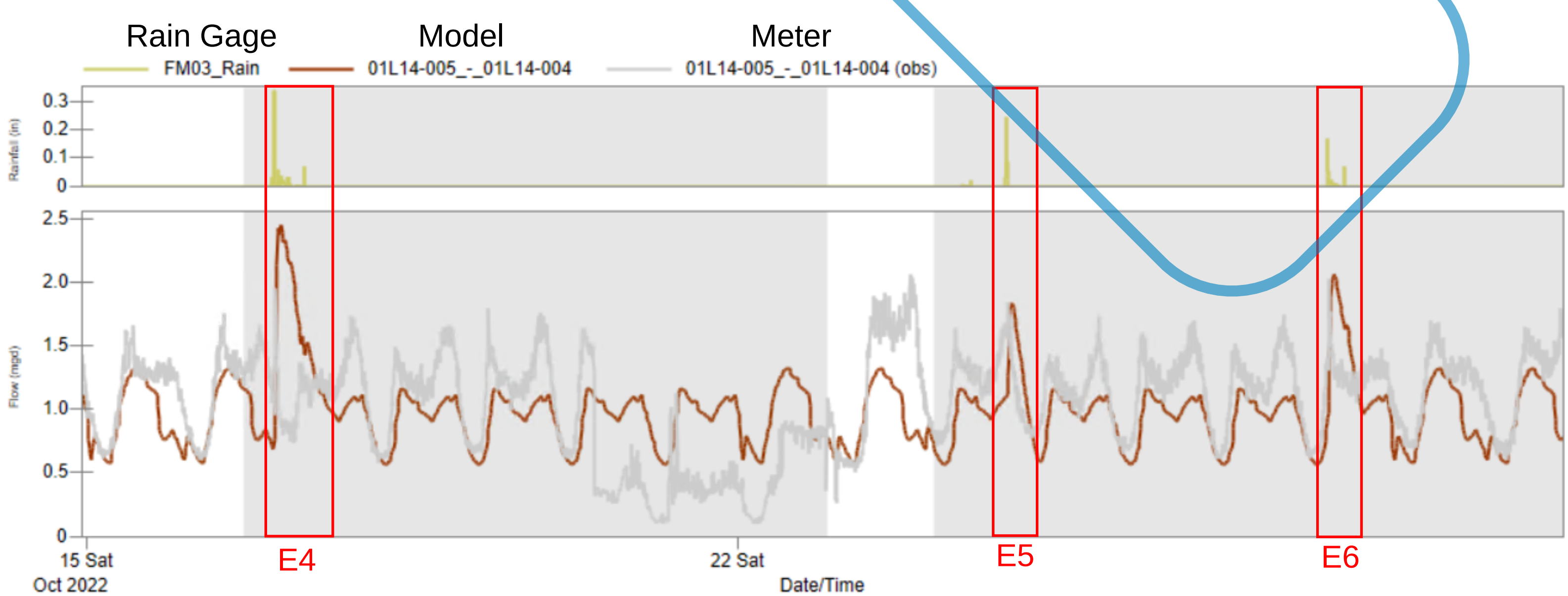
FM03



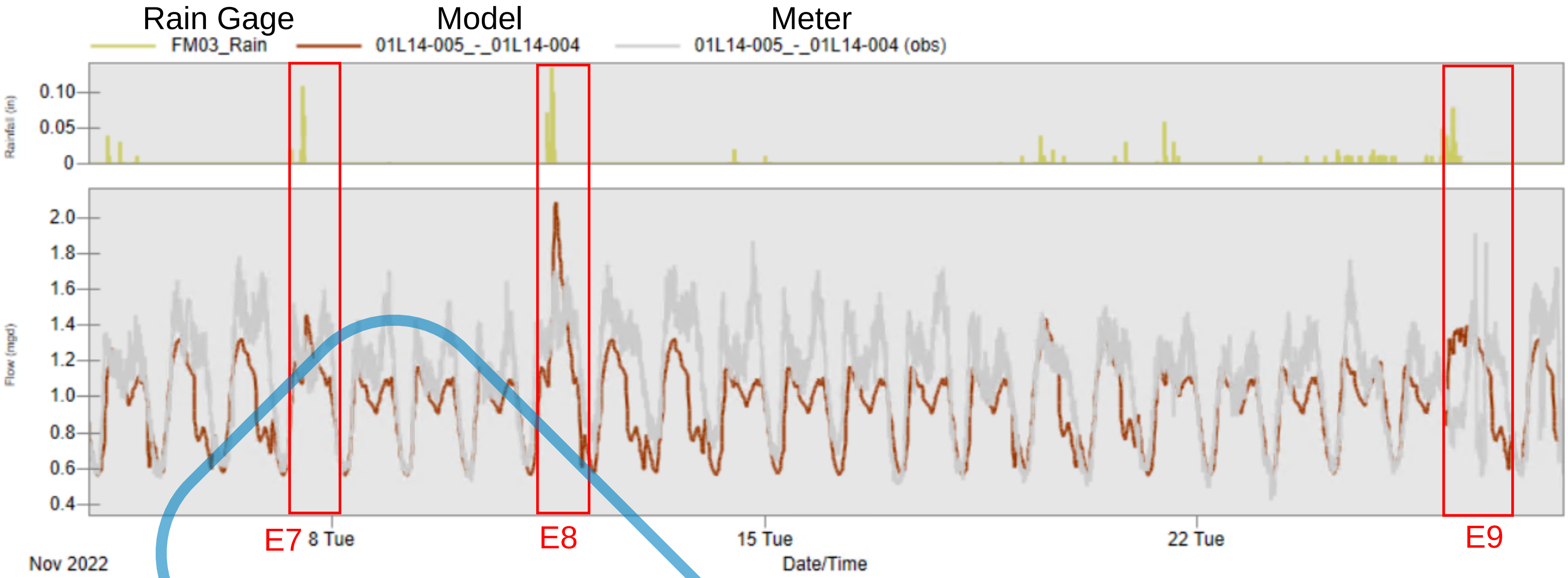
Rain Gage
Model
Meter
FM03_Rain
01L14-005_-_01L14-004
01L14-005_-_01L14-004 (obs)
Rainfall (in)
0.3
0.2
0.1
0
Flow (mgd)
2.5
2.0
1.5
1.0
0.5
0
Sep
Oct
Nov
Dec
2022
Date/Time



Rain Gage
Model
Meter
FM03_Rain
01L14-005_-_01L14-004
01L14-005_-_01L14-004 (obs)
Rainfall (in)
0.15
0.10
0.05
0
Flow (mgd)
2.5
2.0
1.5
1.0
0.5
E1
E2
E3
31 Wed
1 Thu
2 Fri
3 Sat
4 Sun
5 Mon
6 Tue
7 Wed
8 Thu
9 Fri
10 Sat
11 Sun
12 Mon
13 Tue
Aug 2022
Date/Time

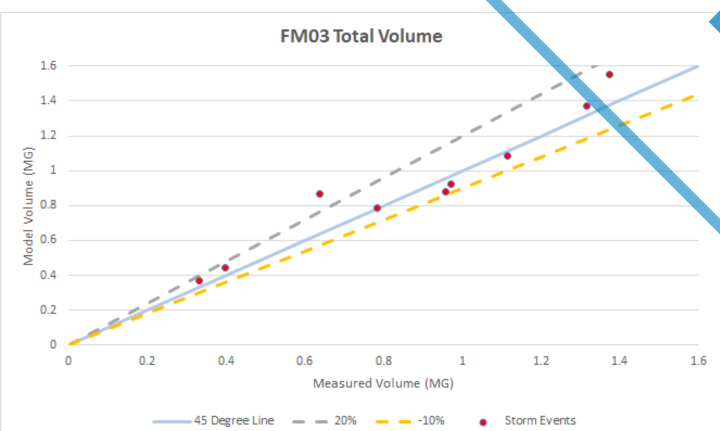


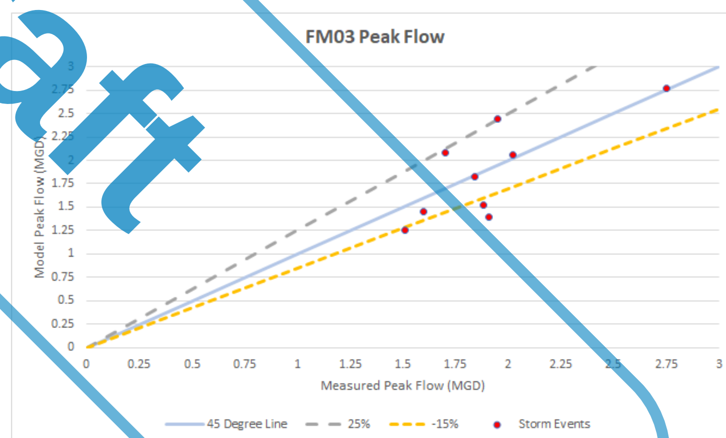
Rain Gage
Model
Meter
FM03_Rain
01L14-005_-_01L14-004
01L14-005_-_01L14-004 (obs)
Rainfall (in)
0.3
0.2
0.1
0
Flow (mgd)
2.5
2.0
1.5
1.0
0.5
0
15 Sat
22 Sat
Oct 2022
Date/Time
E4
E5
E6



FM03			
Event	Model Volume (MG)	Meter Volume (MG)	% Difference
1	0.8659	0.6375	36%
2	0.3679	0.3327	11%
3	0.7862	0.7829	0%
4	1.553	1.374	13%
5	0.4457	0.3977	12%
6	1.086	1.116	-3%
7	0.879	0.9586	-8%
8	0.9229	0.9717	-5%
9	1.372	1.317	4%

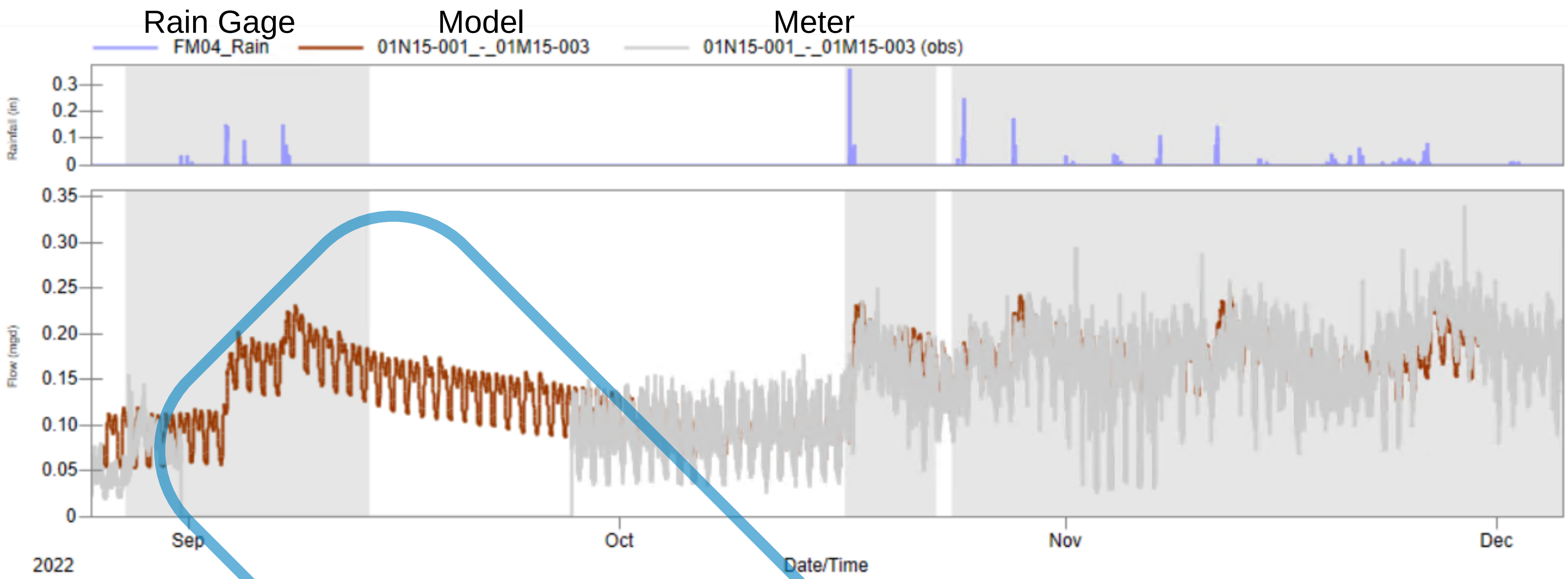
FM03			
Event	Model Peak Flow (MGD)	Meter Peak Flow (MGD)	% Difference
1	2.764	2.75	1%
2	1.251	1.51	-17%
3	1.527	1.88	-19%
4	2.449	1.95	26%
5	1.829	1.84	-1%
6	2.059	2.02	2%
7	1.453	1.6	-9%
8	2.082	1.7	22%
9	1.395	1.91	-27%

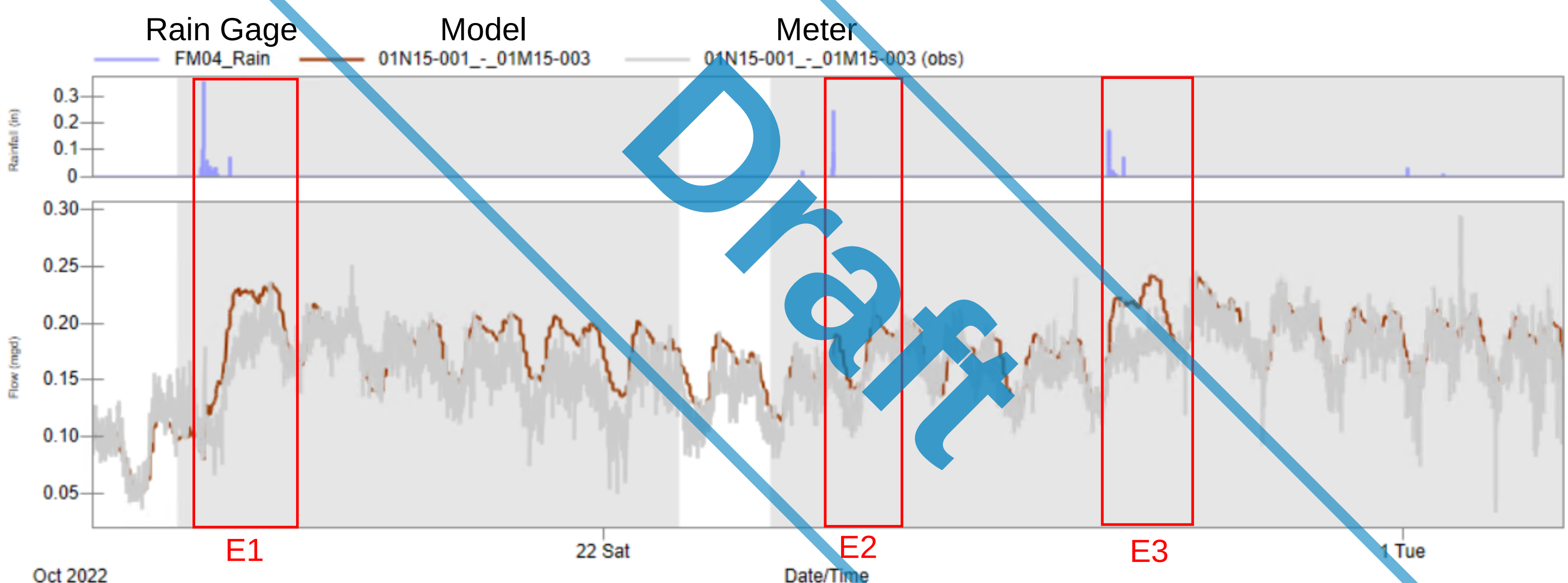


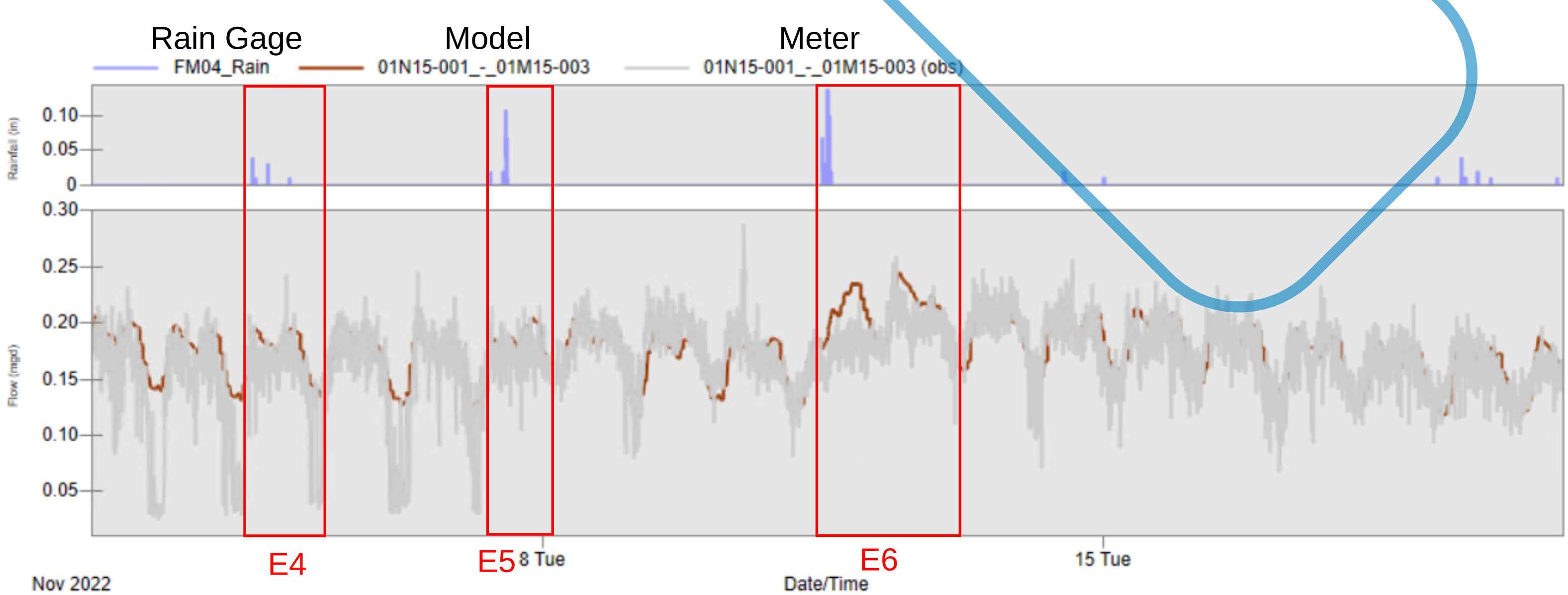


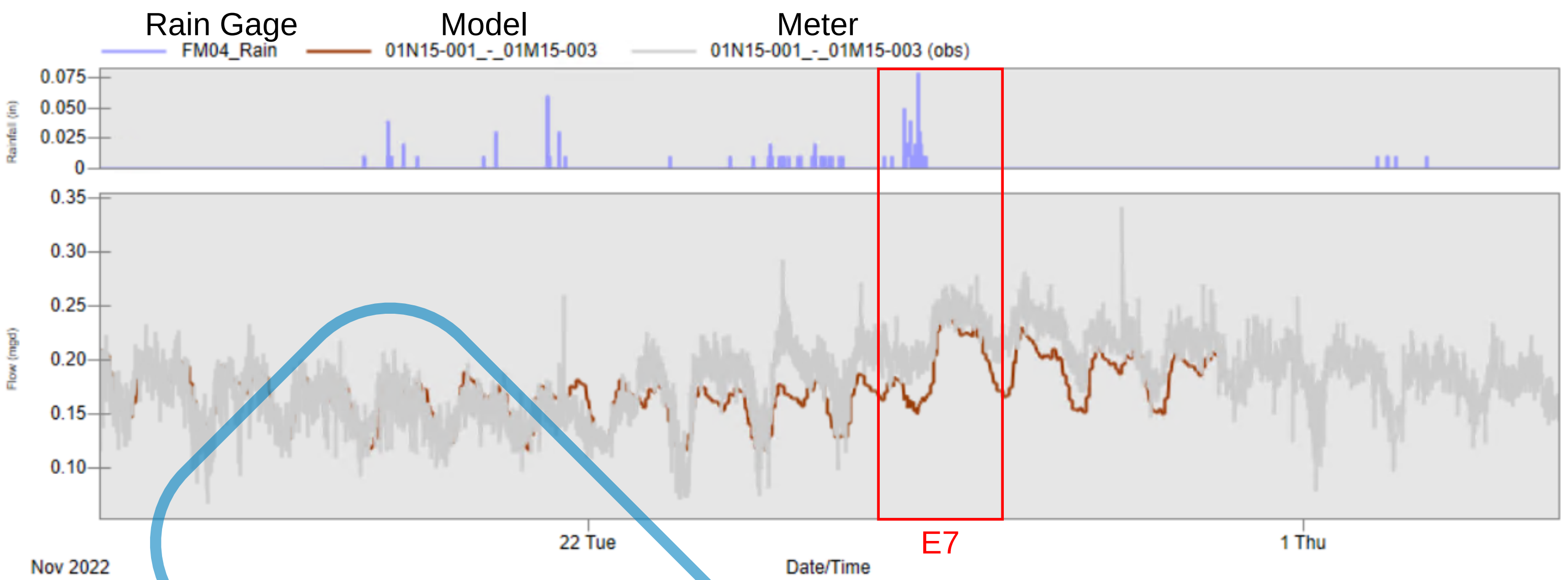
FM04

-Missing flow meter data from Sep 1 - Sep 27



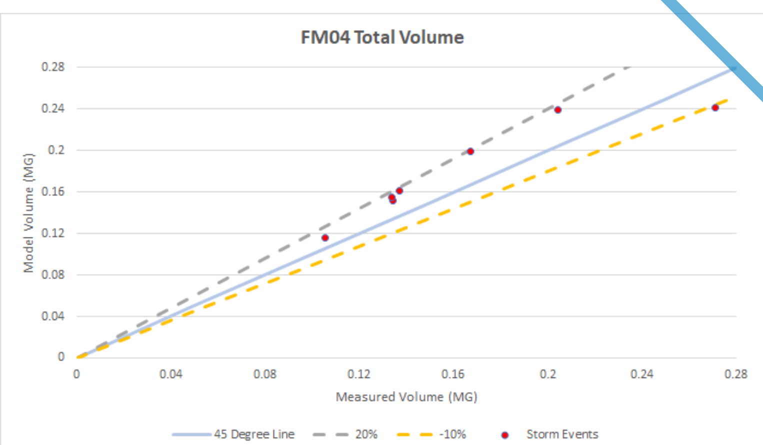


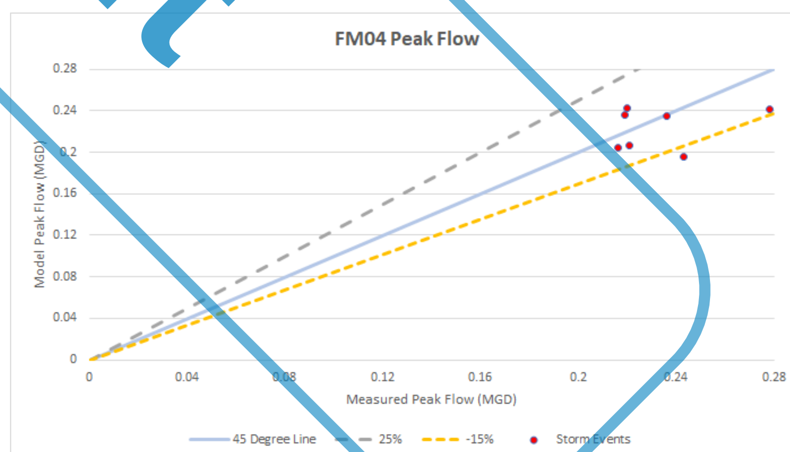




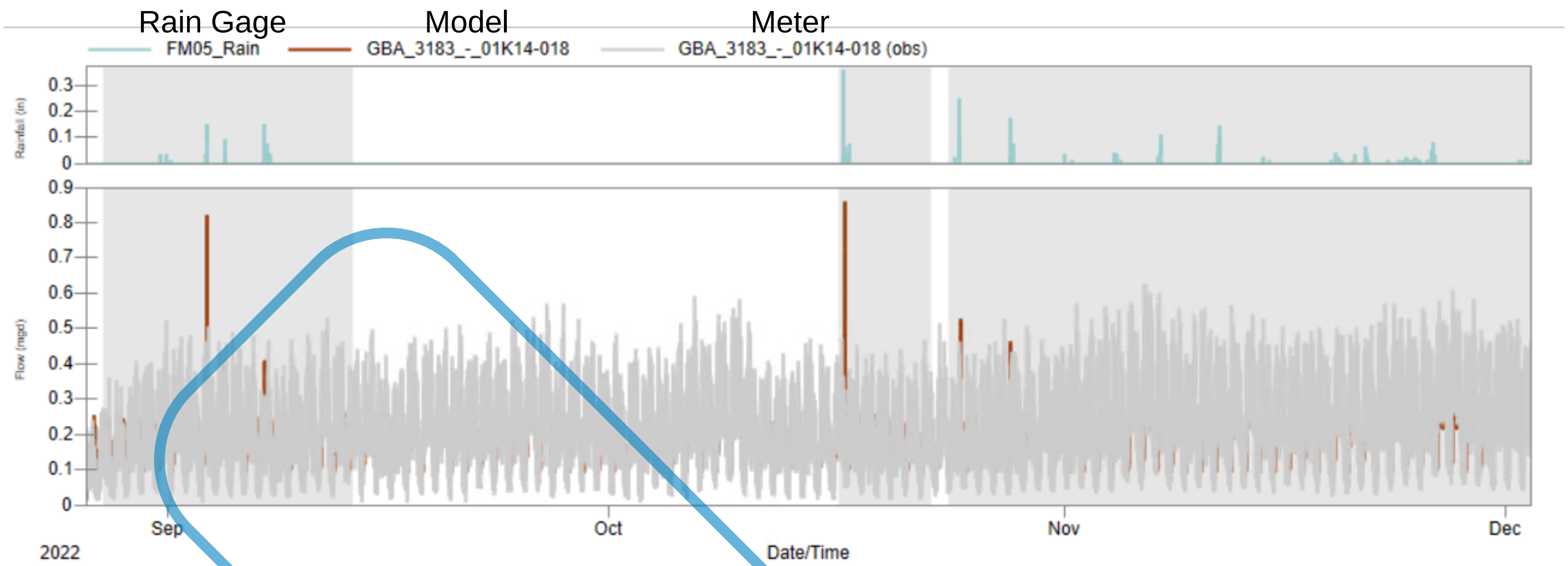
FM04			
Event	Model Volume (MG)	Meter Volume (MG)	% Difference
1	0.2389	0.2042	17%
2	0.1514	0.1343	13%
3	0.1995	0.1673	19%
4	0.155	0.1336	16%
5	0.1159	0.1056	10%
6	0.1607	0.1372	17%
7	0.2414	0.2711	-11%

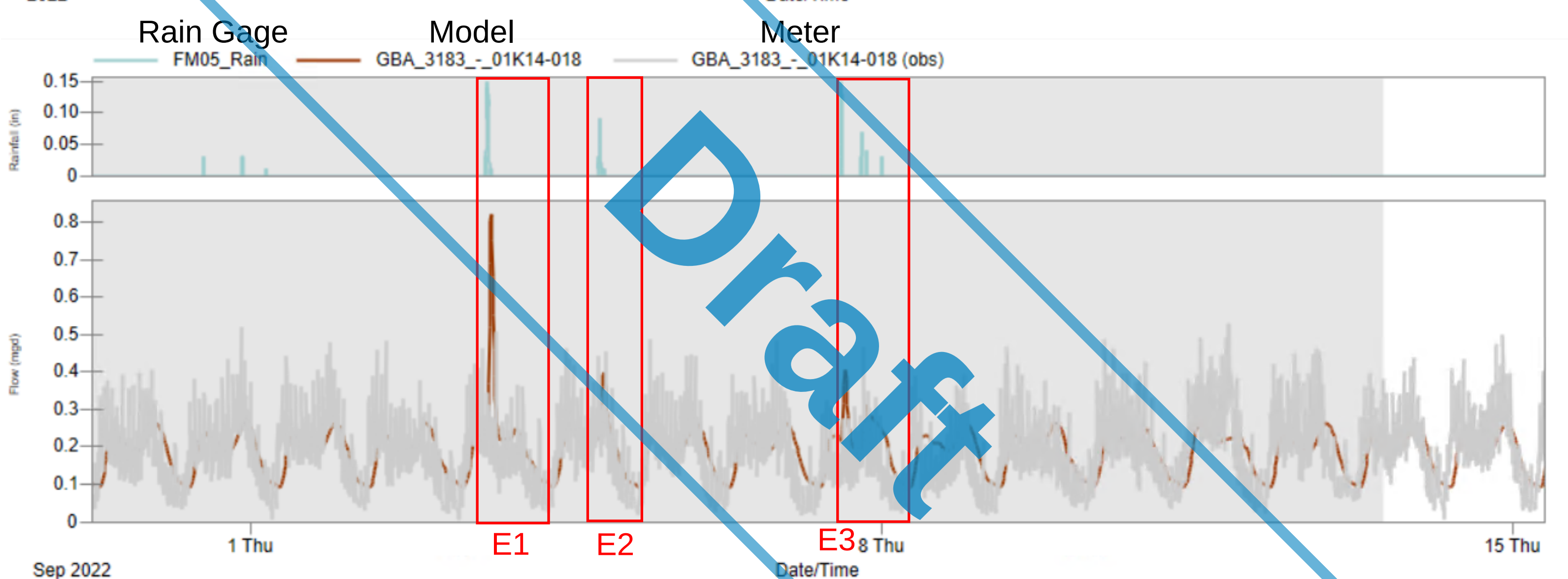
FM04			
Event	Model Peak Flow (MGD)	Meter Peak Flow (MGD)	% Difference
1	0.2354	0.236	0%
2	0.2069	0.221	-6%
3	0.2425	0.22	10%
4	0.1952	0.243	-20%
5	0.2039	0.216	-6%
6	0.2359	0.219	8%
7	0.241	0.278	-13%

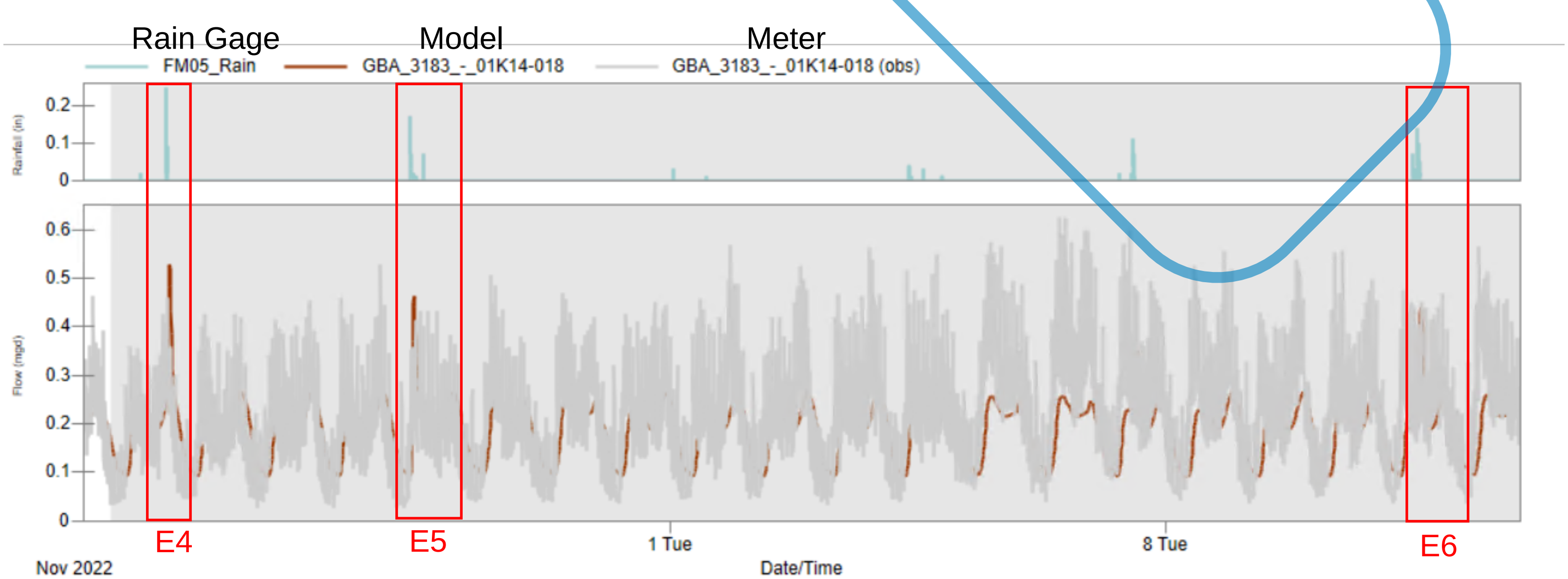




FM05


Rain Gage
Model
Meter
FM05_Rain
GBA_3183_-_01K14-018
GBA_3183_-_01K14-018 (obs)
Rainfall (in)
Flow (mgd)
Sep
Oct
Nov
Dec
2022
Date/Time


Rain Gage
Model
Meter
FM05_Rain
GBA_3183_-_01K14-018
GBA_3183_-_01K14-018 (obs)
Rainfall (in)
Flow (mgd)
E1
E2
E3
1 Thu
8 Thu
15 Thu
Sep 2022
Date/Time

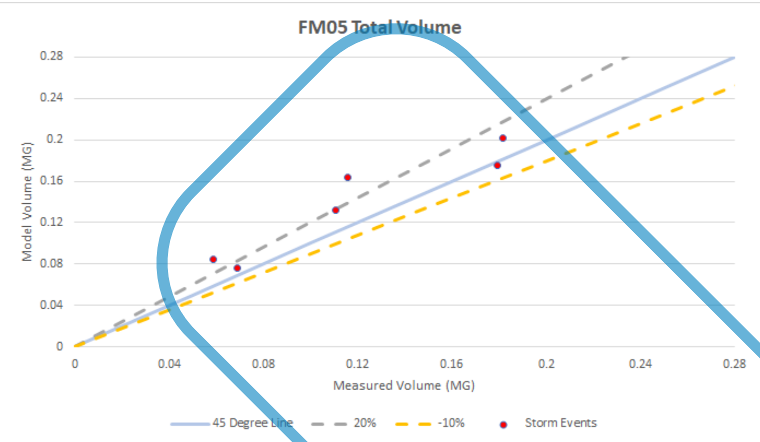

Rain Gage
Model
Meter
FM05_Rain
GBA_3183_-_01K14-018
GBA_3183_-_01K14-018 (obs)
Rainfall (in)
Flow (mgd)
E4
E5
E6
1 Tue
8 Tue
Nov 2022
Date/Time

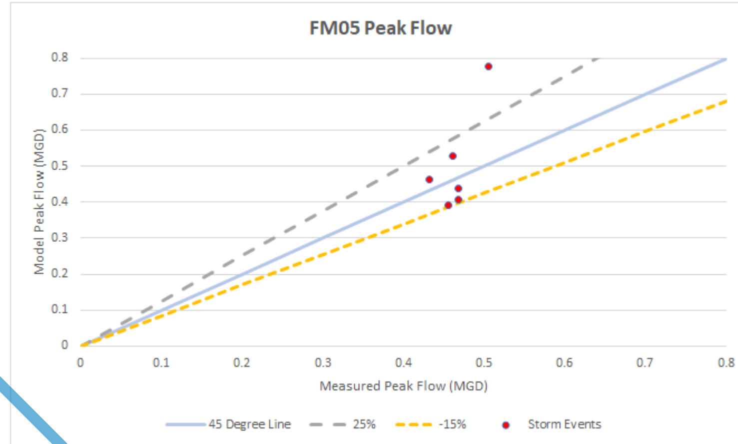
FM05

Event	Model Volume (MG)	Meter Volume (MG)	% Difference
1	0.132	0.1108	19%
2	0.07643	0.06878	11%
3	0.1635	0.1159	41%
4	0.0849	0.05876	44%
5	0.2015	0.1816	11%
6	0.1753	0.1794	-2%

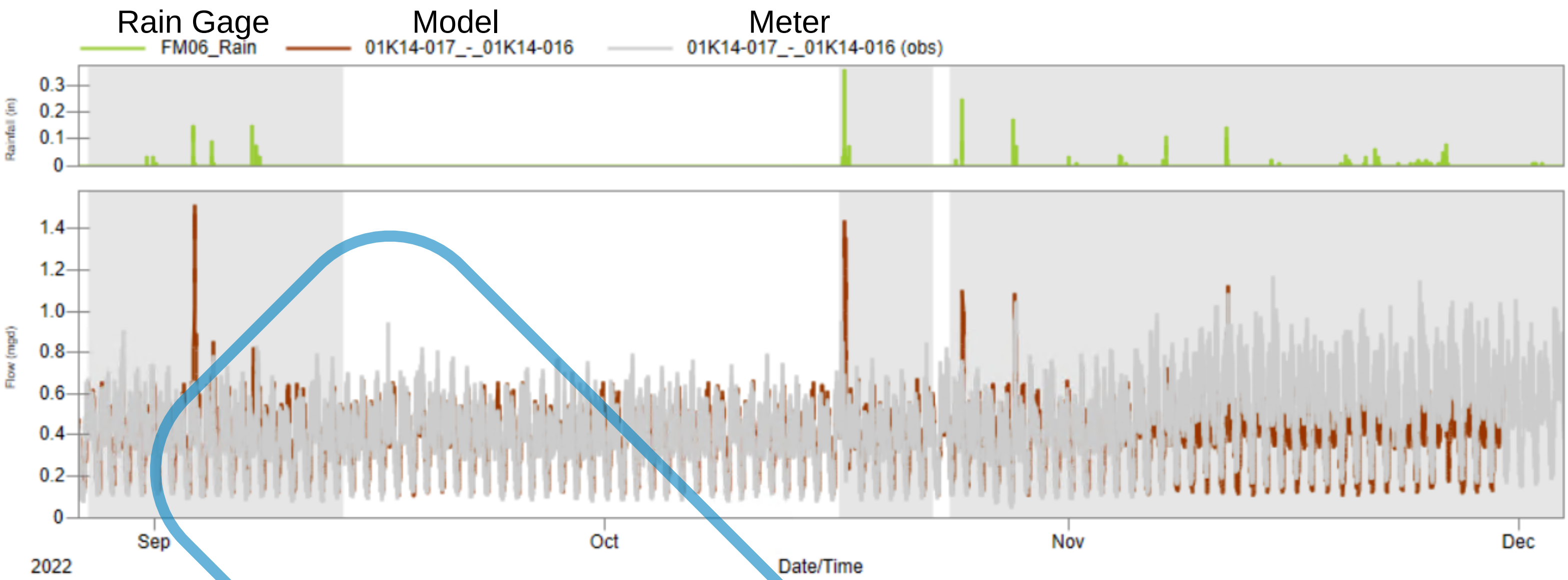
FM05

Event	Model Peak Flow (MGD)	Meter Peak Flow (MGD)	% Difference
1	0.7783	0.505	54%
2	0.3904	0.456	-14%
3	0.4059	0.468	-13%
4	0.5281	0.461	15%
5	0.4637	0.432	7%
6	0.439	0.468	-6%

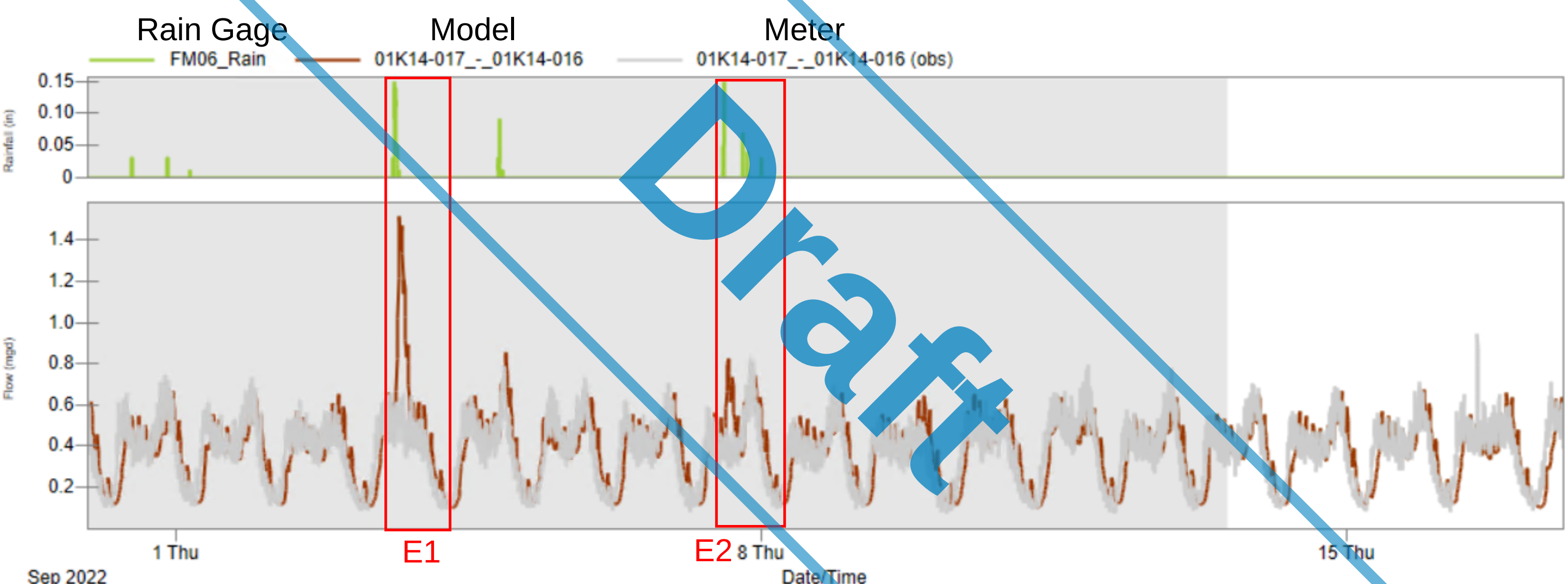




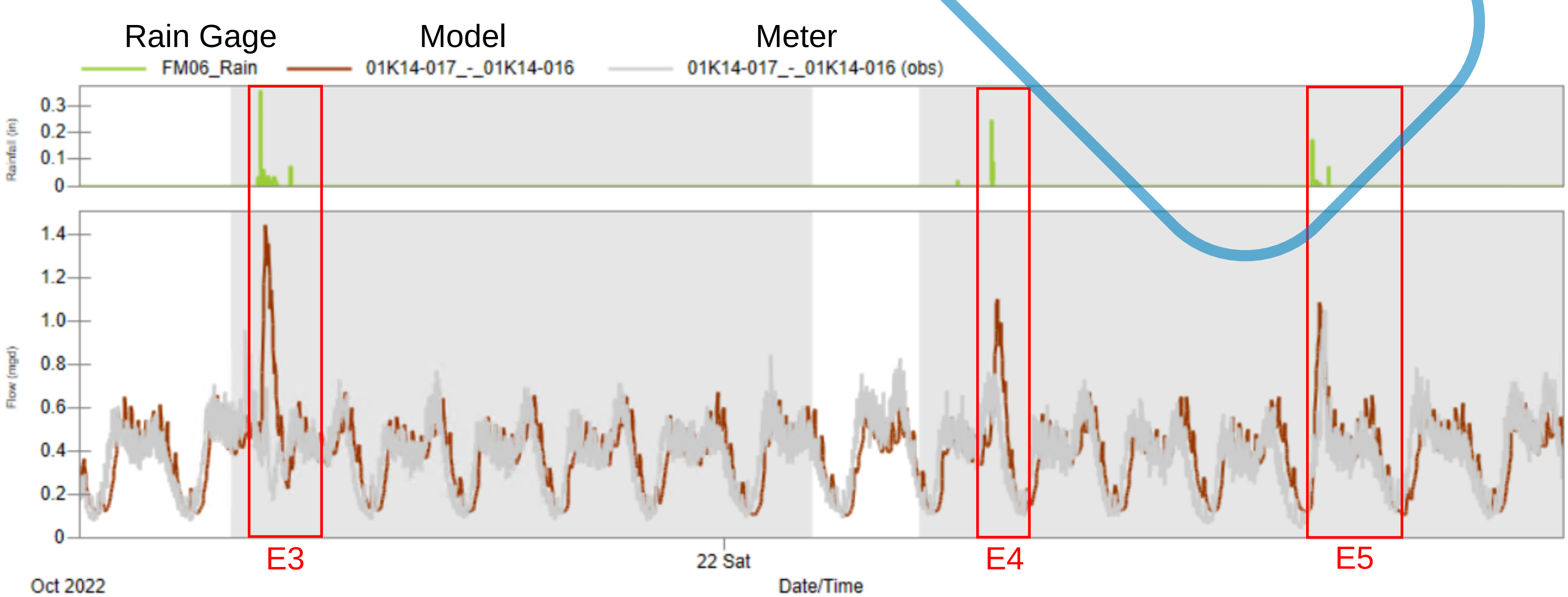
FM06



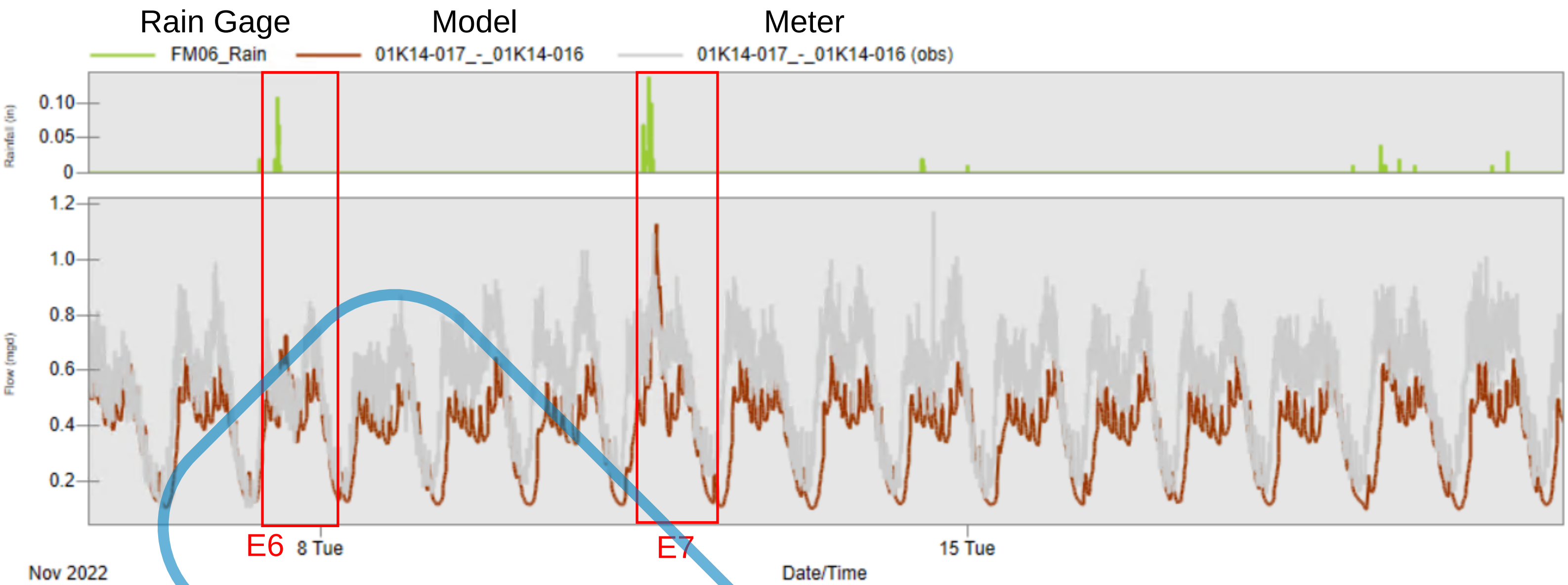
Rain Gage
FM06_Rain
Model
01K14-017_-_01K14-016
Meter
01K14-017_-_01K14-016 (obs)
Rainfall (in)
Flow (mgd)
Sep
Oct
Nov
Dec
2022
Date/Time



Rain Gage
FM06_Rain
Model
01K14-017_-_01K14-016
Meter
01K14-017_-_01K14-016 (obs)
Rainfall (in)
Flow (mgd)
E1
E2
1 Thu
8 Thu
15 Thu
Sep 2022
Date/Time

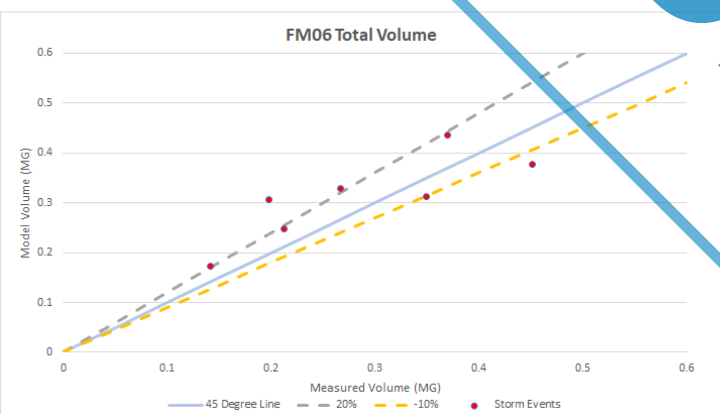


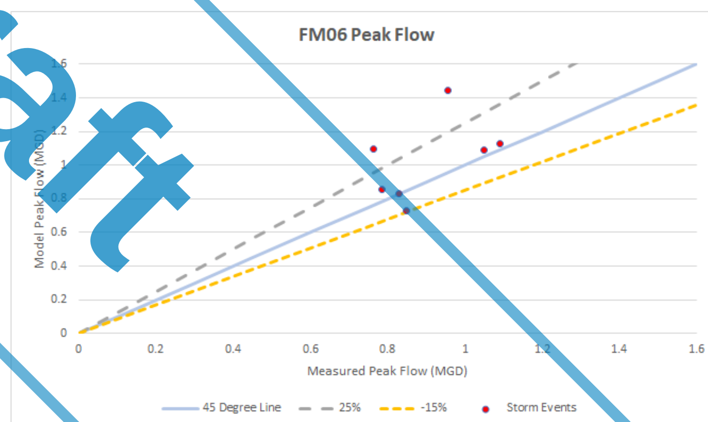
Rain Gage
FM06_Rain
Model
01K14-017_-_01K14-016
Meter
01K14-017_-_01K14-016 (obs)
Rainfall (in)
Flow (mgd)
E3
E4
E5
22 Sat
Oct 2022
Date/Time



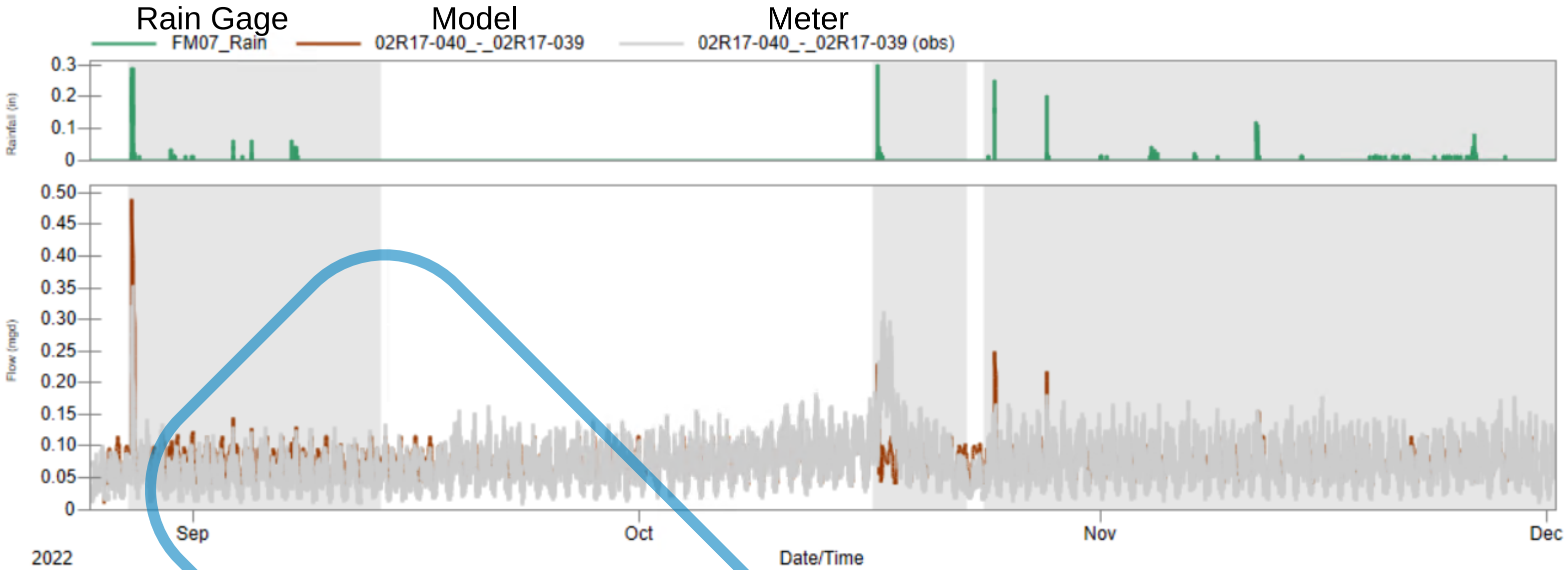
FM06			
Event	Model Volume (MG)	Meter Volume (MG)	% Difference
1	0.1722	0.1412	22%
2	0.3286	0.267	23%
3	0.3058	0.1981	54%
4	0.2485	0.2127	17%
5	0.4346	0.3696	18%
6	0.3115	0.3492	-11%
7	0.3764	0.4511	-17%

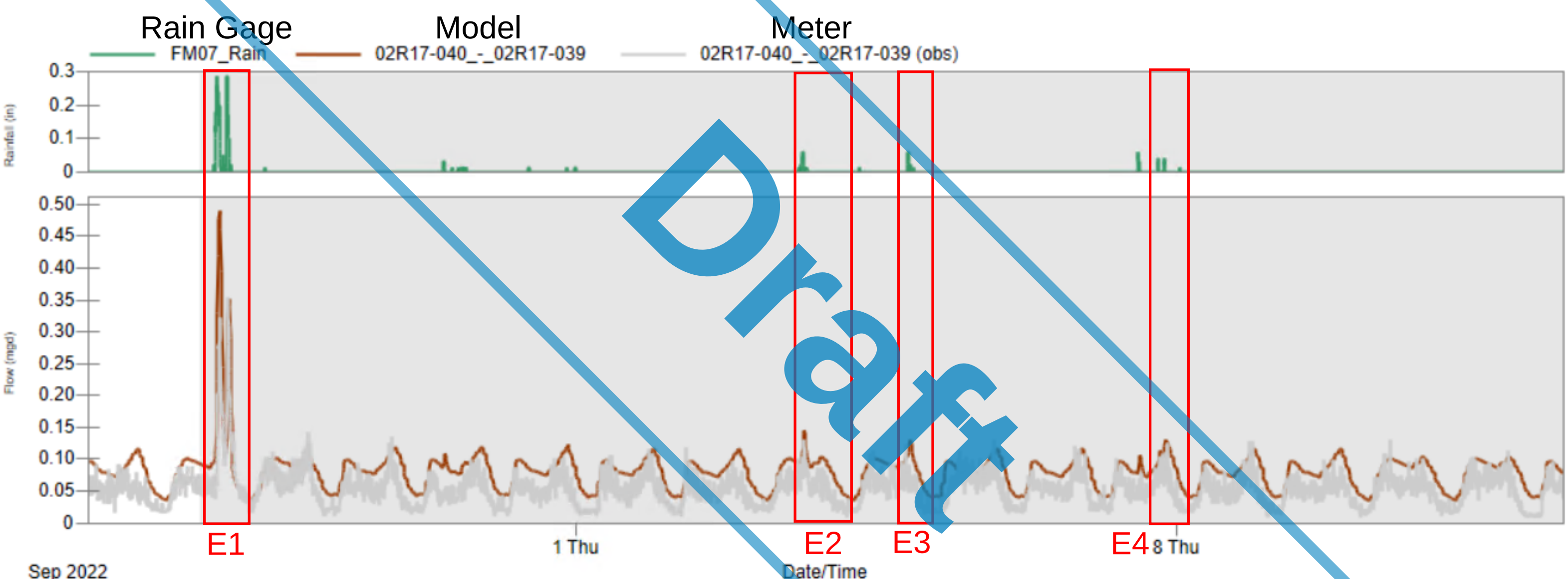
FM06			
Event	Model Peak Flow (MGD)	Meter Peak Flow (MGD)	% Difference
1	0.8554	0.785	9%
2	0.8278	0.828	0%
3	1.444	0.955	51%
4	1.098	0.763	44%
5	1.09	1.05	4%
6	0.7307	0.8472	-14%
7	1.127	1.09	3%

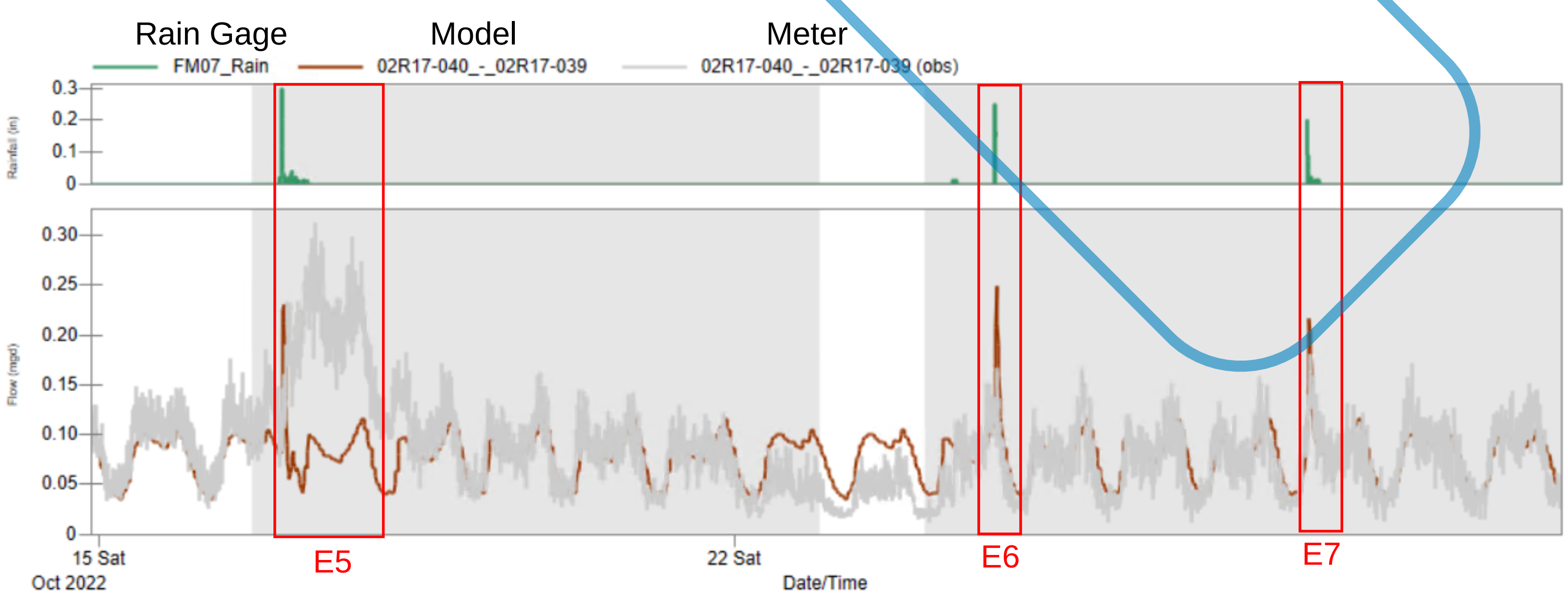


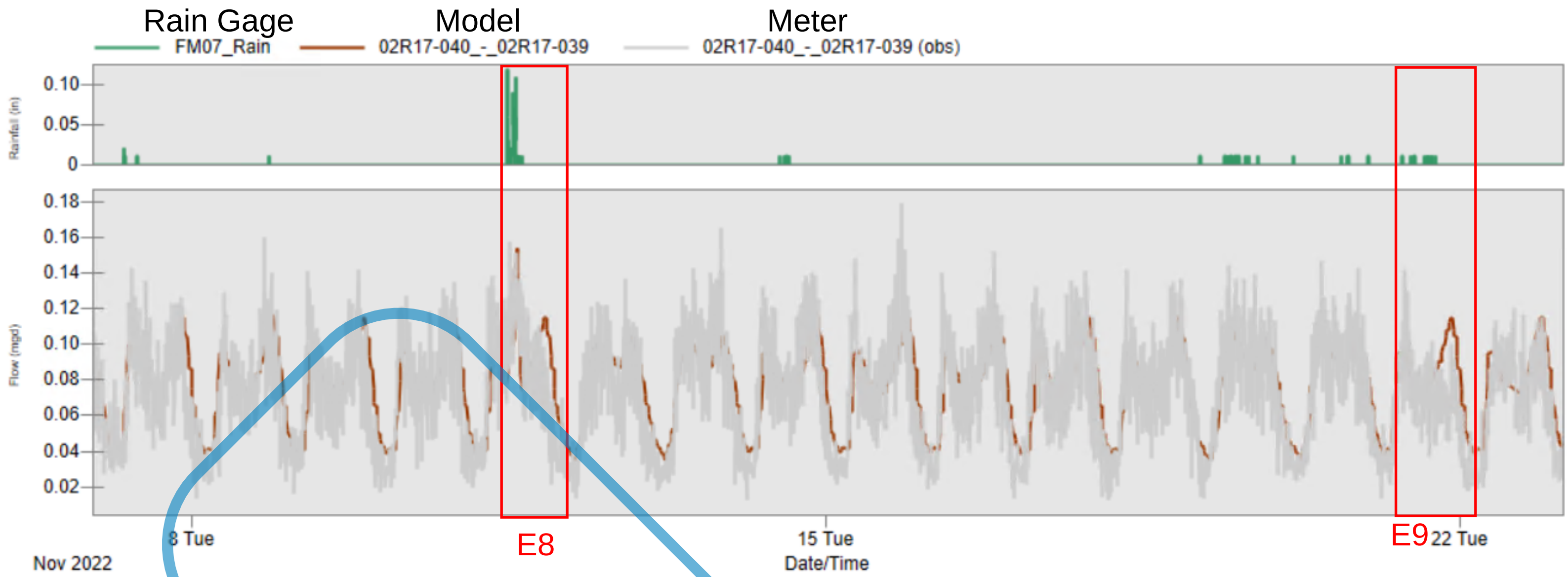


FM07


Rain Gage
FM07_Rain
Model
02R17-040_-_02R17-039
Meter
02R17-040_-_02R17-039 (obs)
Rainfall (in)
Flow (mgd)
Sep
Oct
Nov
Dec
2022
Date/Time

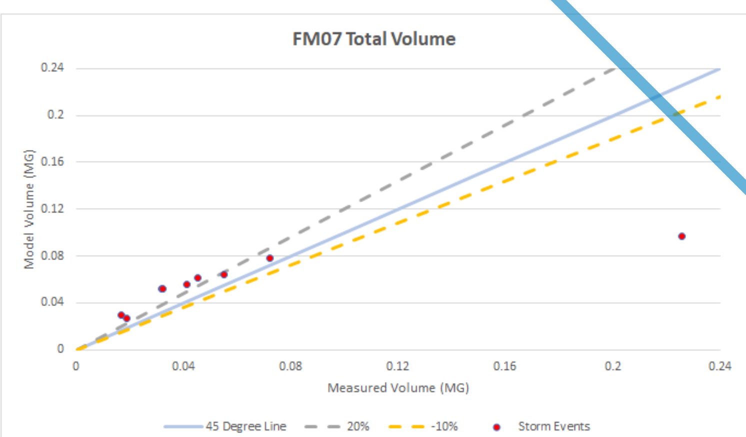

Rain Gage
FM07_Rain
Model
02R17-040_-_02R17-039
Meter
02R17-040_-_02R17-039 (obs)
Rainfall (in)
Flow (mgd)
E1
E2
E3
E4
1 Thu
8 Thu
Sep 2022
Date/Time

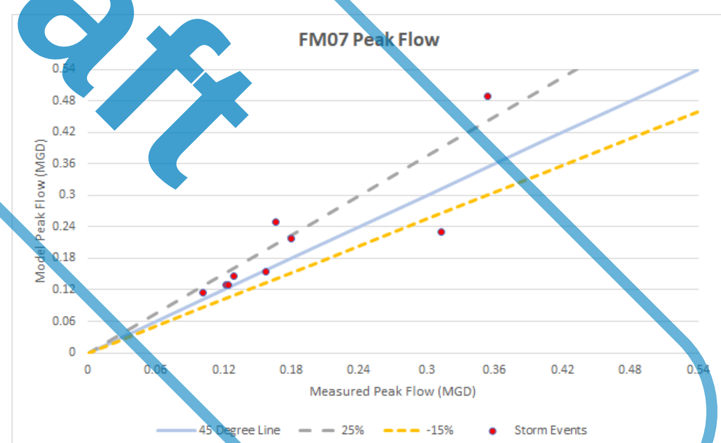

Rain Gage
FM07_Rain
Model
02R17-040_-_02R17-039
Meter
02R17-040_-_02R17-039 (obs)
Rainfall (in)
Flow (mgd)
E5
E6
E7
15 Sat
22 Sat
Oct 2022
Date/Time



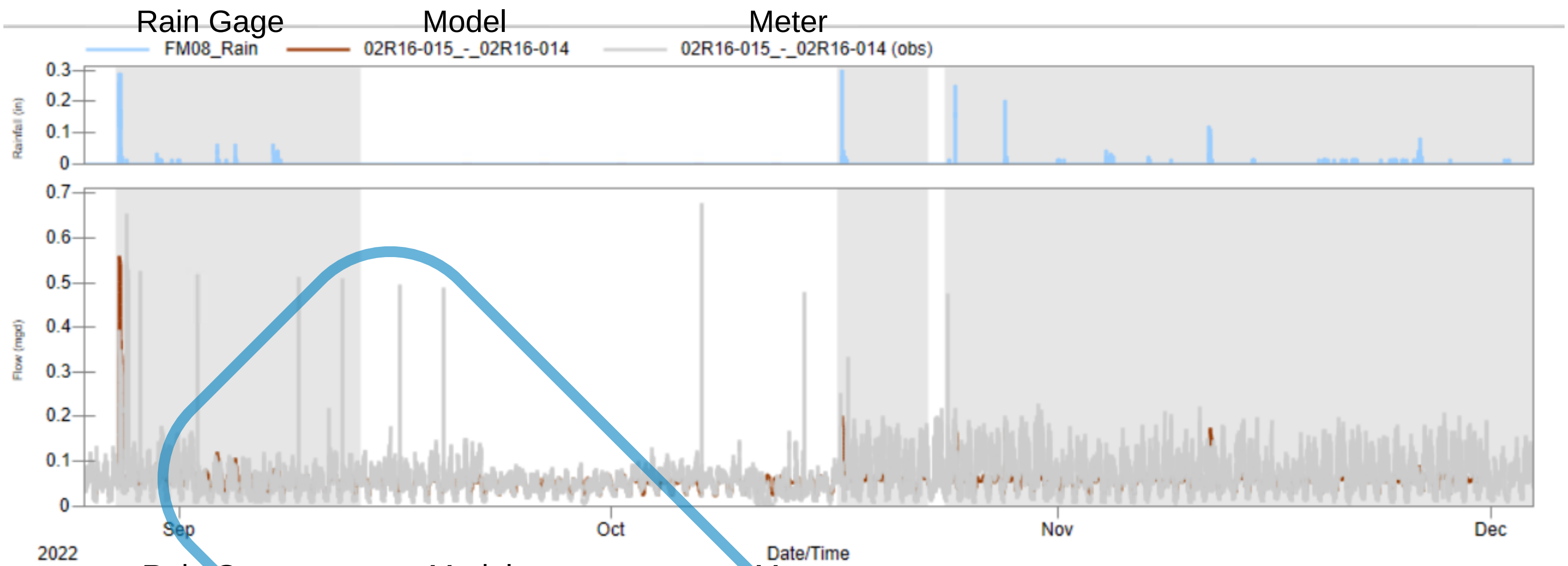
FM07			
Event	Model Volume (MG)	Meter Volume (MG)	% Difference
1	0.06133	0.04525	36%
2	0.0517	0.03191	62%
3	0.0298	0.01668	79%
4	0.05238	0.03237	62%
5	0.09639	0.2259	-57%
6	0.02633	0.01857	42%
7	0.07848	0.072	9%
8	0.06437	0.05521	17%
9	0.05534	0.04106	35%

FM07			
Event	Model Peak Flow (MGD)	Meter Peak Flow (MGD)	% Difference
1	0.4889	0.354	38%
2	0.1457	0.129	13%
3	0.1288	0.122	6%
4	0.1291	0.124	4%
5	0.2303	0.3123	-26%
6	0.2485	0.166	50%
7	0.217	0.18	21%
8	0.1544	0.157	-2%
9	0.1151	0.102	13%

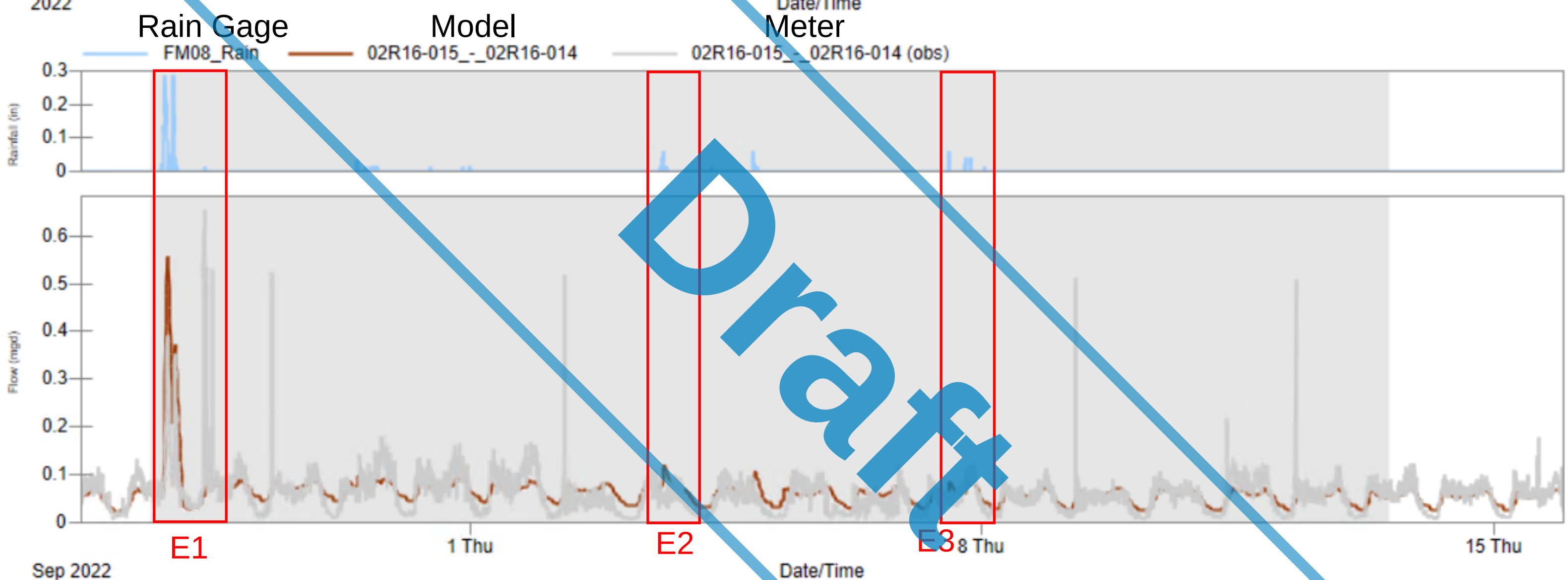




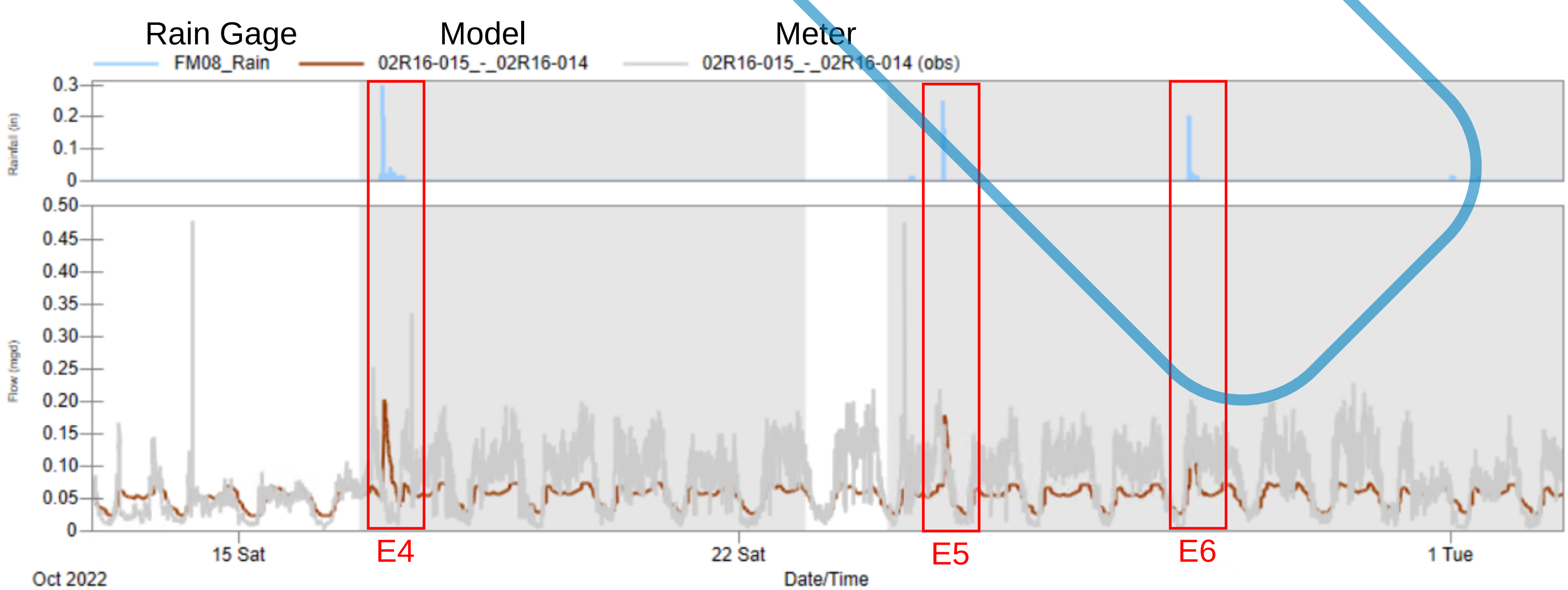
FM08



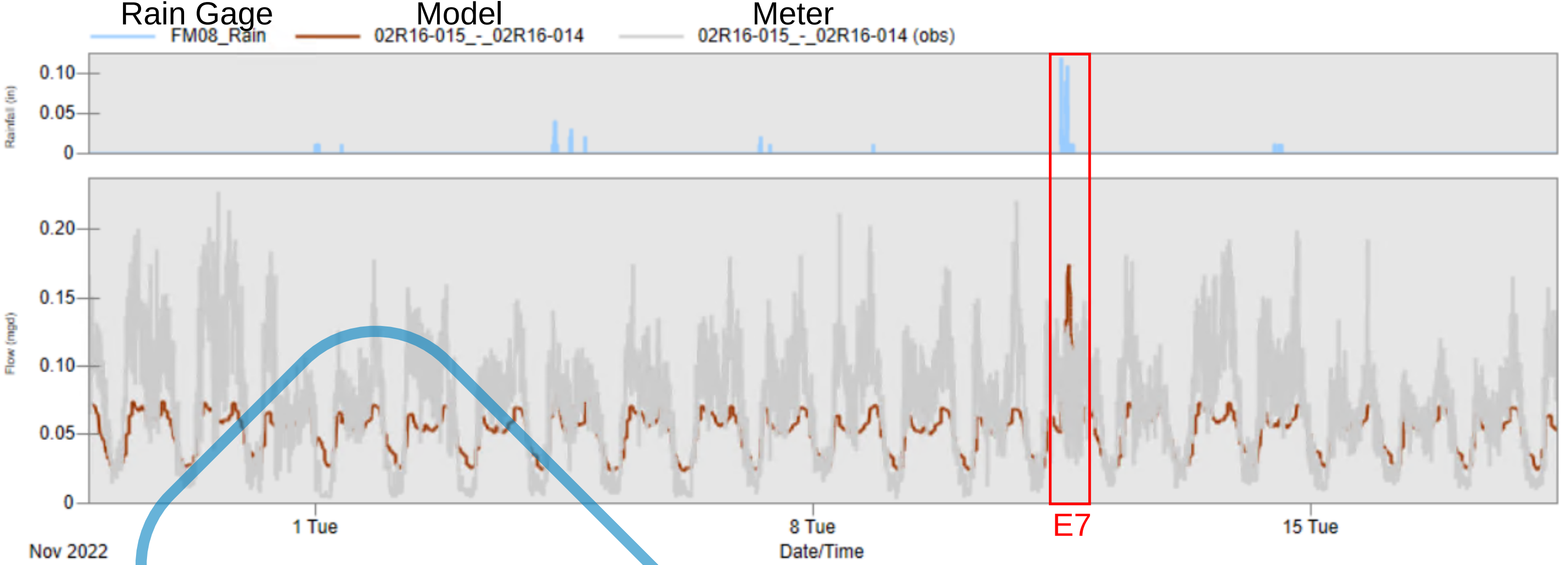
Rain Gage
Model
Meter
FM08_Rain
02R16-015_-_02R16-014
02R16-015_-_02R16-014 (obs)
Rainfall (in)
Flow (mgd)
Sep
Oct
Nov
Dec
2022
Date/Time



Rain Gage
Model
Meter
FM08_Rain
02R16-015_-_02R16-014
02R16-015_-_02R16-014 (obs)
Rainfall (in)
Flow (mgd)
E1
E2
E3
1 Thu
8 Thu
15 Thu
Sep 2022
Date/Time

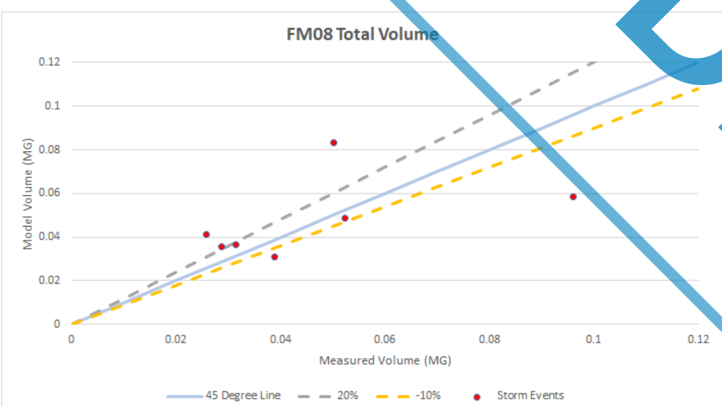


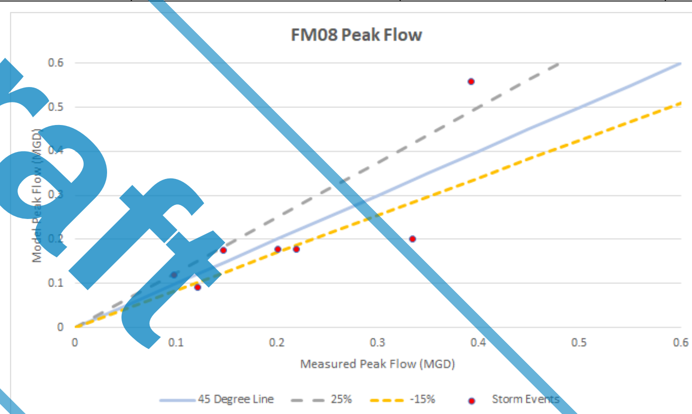
Rain Gage
Model
Meter
FM08_Rain
02R16-015_-_02R16-014
02R16-015_-_02R16-014 (obs)
Rainfall (in)
Flow (mgd)
E4
E5
E6
15 Sat
22 Sat
1 Tue
Oct 2022
Date/Time



FM08			
Event	Model Volume (MG)	Meter Volume (MG)	% Difference
1	0.08344	0.05022	66%
2	0.04124	0.02575	60%
3	0.03638	0.03149	16%
4	0.03563	0.02867	24%
5	0.03071	0.03883	-21%
6	0.05835	0.09611	-39%
7	0.04865	0.05227	-7%

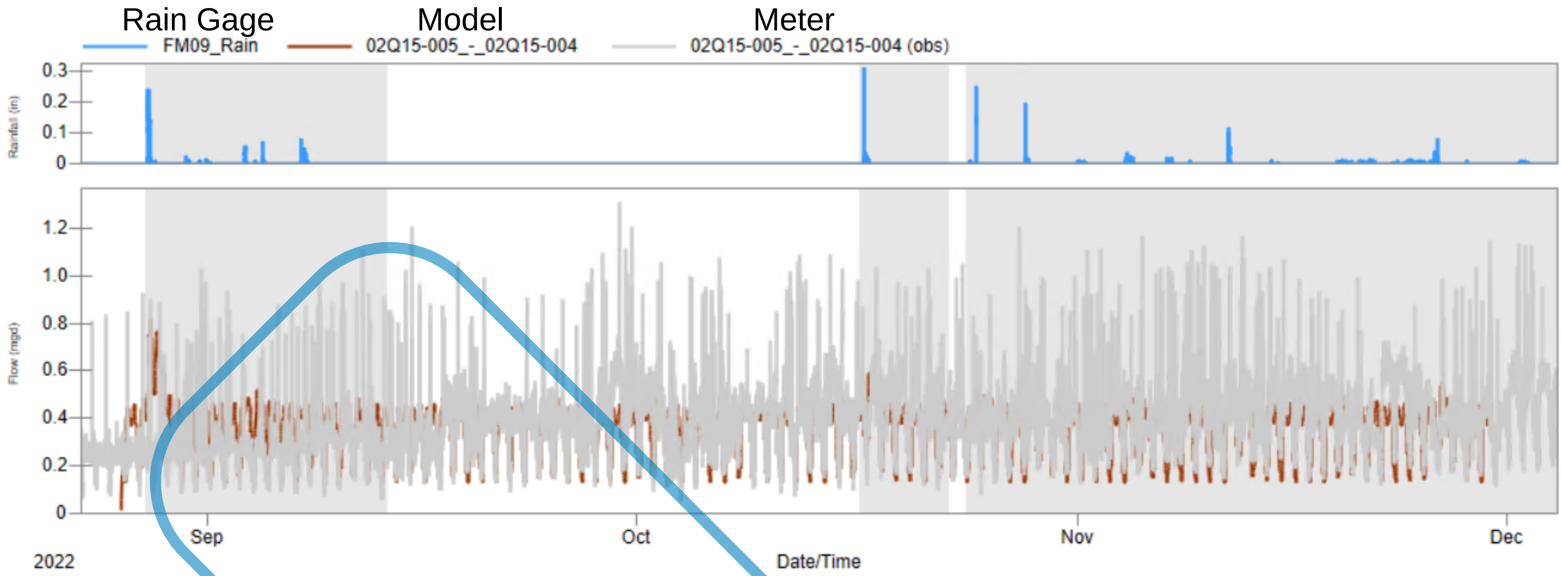
FM08			
Event	Model Peak Flow (MGD)	Meter Peak Flow (MGD)	% Difference
1	0.5588	0.392	43%
2	0.119	0.098	21%
3	0.09104	0.121	-25%
4	0.2012	0.3343	-40%
5	0.1772	0.219	-19%
6	0.177	0.201	-12%
7	0.1744	0.147	19%

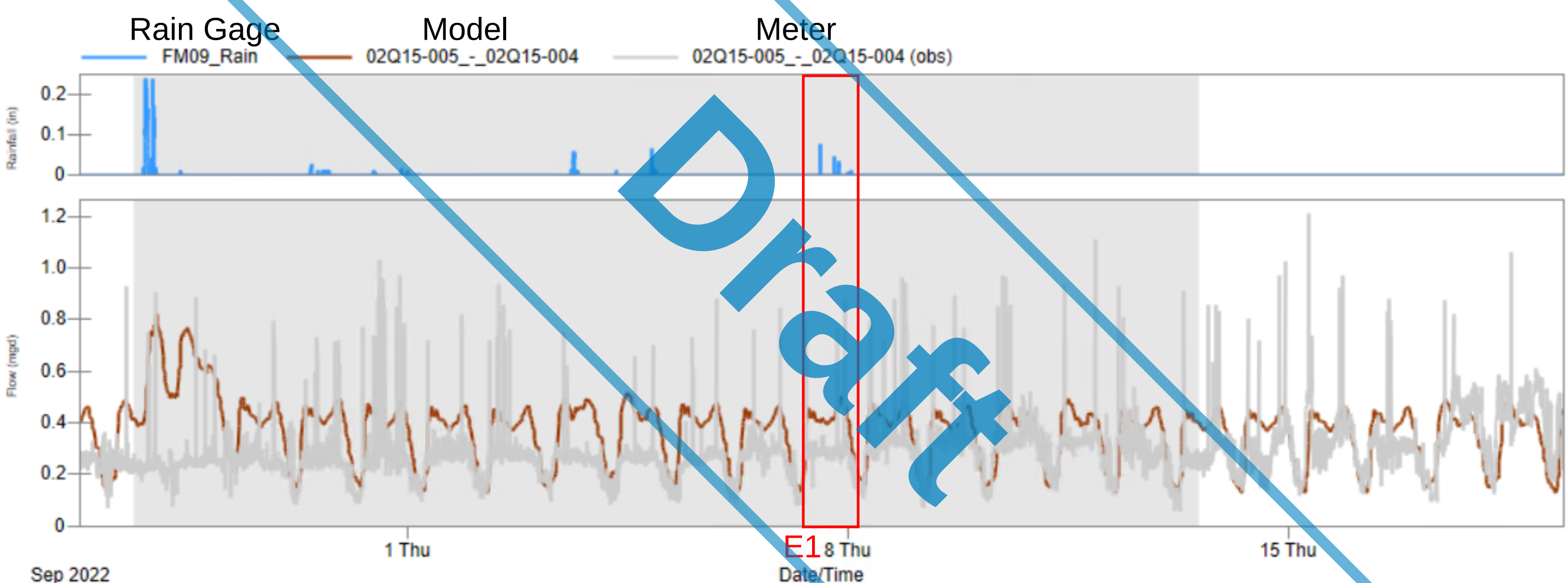


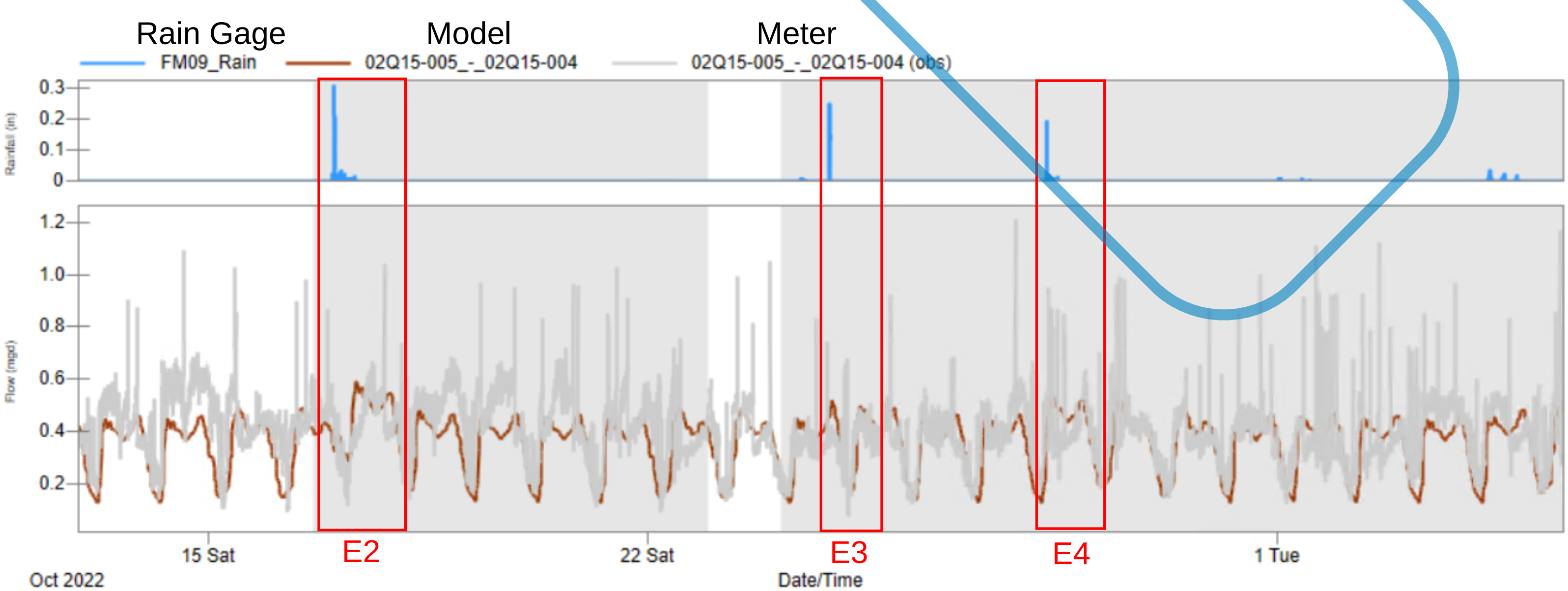


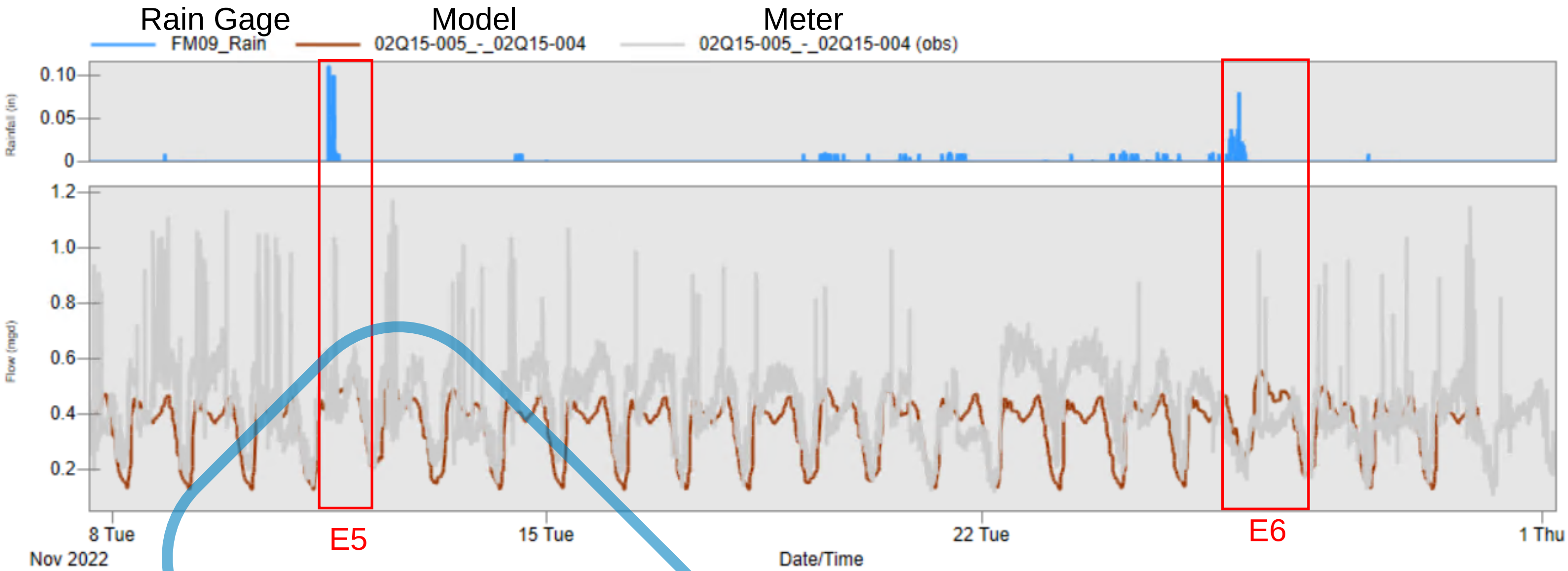
FM09

- Random spikes in flow meter data not considered in peak flow comparison between model and meter data



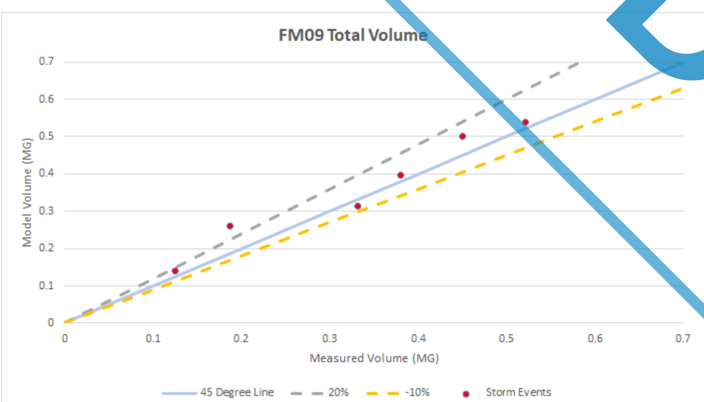


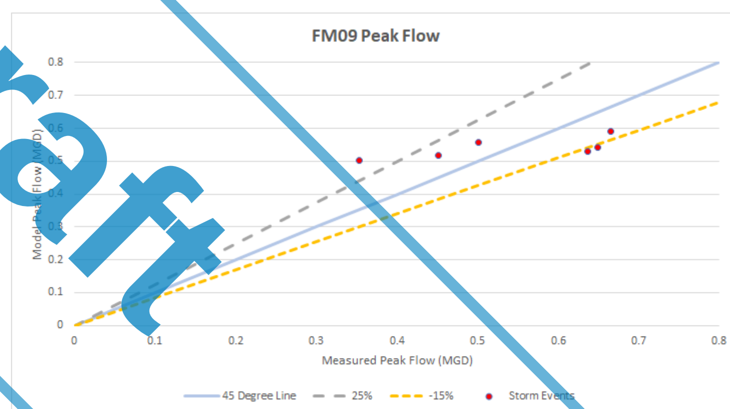




FM09			
Event	Model Volume (MG)	Meter Volume (MG)	% Difference
1	0.26	0.1867	39%
2	0.5374	0.5217	3%
3	0.1413	0.1244	14%
4	0.396	0.3807	4%
5	0.3153	0.3311	-5%
6	0.5021	0.4506	11%

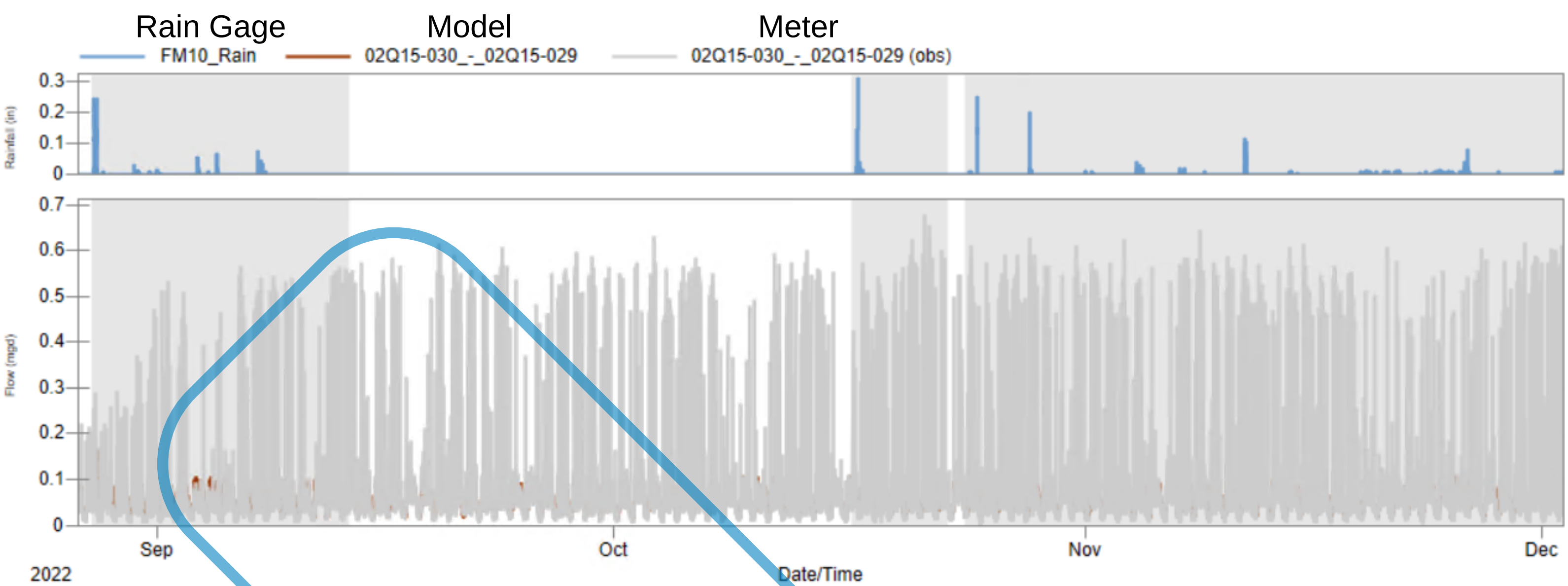
FM09			
Event	Model Peak Flow (MGD)	Meter Peak Flow (MGD)	% Difference
1	0.5014	0.353	42%
2	0.5894	0.665	-11%
3	0.517	0.451	15%
4	0.5285	0.636	-17%
5	0.5418	0.649	-17%
6	0.5571	0.501	11%

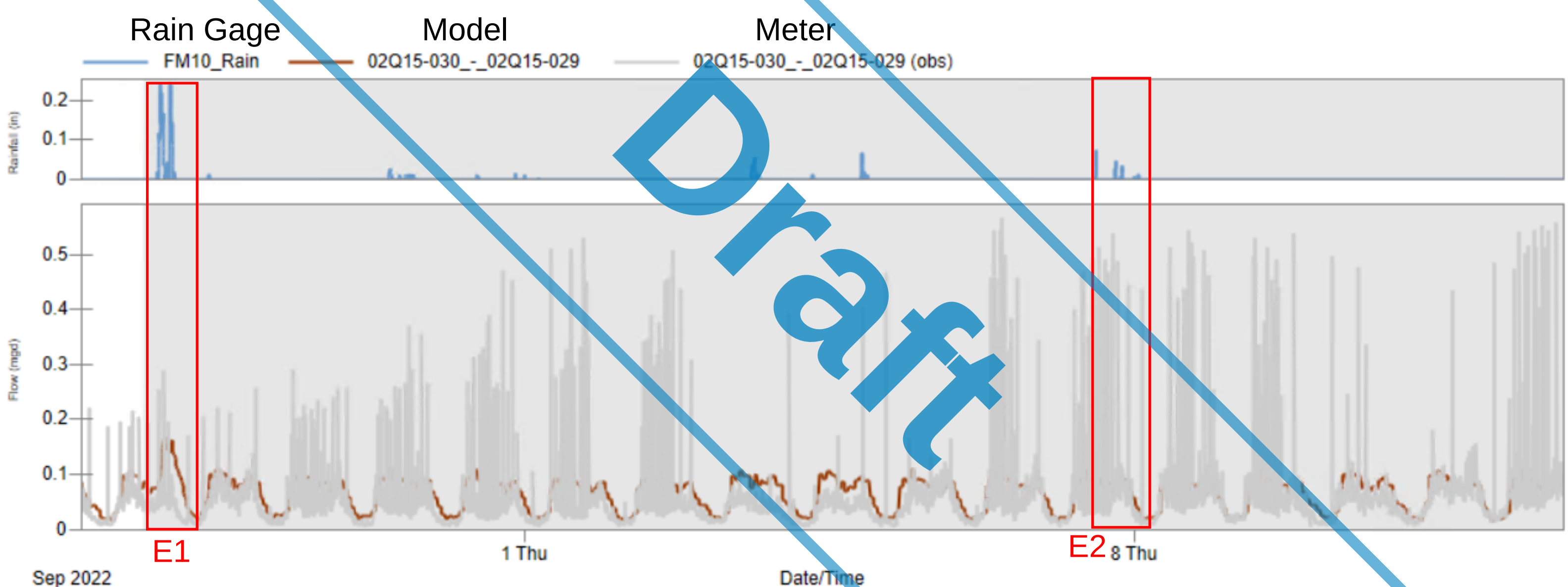


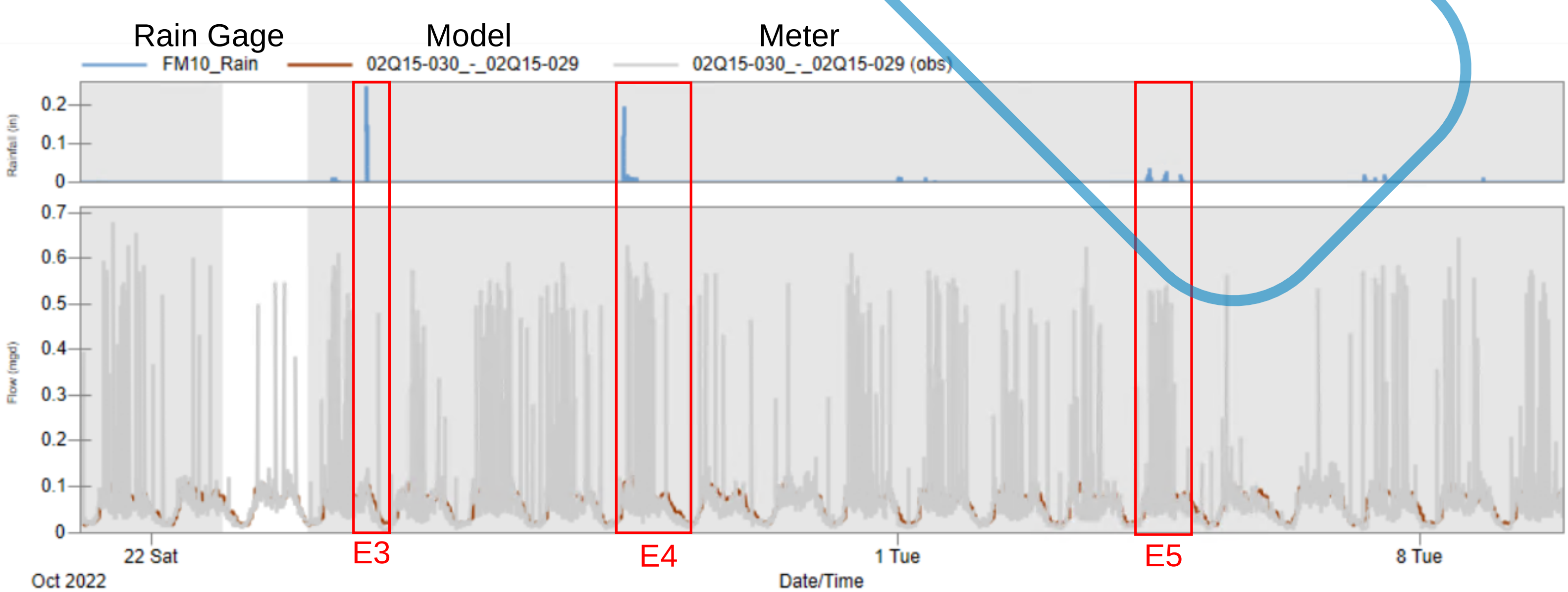


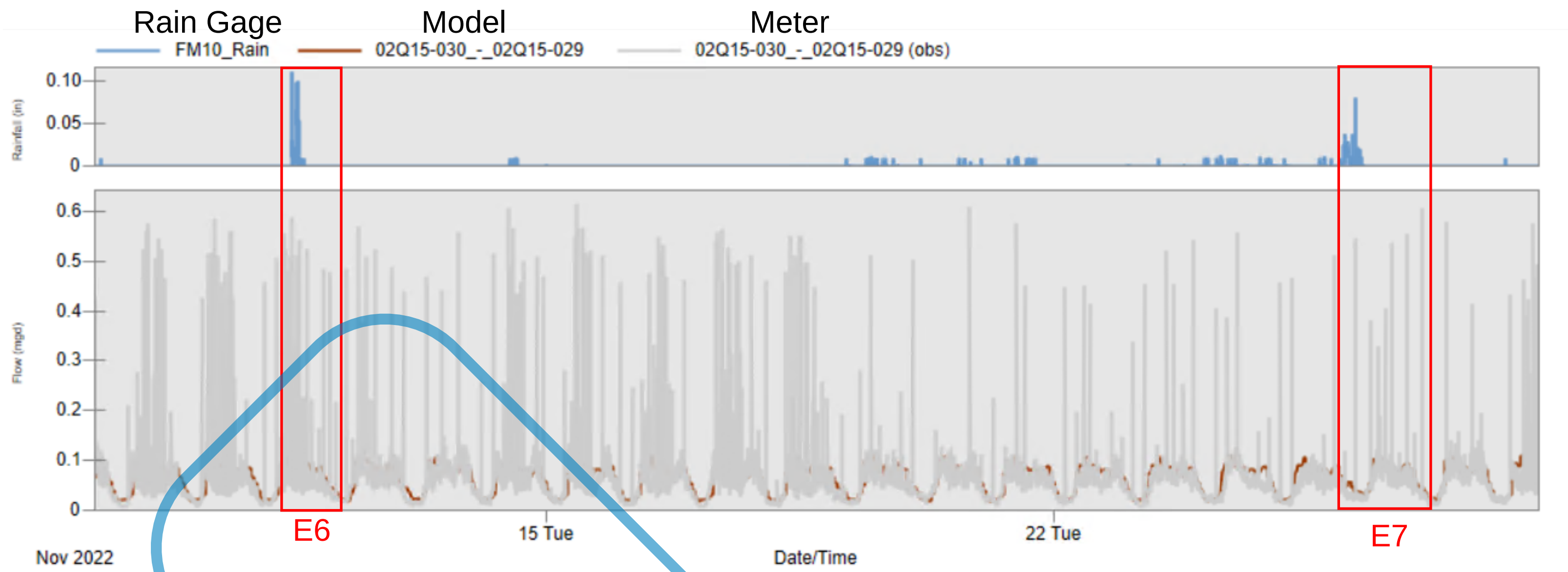
FM10

- Random spikes in flow meter data not considered in peak flow comparison between model and meter data



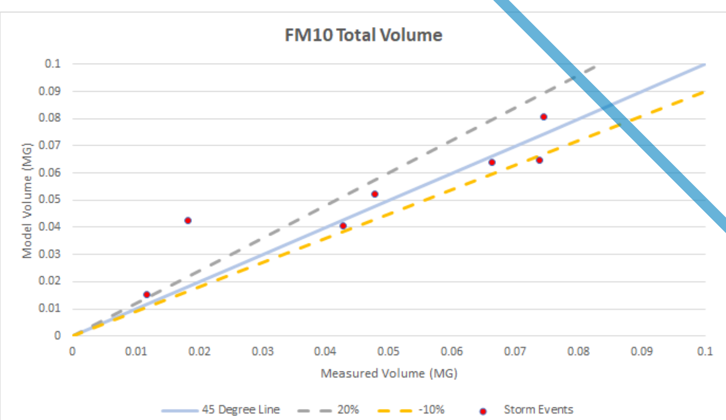


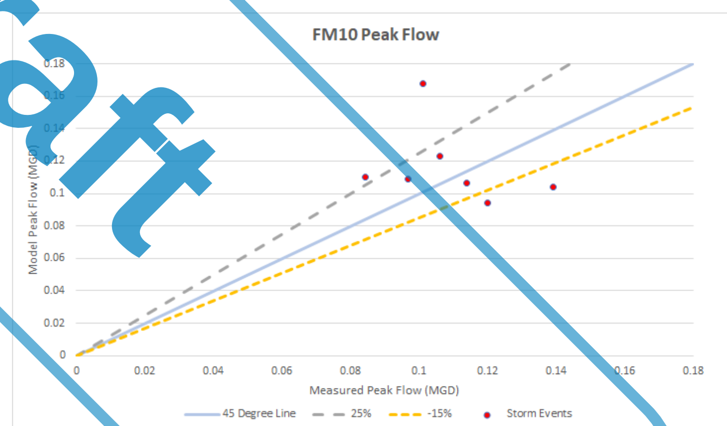




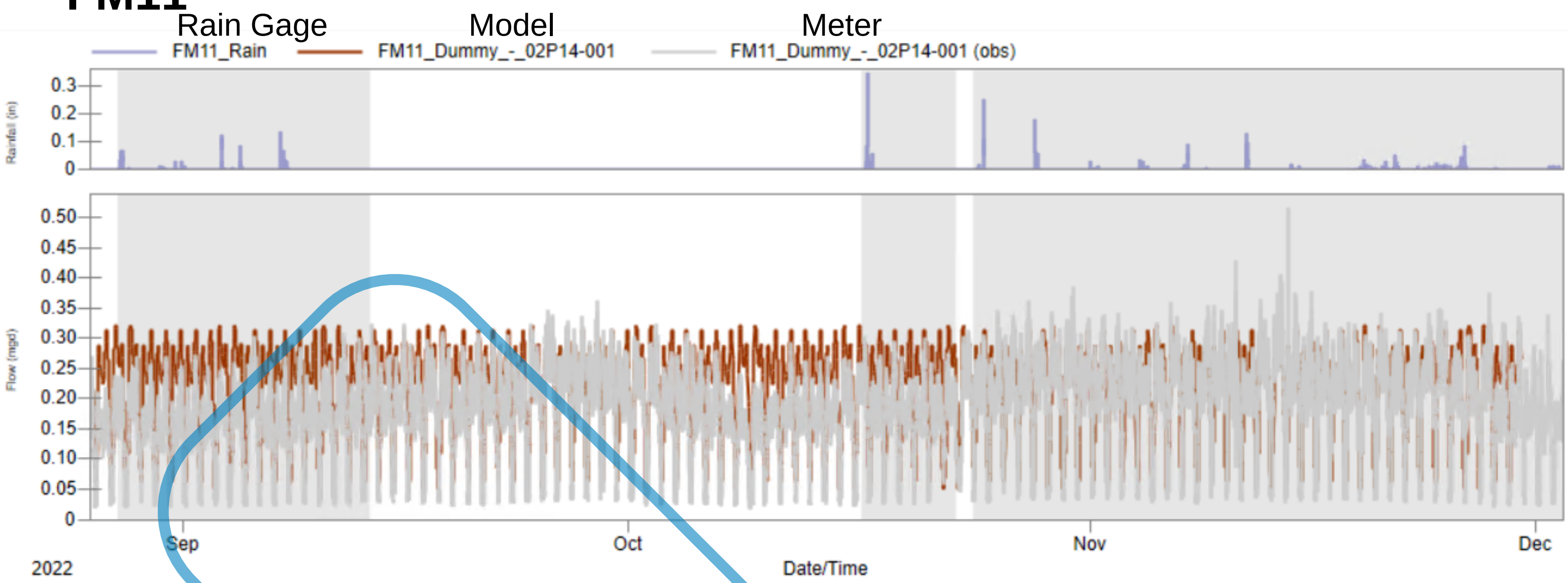
FM10			
Event	Model Volume (MG)	Meter Volume (MG)	% Difference
1	0.04252	0.01815	134%
2	0.04071	0.0428	-5%
3	0.01523	0.01168	30%
4	0.06486	0.07383	-12%
5	0.0641	0.06629	-3%
6	0.05245	0.04768	10%
7	0.08059	0.07449	8%

FM10			
Event	Model Peak Flow (MGD)	Meter Peak Flow (MGD)	% Difference
1	0.1677	0.101	66%
2	0.09398	0.12	-22%
3	0.1038	0.139	-25%
4	0.1228	0.106	16%
5	0.11	0.0843	30%
6	0.1089	0.0967	13%
7	0.1063	0.114	-7%

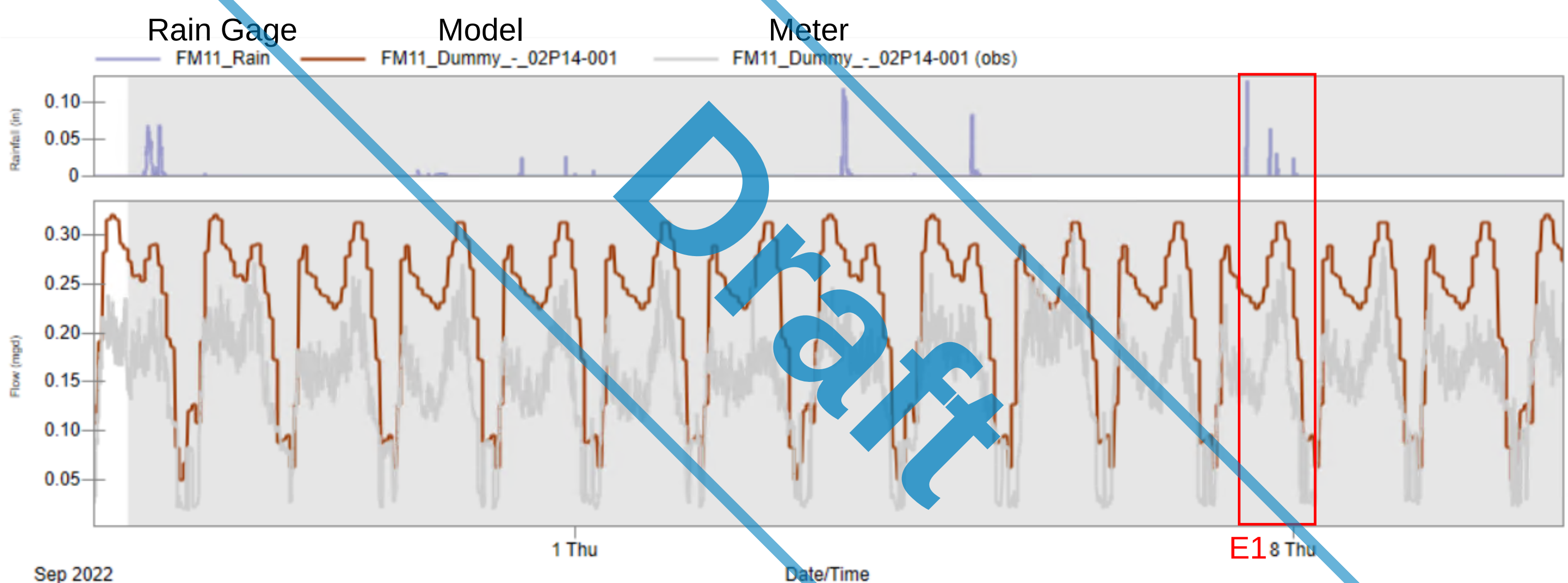




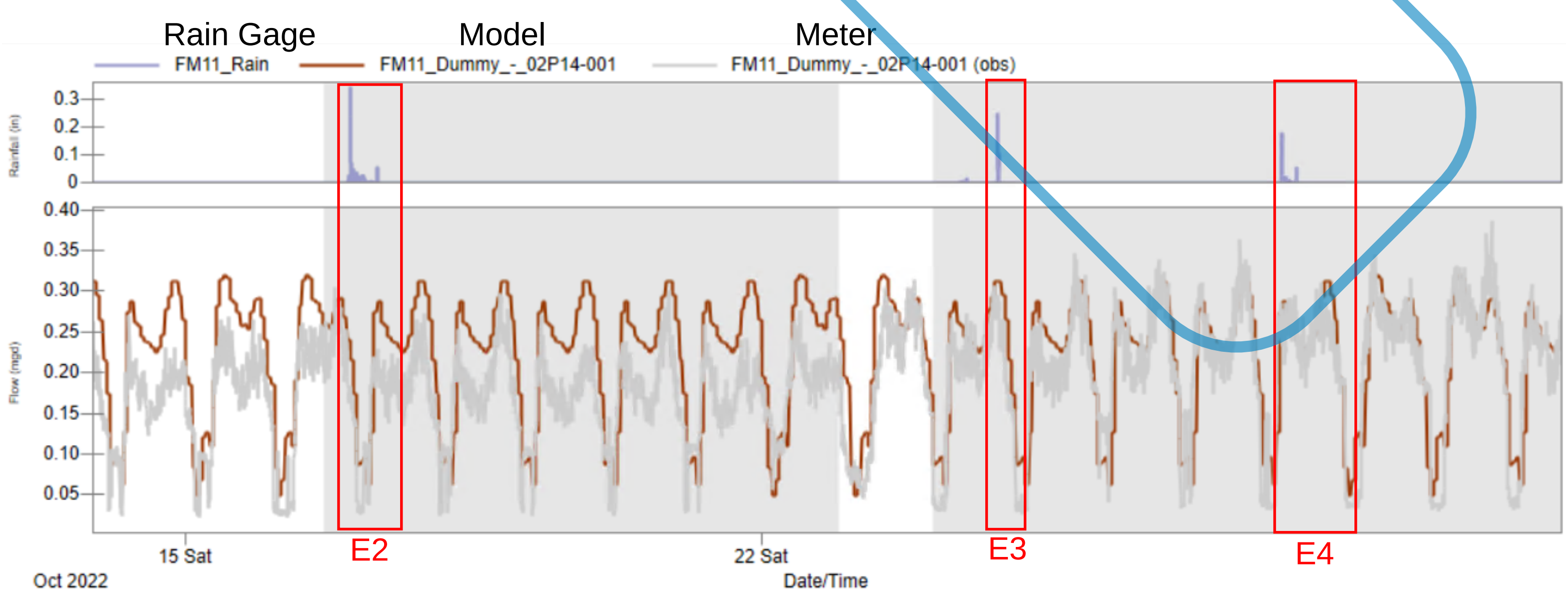
FM11



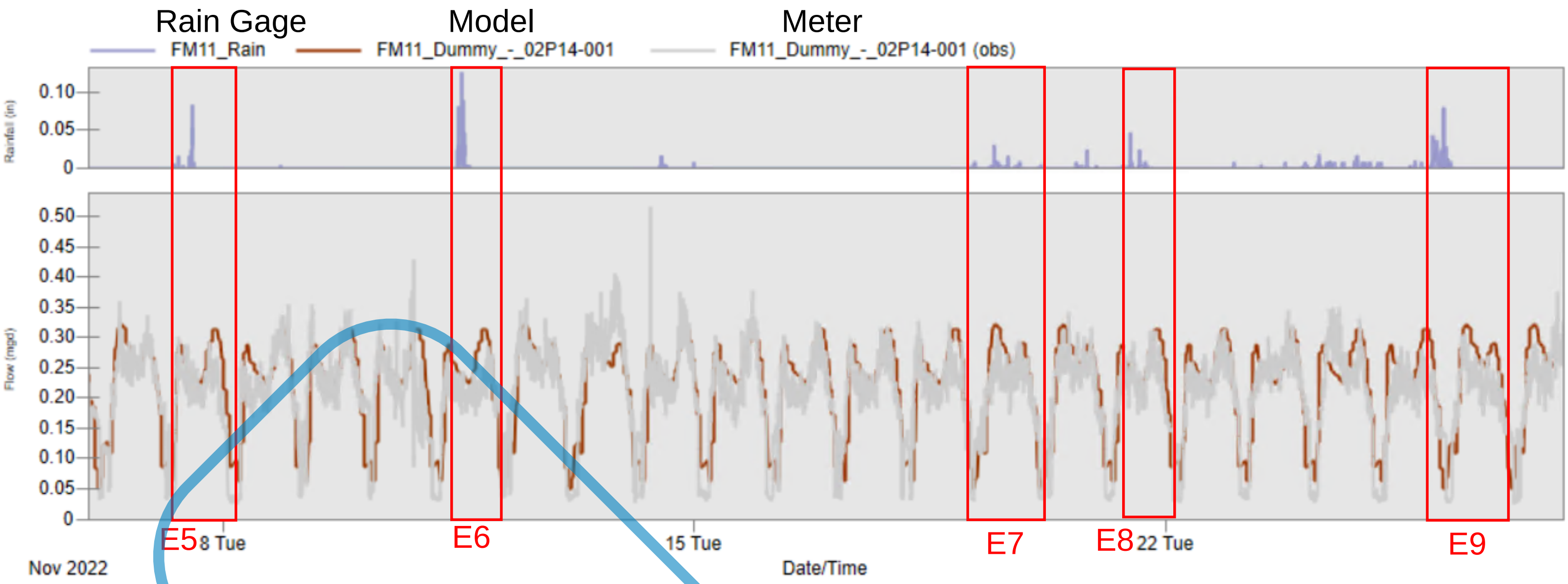
Rain Gage
Model
Meter
FM11_Rain
FM11_Dummy_-_02P14-001
FM11_Dummy_-_02P14-001 (obs)
Rainfall (in)
0.3
0.2
0.1
0
Flow (mgd)
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0
Sep
Oct
Nov
Dec
2022
Date/Time



Rain Gage
Model
Meter
FM11_Rain
FM11_Dummy_-_02P14-001
FM11_Dummy_-_02P14-001 (obs)
Rainfall (in)
0.10
0.05
0
Flow (mgd)
0.30
0.25
0.20
0.15
0.10
0.05
1 Thu
E1
8 Thu
Sep 2022
Date/Time

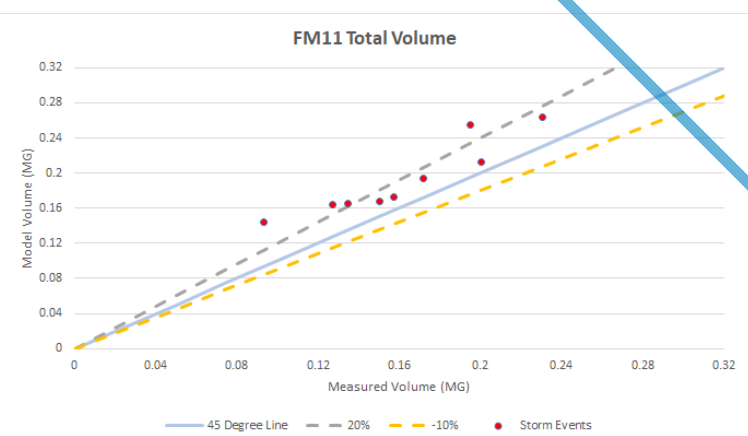


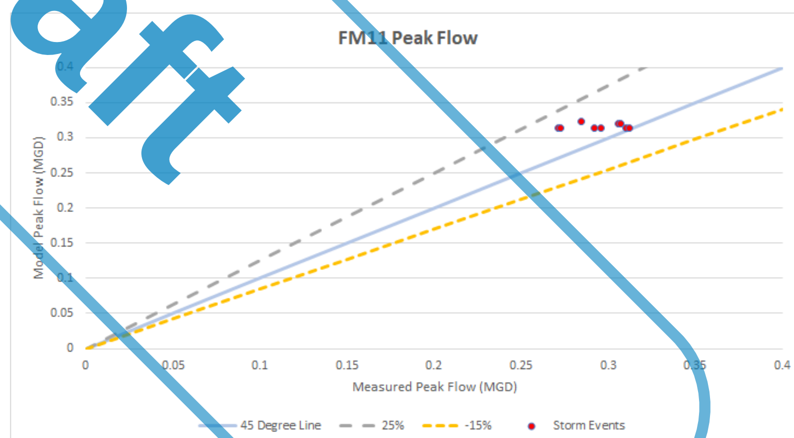
Rain Gage
Model
Meter
FM11_Rain
FM11_Dummy_-_02P14-001
FM11_Dummy_-_02P14-001 (obs)
Rainfall (in)
0.3
0.2
0.1
0
Flow (mgd)
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
15 Sat
E2
22 Sat
E3
E4
Oct 2022
Date/Time



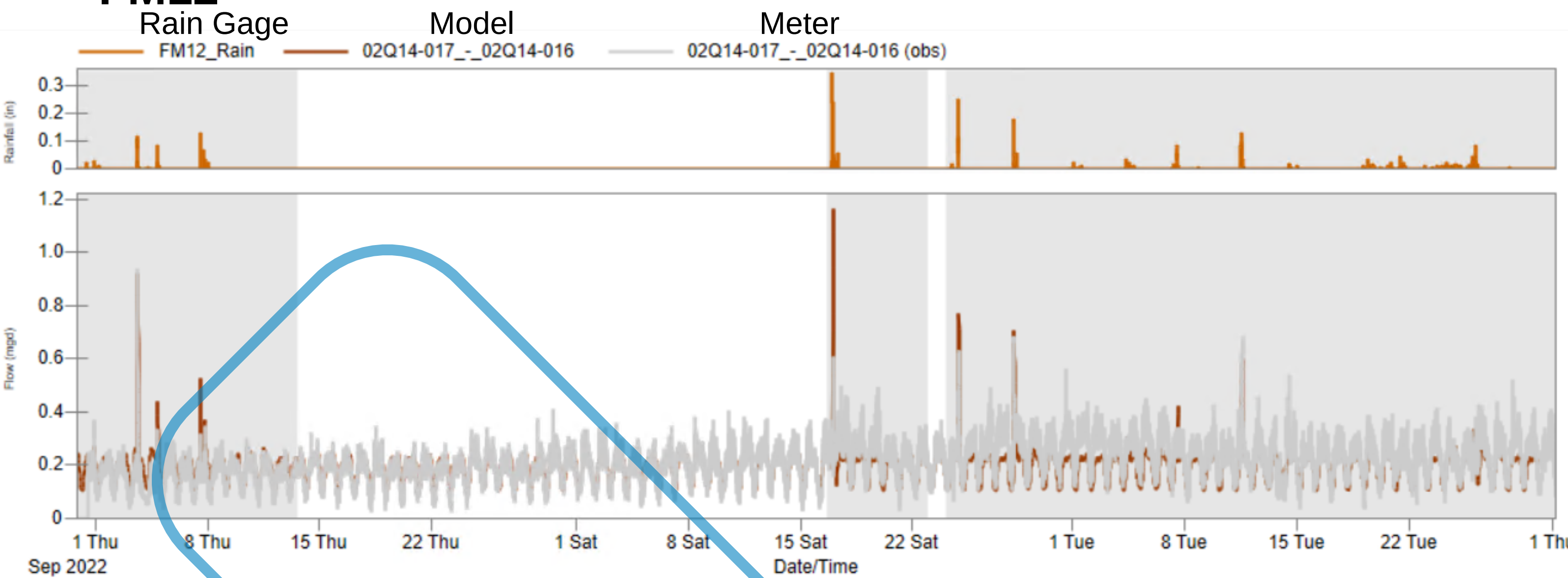
FM11			
Event	Model Volume (MG)	Meter Volume (MG)	% Difference
1	0.1436	0.09304	54%
2	0.2548	0.195	31%
3	0.1657	0.1346	23%
4	0.2125	0.2002	6%
5	0.1641	0.127	29%
6	0.1681	0.1503	12%
7	0.1939	0.1719	13%
8	0.1724	0.1576	9%
9	0.2631	0.2305	14%

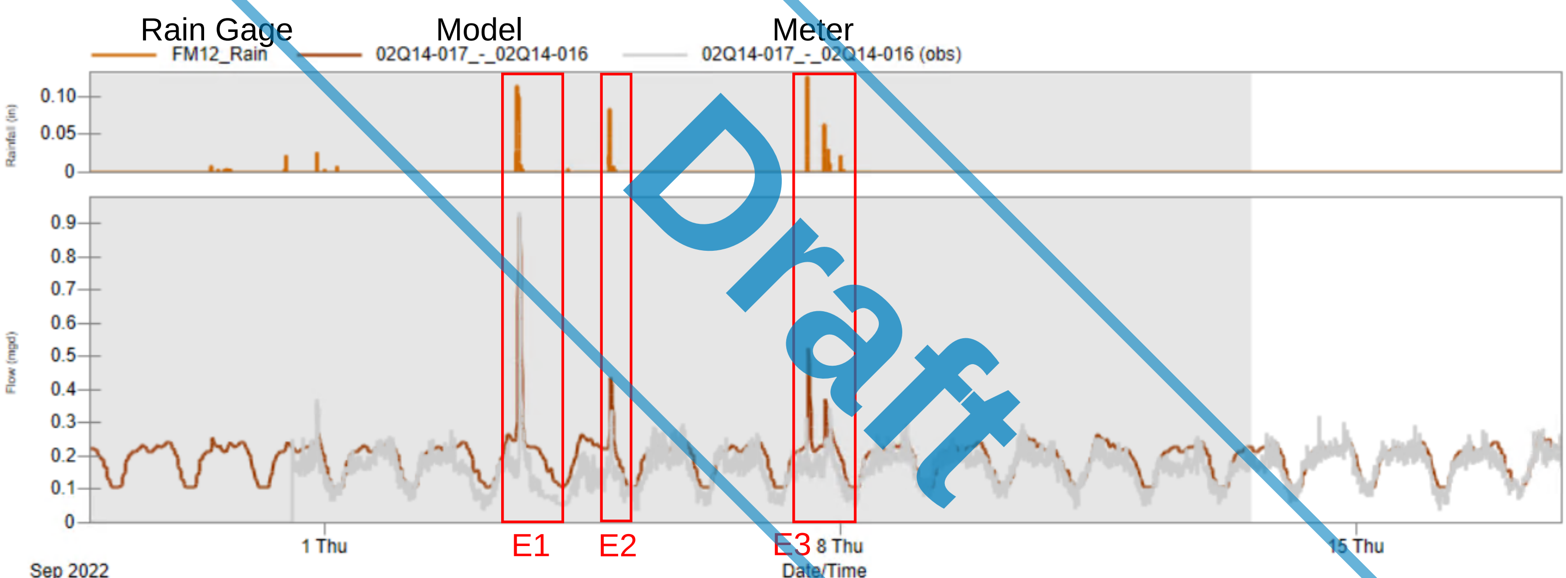
FM11			
Event	Model Peak Flow (MGD)	Meter Peak Flow (MGD)	% Difference
1	0.3131	0.2713	15%
2	0.3131	0.2724	15%
3	0.3131	0.296	6%
4	0.3131	0.3104	1%
5	0.3131	0.292	7%
6	0.3231	0.2846	14%
7	0.3202	0.3059	5%
8	0.3131	0.3118	0%
9	0.3202	0.307	4%

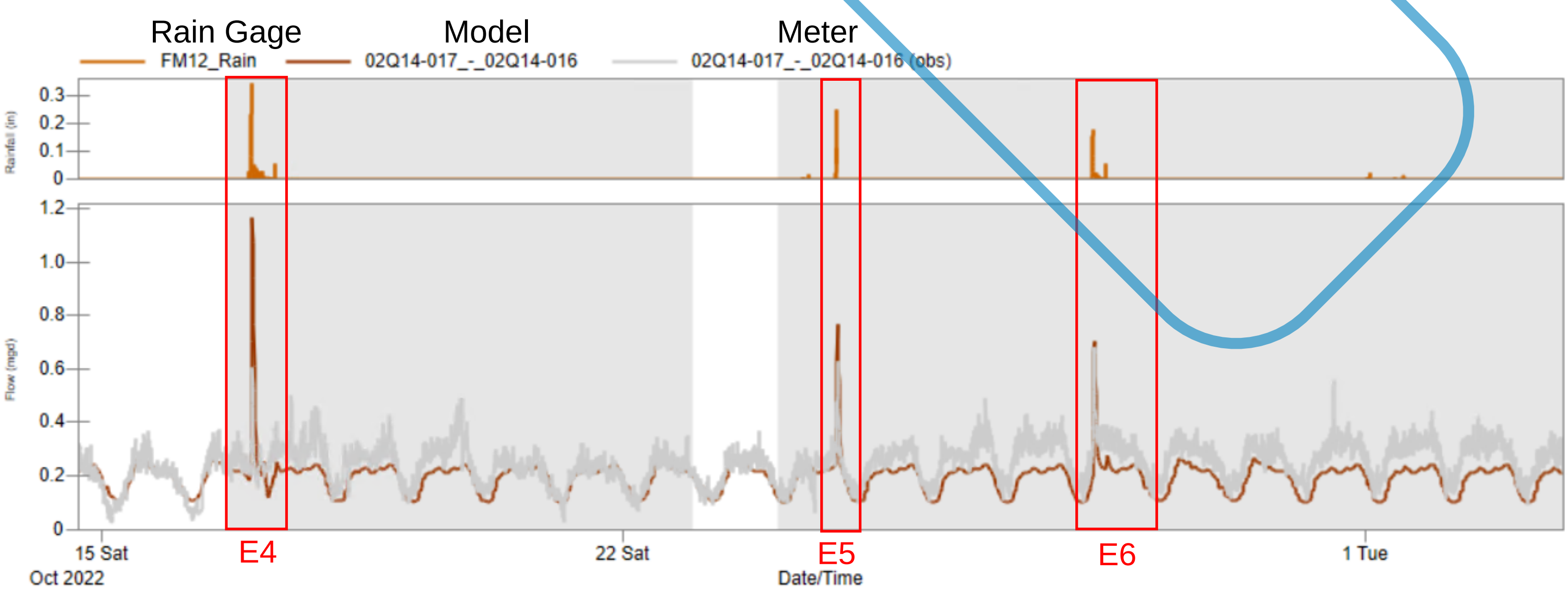


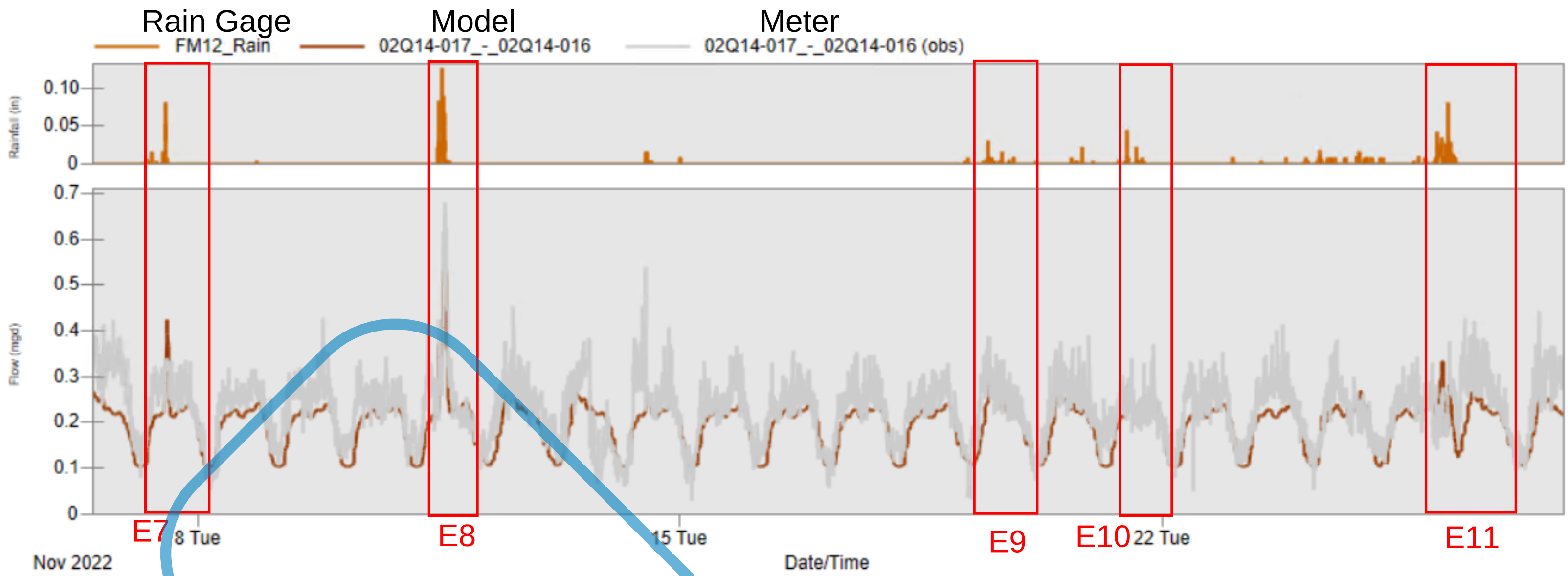


FM12


Rain Gage
FM12_Rain
Model
02Q14-017_-_02Q14-016
Meter
02Q14-017_-_02Q14-016 (obs)
Rainfall (in)
Flow (mgd)
1 Thu
8 Thu
15 Thu
22 Thu
1 Sat
8 Sat
15 Sat
22 Sat
1 Tue
8 Tue
15 Tue
22 Tue
1 Thu
Sep 2022
Date/Time

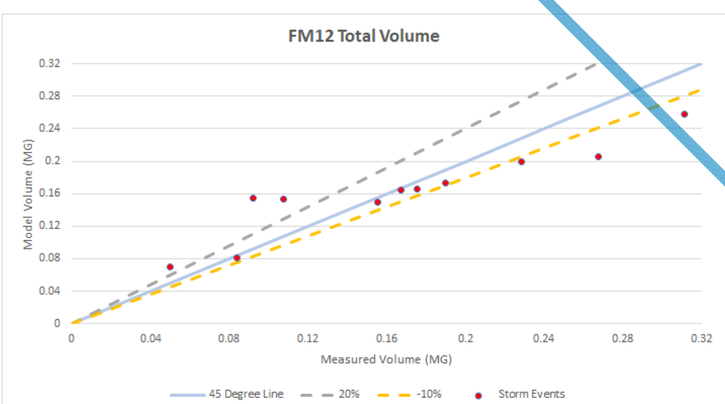

Rain Gage
FM12_Rain
Model
02Q14-017_-_02Q14-016
Meter
02Q14-017_-_02Q14-016 (obs)
Rainfall (in)
Flow (mgd)
E1
E2
E3
1 Thu
8 Thu
15 Thu
Sep 2022
Date/Time

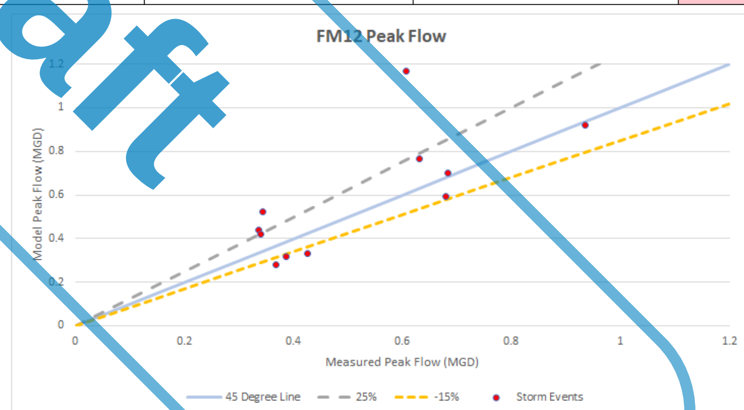

Rain Gage
FM12_Rain
Model
02Q14-017_-_02Q14-016
Meter
02Q14-017_-_02Q14-016 (obs)
Rainfall (in)
Flow (mgd)
E4
E5
E6
15 Sat
22 Sat
1 Tue
Oct 2022
Date/Time



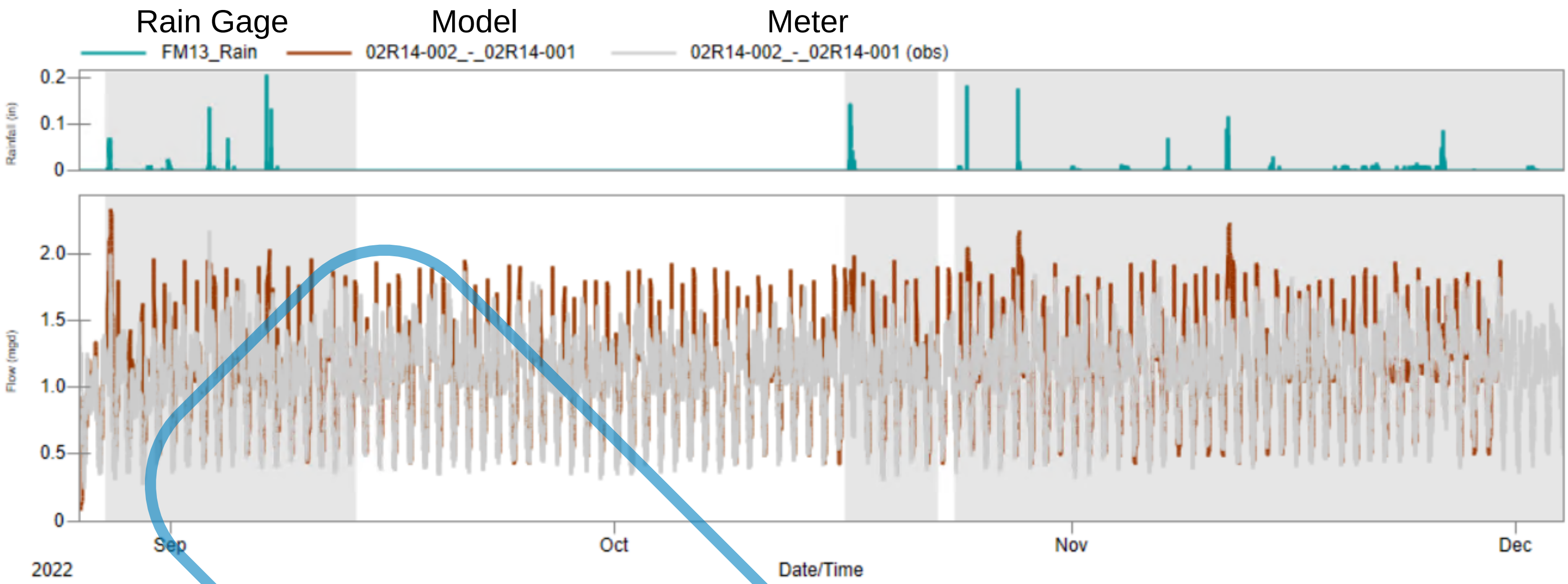
FM12			
Event	Model Volume (MG)	Meter Volume (MG)	% Difference
1	0.154	0.09208	67%
2	0.07048	0.04971	42%
3	0.153	0.1074	42%
4	0.1652	0.1755	-6%
5	0.08064	0.08385	-4%
6	0.206	0.2675	-23%
7	0.1995	0.2285	-13%
8	0.164	0.1671	-2%
9	0.1731	0.1899	-9%
10	0.1498	0.1555	-4%
11	0.2585	0.3113	-17%

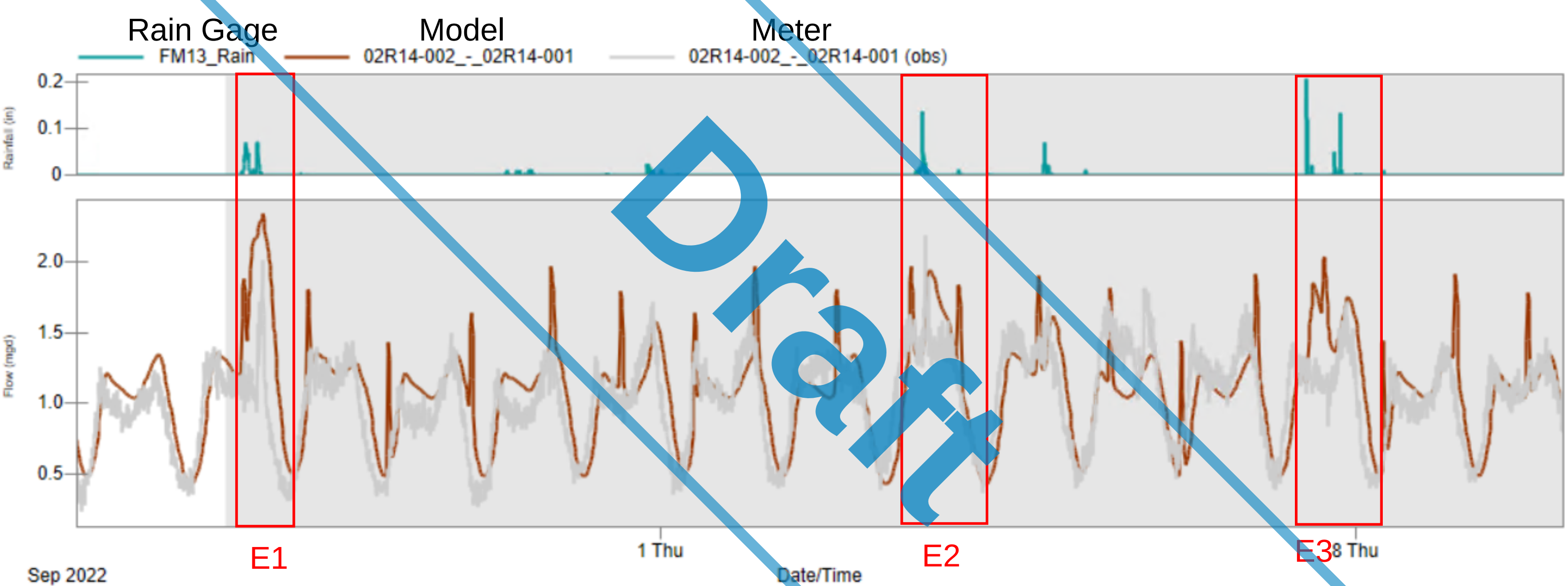
FM12			
Event	Model Peak Flow (MGD)	Meter Peak Flow (MGD)	% Difference
1	0.9183	0.935	-2%
2	0.4369	0.336	30%
3	0.5225	0.344	52%
4	1.166	0.607	92%
5	0.7663	0.631	21%
6	0.7024	0.683	3%
7	0.4216	0.3395	24%
8	0.5951	0.679	-12%
9	0.3186	0.3867	-18%
10	0.2816	0.3677	-23%
11	0.3333	0.4252	-22%

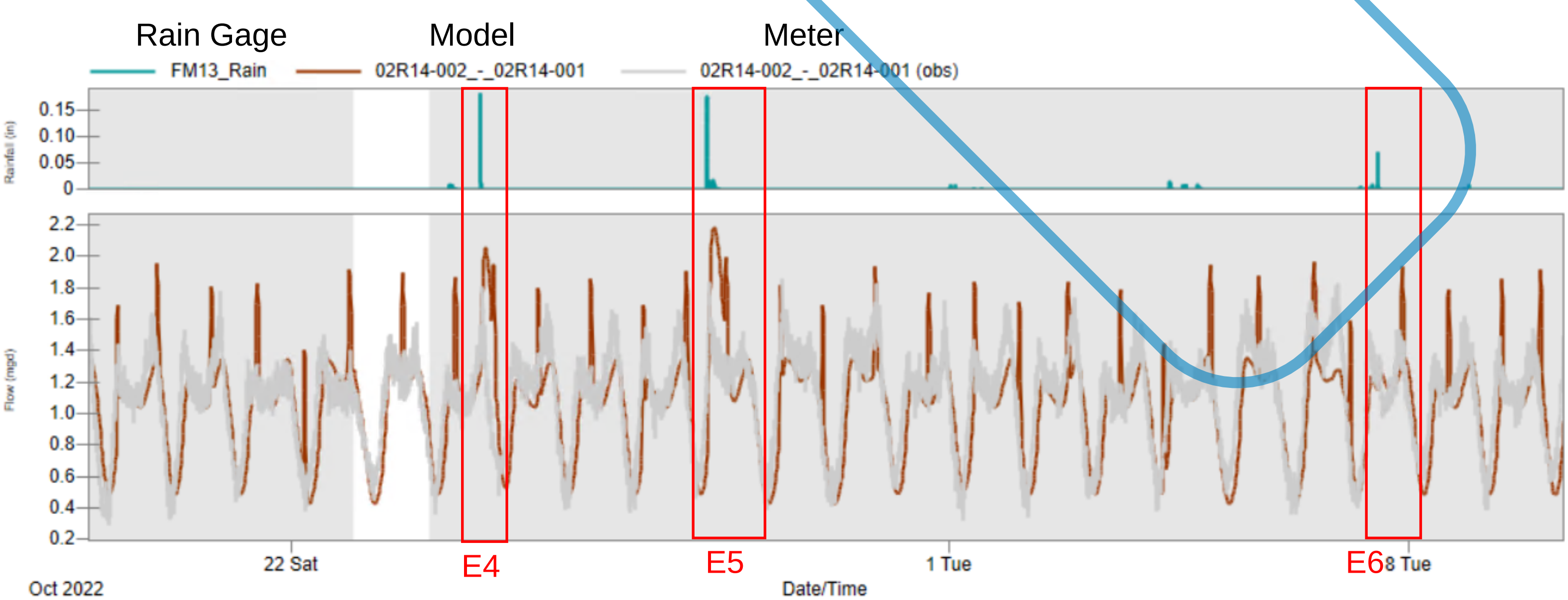


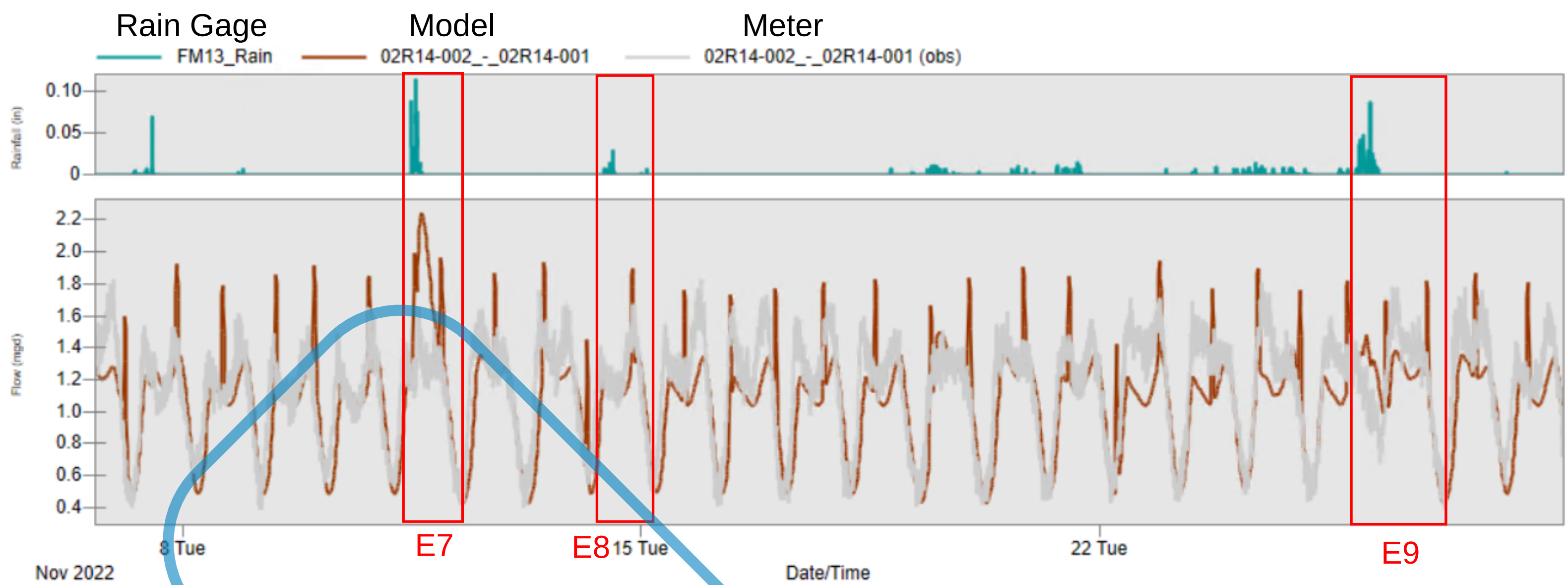


FM13


Rain Gage
Model
Meter
FM13_Rain
02R14-002_-_02R14-001
02R14-002_-_02R14-001 (obs)
Rainfall (in)
Flow (mgd)
Sep
Oct
Nov
Dec
2022
Date/Time

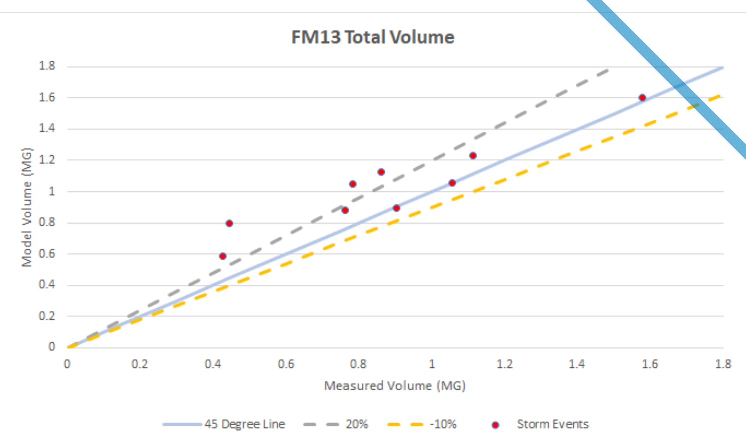

Rain Gage
Model
Meter
FM13_Rain
02R14-002_-_02R14-001
02R14-002_-_02R14-001 (obs)
Rainfall (in)
Flow (mgd)
E1
E2
E3
1 Thu
8 Thu
Sep 2022
Date/Time

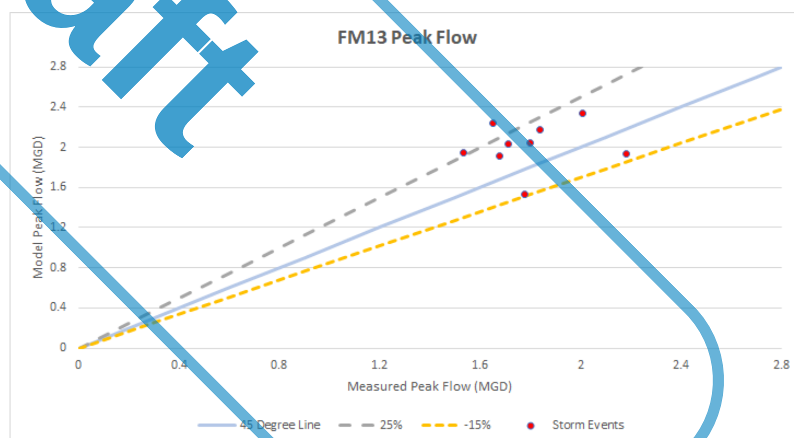

Rain Gage
Model
Meter
FM13_Rain
02R14-002_-_02R14-001
02R14-002_-_02R14-001 (obs)
Rainfall (in)
Flow (mgd)
E4
E5
E6
22 Sat
1 Tue
8 Tue
Oct 2022
Date/Time



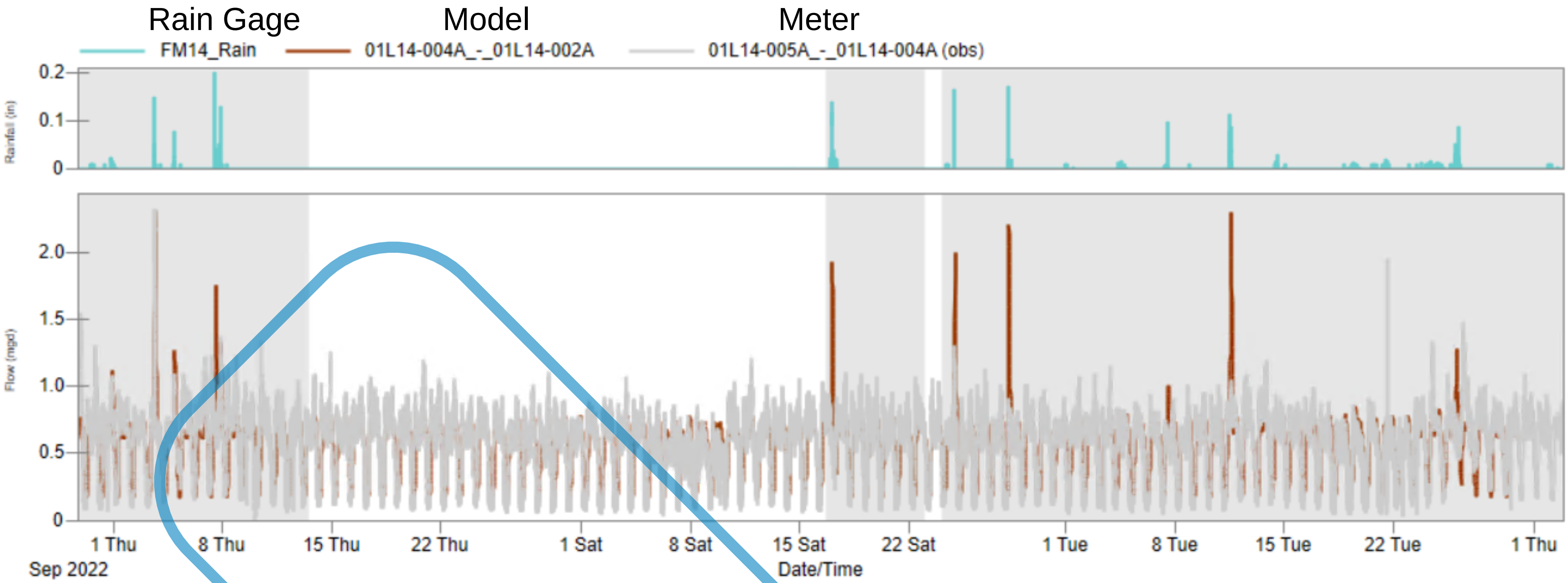
FM13			
Event	Model Volume (MG)	Meter Volume (MG)	% Difference
1	0.7951	0.4453	79%
2	0.8826	0.7628	16%
3	1.048	0.7838	34%
4	0.584	0.4258	37%
5	1.231	1.113	11%
6	1.054	1.056	0%
7	1.129	0.8628	31%
8	0.8968	0.9046	-1%
9	1.604	1.58	2%

FM13			
Event	Model Peak Flow (MGD)	Meter Peak Flow (MGD)	% Difference
1	2.34	2.01	16%
2	1.939	2.184	-11%
3	2.037	1.712	19%
4	2.049	1.801	14%
5	2.178	1.837	19%
6	1.949	1.535	27%
7	2.242	1.652	36%
8	1.911	1.676	14%
9	1.532	1.776	-14%

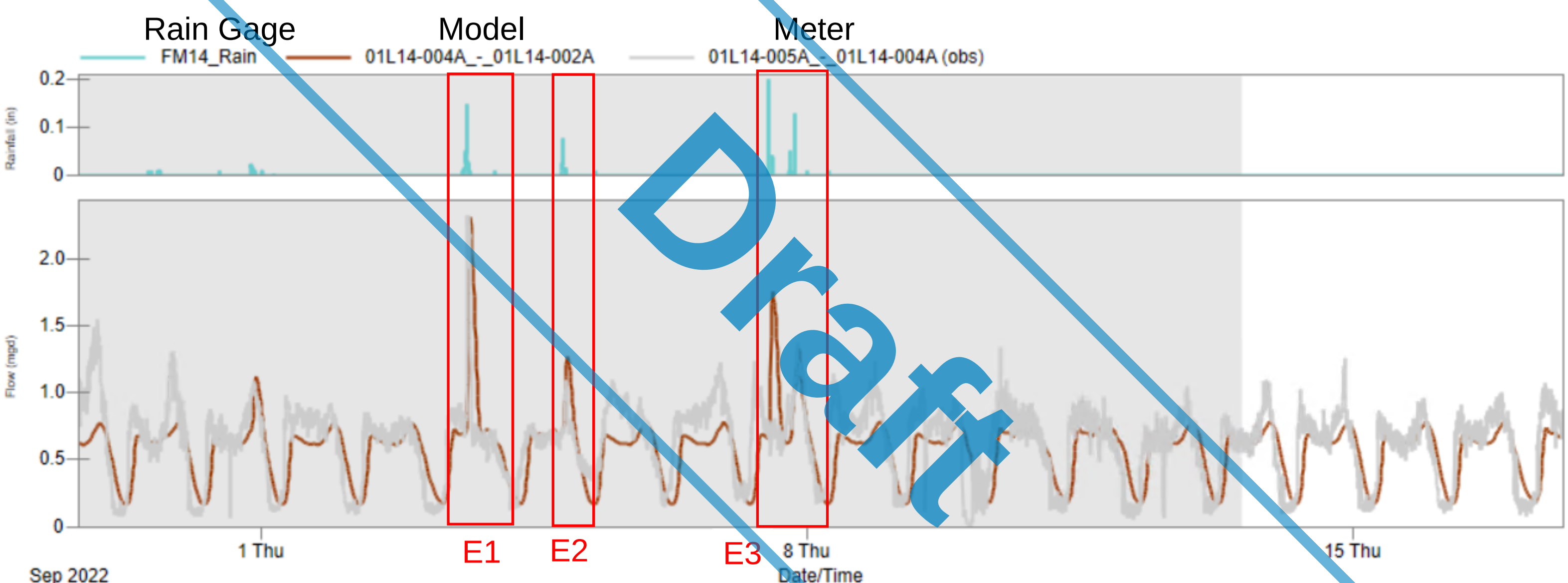




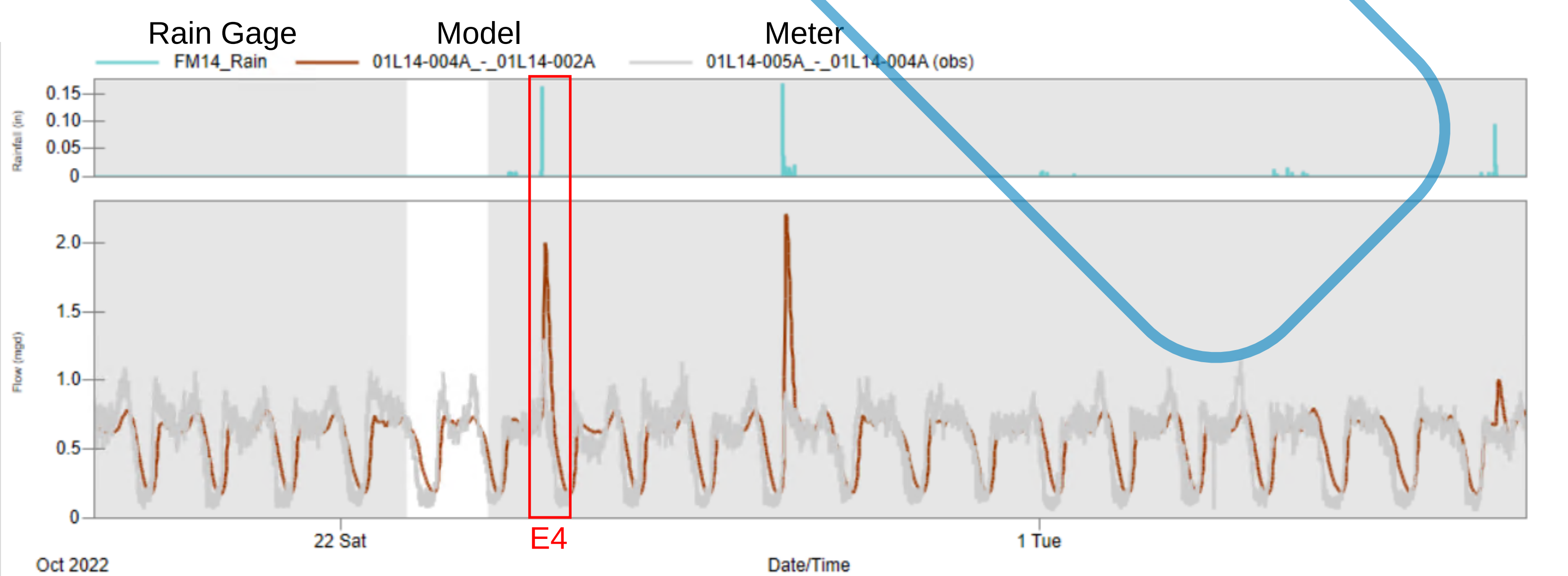
FM14



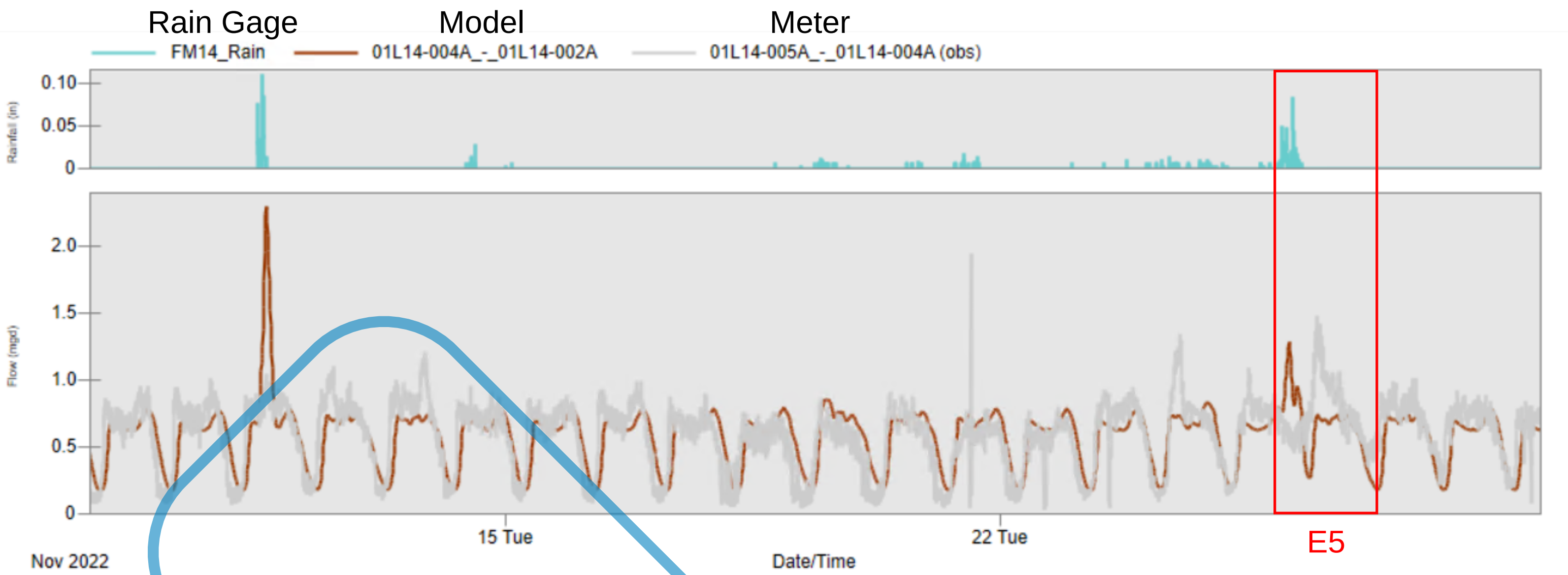
Rain Gage
Model
Meter
FM14_Rain
01L14-004A_-_01L14-002A
01L14-005A_-_01L14-004A (obs)
Rainfall (in)
Flow (mgd)
1 Thu
8 Thu
15 Thu
22 Thu
1 Sat
8 Sat
15 Sat
22 Sat
1 Tue
8 Tue
15 Tue
22 Tue
1 Thu
Sep 2022
Date/Time



Rain Gage
Model
Meter
FM14_Rain
01L14-004A_-_01L14-002A
01L14-005A_-_01L14-004A (obs)
Rainfall (in)
Flow (mgd)
E1
E2
E3
1 Thu
8 Thu
15 Thu
Sep 2022
Date/Time

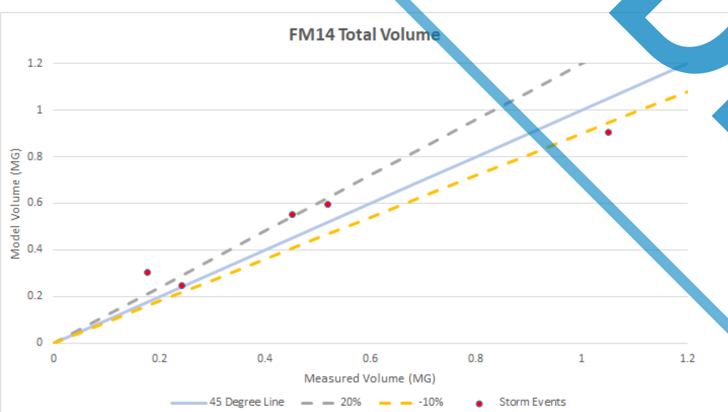


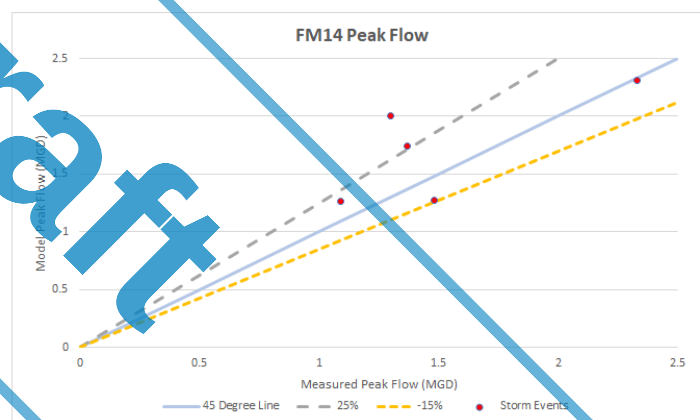
Rain Gage
Model
Meter
FM14_Rain
01L14-004A_-_01L14-002A
01L14-005A_-_01L14-004A (obs)
Rainfall (in)
Flow (mgd)
E4
22 Sat
1 Tue
Oct 2022
Date/Time



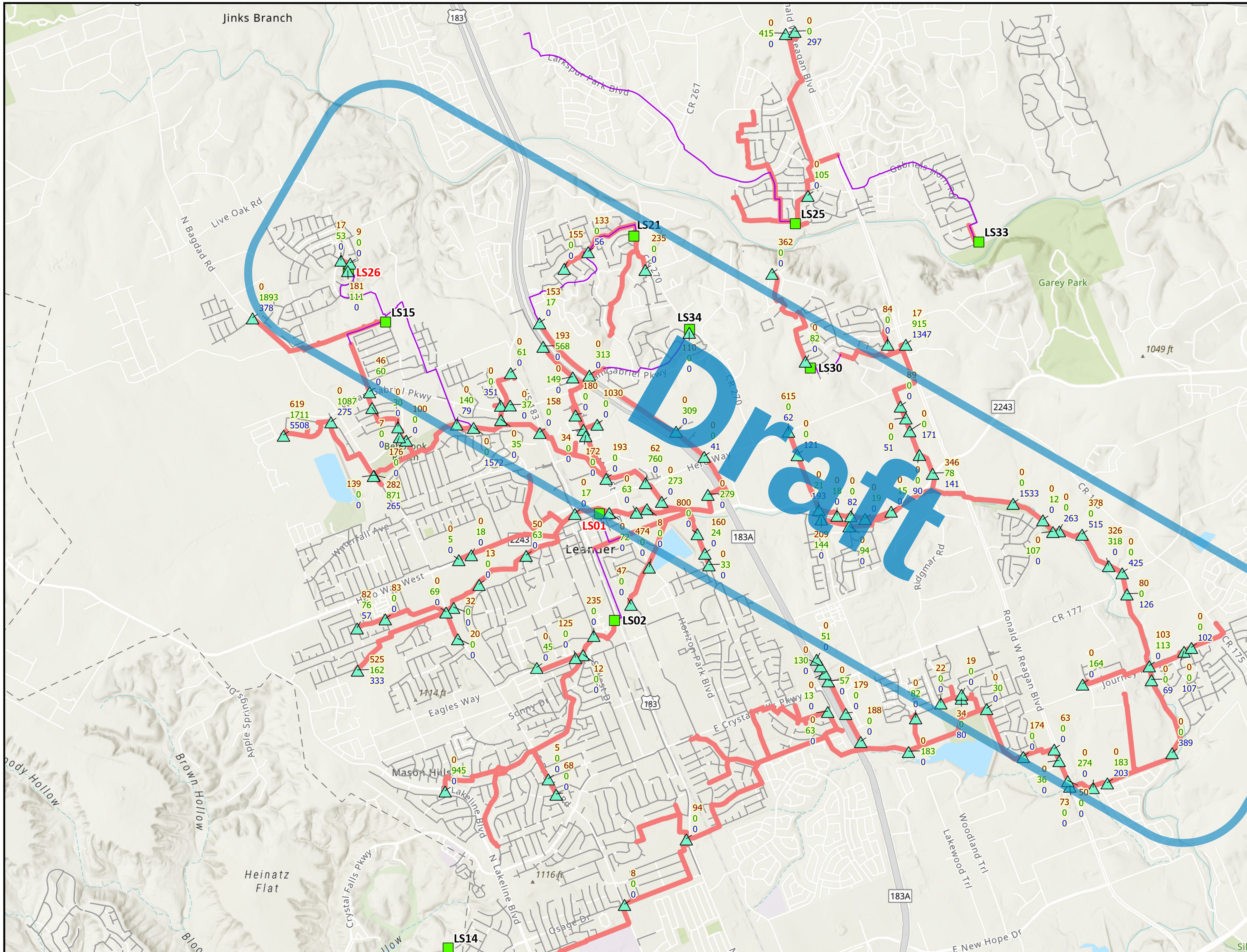
FM14			
Event	Model Volume (MG)	Meter Volume (MG)	% Difference
1	0.5534	0.4523	22%
2	0.2447	0.2431	1%
3	0.5948	0.5184	15%
4	0.3034	0.1773	71%
5	0.9043	1.051	-14%

FM14			
Event	Model Peak Flow (MGD)	Meter Peak Flow (MGD)	% Difference
1	2.31	2.33	-1%
2	1.265	1.09	16%
3	1.747	1.37	28%
4	2.002	1.3	54%
5	1.277	1.48	-14%





Appendix D: Future Growth Exhibits



City of Leander

City of Leander
Williamson County, TX

FUTURE
GROWTH LUE EXHIBIT

Balcones Canyonlands National Wildlife Refuge
Cedar Park
35

Legend

- Modeled Wastewater Line
- Modeled Force Main
- Modeled Lift Station
- Sewer Main
- Future Connections
  - 5-yr LUEs[1]
  - 10-yr LUEs[1]
  - 20-yr LUEs[1]

1 - These values are incremental and represent the increase in Living Unit Equivalents (LUEs) for the 5, 10, and 20-year time horizons

N

0 0.65 1.3
Miles

Date: 4/24/2024

GBA

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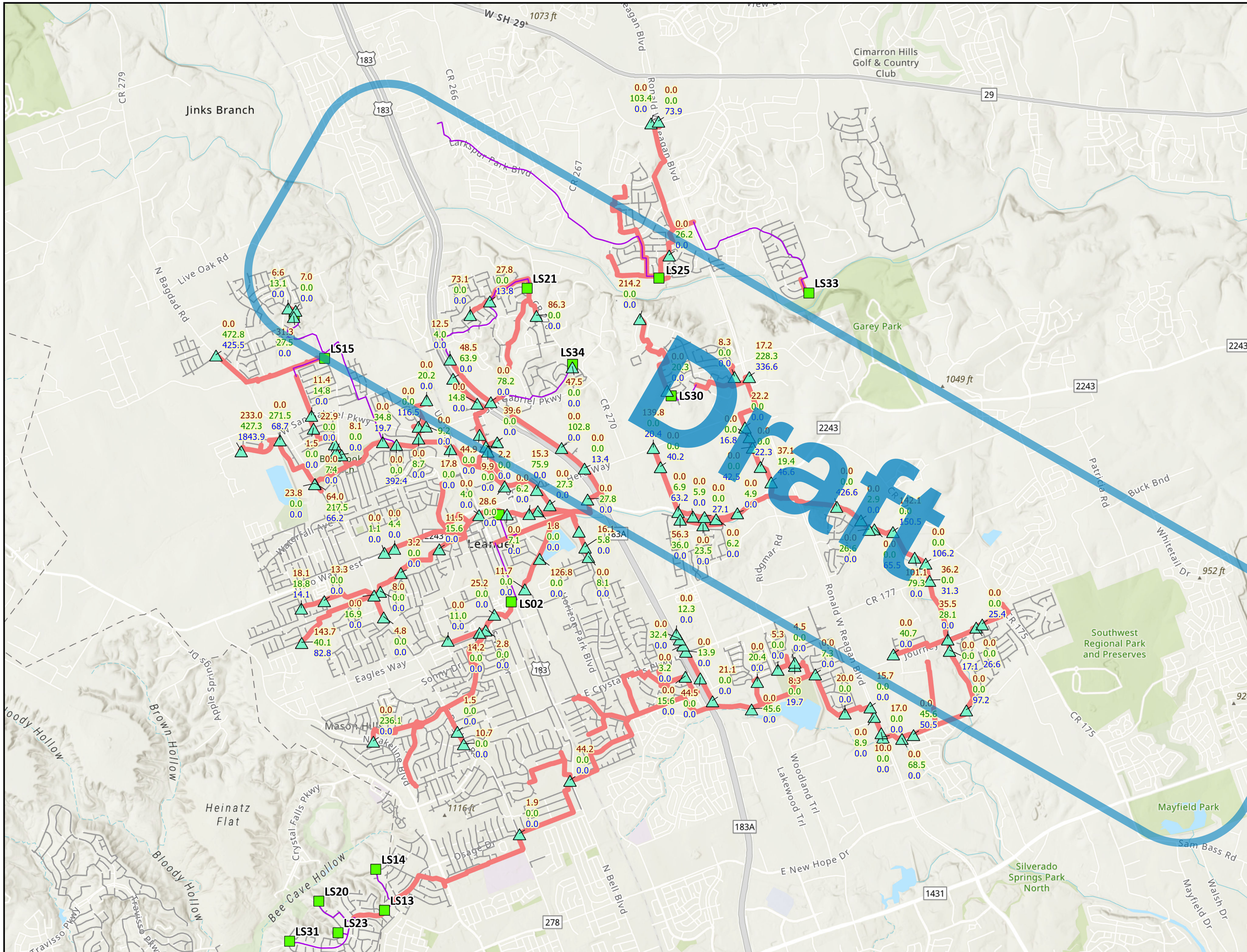

City of Leander

City of Leander Williamson County, TX

FUTURE GROWTH SEWERSHED AREA EXHIBIT

Round Rock
281
Austin

Legend

- Modeled Wastewater Line
- Modeled Lift Station
- Modeled Force Main
- Sewer Main
- Future Connections
- 5-yr Sewershed Acreage[1]
- 10-yr Sewershed Acreage[1]
- 20-yr Sewershed Acreage[1]

1 - These values are incremental and represent the increase in sewershed area, in acres, for the 5, 10, and 20-year time horizons

N

0 0.8 1.6

Miles

Date: 4/24/2024

GBA

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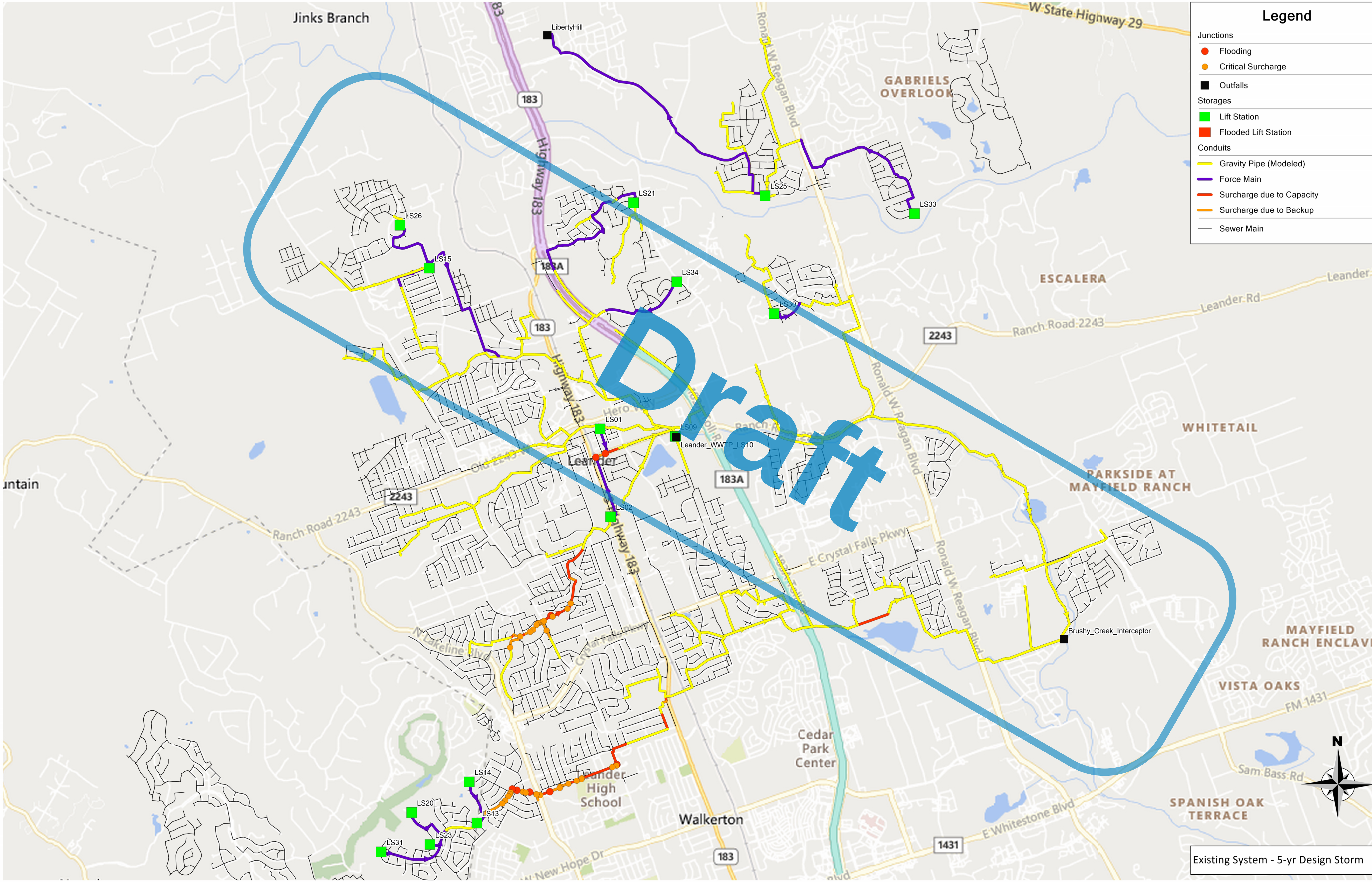
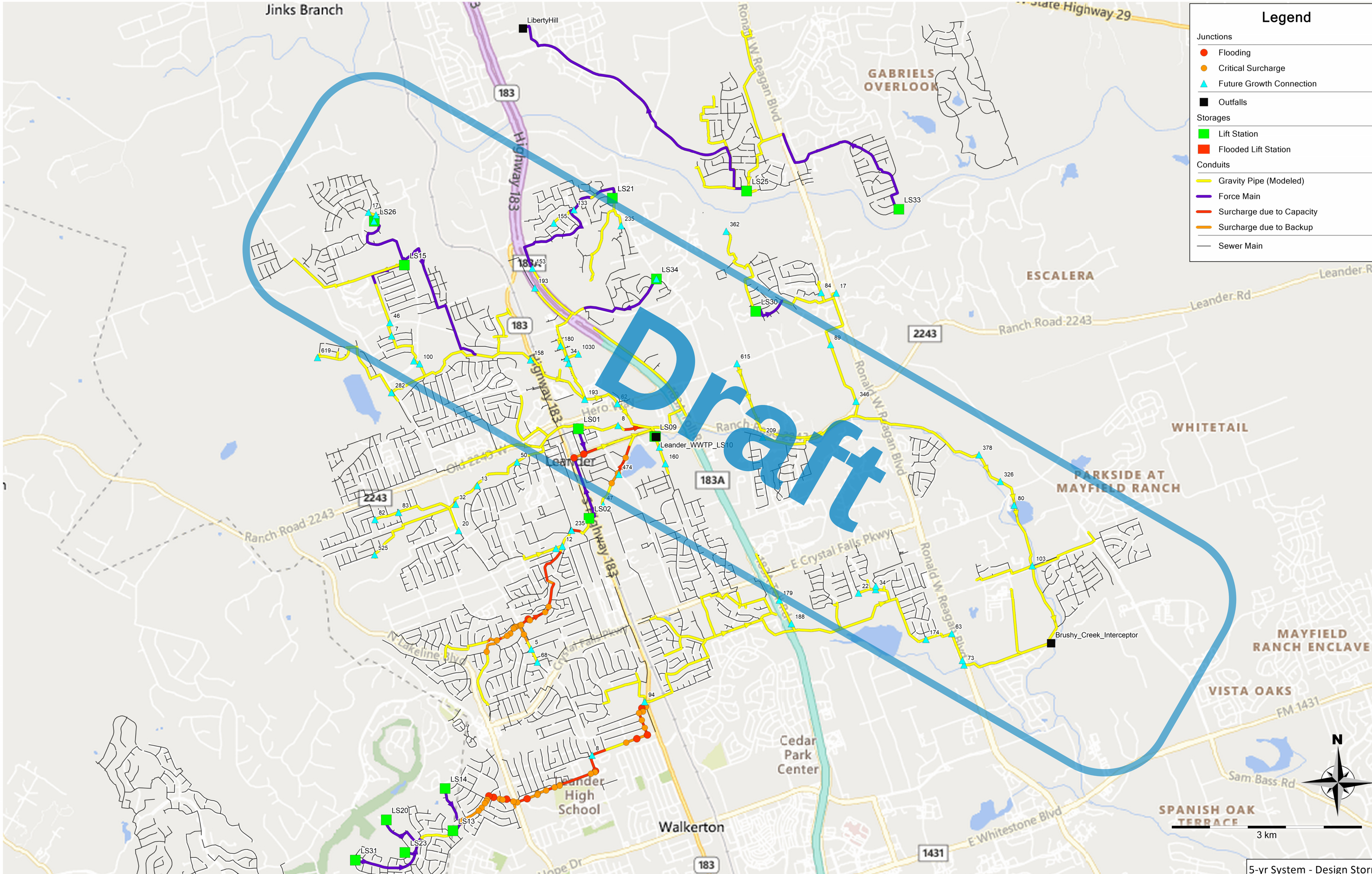
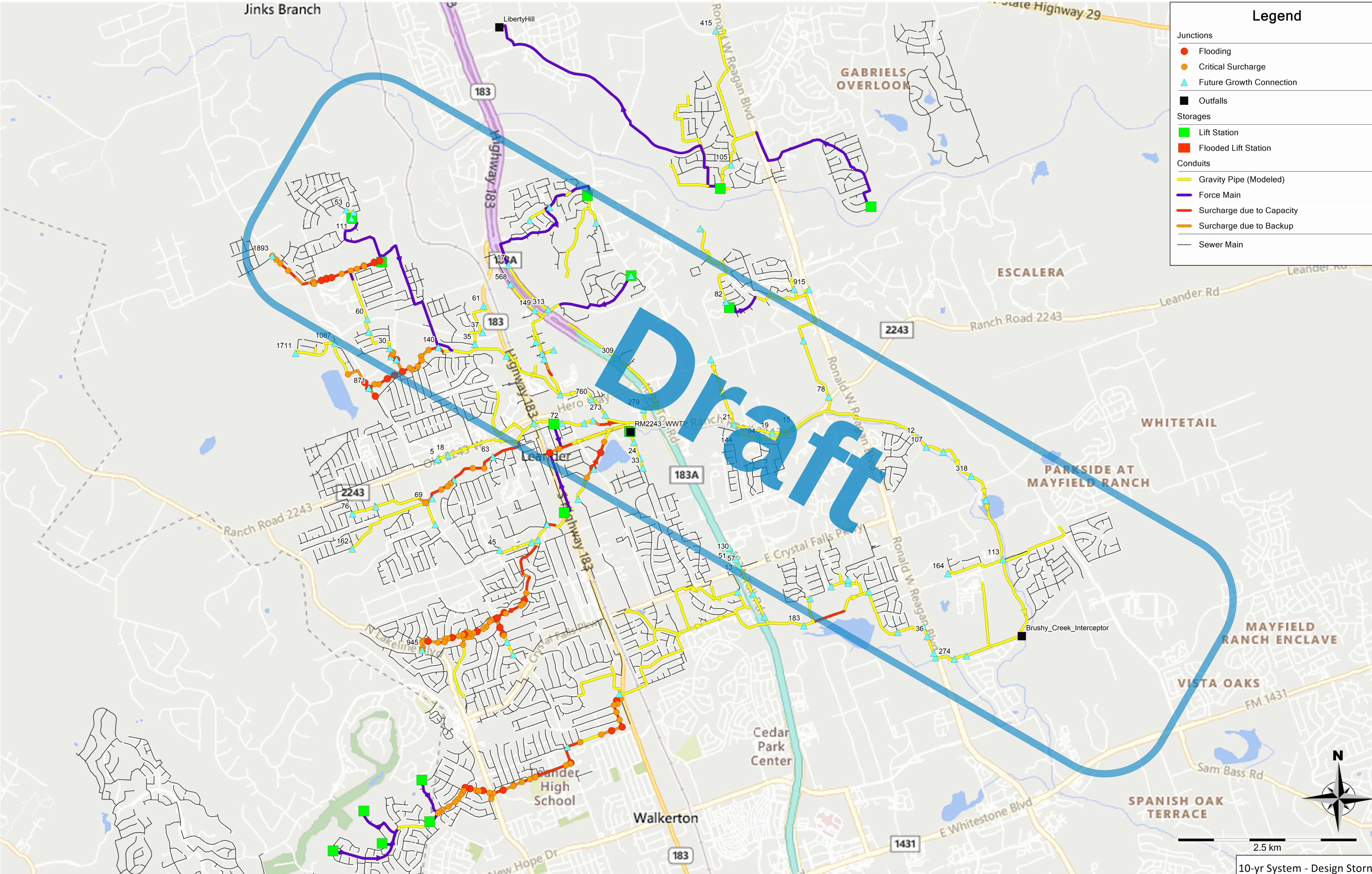
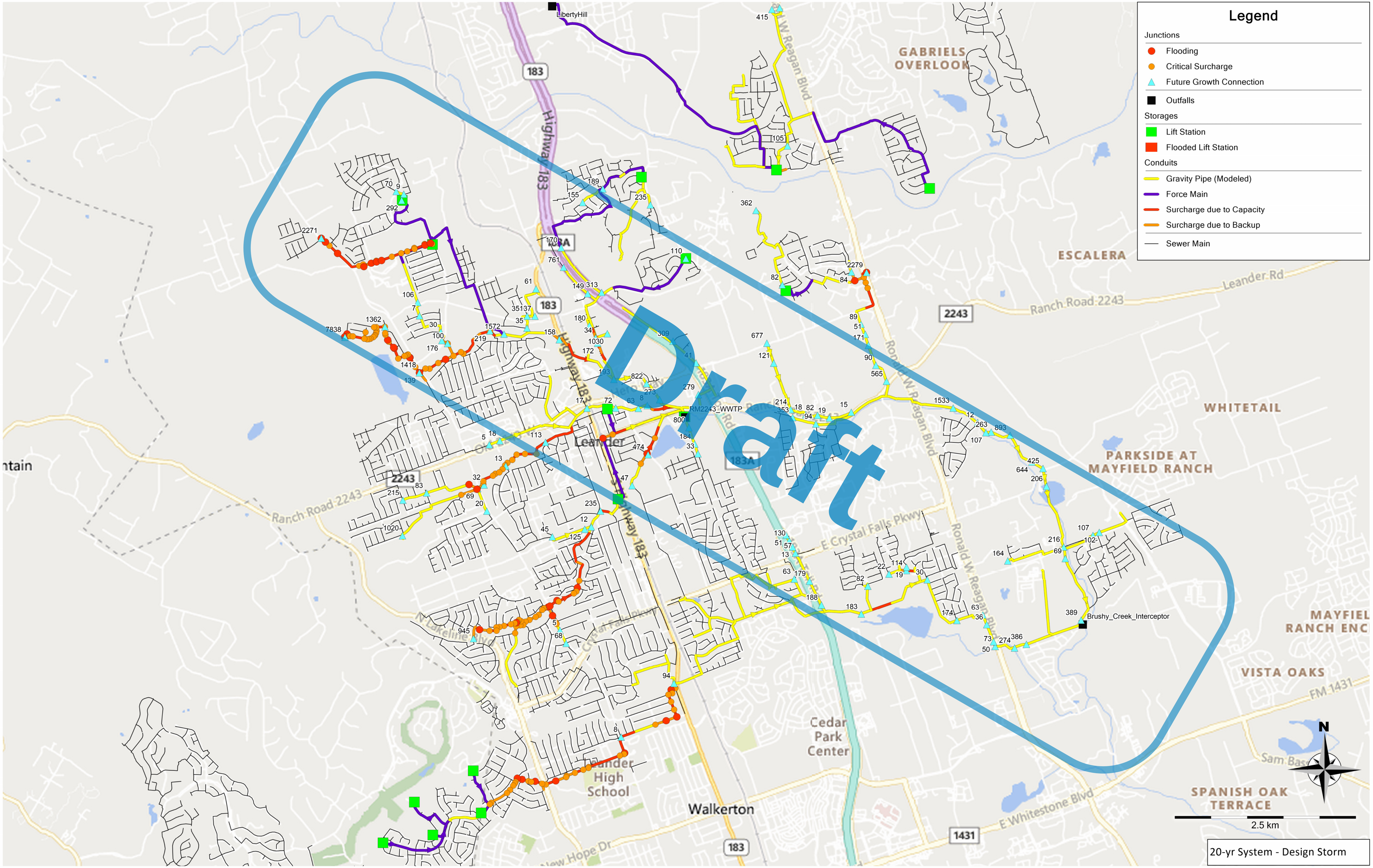
Appendix E: Design Storm Modeling Results (PCSWMM)

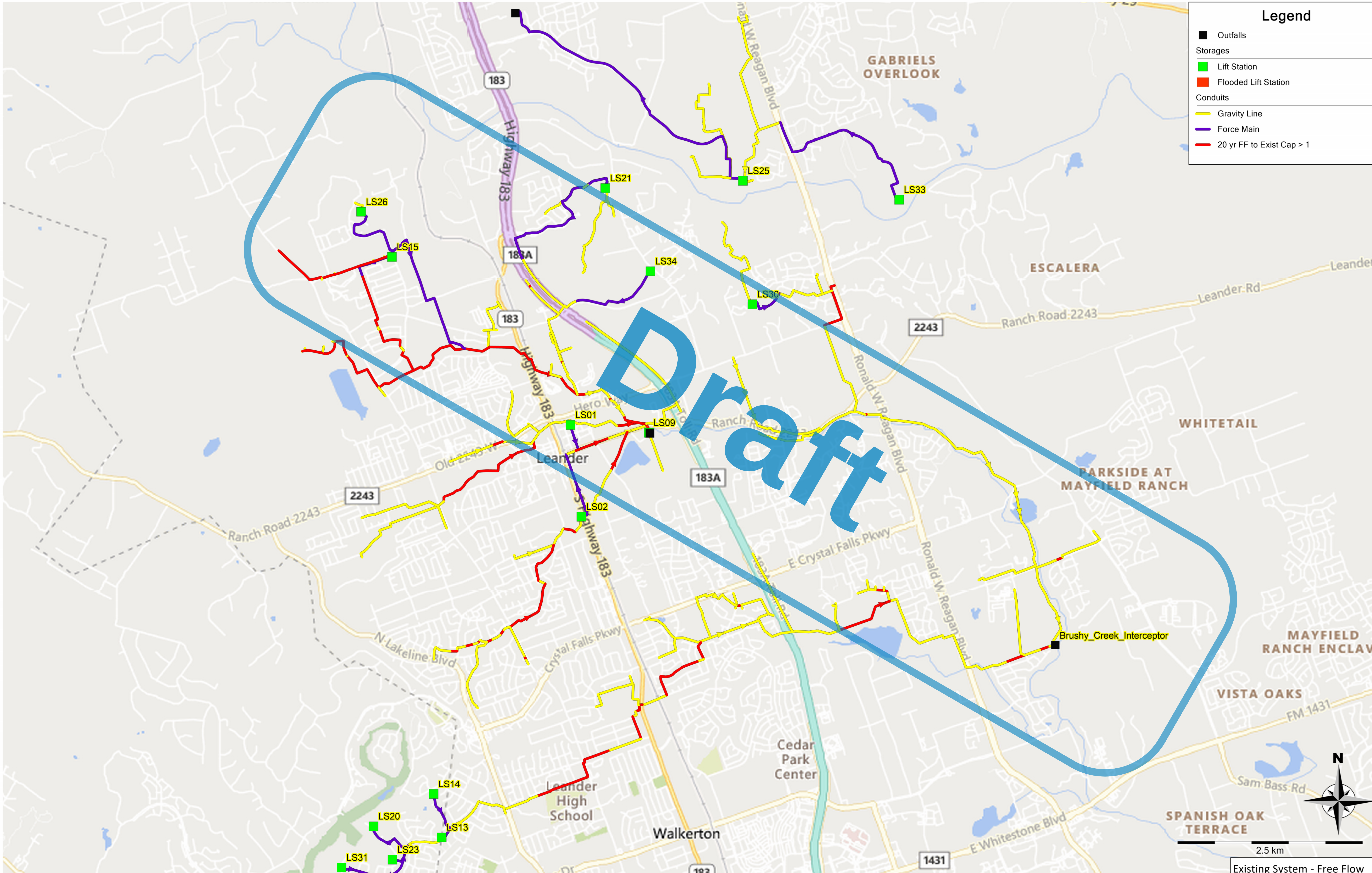

Legend
Junctions
Flooding
Critical Surcharge
Outfalls
Storages
Lift Station
Flooded Lift Station
Conduits
Gravity Pipe (Modeled)
Force Main
Surcharge due to Capacity
Surcharge due to Backup
Sewer Main
Draft
Existing System - 5-yr Design Storm
LibertyHill
LS26
LS15
LS21
LS25
LS33
LS34
LS30
LS01
LS09
Leander_WWTP_LS10
LS02
Brushy_Creek_Interceptor
LS14
LS20
LS13
LS23
LS31
N


Legend
Junctions
Flooding
Critical Surcharge
Future Growth Connection
Outfalls
Storages
Lift Station
Flooded Lift Station
Conduits
Gravity Pipe (Modeled)
Force Main
Surcharge due to Capacity
Surcharge due to Backup
Sewer Main
Draft
5-yr System - Design Storm
3 km
N
Jinks Branch
Leander
Walkerton
Cedar Park Center
Leander High School
GABRIELS OVERLOOK
ESCALERA
WHITETAIL
PARKSIDE AT MAYFIELD RANCH
MAYFIELD RANCH ENCLAVE
VISTA OAKS
SPANISH OAK TERRACE
LibertyHill
Leander_WWTP_LS10
Brushy_Creek_Interceptor
LS01
LS02
LS09
LS13
LS14
LS15
LS20
LS21
LS23
LS25
LS26
LS30
LS31
LS33
LS34


Legend
Junctions
Flooding
Critical Surcharge
Future Growth Connection
Outfalls
Storages
Lift Station
Flooded Lift Station
Conduits
Gravity Pipe (Modeled)
Force Main
Surcharge due to Capacity
Surcharge due to Backup
Sewer Main
Draft
Jinks Branch
LibertyHill
RM2243_WWTP
Brushy_Creek_Interceptor
GABRIELS OVERLOOK
ESCALERA
WHITETAIL
PARKSIDE AT MAYFIELD RANCH
MAYFIELD RANCH ENCLAVE
VISTA OAKS
SPANISH OAK TERRACE
Leander
Cedar Park Center
Leander High School
Walkerton
Ronald W Reagan Blvd
Highway 183
State Highway 29
Leander Rd
Ranch Road 2243
E Crystal Falls Pkwy
N Lakeline Blvd
FM 1431
Sam Bass Rd
E Whitestone Blvd
W New Hope Dr
183
183A
2243
1431
N
2.5 km
10-yr System - Design Storn



Legend
Junctions
Flooding
Critical Surcharge
Future Growth Connection
Outfalls
Storages
Lift Station
Flooded Lift Station
Conduits
Gravity Pipe (Modeled)
Force Main
Surcharge due to Capacity
Surcharge due to Backup
Sewer Main
Draft
20-yr System - Design Storm
2.5 km
N
LibertyHill
RM2243_WWTP
Brushy_Creek_Interceptor
GABRIELS OVERLOOK
ESCALERA
WHITETAIL
PARKSIDE AT MAYFIELD RANCH
VISTA OAKS
SPANISH OAK TERRACE
Leander
Cedar Park Center
Walkerton
Leander High School
Highway 183
Ranch Road 2243
Leander Rd
E Crystal Falls Pkwy
Ronald W Reagan Blvd
E Whitestone Blvd
FM 1431
N Lakeline Blvd
New Hope Dr
183
183A
2243
1431


Legend
Outfalls
Storages
Lift Station
Flooded Lift Station
Conduits
Gravity Line
Force Main
20 yr FF to Exist Cap > 1
Draft
LS01
LS02
LS09
LS13
LS14
LS15
LS20
LS21
LS23
LS25
LS26
LS30
LS31
LS33
LS34
Brushy_Creek_Interceptor
GABRIELS OVERLOOK
ESCALERA
WHITETAIL
PARKSIDE AT MAYFIELD RANCH
MAYFIELD RANCH ENCLAVE
VISTA OAKS
SPANISH OAK TERRACE
Leander
Leander High School
Walkerton
Cedar Park Center
Ranch Road 2243
Leander Rd
E Crystal Falls Pkwy
Crystal Falls Pkwy
N Lakeline Blvd
Ronald W Reagan Blvd
Highway 183
E Whitestone Blvd
Sam Bass Rd
FM 1431
183
183A
2243
1431
N
2.5 km
Existing System - Free Flow

Appendix F: Overall Projects Map (24” x 36”)

OVERALL PROJECTS MAP

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Appendix G: Overall Project List

Table 6-2: Overall Project List

Project ID	Infrastructure Type	Time Horizon	FY24 CIP Project ID	Project Name	Type of Improvement	Pipe Diameter (in)[1]	Total Length of Pipe (ft)	Lift Station Flow Rate (mgd)	Planning-Level Construction OPCC without Contingency	Construction Contingency (30%)	Planning-Level Construction OPCC with Contingency	Engineering & Survey (20%)	ROW Acquisition	Planning-Level Capital Cost (OPCC with Contingency + Engr./Survey + ROW Acq.)[2]
WW.00.01	Existing/Relief	Present Day	-	Block House Interceptor	Exist. Gravity Relief/Upsizing	21"-24"	13,020	-	$ 11,327,000	$ 3,398,000	$ 14,725,000	$ 2,945,000	$ -	$ 17,670,000
WW.00.02	Existing/Relief	Present Day	-	Mason Creek Interceptor	Exist. Gravity Relief/Upsizing	15"-24"	8,170	-	$ 6,597,000	$ 1,979,000	$ 8,576,000	$ 1,715,000	$ -	$ 10,291,000
WW.05.01	Existing/Relief	5-Year	-	Horizon Lake Interceptor	Exist. Gravity Relief/Upsizing	18"-36"	3,660	-	$ 3,617,000	$ 1,085,000	$ 4,702,000	$ 940,000	$ -	$ 5,642,000
WW.05.02	New/Extension	5-Year	-	Lonestar Landing WW Improvements	New Gravity to Serve Growth	8"	1,225	-	$ 620,000	$ 186,000	$ 806,000	$ 161,000	$ 124,000	$ 1,091,000
WW.05.03	New/Extension	5-Year	-	RM 2243 to Hero Way WW Improvements - East Segment Ph. 1	New Gravity to Serve Growth	12"	1,350	-	$ 810,000	$ 243,000	$ 1,053,000	$ 211,000	$ 136,000	$ 1,400,000
WW.10.01	Existing/Relief	10-Year	WW.41	Benbrook Interceptor (Under Design)	Exist. Gravity Relief/Upsizing	27"	8,460	-	$ 9,870,000	$ 2,961,000	$ 12,831,000	$ 2,566,000	$ -	$ 15,397,000
WW.10.02	Existing/Relief	10-Year	-	Collaborative Way	Exist. Gravity Relief/Upsizing	18"	5,780	-	$ 4,379,000	$ 1,314,000	$ 5,693,000	$ 1,139,000	$ -	$ 6,832,000
WW.10.03	Existing/Relief	10-Year	WW.25	South Brushy Creek Interceptor	Exist. Gravity Relief/Upsizing	15"-24"	6,400	-	$ 4,493,000	$ 1,348,000	$ 5,841,000	$ 1,168,000	$ -	$ 7,009,000
WW.10.04	New/Extension	10-Year	-	South Ronald Reagan Blvd. WW Improvements	New Gravity to Serve Growth	8"	2,000	-	$ 1,012,000	$ 304,000	$ 1,316,000	$ 263,000	$ 202,000	$ 1,781,000
WW.10.05	New/Extension	10-Year	-	Journey Pkwy and Ronald Reagan Blvd WW Improvements	New Gravity to Serve Growth	8"	4,675	-	$ 2,366,000	$ 710,000	$ 3,076,000	$ 615,000	$ 472,000	$ 4,163,000
WW.10.06	New/Extension	10-Year	-	US 183-A WW Improvements Ph. 1	New Gravity to Serve Growth	8"	450	-	$ 228,000	$ 68,000	$ 296,000	$ 59,000	$ 45,000	$ 400,000
WW.10.07	New/Extension	10-Year	-	US 183-A WW Improvements Ph. 2	New Gravity to Serve Growth	8"	875	-	$ 443,000	$ 133,000	$ 576,000	$ 115,000	$ 88,000	$ 779,000
WW.10.08	New/Extension	10-Year	-	Linda Hall WW Improvements	New Gravity to Serve Growth	12"	3,600	-	$ 2,160,000	$ 648,000	$ 2,808,000	$ 562,000	$ 363,000	$ 3,733,000
WW.10.09	New/Extension	10-Year	-	North Fork Brushy Creek WW Interceptor Improvements Ph. 1	New Gravity to Serve Growth	18"	4,630	-	$ 3,506,000	$ 1,052,000	$ 4,558,000	$ 912,000	$ 467,000	$ 5,937,000
WW.10.10	New/Extension	10-Year	-	North Brushy Creek WW Interceptor Improvements	New Gravity to Serve Growth	18"-21"	2,800	-	$ 2,250,000	$ 675,000	$ 2,925,000	$ 585,000	$ 282,000	$ 3,792,000
WW.10.11	New/Extension	10-Year	-	North Bagdad Rd. Lift Station Ph. 1	New Gravity/LS to Serve Growth	18"(G), 10"(F)	10,600(G/F)	1.15	$ 6,235,000	$ 1,871,000	$ 8,106,000	$ 1,621,000	$ 756,000	$ 10,483,000
WW.10.12	New/Extension	10-Year	-	San Gabriel East Regional Lift Station	New LS to Serve Growth	8" (F)	5,500(F)	0.90	$ 2,593,000	$ 778,000	$ 3,371,000	$ 674,000	$ 312,000	$ 4,357,000
WW.10.13	New/Extension	10-Year	-	San Gabriel River WW Interceptor Improvements Ph. 1	New Gravity to Serve Growth	15"-18"	5,140	-	$ 3,863,000	$ 1,159,000	$ 5,022,000	$ 1,004,000	$ 518,000	$ 6,544,000
WW.10.14	New/Extension	10-Year		San Gabriel West Regional Lift Station Ph. 1	New Lift Station	16"(F)	13100	3.60	$ 8,349,000	$ 2,505,000	$ 10,854,000	$ 2,171,000	$ 696,000	$ 13,721,000
WW.10.15	New/Extension	10-Year	-	Lift Station #15, #26, and #36 Decommission	New Gravity to Serve Growth	8"-21"	10,050	-	$ 8,331,000	$ 2,499,000	$ 10,830,000	$ 2,166,000	$ 1,014,000	$ 14,010,000
WW.20.01	Existing/Relief	20-Year	-	Devine Lake	Exist. Gravity Relief/Upsizing	27"	5,240	-	$ 5,625,000	$ 1,688,000	$ 7,313,000	$ 1,463,000	$ -	$ 8,776,000
WW.20.02	Existing/Relief	20-Year	WW.37/.38	North Brushy Creek Interceptor	Exist. Gravity Relief/Upsizing	33"-36"	6,150	-	$ 8,265,000	$ 2,480,000	$ 10,745,000	$ 2,149,000	$ -	$ 12,894,000
WW.20.03	Existing/Relief	20-Year	-	North Ronald Reagan	Exist. Gravity Relief/Upsizing	12"-15"	2,500	-	$ 1,640,000	$ 492,000	$ 2,132,000	$ 426,000	$ -	$ 2,558,000
WW.20.04	New/Extension	20-Year	-	RM 2243 to Hero Way WW Improvements - West Segment	New Gravity to Serve Growth	8"-12"	4,340	-	$ 2,356,000	$ 707,000	$ 3,063,000	$ 613,000	$ 437,000	$ 4,113,000
WW.20.05	New/Extension	20-Year	-	San Gabriel River WW Interceptor Improvements Ph. 2	New Gravity to Serve Growth	8"-15"	9,050	-	$ 5,402,000	$ 1,621,000	$ 7,023,000	$ 1,405,000	$ 913,000	$ 9,341,000
WW.20.06	New/Extension	20-Year	-	North Fork Brushy Creek WW Interceptor Improvements Ph. 2	New Gravity to Serve Growth	12"-15"	2,650	-	$ 1,708,000	$ 512,000	$ 2,220,000	$ 444,000	$ 268,000	$ 2,932,000
WW.20.07	New/Extension	20-Year	-	San Gabriel Pkwy. WW Interceptor Ph. 1	New Gravity to Serve Growth	18"	3,350	-	$ 2,540,000	$ 762,000	$ 3,302,000	$ 660,000	$ 338,000	$ 4,300,000
WW.20.08	New/Extension	20-Year	-	San Gabriel Pkwy. WW Interceptor Ph. 2	New Gravity to Serve Growth	12"	3,150	-	$ 1,890,000	$ 567,000	$ 2,457,000	$ 491,000	$ 318,000	$ 3,266,000
WW.20.09	New/Extension	20-Year	-	Lakeline Blvd. WW Improvements	New Gravity to Serve Growth	15"	5,030	-	$ 3,311,000	$ 993,000	$ 4,304,000	$ 861,000	$ 507,000	$ 5,672,000
WW.20.10	New/Extension	20-Year	-	Colorado Basin Lift Station	New LS to Serve Growth	10"(F)	3,750	1.35	$ 2,782,000	$ 835,000	$ 3,617,000	$ 723,000	$ 224,000	$ 4,564,000
WW.20.11	New/Extension	20-Year	-	Lift Station #38 Decommission	New Gravity to Serve Growth	12"	400	-	$ 540,000	$ 162,000	$ 702,000	$ 140,000	$ 40,000	$ 882,000
WW.20.12	New/Extension	20-Year	-	Greatwood WW Collection System Improvements	New Gravity to Serve OSSF	-	-	-	$ 8,010,000	$ 2,403,000	$ 10,413,000	$ 2,083,000	$ -	$ 12,496,000
WW.20.13	New/Extension	20-Year	-	Whitt Ranch Collection System Improvements	New Gravity to Serve OSSF	-	-	-	$ 2,310,000	$ 693,000	$ 3,003,000	$ 601,000	$ -	$ 3,604,000
WW.20.14	New/Extension	20-Year	-	Sullivan Tract Collection System Improvements	New Gravity to Serve OSSF	-	-	-	$ 9,270,000	$ 2,781,000	$ 12,051,000	$ 2,410,000	$ -	$ 14,461,000
WW.20.15	New/Extension	20-Year	-	Leander Estates Collection System Improvements	New Gravity to Serve OSSF	-	-	-	$ 6,300,000	$ 1,890,000	$ 8,190,000	$ 1,638,000	$ -	$ 9,828,000
WW.20.16	New/Extension	20-Year	-	Hilltop Ranch Collection System Improvements	New Gravity to Serve OSSF	-	-	-	$ 3,150,000	$ 945,000	$ 4,095,000	$ 819,000	$ -	$ 4,914,000
WW.20.17	New/Extension	20-Year	-	North Bagdad Rd. Lift Station Ph. 2	New Pumps for Existing LS	-	-	1.44	$ 245,000	$ 74,000	$ 319,000	$ 64,000	$ 35,200	$ 418,000
WW.20.18	New/Extension	20-Year	-	San Gabriel West Regional Lift Station Ph. 2	Proposed LS Expansion	-	-	4.68	$ 586,000	$ 176,000	$ 762,000	$ 152,000	$ 35,000	$ 949,000
WW.20.19	New/Extension	20-Year	-	San Gabriel West WW Improvements	New Gravity to Serve Growth	8"-18"	3,860		$ 2,215,000	$ 665,000	$ 2,880,000	$ 576,000	$ 389,000	$ 3,845,000
WW.20.20	New/Extension	20-Year	-	San Gabriel East Regional Lift Station Ph. 2	Proposed LS Expansion	10" (F)	5,500	2.30	$ 2,539,000	$ 762,000	$ 3,301,000	$ 660,000	$ 312,000	$ 4,273,000
WW.20.21	New/Extension	20-Year	-	RM 2243 to Hero Way WW Improvements - East Segment Ph. 2	New Gravity to Serve Growth	8"	5,925	-	$ 2,998,000	$ 899,000	$ 3,897,000	$ 779,000	$ 598,000	$ 5,274,000
WW.20.22	New/Extension	20-Year	-	CR 175 and RM 2243 WW Improvements	New Gravity to Serve Growth	8"-12"	5,160	-	$ 2,637,000	$ 791,000	$ 3,428,000	$ 686,000	$ 520,000	$ 4,634,000
WW.20.23	New/Extension	20-Year	-	CR 175 and CR 176 WW Improvements	New Gravity to Serve Growth	8"-12"	7,500	-	$ 4,402,000	$ 1,321,000	$ 5,723,000	$ 1,145,000	$ 757,000	$ 7,625,000

Subtotal, Existing/Relief Projects	$ 87,069,000
Subtotal, New/Extension Projects[2]	$ 179,582,000
Total, All Projects	**$ 266,651,000**

Notes:

1) For pipe diameters and lengths, gravity main is assumed, except where (F) indicates force main, and (G) indicates gravity main.

2) For new/extension projects not within the ROW or an existing easement, a unit cost of $87,900/acre was utilized for easement cost estimates.
The easement unit cost includes survey, easement acquisiton, engineering fees, condemnation/attorney fees, and ROW agent fees.

3) It is recommended that further on-site evaluation and data collection (e.g., checking manholes for evidence of surcharge, targeted flow monitoring) be conducted before initiating any project based on modeling results.

Time Horizon	Capital Cost
Present Day	$ 27,961,000
5-Year	$ 8,133,000
10-Year	$ 98,938,000
20-Year	$ 131,619,000
Total, All Projects	$ 266,651,000

ATTACHMENT P

City of Leander

2024 WASTEWATER FACILITY PLAN: RM 2243 WWTP

CITY OF LEANDER, TEXAS

Draft

DRAFT REPORT

JULY 2024

GBA PN 15393.02

GBA

TBPE FIRM No. 4242
9601 Amberglen Blvd.
Austin, TX 78729
512-259-3882 | www.gbateam.com

City of Leander, Texas

Wastewater Facility Master Plan Report

July 2024

Prepared for:

City of Leander, Texas

Draft

Prepared by:

GBA

TBPE Firm No. 4242

9601 Amberglen Blvd, Ste. 109

Austin, TX 78729

PN: 15393.02

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List of Acronyms and Abbreviations

AADF	Annual Average Dry-Weather Flow
AMSL	Above Mean Sea Level
ARRS	Advanced Robotic and Remote Sensing
BCRWWS	Brushy Creek Regional Wastewater System
BOD	Biochemical Oxygen Demand
CBOD	Carbonaceous Biochemical Oxygen Demand
CCTV	Closed-circuit Television
CF	Cubic Feet
CFU	Colony Forming Units
CIP	Capital Improvement Plan
ENR	Engineering News-Record
ETJ	Extraterritorial Jurisdiction
FEMA	Federal Emergency Management Agency
FY	Fiscal Year
GBA	George Butler Associates, Inc.
GIS	Geographic Information System
GPM	Gallons per Minute
I&I	Inflow and Infiltration
LS	Lift Station
LUE	Living Unit Equivalent
MBR	Membrane Bioreactor
MGD	Million Gallons Per Day
OPCC	Opinion of Probable Construction Cost
O&M	Operation and Maintenance
PEC	Pedernales Electric Cooperative, Inc.
PEECO	Process Engineering Equipment Company
POS	Point of Sale
QA/QC	Quality Assurance/Quality Control
RAS	Return Activated Sludge
rbCBOD	Readily Biodegradable Carbonaceous Biochemical Oxygen Demand
RM	Ranch-To-Market Road (as in RM 2243)
SBR	Sequencing Batch Reactors
SCFM	Standard Cubic Feet Per Minute
SF	Square Feet
TCEQ	Texas Commission on Environmental Quality
TKN	Total Kjedahl Nitrogen
TP	Total Phosphorus
TPDES	Texas Pollutant Discharge Elimination System
TSS	Total Suspended Solids
UV	Ultraviolet
WAS	Waste Activated Sludge
WWTP	Wastewater Treatment Plant

1) EXECUTIVE SUMMARY

Not included in draft report submittal.

2) INTRODUCTION

A. Introduction and Purpose

The City of Leander, Texas retained George Butler Associates, Inc. (GBA) to analyze the City of Leander RM 2243 Wastewater Treatment Plant (WWTP) performance and develop design alternatives for plant expansions and enhancements. RM 2243 WWTP is currently permitted for an annual average dry-weather flow (AADF) of 2.25 million gallons per day (MGD) and is authorized to expand to an AADF of 5.25 MGD (Permit No: WQ0012644-001). Due to rapid development and population growth, the RM 2243 WWTP is rapidly approaching full capacity. Additional flow can be sent to the Brushy Creek Regional Wastewater System (BCRWWS) through a 7,000 linear foot 15-inch gravity relief main to provide up to 2.0 MGD of additional capacity while plant expansions are being designed and constructed.

This Wastewater Facility Plan was prepared to provide the City of Leander with a comprehensive strategy for the implementation of improvements to its wastewater treatment facility. GBA has confirmed the current performance of the plant, determined how population growth impacts the current plant efficiencies, and developed expansion and enhancement design recommendations. For determining the timing of proposed phased improvements, it was also necessary to analyze the flows and utilization of the gravity relief main capacity. This plan addresses the current and anticipated discharge permit requirements and will prepare the City to meet its future wastewater collection and treatment goals. The facility plan was completed in conjunction with the Collection System Master Plan.

B. Scope of Work

The scope of work for the Wastewater Facility Plan included collecting all available data, such as influent flow measurements, influent and effluent lab test results, and record drawings and submittals for past plant expansions. The record drawings and aerial images were collected to develop a facility map in GIS showing detailed information on all facilities present at the RM 2243 WWTP. Existing plant capacities, hydraulic restrictions, and overall plant performance were analyzed through spreadsheet analysis and modeling. Growth projections were developed as part of the Collection System Master Plan and utilized in the Wastewater Facility Plan to generate flow projections to the RM 2243 WWTP. Treatment alternatives for screening, disinfection, and solids treatment were generated and analyzed with regard to cost, performance, operation and maintenance requirements. A Facility Plan was completed outlining the final recommendations, supplemented with a conceptual site layout, process flow diagram, and a hydraulic grade line model. More specific tasks are provided below:

- Employed advance robotic and remote sensing (ARRS) to collect digital imagery and lidar topography for facility mapping.
- Coordinated potholing and performed survey to confirm selected existing facility locations.
- Digitized 3-D models of all above-ground facilities and compiled GIS data on facilities including date of installation, size, material, lines, manholes, junction boxes, and major treatment equipment and delivered to the City.
- Developed flow projections to the RM 2243 WWTP in conjunction with the collection system master plan.
- Prepared and evaluated treatment alternatives for screening, disinfection, and sludge thickening.
- Developed opinions of probable cost and annual operation costs for the recommended alternatives.
- Ranked each alternative technology based on capital cost, annual operating costs, performance, noise control, odor control, ease of operations, and reliability.
- A process flow diagram, a hydraulic grade line model, and a proposed site layout were developed for the highest-ranked alternative.
- Built a GPS-X model of the RM 2243 WWTP to evaluate existing plant performance and model the expanded plant.
- Generated a report detailing the work completed, analyses, and recommended improvements to the RM 2243 WWTP.

C. Compliance and Planning Documents

The permit for the City of Leander RM 2243 WWTP was amended in 2020 to allow for the expansion of the plant from the existing AADF of 2.25 MGD to a proposed 5.25 MGD ultimate phase, and the 2-hour peak flow to increase from 6.75 MGD to 15.75 MGD (Table 2-1). The proposed effluent parameter set remained the same for BOD, TSS and Ammonia-Nitrogen at 5, 5, 2 (mg/L), while the proposed effluent parameter for phosphorus was lowered from 1 to 0.5 (mg/L). It is important to note that the amended permit expires in January 2025. In June 2024 GBA was authorized to generate and submit a major permit amendment/renewal application to the TCEQ.

The effluent limits in the City of Leander's TPDES permit (WQ0012644-001) are anticipated to remain unchanged during the renewal process due to no significant alterations affecting the downstream waterbodies as specified in an email from TCEQ (Appendix A). The RM 2243 WWTP is currently operating within the discharge limits outlined in Permit WQ0012644001 (Table 2-1). Additional requirements include a minimum 1.0 mg/l chlorine residual (at 20 minutes detention), maximum discharge chlorine residual of 0.1 mg/l, pH between 6.0 and 9.0 and minimum dissolved oxygen concentration of 6.0 mg/l.

Table 2-1. TCEQ Permit Current and Final Effluent Limitations.

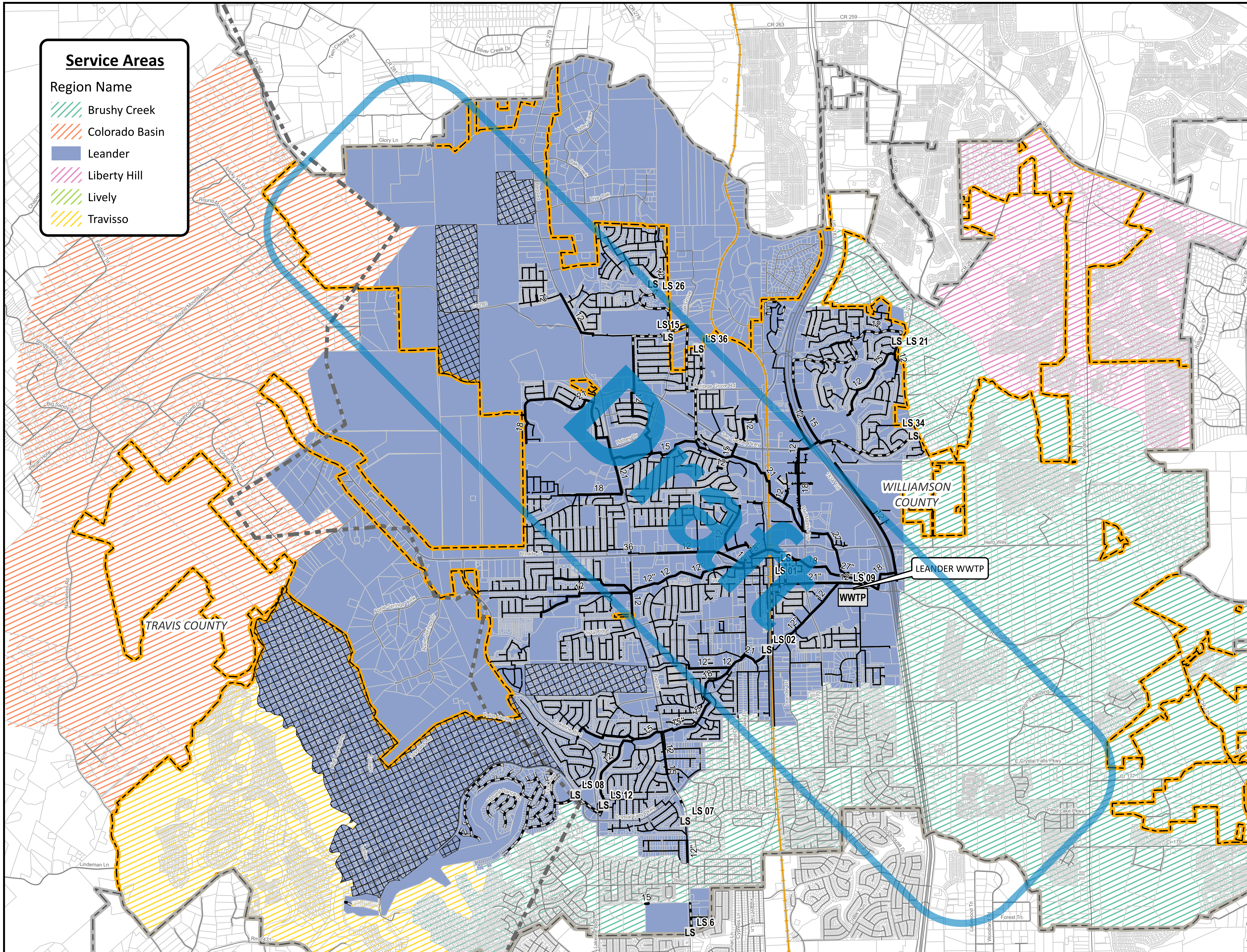
Effluent Characteristic	Projected Influent (mg/L)	Current Effluent Limitations (Daily Avg in mg/L)	Final Effluent Limitations (Daily Avg in mg/L)
Annual Average Daily Flow / 2-hr Peak Flow (MGD)	-	2.25 / 6.75	5.25 / 15.75
Carbonaceous Biochemical Oxygen Demand, 5-day ($CBOD_5$)	280	5	5
Total Suspended Solids (TSS)	280	5	5
Ammonia Nitrogen (NH_3-N)	50	2	2
Total Phosphorus (TP)	9	1	0.5
E. coli (in CFU)	-	126	126

3) STUDY AREA CHARACTERISTICS

A. Study Area

The study area of this project comprises the RM 2243 WWTP Service Area (Figure 3-1), which encompasses a substantial portion of Northwestern Leander and extends into Leander's Extraterritorial Jurisdiction (ETJ). It mainly includes wastewater flows generated west of Highway 183A, south of County Roads 281 and 278, east of Travisso, and north of Crystal Falls Parkway. The area is primarily in Williamson County, with a small western section extending into Travis County.

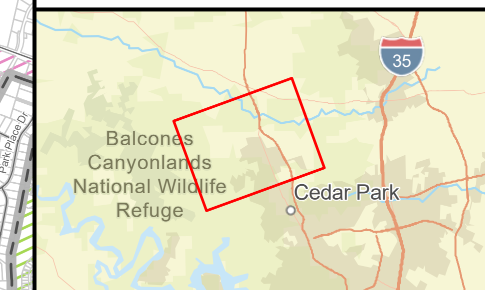
Outside the study area lies the Brushy Creek Regional Wastewater System (BCRWWS), which covers a significant portion of the remaining City area. It is important to note that the City of Leander owns 4.23 MGD of treatment capacity at BCRWWS and leases any excess treatment capacity. Currently, the City is sending an average of 2 MGD to the BCRWWS through the Brushy Creek Interceptor. Additionally, the City is in the process of constructing a diversion line from the RM 2243 WWTP to the BCRWWS with a maximum capacity of 2 MGD. The diversion of up to 2.0 MGD of flows from the RM 2243 WWTP to the BCRWWS will provide the additional treatment capacity in the study area to serve new growth and allow for the design and construction of an expansion to the RM 2243 WWTP. As summarized in the Flow Projections to BCRWWS Memorandum from 11/1/2023, attached as Appendix B, it was estimated that the Brushy Creek basin (excluding the area served by the RM 2243 WWTP) would reach near-build-out conditions at approximately 4.2 MGD. Therefore, any additional buy-in capacity was deemed unnecessary.



City of Leander

City of Leander Williamson County, TX

FIGURE 3-1: SERVICE AREA MAP



Legend

LS	Lift Station
WWTP	Wastewater Treatment Plant
	10" and Smaller Wastewater Line
	12" and Larger Wastewater Line
	Forcemain
	On-Site Septic (OSS) Area
	Road
	Railroad
	Leander City Limits
	Leander ETJ
	County Boundary

N

0 0.75 1.5

Miles

Date: 6/19/2024

GBA

G:\15393.01\GIS\LeanderWWMP_ReportFigures.aprx

B. Growth and Flow Projections

The growth projections for the City were developed as part of the collection system master plan and are the basis for this report. Growth projections were generated in alignment with the population and LUE projections provided by the City on October 12, 2023 (Attached as Appendix C). These projections were derived using annual growth rates which decreased over time and were subsequently converted into an equivalent number of LUEs. The growth projections utilized the residential development and future land use maps supplied by the City, as depicted in Figure 3-2 and Figure 3-3, respectively. Figure 3-2 illustrates the location of current, planned, and under-construction residential projects, which was used to understand the timing, location, and estimated growth generated by future residential developments. Meanwhile, Figure 3-3 delineates various land use types, facilitating rough estimates of potential development densities and attendant utility demands.

The 5-year projections assume full construction and occupancy of all residential properties on the development map by the end of 2027. For the 10-year and 20-year projections, the future land use map, supplemented by input from the City's planning department, was utilized to spatially assign growth across the system to align with the city-provided population projections (Table 3-1). Figure 3-4 shows the 5-year, 10-year, and 20-year projections for the entire City of Leander with an outline displaying the service area of the RM 2243 plant. Notably, a significant portion of Leander's expected growth is predicted to occur in the northwest region of the City.

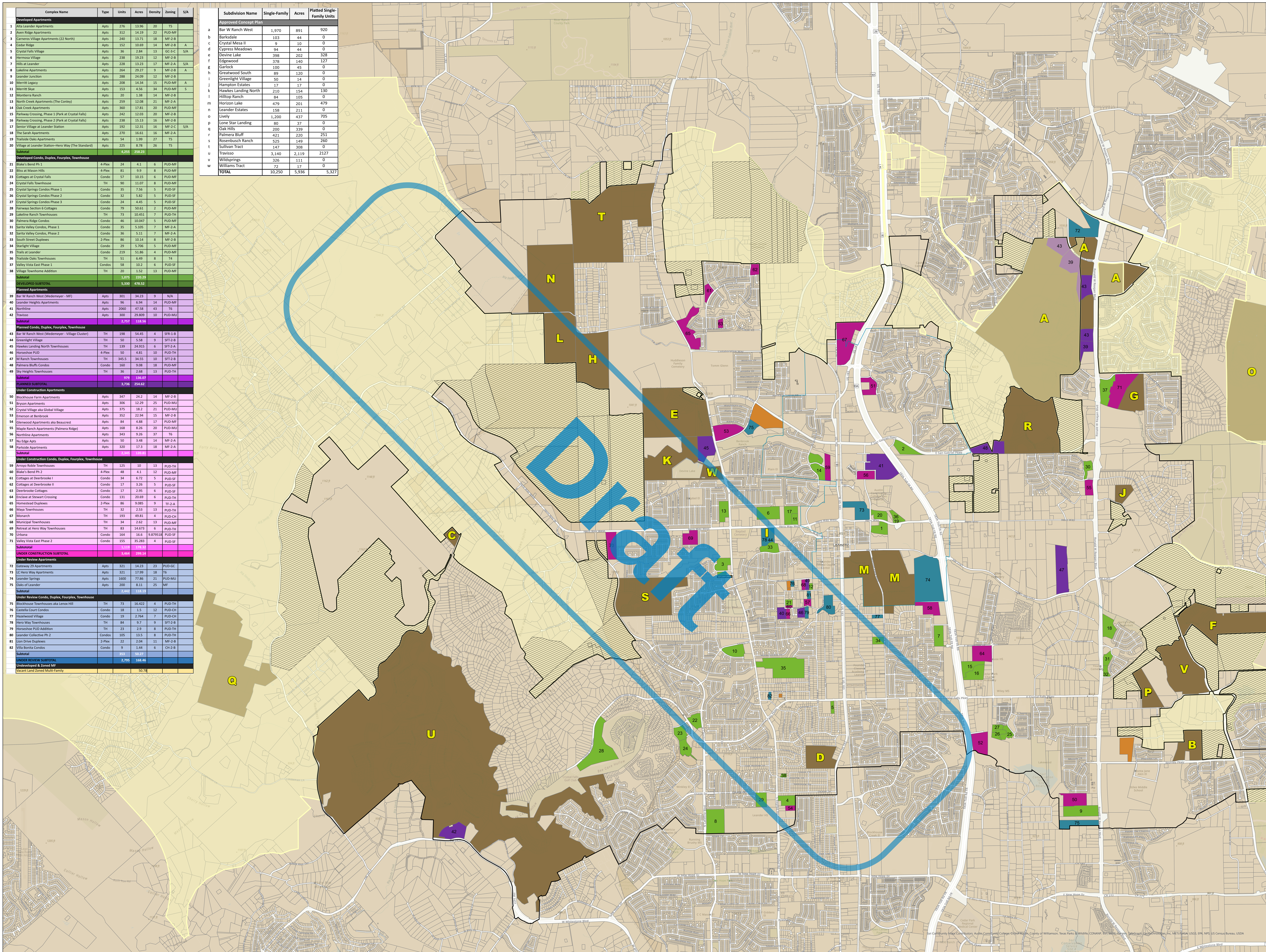
Flow projections to the RM2243 wastewater treatment plant (WWTP), shown in Figure 3-5, were developed by utilizing both the collection system model from PCSWMM in the wastewater collection system master plan and historic plant flow data. The orange dashed curve shown in Figure 3-5 depicts the modeled average flow predicted to enter the RM2243 plant over the next 20 years. The orange triangles specifically highlight the modeled flow projections for the 5-, 10-, and 20-year growth horizons. Historic flow data was also projected and included in the analysis (shown as the blue dashed curve). By considering both modeled projections and historic trends, a more conservative approach was used to predict the anticipated future flow rates at the RM2243 WWTP that considered metered flow trends until 2027, and then model-based trends thereafter. Based on this combined analysis, the plant is expected to reach its currently permitted capacity of 2.25 MGD by March 2025 and its ultimate capacity of 5.25 MGD by June 2034.

Table 3-1: Population Projections Provided by City

Year	Annual Growth Rate	Population	No. of Living Unit Equivalents (LUEs)
2022	9.7%	86,733	33,687
2027	7.5%	131,746	49,795
2032	3.0%	168,869	63,827
2042	1.0%	207,808	78,545

	Complex Name	Type	Units	Acres	Density	Zoning	S/A
	Developed Apartments						
1	Alta Leander Apartments	Apts	276	13.96	20	T5	
2	Aven Ridge Apartments	Apts	312	14.19	22	PUD-MF	
3	Carneros Village Apartments (22 North)	Apts	240	13.71	18	MF-2-B	
4	Cedar Ridge	Apts	152	10.69	14	MF-2-B	A
5	Crystal Falls Village	Apts	36	2.84	13	GC-3-C	S/A
6	Hermosa Village	Apts	238	19.23	12	MF-2-B	
7	Hills at Leander	Apts	228	13.23	17	MF-2-A	S/A
8	Lakeline Apartments	Apts	264	29.27	9	MF-2-B	A
9	Leander Junction	Apts	288	24.09	12	MF-2-B	
10	Merritt Legacy	Apts	208	14.34	15	PUD-MF	A
11	Merritt Skye	Apts	153	4.56	34	PUD-MF	S
12	Montierra Ranch	Apts	20	1.38	14	MF-2-B	
13	North Creek Apartments (The Conley)	Apts	259	12.08	21	MF-2-A	
14	Oak Creek Apartments	Apts	360	17.81	20	PUD-MF	
15	Parkway Crossing, Phase 1 (Park at Crystal Falls)	Apts	242	12.03	20	MF-2-B	
16	Parkway Crossing, Phase 2 (Park at Crystal Falls)	Apts	238	15.13	16	MF-2-B	
17	Senior Village at Leander Station	Apts	192	12.31	16	MF-2-C	S/A
18	The Sarah Apartments	Apts	270	16.61	16	MF-2-A	
19	Trailside Oaks Apartments	Apts	54	1.99	27	T5	
20	Village at Leander Station–Hero Way (The Standard)	Apts	225	8.78	26	T5	
	Subtotal		4,255	258.23			
	Developed Condo, Duplex, Fourplex, Townhouse						
21	Blake's Bend Ph 1	4-Plex	24	4.1	6	PUD-MF	
22	Bliss at Mason Hills	4-Plex	81	9.9	8	PUD-MF	
23	Cottages at Crystal Falls	Condo	57	10.15	6	PUD-MF	
24	Crystal Falls Townhouse	TH	90	11.07	8	PUD-MF	
25	Crystal Springs Condos Phase 1	Condo	35	7.56	5	PUD-SF	
26	Crystal Springs Condos Phase 2	Condo	32	5.82	5	PUD-SF	
27	Crystal Springs Condos Phase 3	Condo	24	4.45	5	PUD-SF	
28	Fairways Section 6 Cottages	Condo	79	50.61	2	PUD-MF	
29	Lakeline Ranch Townhouses	TH	73	10.451	7	PUD-TH	
30	Palmera Ridge Condos	Condo	46	10.047	5	PUD-MF	
31	Sarita Valley Condos, Phase 1	Condo	35	5.105	7	MF-2-A	
32	Sarita Valley Condos, Phase 2	Condo	36	5.11	7	MF-2-A	
33	South Street Duplexes	2-Plex	86	10.14	8	MF-2-B	
34	Starlight Village	Condo	29	5.706	5	PUD-MF	
35	Trails at Leander	Condo	219	51.86	4	PUD-MF	
36	Trailside Oaks Townhouses	TH	51	6.49	8	T4	
37	Valley Vista East Phase 1	Condos	58	10.2	6	PUD-SF	
38	Village Townhome Addition	TH	20	1.52	13	PUD-MF	
	Subtotal		1,075	220.29			
	DEVELOPED SUBTOTAL		5,330	478.52			
	Planned Apartments						
39	Bar W Ranch West (Wedemeyer - MF)	Apts	301	34.23	9	N/A	
40	Leander Heights Apartments	Apts	96	6.94	14	PUD-MF	
41	Northline	Apts	2060	47.58	43	T6	
42	Travisso	Apts	300	29.809	10	PUD-MU	
	Subtotal		2,757	118.56			
	Planned Condo, Duplex, Fourplex, Townhouse						
43	Bar W Ranch West (Wedemeyer - Village Cluster)	TH	198	54.45	4	SFR-1-B	
44	Greenlight Village	TH	50	5.58	9	SFT-2-B	
45	Hawkes Landing North Townhouses	TH	139	24.915	6	SFT-2-A	
46	Horseshoe PUD	4-Plex	50	4.81	10	PUD-TH	
47	M Ranch Townhouses	TH	345.5	34.55	10	SFT-2-B	
48	Palmera Bluffs Condos	Condo	160	9.08	18	PUD-MF	
49	Sky Heights Townhouses	TH	36	2.68	13	PUD-TH	
	Subtotal		979	136.07			
	PLANNED SUBTOTAL		3,736	254.62			
	Under Construction Apartments						
50	Blockhouse Farm Apartments	Apts	347	24.2	14	MF-2-B	
51	Bryson Apartments	Apts	306	12.29	25	PUD-MU	
52	Crystal Village aka Global Village	Apts	375	18.2	21	PUD-MU	
53	Emerson at Benbrook	Apts	352	22.94	15	MF-2-B	
54	Glenwood Apartments aka Beaucrest	Apts	84	4.88	17	PUD-MF	
55	Maple Ranch Apartments (Palmera Ridge)	Apts	168	8.26	20	PUD-MU	
56	Northline Apartments	Apts	343	9.26	37	T6	
57	Nu Edge Apts	Apts	50	3.48	14	MF-2-A	
58	Parkside Apartments	Apts	320	17.3	18	MF-2-A	
	Subtotal		2,345	120.81			
	Under Construction Condo, Duplex, Fourplex, Townhouse						
59	Arroyo Roble Townhouses	TH	125	10	13	PUD-TH	
60	Blake's Bend Ph 2	4-Plex	48	4.1	12	PUD-MF	
61	Cottages at Deerbrooke I	Condo	34	6.72	5	PUD-SF	
62	Cottages at Deerbrooke II	Condo	17	3.26	5	PUD-SF	
63	Deerbrooke Cottages	Condo	17	2.95	6	PUD-SF	
64	Enclave at Stewart Crossing	Condo	131	20.69	6	PUD-TH	
65	Homestead Duplexes	2-Plex	86	9.085	9	TF-2-A	
66	Maya Townhouses	TH	32	2.53	13	PUD-TH	
67	Monarch	TH	193	49.81	4	PUD-CH	
68	Municipal Townhouses	TH	34	2.62	13	PUD-MF	
69	Retreat at Hero Way Townhouses	TH	83	14.673	6	PUD-TH	
70	Urbana	Condo	164	16.6	9.879518	PUD-SF	
71	Valley Vista East Phase 2	Condo	155	35.283	4	PUD-SF	
	Subtototal		1,119	178.32			
	UNDER CONSTRUCTION SUBTOTAL		3,464	299.14			
	Under Review Apartments						
72	Gateway 29 Apartments	Apts	321	14.23	23	PUD-GC	
73	LC Hero Way Apartments	Apts	321	17.99	18	T6	
74	Leander Springs	Apts	1600	77.86	21	PUD-MU	
75	Oaks of Leander	Apts	200	8.11	25	MF	
	Subtotal		2,442	118.19			
	Under Review Condo, Duplex, Fourplex, Townhouse						
75	Blockhouse Townhouses aka Lenox Hill	TH	73	16.422	4	PUD-TH	
76	Castella Court Condos	Condo	18	1.5	12	PUD-CH	
77	Hazelwood Village	Condo	19	2.764	7	PUD-CH	
78	Hero Way Townhouses	TH	84	9.7	9	SFT-2-B	
79	Horseshoe PUD Addition	TH	23	2.9	8	PUD-TH	
80	Leander Collective Ph 2	Condos	105	13.5	8	PUD-TH	
81	Lion Drive Duplexes	2-Plex	22	2.04	11	MF-2-B	
82	Villa Bonita Condos	Condo	9	1.44	6	CH-2-B	
	Subtotal		353	50.27			
	UNDER REVIEW SUBTOTAL		2,795	168.46			
	Undeveloped & Zoned MF						
	Vacant Land Zoned Multi-Family			50.78			

	Subdivision Name	Single-Family	Acres	Platted Single-Family Units
	Approved Concept Plan			
a	Bar W Ranch West	1,970	891	920
b	Barksdale	103	44	0
c	Crystal Mesa II	9	10	0
d	Cypress Meadows	94	44	0
e	Devine Lake	398	202	328
f	Edgewood	378	140	127
g	Garlock	100	45	0
h	Greatwood South	89	120	0
i	Greenlight Village	50	14	0
j	Hampton Estates	17	17	0
k	Hawkes Landing North	210	154	130
l	Hilltop Ranch	84	105	0
m	Horizon Lake	479	201	479
n	Leander Estates	158	211	0
o	Lively	1,200	437	705
p	Lone Star Landing	80	37	0
q	Oak Hills	200	339	0
r	Palmera Bluff	421	220	251
s	Rosenbusch Ranch	525	149	260
t	Sullivan Tract	147	308	0
u	Travisso	3,140	2,119	2127
v	Wildsprings	326	111	0
w	Williams Tract	72	17	0
	TOTAL	10,250	5,936	5,327



Residential Properties

Effective August 17th, 2023

City of Leander

www.leandertx.gov

0 0.3 0.6 1.2 1.8 2.4 Miles

N

Legend

City Limits

Future Annexation Per DA

Leander ETJ

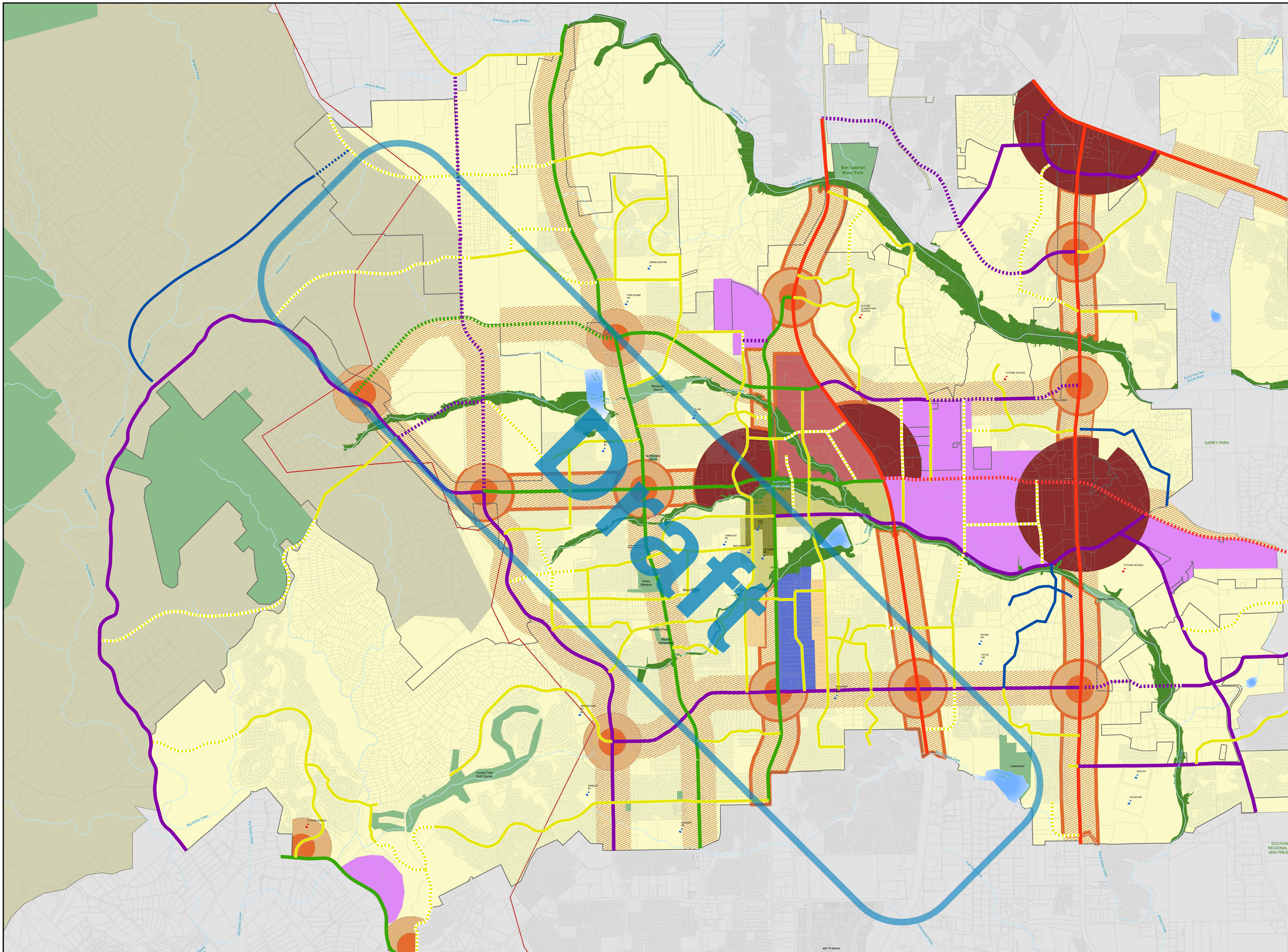
TOD Boundary

Active Subdivision

Multi-Family Properties Status

- Developed
- Planned
- Under Construction
- Under Review
- Not Built

Figure 3-3: Residential Properties Map



Future Land Use Map

Effective October 12, 2021

City of Leander

www.leandertx.gov

0 1,500 3,000 6,000 9,000
Feet

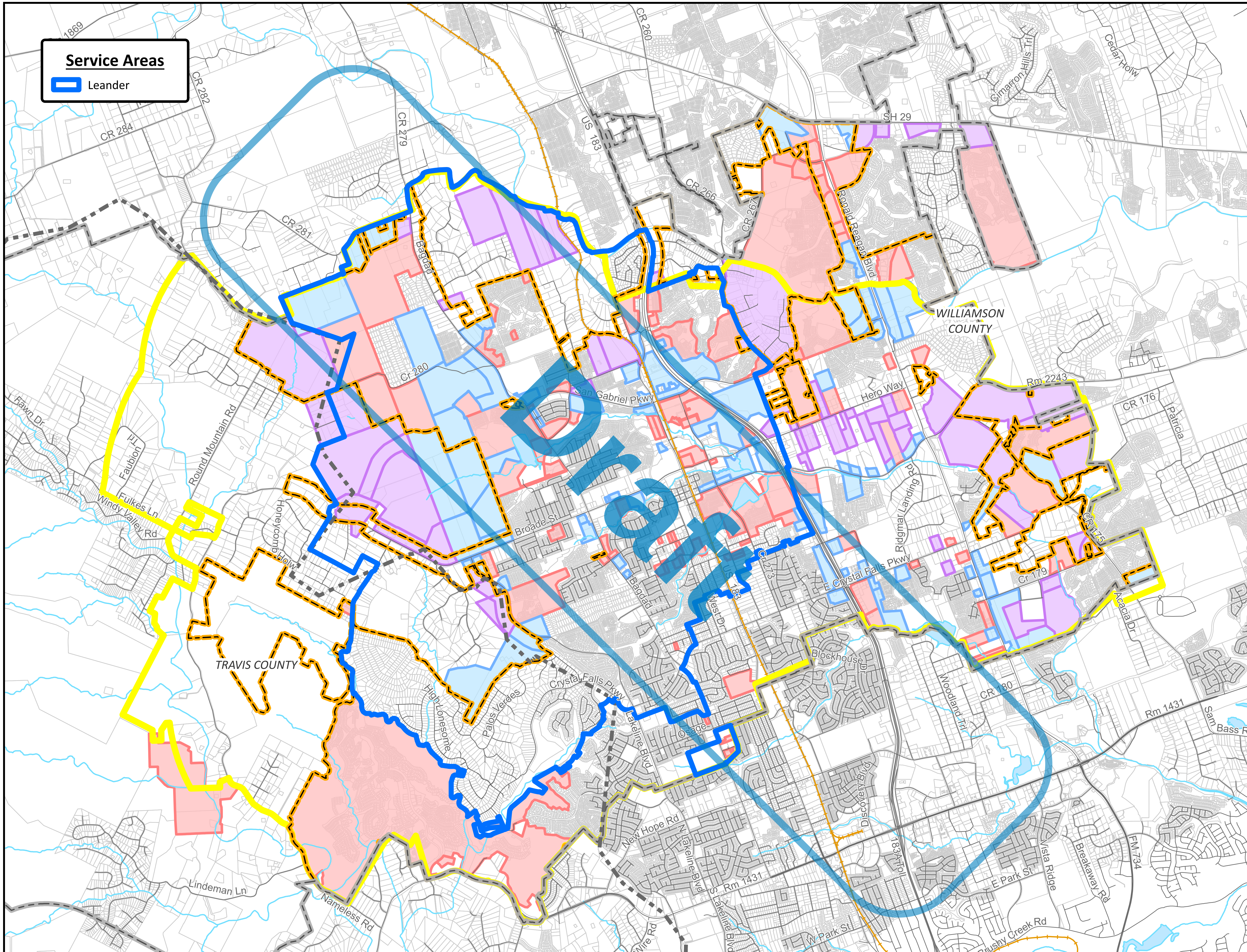
0 0.25 0.5 1 1.5
Miles

- Access Controlled, Existing
- Arterial 6 Lane, Existing
- Arterial 4 Lane, Existing
- Collector, Existing
- Rural, Existing
- Access Controlled, Proposed
- ARTERIAL 6, Proposed
- Arterial 4 Lane, Proposed
- Collector, Proposed
- Rural, Proposed
- Existing School
- Future School
- Lakes and Ponds
- Streams
- Rural
- Neighborhood Residential
- Transitional
- Neighborhood Center - Solid
- Neighborhood Center
- Multi-Use Corridor
- Multi-Use Corridor - Priority Corridor
- Neighborhood Center - Priority Corridor
- Activity Center
- Employment Center
- Industrial
- Old Town
- Urban Mixed Use
- Leander Central
- Greenway
- Parks and Preserves

Texas Local Government Code Section 213.005: A comprehensive plan shall not constitute zoning regulations or establish zoning district boundaries.

* Properties added to the ETJ after the adoption of this Future Land Use Map are designated as Neighborhood Residential.

Figure 3-3: Future Land Use Map



City of Leander

City of Leander
Williamson County, TX

FIGURE 3-5:
GROWTH AREA MAP

Legend

- 5-Year Projected Development
- 10-Year Projected Development
- 20-Year Projected Development
- Road
- Railroad
- Creek/Stream/River
- Lake
- Leander City Limits
- Leander ETJ
- Leander Sewer CCN
- County Boundary

N

0 0.5 1 2
Miles

Date: 6/19/2024

GBA

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Figure 3-5: Flow Projections to RM2243 WWTP

4) WASTEWATER CHARACTERISTICS

A. Existing Wastewater Collection System

As outlined in the scope, this section describes the collection system within the RM 2243 WWTP service area. The service area's collection system provides insights to the origin and flow dynamics of wastewater entering the treatment plant. The RM 2243 WWTP service area wastewater collection system is comprised of approximately 740,000 LF of gravity mains, 12 major lift stations, and approximately 74,000 LF of force mains. Table 4-1 provides details on major lift stations within the RM 2243 WWTP service area, such as the number of pumps, firm capacity, force main diameter, force main length, and a description outlining any pertinent information. Table 4-2 describes each main interceptor within the service area, providing details such as pipe diameter range, length, and a brief description.

Table 4-1. Lift Station Descriptions

Lift Station	No. of Pumps	Firm Capacity (GPM)	Force Main Diameter (in)	Force Main Length (ft)	Description
LS 1	2	-	6	1140	Lift station 1 is planned to be decommissioned as part of the East Street Project in FY2024 (CIP WW.49).
LS 2	3	2400	12	3050	This lift station serves an area of Mason Creek, west of US 183.
LS 6	2	245	8	3170	This lift station serves Leander High School.
LS 7	2	600	8	1590	This lift station serves Lift Station #6, Timberline West, and Boulders at Crystal Falls.
LS 8	2	185	3	500	This lift station serves Whitestone Elementary School.
LS 9	2	2600	16	700	This lift station serves as the main lift station feeding the RM 2243 WWTP. This lift station is planned to be decommissioned and replaced with a master lift station to serve the ultimate WWTP buildout (CIP. WW.43).

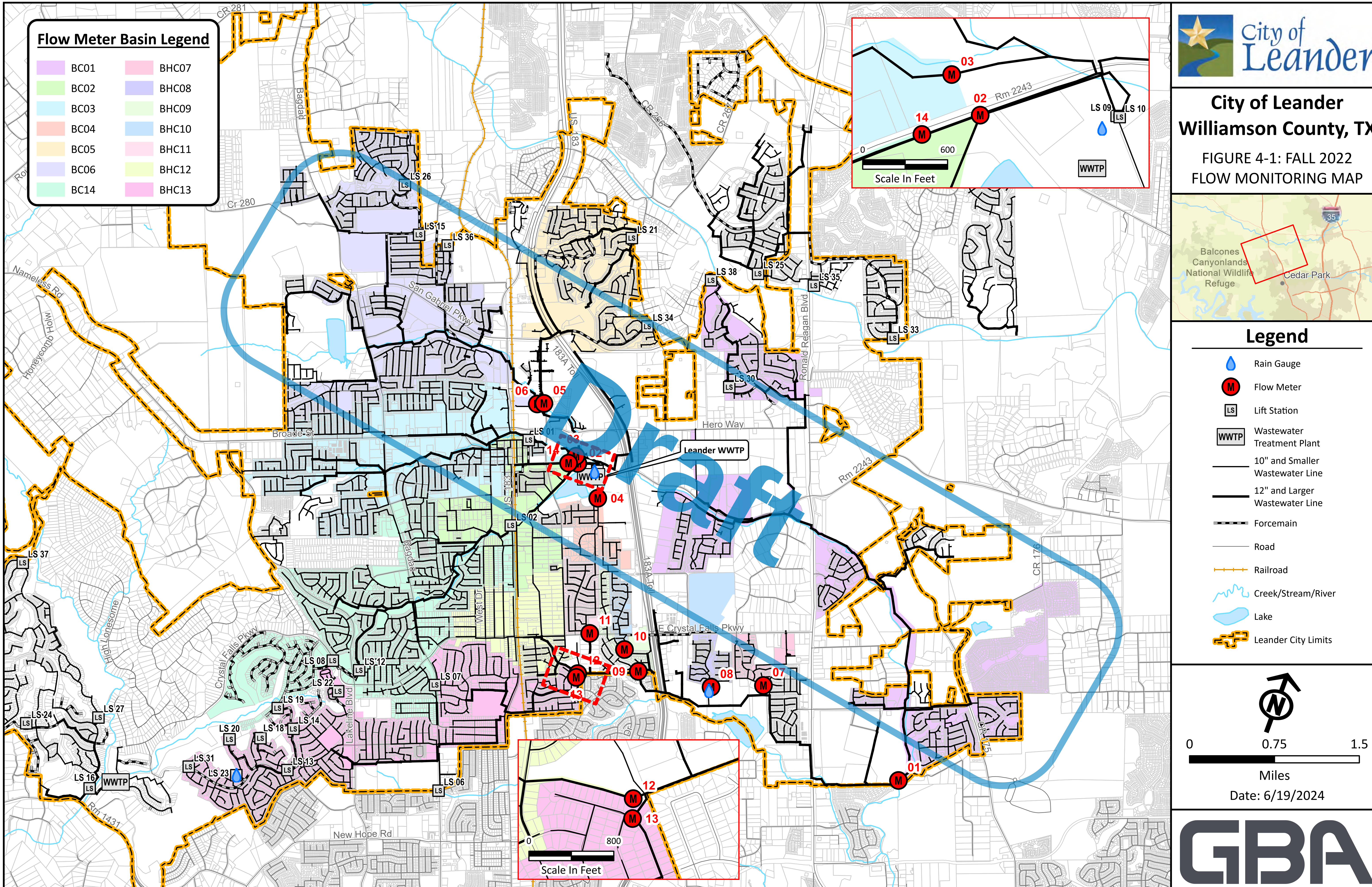
LS 10	3	1200	16	700	This lift station serves as a secondary lift station feeding the RM 2243 WWTP. This lift station is planned to be decommissioned and replaced with a master lift station to serve the ultimate WWTP buildout (CIP. WW.43).
LS 15	2	400	6	1990	Lift station 15 primarily serves the Savannah Ranch subdivision.
LS 21	2	1200	12	7420	The lift station serves the Bryson subdivision.
LS 26	2	960	8	10640	This lift station serves the Deerbrooke neighborhood.
LS 34	2	700	8	4020	The lift station serves the Bryson subdivision.
LS 36 [1]	-	-	4	1590	This lift station serves the Haven Oaks subdivision.

Footnote 1 – Lift Station 36 pump details were not available during draft report development. More information may be provided upon receipt of pump information.

Table 4-2. Description of Major Interceptors

Interceptor	Pipe Diameter Range	Length (ft)	Description
Mason Creek	15"-18"	8,500	The existing Mason Creek Interceptor runs from Bagdad Road to Lift Station 7 along Mason Creek. The LS pumps through a 12-inch force main to a 21-inch gravity main and finally to the Leander WWTP.
Block House Creek	12"-30"	34,100	The existing Block House Creek interceptor runs along Block House Creek from just south of the intersection of Lakeline Boulevard and Crystal Falls Parkway and ties into the Brushy Creek Interceptor at the interconnect with the BCRWWS.
Brushy Creek North	12"-27"	15,000	The existing Brushy Creek North Interceptor runs along the North Fork of Brushy Creek from Bagdad Road to the Leander WWTP.

The 2022 Flow Monitoring Report was conducted to analyze the City's wastewater system, which was divided into 14 interconnected drainage basins (Figure 4-1). These basins include approximately 189 miles of gravity wastewater pipes. Flow meters were strategically placed to measure flows generated in these basins. Surcharge issues were identified at Site 3 due to downstream restrictions, and Site 8 encountered nine dry weather surcharges, suggesting either potential undersizing of the service line or abnormal upstream discharges. Excessive infiltration was identified at Site 4 while excessive inflow was noted at Sites 1, 2, 3, 9, 13, and 14. Rainfall during the monitoring period was slightly below historical averages, with only three out of eight storm events exceeding 1 inch of total rainfall. Nearly half of the metering sites showed evidence of excessive inflow, while only one site exhibited excessive infiltration, indicating that direct inflow sources are a more significant problem than cracks or joint separations.



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B. Existing Wastewater Treatment System

The RM 2243 WWTP was initially built in 1985 as a package plant containing a lift station, aeration basins, clarifiers, a chlorine contact channel, an aerated sludge holding basin, sludge drying beds, and a cascade channel outfall. The plant was expanded in 1987 with an oxidation ditch extended aeration system, including various components like a new plant lift station, headworks, an oxidation ditch aeration basin, clarifiers, a chlorine contact chamber, a sludge holding tank, and a RAS lift station. Over time, the original two plant processes have transitioned to serve as sludge processing units, while a new treatment plant was constructed in 2000. The current treatment facility is comprised of two on-site lift stations, a headworks, an anoxic rapid mix basin, two anaerobic basins, two aeration basins, two clarifiers, two chlorine contact channels, disc filters, a traveling bridge sand filter, and a dechlorination basin.

The plant employs several methods to meet permitted nutrient limits, including chemical phosphorus removal using aluminum sulfate, volatile fatty-acid induced phosphorus removal, and single-stage nitrification nutrient removal-activated sludge processes. Additionally, alongside retrofitted solids processing units from the original plant, screw presses were installed in 2023 and are utilized for sludge dewatering before disposal. The ancillary systems present at the RM 2243 WWTP include aeration systems to provide air to the aeration, mixed liquor, and chlorine contact basins, chemical feed systems for chlorination, dechlorination, and aluminum sulfate dosing for chemical phosphorus removal, a non-potable water system to provide process water throughout the plant, and emergency power generation to ensure continuous operation during power outages.

5) EXISTING WWTP ANALYSIS

A. Facility Mapping

A preliminary GIS-based site utility map was created for all major aboveground facilities and underground utilities/process lines using historical data. The process involved reviewing construction drawings and as-built records to digitize and map these features accurately. Drone technology provided 3D representations of above-ground structures. Despite some data gaps and inconsistencies in historical records, thorough QA/QC processes ensured accuracy. The resulting GIS database includes detailed layers for process piping, utilities, instrumentation and controls, building footprints, and plant boundaries (Refer to Appendix D for more information on the development of the facility map). Potholing and subsequent surveying confirmed existing utilities, with these data points included in the facility map. A workshop was held with the city in February 2024 discussing the facility map's features and benefits. The facility map GIS data is to be submitted with the final report.

B. Overview of Plant Processes

The following section details the overall treatment process through the RM 2243 with Figure 5-1 depicting the overall process flow diagram for the existing plant.

a) Influent Lift Station

Lift Stations #9 and #10 are the primary on-site lift stations that feed into the RM 2243 Wastewater Treatment Plant (WWTP). Lift Station #9 is equipped with two 2,600 gallons per minute (GPM) pumps, while Lift Station #10 has three 600 GPM pumps. An ongoing project involves replacing these two existing lift stations with a new master lift station. The new, master lift station will have the capacity to serve the existing and build-out capacities of the RM 2243 WWTP with an ultimate capacity of 10,938 GPM to 15,204 GPM. Additionally, the project includes the construction of diversion facilities to convey a maximum of 2 MGD via a gravity relief main from the RM 2243 WWTP site to an existing 15-inch gravity main connecting to the BCRWWS Interceptor.

b) Preliminary Treatment

After passing through the influent lift station, large solids like sticks, plastic materials, cloth, paper, glass, and inorganic solids are removed using an automatic and a backup manual bar screen, which requires the operator to manually rake out the debris. This coarse screening process removes between 0.5 to 6 ft^3 of screenings per million gallons of wastewater. These screenings are transferred by auger to a washer/compacter and then to a refuse container for disposal. The wastewater then enters an aerated grit chamber where inorganics, such as sand, silt, and gravel, settle at the bottom. A mixer in the center of the basin aids in the settling process, allowing the grit to be removed while other biological treatment components remain in solution. The existing grit chamber is anticipated to produce 2 to 4 ft^3 of grit per million gallons of wastewater. The grit washing process further cleans the grit to remove any remaining detritus or organic matter. Water from the grit washing is returned to the head of the plant for treatment and washed grit is disposed of properly to avoid flies and odor.

c) Primary Treatment

During high flow events, approximately 10-20% of the wastewater leaving the grit chamber enters the anoxic mixing basin, where it acts as a carbon source for biological activity. The treatment process in this basin eliminates oxygen, nitrates, nitrites, and other compounds that bacteria can convert into oxygen. Phosphorus release and denitrification processes initiate in this basin. Return activated sludge (RAS) is directed back to this basin, not to the aeration chambers. The detention time in this basin is approximately 0.75 hours.

During normal flows, all wastewater exiting the grit chamber flows into each anaerobic chamber at a 50/50 split; however, during high flow events, each chamber only receives 40% of the total incoming flow while the remaining 20% enters the anoxic mixing basin. In the anerobic chamber, the wastewater mixes with effluent from the anoxic mixing basin that has been depleted of oxygen. Bacterial phosphorus release begins immediately and continues throughout the basin's detention time, which is about 1.5 hours.

The aeration basins function as biological reactors, providing conditions conducive to bacterial growth. This is achieved through flow retention, aeration and mixing, and biological treatment. The anaerobic basin effluent is held in the aeration tank for approximately 1.5 hours to facilitate biological growth and treatment. The aeration blower settings regulate the air entering the chamber through coarse bubble diffusers to ensure proper mixing, and fine bubble diffusers for efficient oxygen transfer. The dissolved oxygen in this chamber creates an ideal environment for bacterial growth, facilitating the breakdown of waste materials, which serve as the bacteria's food supply. Additionally, bacteria in this zone exhibit a "luxury uptake" of phosphorus, absorbing more phosphorus than was released in the anaerobic basins.

d) Secondary Treatment

The effluent from the aeration basins enters the clarifier through a central ring, allowing suspended solids to settle while the clarified effluent is directed to further treatment. The clarifier separates heavier solids by settling and lighter solids by skimming. Settled solids are either returned to the anoxic, rapid mix chamber as return activated sludge (RAS) or sent to the solids handling units as waste activated sludge (WAS). Wasting only occurs from Clarifier 1, the north clarifier, and the settled solids from Clarifier 2, the south clarifier, are returned to the anoxic, rapid mix chamber exclusively. Skimmed solids from both clarifiers are directed to the carousel for removal. Under low flow conditions, effluent from Clarifier 1 is pumped to Clarifier 2 using airlift pumps. In this configuration, Clarifier 2 functions as a tertiary clarifier, with minimal sludge accumulation at the basin bottom. Under normal, or higher, flow conditions the clarifiers operate in parallel.

e) Tertiary Treatment

The effluent from the clarifiers is directed to the aerated chlorine contact chamber, where it undergoes disinfection through chlorine dosing. To meet the standards set by the TCEQ, sufficient chlorine is applied to maintain a concentration of 1.0 mg/L after a 20-minute contact period. The effluent from the chlorine contact chamber is filtered through 5 rotary cloth filter disk units, then sent to a de-chlorination chamber before being discharged as effluent. The traveling bridge sand filter in the southern treatment train is presently out of commission.

f) Sludge Handling

Waste activated sludge is exclusively transferred from the northernmost clarifier to the carousel for further processing and dewatering. Acting as a digestion facility, the carousel mixes and aerates the sludge. WAS is transferred from the northern clarifier to the sludge handling basin while WAS from the southern clarifier is returned to the anoxic chamber. The sludge from the carousel flows by gravity into the sludge handling clarifiers, where it is separated from the water and settles. The clarified effluent then flows back to the headworks of the plant. Subsequently, the sludge is pumped from the sludge handling clarifiers to the sludge thickener (Old Process Engineering Equipment Company, PEECO, Plant). The thickened sludge is directed to the screw press building, where it undergoes dewatering via the screw presses. The filtrate produced by the screw press is sent to a lift station that returns it to the sludge handling digester. Meanwhile, the solids are transferred through a hopper to one of two roll-off dumpsters for disposal.

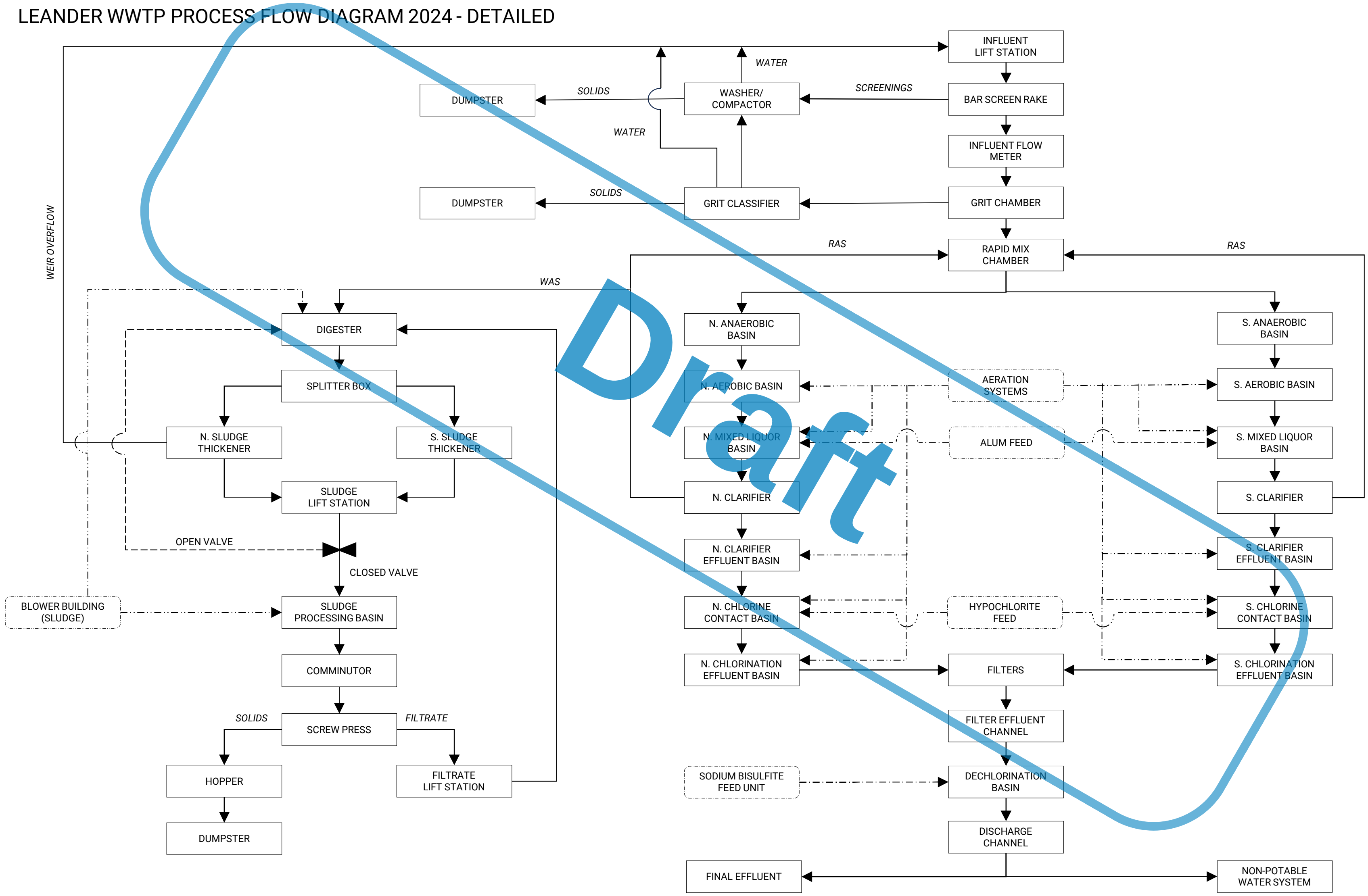


Figure 5-1: RM 2243 WWTP Process Flow Diagram

C. Reclaimed Water System

An ongoing project (CIP WW.46 - Leander RM 2243 Reclaimed Water System Improvement) will provide a phased reclaimed water system at the RM 2243 WWTP. The first phase of the project will include facilities to divert reclaimed water to a filling station located at the plant site and will include pressurization equipment, a Point of Sale (POS) system as well as provisions for expansion. The second phase of the project will include a 3,000 GPM low-head transfer pump station, re-chlorination system, 250,000-gallon ground storage tank, 1,750-GPM high-service pump station with associated 20,000-gallon hydrotank, and approximately 7,000 LF of 12" transmission main from the WWTP to the Northline project 10" reclaimed water line. Reclaimed water from this system can be used for multiple purposes, including irrigation, industrial, water features, and other authorized uses, and will specifically be utilized by the upcoming downtown district, Northline, in the City of Leander as construction process water. The system will replace the existing non-potable plan system built in 2000.

D. Treatment Deficiencies

The RM 2243 WWTP currently meets the effluent parameter set required by the WQ0012644001 Permit. Analysis of current removal efficiencies was performed using data provided by the City of Leander for October 2022 to October 2023 (Table 5-1, Appendix E).

Table 5-1. Current Treatment Efficiencies

Parameter	Permitted Concentration (mg/L)	Avg. Influent Concentration (mg/L)	Avg. Effluent Concentration (mg/L)	Required Efficiency (%)	Actual Efficiency (%)
CBOD	5	211	4.4	97.6%	97.9%
TSS	5	266	2.7	98.1%	99.0%
Ammonia	2	51.5	0.9	96.1%	98.2%
Phosphorus	1	8.8	0.4	88.6%	95.4%

E. Plant Treatment Process Hydraulic Analysis (Existing Plant)

A hydraulic analysis of the existing plant's treatment processes was conducted using a design flow rate of 2.25 MGD with a peaking factor of 3. This analysis is important for understanding the plant's capacity to maintain reliable operations under peak flow conditions. The hydraulic grade and total head loss through each element was calculated using specific design criteria and relevant calculations for weirs, channels, and pipes. These calculations help to identify potential bottlenecks, backups, and/or overflows and ensure that the flow can be managed effectively through the system.

The upstream and downstream water surface elevations for each unit are shown in Table 6, along with the available freeboard, the distance between the water surface and the top of wall at peak flow conditions. Detailed calculations for the hydraulic analysis are provided in Appendix F. The available freeboard is essential for minimizing the risk of overflow in the basins.

All components of the plant were found to have adequate freeboard, with no risk of back-up, except for the filters. The filters have a risk of backing up into the chlorine effluent basin during maximum flow events. However, under these conditions, the chlorine effluent basin still meets the minimum requirement of 18 inches of freeboard set by the TCEQ.

Table 5-2. Hydraulic Analysis Summary at Current Conditions

Element	Upstream WS Elev. (AMSL)	Downstream WS Elev. (AMSL)	Freeboard (ft)
Bar Screen	954.23	953.81	2.77
Parshall Flume	953.81	952.25	3.19
Grit Basin	952.15	951.75	1.85
Influent Channel	951.75	951.33	2.25
Rapid Mix Basin	951.21	950.75	1.79
Anaerobic/Aeration Basin	950.35	950.01	1.65
Mixed Liquor Basin	950.01	949.45	1.99
Clarifier	947.12	946.00	4.88
Chlorine Contact Basin	945.66	945.25	3.34
Chlorine Effluent Basin	942.76	**942.25**	3.24
Filters	**943.90**	941.25	2.10
Dechlorination	940.20	939.00	5.80
Effluent	939.00	937.97	-

F. Capacity Analysis

The RM 2243 WWTP is designed to handle an average daily flow of 2.25 MGD and a peak flow of 6.75 MGD. An analysis of each treatment unit's capacity was conducted to ensure compliance with TCEQ requirements outlined in the Texas Administrative Code Title 30 Chapter 217 rules. Currently, all preliminary, primary, secondary, and sludge treatment basins meet TCEQ requirements, except for the maximum organic loading in the aeration basins.

To assess compliance, a flow rate of 2.25 MGD, a peaking factor of 3, and influent waste characterization data (including BOD5, TSS, ammonia, and phosphorous concentrations) were used to calculate each system parameter. The results are summarized in Table 5-3 with full calculations in Appendix G. Notably, there are no TCEQ requirements for rapid mix basins, so a capacity analysis for these units was not conducted.

The maximum organic loading in the aeration basins exceeds TCEQ requirements due to higher influent BOD concentrations than when the plant was initially designed. The plant was originally designed in 1999 assuming an influent BOD_5 concentration of 200 mg/l. The current influent BOD_5 concentration has increased to 280 mg/l (Table 2-1). The increase in influent BOD concentrations to the plant may be more attributed to changes in demographics attributed to population growth, more efficient water use, and/or an increase in commercial or industrial wastewater sources. However, the required air flow in the aeration basins is well above the minimum required by TCEQ, at 5,200 SCFM. A recent addition of fine bubble diffused air has been implemented to supply additional dissolved oxygen to the aeration basins, enhancing the efficiency and effectiveness of the aeration process. To manage the high organic loading rate entering the aeration basin, one approach is to consider oversizing the new treatment plant to handle this load. Additionally, installing fine screens at the headworks of the plant would mitigate organic loading into the aeration basins.

The clarifiers meet both design and peak TCEQ requirements for surface loading rate, weir loading rate, and detention time. For filtration, the peak maximum filtration rate is below the maximum TCEQ requirement. The capacity analysis for the filters considers only for the five disc filters, excluding the traveling bridge sand filter that is currently out of commission. However, the sand filter remains on site and could be utilized, if necessary, though it would require some rehabilitation of the media. It is important to note that the peak detention time for disinfection is slightly above the minimum requirement and should be monitored closely. The peak detention time for de-chlorination meets the TCEQ requirement exactly, so it should also be monitored.

Based on the effluent test results (Appendix E), and the capacity and hydraulic analyses, the existing plant was found to be functioning properly overall and meeting the effluent requirements. The high organic loading to the aeration basins can be mitigated by either installing larger aeration basins at the new plant or implementing fine screens at a new headworks. Therefore, no improvements to the existing process units or structures were deemed necessary.

Table 5-3: Capacity Analysis at Current Conditions

Parameter	TCEQ Requirement	Calculated Value
Aeration:		
Max. Organic Loading (lb BOD5/d/1000CF) =	35	**40**
Required Air Flow (SCFM) =	4,034	5,200
Clarifiers:		
Peak Max. Surface Loading (gpd/SF) =	1,200	877
Peak Min. Detention Time (hr) =	1.8	2.9
Design Max. Surface Loading (gpd/SF) =	600	292
Design Min. Detention Time (hr) =	3	9
Peak Max. Weir Loading (gpd/ft) =	20,000	15,800
Peak Max. Solids Loading (lb/d/SF) =	50	25
Filters:		
Peak Max. Filtration Rate (GPM/SF) =	6.5	5.2
Disinfection:		
Peak Detention Time (min) =	20	21
Dechlorination:		
Peak Detention Time (min) =	0.33	0.33

G. Existing Emergency Power Resources

The RM 2243 site currently has two existing emergency standby generators. Generator #1 is located on the northeastern corner, providing 250 kW, 480 V, 3 Phase power to the on-site lift stations, pumps, and blowers for sludge digestion units, non-potable water system, and filters. Generator #2, located on the west side, is a 200 kW, 480 V, 3 Phase generator, is currently out of commission and previously supplied emergency power to the office and control panel for sludge digestion and thickening units. Recently the City worked with PEC to install a manual transfer switch between the Leander and Block House Creek circuits. This manual switch allows for dual feed to the plant site as part of emergency power provisions.

6) BASIS OF PLANNING

A. Design Criteria

Metcalf and Eddy's *Wastewater Engineering: Treatment and Resource Recovery* and TCEQ Chapter 217: *Design Criteria for Domestic Wastewater Systems* served as the foundation for the wastewater treatment plant design criteria in this report. These sources provided essential guidelines and standards, ensuring our design approach meets both industry best practices and Texas-specific regulatory requirements.

B. Cost Estimates

For the cost estimates included in this report, unit costs from recently bid projects in Texas were utilized, adjusted for inflation using the Engineering News-Record (ENR) Construction Cost Index. Additionally, estimates provided by local vendors for select pieces of equipment were incorporated.

7) WASTEWATER TREATMENT PLANT MODELING IN GPS-X

A. Modeling Introduction

A model of the RM2243 Wastewater Treatment Plant (WWTP) in Leander was built using GPS-X, a Hydromantis software, based on information from as-built plans, site visits, and communications with plant staff. An initial calibration was conducted using only the yearly averages of influent and effluent data, as there was no available data for the plant's internal processes (e.g., aeration basin effluent, clarifier effluent, etc.). GBA recommended additional testing to refine the model and better understand the internal processes within the treatment plant. Consequently, the City carried out four weeks of testing, allowing GBA to further calibrate the model. This chapter discusses the results of the updated model calibration, expanded plant modeling, and overall plant expansion modeling with projected loadings.

B. Testing Data Results

The four weeks of testing performed by the City determined the concentrations of carbonaceous biological oxygen demand over five days ($CBOD_5$), total suspended solids (TSS), ammonia nitrogen (NH_3-N), total Kjedahl nitrogen (TKN), total phosphorus (TP), and total alkalinity at selected locations throughout the plant (See Figure 7-1 for a screenshot of the existing model showing sampling locations and Appendix H for testing data). $CBOD_5$ measures the amount of oxygen required to stabilize biological waste over a five-day period. TSS measures the total amount of suspended solid particles in water. NH_3-N measures the concentration of ammonia, while TKN measures the sum of ammonia, ammonium, and organic nitrogen. TP measures the total concentration of both dissolved and particulate forms of phosphorus. Total alkalinity is the measure of water's buffering capacity, or its ability to neutralize acids while maintaining a stable pH. Tests were conducted in accordance with Standard Methods by the Accredited Laboratory that the City uses for permit compliance testing and analysis.

City staff provided summary reports from the lab; however, detailed reports with QA/QC information and chain of custody information were not included. The testing data showed significant variability across the four weeks of testing, posing challenges for model calibration. The WWTP model simulates steady-state plant operations, which is best represented by months of data with low variability. GBA calibrated the model using the available data and guidance from GPS-X support staff.

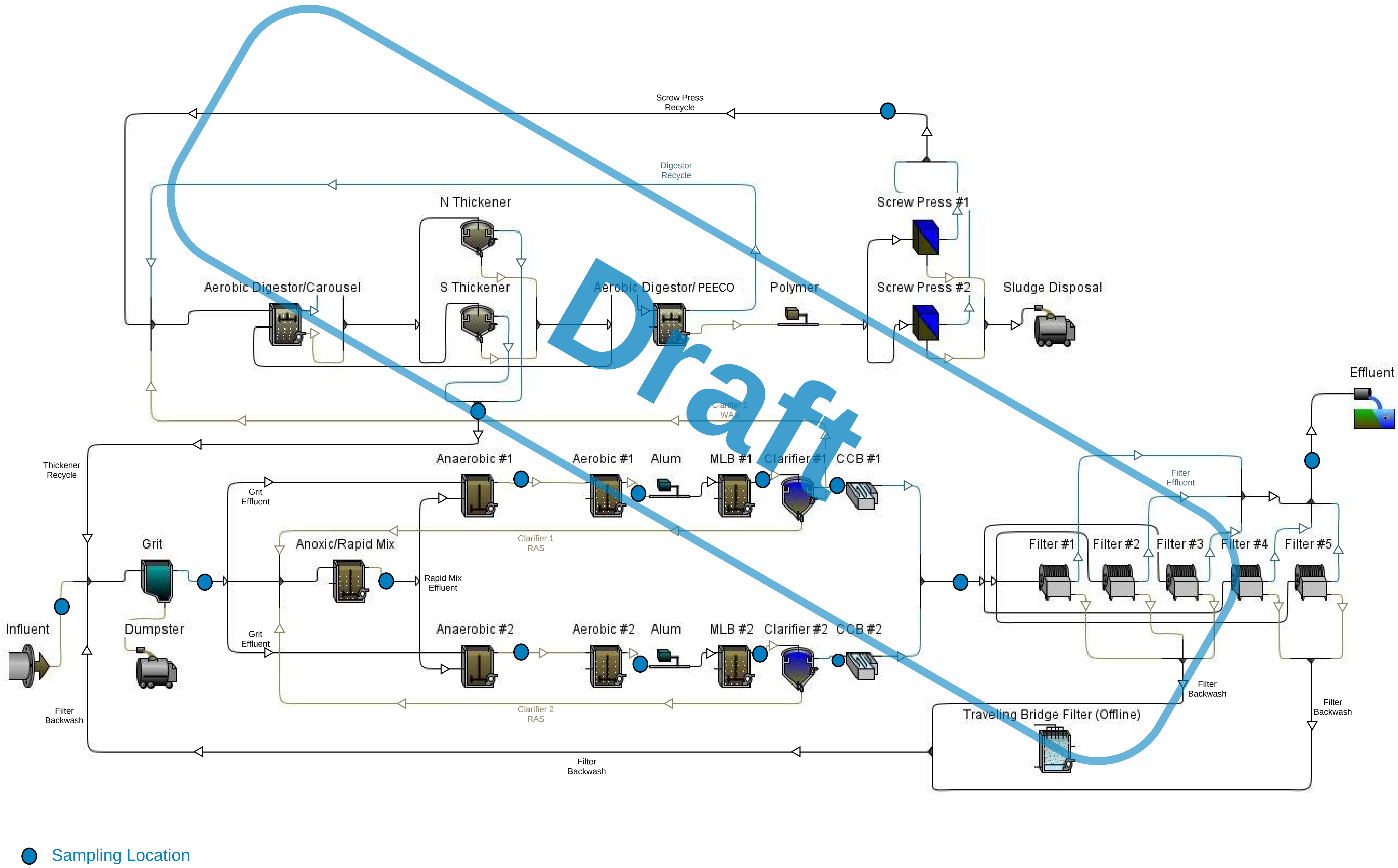


Figure 7-1: Existing Plant Model with Sampling Locations

C. Model Calibration Results

Model calibration was achieved by adjusting various operational and kinetic parameters of the units to align the model's predictions with the testing data. The calibrated model outputs are graphically shown in Appendix I as the red, dashed lines, testing data is shown in light blue, and the dashed blue line represents model results from a model run with default kinetic values. The calibrated model predicted lower concentrations of TSS and $CBOD_5$ throughout the internal processes of the plant but aligned well with the clarifier and filter effluent testing data. GPS-X support staff advised to reduce the influent concentration of readily biodegradable CBOD (rbCBOD), which slightly improved the $CBOD_5$ calibration, but still is showing lower values than the testing data.

The model simulation conducted with the default kinetic parameters for ammonia oxidizers predicted 0.5 mg NH_3-N/l in the rapid mix effluent, while the testing data ranged from ~ 8 – 20 mg NH_3-N/l. Default kinetic parameters in the GPS-X model are sourced from Metcalf and Eddy and are representative of typical wastewater kinetics. To align with the testing data, the growth rate for ammonia oxidizers in the rapid mix and aeration basin were decreased by nearly half, which increased the NH_3-N concentration leaving the rapid mix and aeration basins, aligning more closely to the testing data.

All four days of testing data indicated NH_3-N removal occurring in the clarifier (Appendix H). GPS-X support staff suggested that this was due to dissolved oxygen (DO) carryover from the aeration basin, promoting further nitrification. The clarifier model settings were modified to link its parameters to those of the aeration basin, as advised by GPS-X support staff. This adjustment resulted in a slight NH_3-N removal in the clarifier, but not to the extent observed in the testing data.

The calibrated model curves align with the overall trend and effluent concentrations for both TKN and TP, despite variability in the testing data. The model using default values predicted a drastic consumption of total alkalinity throughout the plant, resulting in approximately 60 mg total alkalinity/l in the effluent, while the testing data showed an average of 170 mg/l of total alkalinity in the effluent. To address this, the calibrated model was run with a decreased diffusion coefficient ratio of CO_2 to O_2, as advised by GPS-X support staff, which reduced alkalinity consumption and aligned more closely with the measured value of around 150 mg total alkalinity/l from the testing data. Table 7-1 provides a summary of changes that were made to the model to closer align with the testing data.

Table 7-1. Summary of Changes for Model Calibration

Parameter:	Change:
Kinetic Parameters:	
Growth rate for ammonia oxidizers in the Rapid Mix Basin	Decreased from 0.9/d to 0.4/d to reduce efficiency of nitrifiers
Growth rate for ammonia oxidizers in the Aeration Basin	Decreased from 0.9/d to 0.5/d to reduce efficiency of nitrifiers
Decay rate for ammonia oxidizers in the Rapid Mix and Aeration Basin	Increased from 0.17/d to 0.2/d to reduce efficiency of nitrifiers
Other Parameters:	
Grit production rate	Increased from 20 mg/l to 45 mg/l to enhance grit chamber performance
Diffusion Coefficient Ratio of CO_2 gas to O_2 gas	Decreased from 0.88 to 0.25 to reduce total alkalinity consumed
Non-settleable fraction in clarifier	Decreased from 0.01 to 0.005 to increase overall settling performance of clarifier
Settling correction factor for heterotrophic and ammonia oxidizer biomass	Increased from 0.9 to 2.0 to increase settling of $CBOD_5$
Removal efficiency of heterotrophic, fermenting, ammonia oxidizer, nitrite oxidizer, and phosphate accumulating biomass for filters	Increased from 0.37 to 0.9 to increase filter removal efficiency of $CBOD_5$
Removal efficiency of particulate inert material for filters	Reduced from 0.75 to 0.5 to reduce filter removal efficiency of TSS
Removal efficiency of unbiodegradable cell product for filters	Decreased from 0.75 to 0.3 to reduce filter removal efficiency of TSS

D. Expanded Plant Modeling

A new, identical plant was built in the model based on the dimensions outlined in the permit amendment correspondence with TCEQ dated November 2018 (Figure 7-2, See Appendix J for unit dimensions). The operational parameters at the existing plant, such as return rates, wasting rates, and alum dosing, were applied to the new plant to establish redundancy between both plants. Two expanded plant scenarios were modeled: one where the new units were assigned the parameters from the existing model calibration and one with default kinetic parameters. Both model scenarios were created to analyze the performance of the new plant under different conditions, aiming to determine the most effective way to model the overall expanded plant.

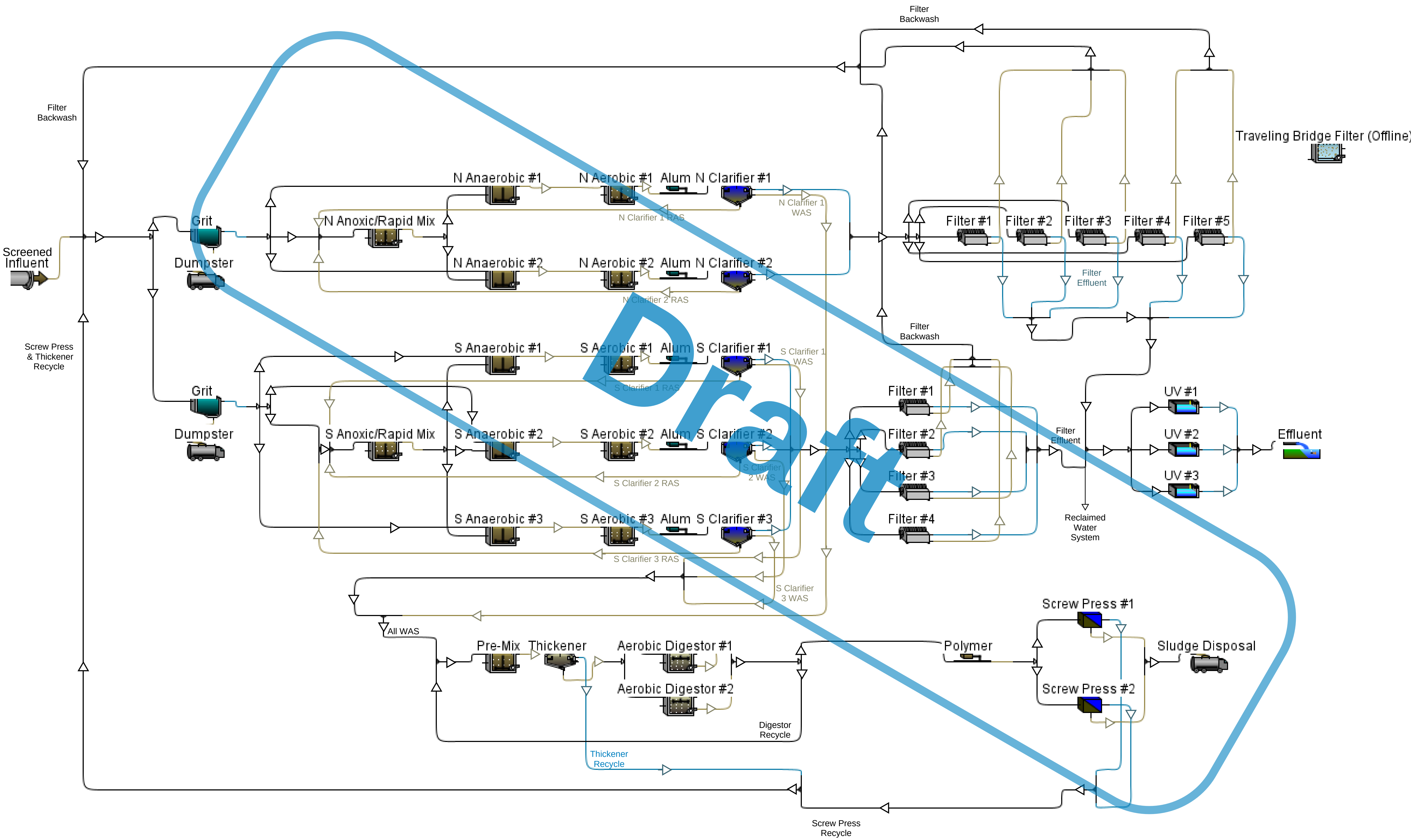


Figure 7-2: Expanded Plant Model

Both model scenarios predict similar $CBOD_5$, TSS, and TP concentrations throughout the expanded plant and slightly lower concentrations compared to the calibrated, existing plant model (See Appendix I for modeling results). The default kinetics scenario estimated lower concentrations of both $CBOD_5$ and TSS in the effluent than the existing plant and the expanded model scenario with calibrated values.

When running the expanded plant with the decreased, calibrated growth rates for ammonia oxidizers from the existing plant model, the new plant reduced NH_3-N in the effluent to ~ 28 mg NH_3-N/l. Resetting the new rapid mix and aeration basins back to the default kinetic values for ammonia oxidizers resulted in ~ 0.2 mg NH_3-N/l in the effluent. Similar trends were observed for TKN. The expanded plant model with calibrated values predicted higher total alkalinity than the existing plant and the expanded plant model with default values.

Due to inadequate nitrification observed when modeling the new plant with the calibrated kinetic values, expanded plant modeling proceeded with resetting the kinetic parameters back to the default values in the rapid mix and aerobic basins. Further investigation and additional resources are necessary to identify the factors inhibiting nitrification at the existing treatment plant. This includes comprehensive analysis of potential causes such as environmental conditions, pH and dissolved oxygen levels, or operational issues like inadequate mixing or sludge retention time. Conducting detailed sampling and monitoring, engaging in advanced diagnostic testing and analysis will provide more clarity on internal processes and kinematics for enhanced modeling accuracies.

E. Overall Plant Modeling with Projected Loadings

Further modeling was conducted utilizing the projected influent concentrations shown in Table 7-2. The plots shown in Appendix I show the modeled expanded plant with default kinetic values, and the existing plant modeled with the calibrated parameters and the final effluent which includes the effluent from both treatment plants. In general, the concentrations are higher at the existing plant for $CBOD_5$, TSS, NH_3-N, and TP, and are modeled to meet permit limits in the overall effluent.

Table 7-2. Modeled Influent Concentrations

Influent Parameter	Testing Data Influent Concentrations (mg/l)	Projected Influent Concentrations (mg/l)
Flow	2.25 MGD	5.25 MGD
$CBOD_5$	287	280
TSS	240	280
NH_3-N	33.7	50
TP	4.4	9

F. Modeling Conclusion

The recalibration of the RM2243 WWTP model using GPS-X, based on four weeks of testing data, has yielded valuable insights into the plant's internal processes and overall performance. The main findings are: the model predicts significantly lower concentrations of $CBOD_5$ and TSS than those observed in the testing data; NH3-N levels are also modeled lower than the testing data indicates, suggesting hindered nitrification at the current plant; and the alkalinity concentrations throughout the plant do not match the modeled concentrations or trends. Although the plant is currently meeting permit limits, the City should consider routine testing of internal processes to gather more consistent and extensive data, to confirm that the four weeks of testing data are representative of operational performance. If there is sufficient testing data to provide adequate confidence that analytical results are representative, adjustments to operational parameters, such as optimizing aeration rates, adjusting sludge retention time, and/or enhancing mixing efficiency can be appropriately supported. By taking these additional steps, the City can more accurately understand internal plant dynamics to support operational adjustments thereby optimizing the plant's performance, ensuring compliance with permit limits, and improving overall efficiency and reliability.

8) DEVELOPMENT AND EVALUATION OF ALTERNATIVES

A. Development of Alternatives

Various technologies for screening, disinfection, and sludge thickening were evaluated based on their costs, operation and maintenance requirements, reliability, and performance. The liquid treatment portion of the wastewater plant was desired by the Public Works department to be configured similarly to the existing plant to ensure ease of operations and consistency. Other liquid treatment alternatives utilized in the Central TX region include membrane bioreactors (MBR) and sequencing batch reactors (SBR). However, GBA has observed that wastewater treatment facilities in the region have encountered issues with membrane fouling and difficulties in successfully utilizing MBR technology. SBRs are also not recommended due to their complex operations and lack of resistance to shock loadings.

This section provides a description of each technology evaluated, along with the advantages and disadvantages of each. The cost estimates provided correspond to the equipment size and quantity required for the ultimate phase of the plant.

B. Screening Alternatives

Screening is the first unit operation utilized at wastewater treatment plants to remove objects such as rags, paper, plastics, and metal to prevent damage and clogging of downstream equipment, piping, and appurtenances. The two screening technologies considered for this report are bar screens and drum screens, both of which are mechanical pre-treatment devices located at the headworks.

a) Bar Screens

Bar screens are essential components in wastewater treatment plants, comprised of vertical or inclined bars spaced at regular intervals to allow water to pass through while capturing debris. This design prevents large objects such as plastics, sticks, and rags from entering downstream processes. The captured debris can be removed from the bars either manually or automatically using rakes or conveyor systems. A summary of the advantages and disadvantages of bar screens is shown in Table 8-1.

Table 8-1. Advantages and Disadvantages of Bar Screens

Advantages	Disadvantages
• Lower capital cost. • Smaller footprint.	• Open to atmosphere – potential odors. • Many moving parts requiring lubrication and maintenance. • Does not remove smaller solids less than 0.25 inch, or bar spacing.

b) Drum Screens

Drum screens are another crucial element in wastewater treatment, featuring a rotating cylindrical screen made of perforated metal, mesh, or wedge wire. As wastewater flows into the drum screen, the rotating action lifts solids onto the screen surface, where they are retained with the water passing through the screen. To maintain optimal performance, the captured solids are typically removed from the screen surface by a spray system, brush, or scraper mechanism. These solids are then deposited into a collection hopper for disposal. A summary of the advantages and disadvantages of drum screens is shown in Table 8-2.

Table 8-2. Advantages and Disadvantages of Drum Screens

Advantages	Disadvantages
• All rotating parts are closed to the atmosphere (significantly reduced odor). • Removes smaller solids less than 0.25 inch. • External spray bars for cleaning. • Requires little operator attention. • Constructed with corrosion resistant metal. • Compatible with membrane bioreactor (MBR) operations. • Reduces organic loading to aeration basins.	• Higher capital cost. • Larger footprint. • Potential of removing excessive amounts of organic matter, depending on system operation and screen opening size.

c) Cost Comparison of Screening Alternatives

Tables 8-3 and 8-4 show the cost breakdown for both screening alternatives. Table 8-5 summarizes the cost differences between the rotary drum screens and the bar screens. The annual operation costs for both technologies include the estimated electrical costs using an electric rate of $0.14/kWh (See Appendix K for supporting documentation for cost estimates).

Table 8-3. Cost of Fairfield Locklink Bar Screen

Item	Quantity	Cost Estimate
Mechanical Bar Screens	2	$200,000
One Manual Bar Screen	1	$70,000
Washer/Compactor	1	$80,000
Total	-	**$350,000**

Table 8-4. Cost of Hycor Rotoshear Drum Screen

Item	Quantity	Cost Estimate
Drum Screens	3	$780,000
Total	-	**$780,000**

Table 8-5: Screening Alternatives Cost Comparison

	Bar Screens	Rotary Drum Screens
Estimated Construction Cost	$350,000	$780,000
Estimated Yearly Operation Costs	$230	$5,500

C. Disinfection Alternatives

Two primary alternatives for disinfection, ultraviolet (UV) irradiation and chlorine-based methods, are often considered for wastewater treatment plants. UV disinfection involves the use of UV light to inactivate microorganisms by disrupting their genetic material, while chlorine-based methods utilize chlorine compounds to oxidize the cellular material in microorganisms, effectively destroying them. An evaluation of these alternatives was conducted to determine the most suitable disinfection approach for the RM 2243 plant.

a) Ultraviolet Disinfection

UV disinfection systems utilize electromagnetic energy from mercury arc lamps to disrupt the genetic material of organisms, preventing reproduction. These systems include mercury arc lamps, a reactor, and ballasts. UV radiation typically falls within the 250 to 270 nm wavelength range, which is optimal for microbial inactivation. Table 8-6 summarizes the advantages and disadvantages of UV disinfection systems.

Table 8-6. Advantages and Disadvantages of UV Disinfection Systems

Advantages	Disadvantages
• Effective against viruses, spores, and cysts. • Physical process eliminates the need for chemical disinfectants. • No harmful residual effects. • Safe, user-friendly operation. • Shorter contact time compared to other methods (approximately 20 to 30 seconds with low-pressure lamps) depending on loading and bioassay. • Typically requires less space. • Does not require de-chlorination. • Does not have shelf-life limits of chlorine solutions.	• Low UV dosage may not effectively inactivate certain microorganisms. • Organisms can sometimes repair UV-induced damage, which is a major concern in Texas due to issues with heat. • Preventive maintenance required to control fouling of tubes, which is crucial to successful treatment. • Lamps need to be replaced periodically. • High levels of turbidity or total suspended solids reduce overall effectiveness of the treatment. • Not as cost-effective as chlorination, except when de-chlorination is needed. • Requires more power consumption to operate. • Must maintain a strict maintenance schedule. • Requires replacement equipment to be in inventory onsite for emergency repairs and scheduled maintenance (such equipment includes lamps, ballasts, quartz sleeves, banks, and modules). • Requires bioassay for design purposes. • Will most likely need to cover existing and future filter cells to prevent direct sunlight from causing excessive algal growth.

There are two main types of UV disinfection systems: open channel and in-line. Open channel systems use a basin where wastewater flows by gravity, with lamps typically mounted horizontally. In-line systems involve a closed vessel or pipe through which the wastewater flows under pressure, with UV lamps installed in sleeves inside the vessel. Table 8-7 provides a high-level comparison of the two types of UV disinfection.

Table 8-7. Open Channel UV and In-line Channel UV comparison table

Comparison Criteria	Open Channel UV	In-line UV
Advantages	• Flow is easily accessible. • Simplified maintenance. • Easier visual inspection and monitoring. • Possible to convert chlorine contact basins to open channel UV disinfection.	• Space efficiency. • Reduced risk of UV exposure. • Lower cost.
Disadvantages	• Dead zones are easily formed, which can lead to lamp damage and untreated water. • Susceptible to uneven velocity profiles, causing ineffective disinfection and short circuiting. • Level control of the flow can be difficult to achieve.	• Visual issues cannot be assessed until after discharge. • Strict maintenance schedule must be maintained and may require opening the units.

The reliability of UV disinfection systems depends on three key factors: the reactor's hydraulic properties, UV radiation intensity, and wastewater characteristics. An ideal system ensures uniform flow to maximize UV exposure, avoiding short-circuiting and dead zones. Lamp age, fouling, and arrangement affect UV intensity, while wastewater flow rate, suspended solids, and bacterial density influence how much UV radiation reaches pathogens.

UV disinfection regulations fall under TCEQ Chapter 217, Subchapter L and the main points are as follows: UV systems must meet bacteria limits specified in permits; redundancy requirements include at least two UV banks in series and an inventory of replacement equipment; continuous monitoring and flow pacing are required, where flow pacing should be achieved by adjusting the number of active banks in proportion to effluent flow; systems must be sized based on an independent bioassay with lamps similar to the full-scale system.

b) Chlorine Disinfection

Chlorine serves as a primary disinfectant in municipal wastewater treatment, eliminating target organisms by oxidizing cellular material. It can be applied in various forms, including chlorine gas, sodium hypochlorite solution, calcium hypochlorite, and bromine chloride. A summary of the advantages and disadvantages of chlorine disinfection systems is depicted in Table 8-8.

Table 8-8. Advantages and Disadvantages of Chlorine Disinfection Systems

Advantages	Disadvantages
• Well-established technology and cost-effectiveness. • Chlorine residual in effluent can prolong disinfection. • Reliable and effective against a wide spectrum of pathogens. • Can oxidize certain organic and inorganic compounds, which may enhance treatment. • Flexible dosing control. • Can eliminate certain noxious odors during disinfection.	• Chlorine residual is toxic to aquatic life, requiring de-chlorination. • Chlorine is highly corrosive and toxic, requiring strict safety regulations. • Can create more hazardous compounds in wastewater. • Chlorine residual is unstable in the presence of chlorine-demanding materials. • Long-term effects of discharging dechlorinated compounds into the environment not fully understood. • Chemical feed interruptions due to pump failures, freezing lines, carrier water, etc. • Inability to purchase chlorine at certain times (major unforeseen weather events, etc.). • Safety issues for staff and the public, especially if using chlorine gas. • Some organisms such as cryptosporidium form chlorine-resistant cysts.

Chlorine disinfection is a widely utilized and dependable method in wastewater treatment due to its effectiveness against a broad spectrum of microorganisms, including bacteria, viruses, and protozoa. The key process control parameters for any chlorination system are the dose and the chlorine residual. Chlorine disinfection regulations fall under TCEQ Chapter 217, Subchapter K and covers system redundancy, capacity, safety, and operational requirements.

c) Cost Comparison for Disinfection Alternatives

Table 8-9 summarizes the estimated cost of construction of a UV Disinfection Facility with 3 in-line UV units (2 duty, 1 standby), including the piping, valve, electrical circuitry and wiring, and the building and overhead roof construction cost based on a quote from ETS of their UVLW model. Table 8-10 summarizes the estimated cost of construction of a UV Disinfection Facility with 6 open channels, including the disinfection equipment, electrical circuitry and wiring, and the building cost. The capital equipment cost estimate for a chlorine disinfection system encompasses only the expenses related to installing a new chlorine disinfection system at the new treatment plant, designed for an ultimate design flow of 3.0 MGD, as the existing plant already has a fully operational chlorination/de-chlorination system. Implementing UV disinfection would completely replace the existing plant's chemical disinfection system with a new, larger capacity UV disinfection system.

Table 8-9. Breakdown of Estimated Cost for an In-Line UV System

Item	Estimated Cost
UV Units (3 units total)	$950,000
Piping	$50,000
Yard Piping	$100,000
Valves (6 valves total, 3 w/ actuators)	$100,000
Equipment Wiring	$125,000
Controls Building & Overhead Roof	$80,000
Total	**$1,405,000**

Table 8-10. Estimated Cost of Open Channel UV

Item	Estimated Cost
UV Disinfection Equipment	$1,996,200
Electrical Circuitry and Wiring	$232,200
Facility Building	$1,420,800
Yard Piping	$100,000
Total	**$3,750,000**

Table 8-11 summarizes the cost differences between in-line UV, open channel UV, and chlorine disinfection systems. The estimated yearly operation costs for UV disinfection were developed based on the estimated electrical costs to run all units continuously, except for one standby unit. The annual chlorine expenses were derived from the City's expense records and were adjusted for inflation (See Appendix K for supporting documentation for cost estimates).

Table 8-11: Disinfection Alternatives Cost Comparison

	In-Line UV	Open Channel UV	Chlorine
Estimated Construction Cost	$1,405,000	$3,750,000	$1,399,000
Estimated Yearly Operation Costs	$60,000	$32,500	$280,000

D. Thickening Alternatives

Sludge thickening is the process of increasing the solids concentration of the biosolids removed from liquid sewage by reducing the amount of free water in the sludge. This process prepares the sludge for downstream processes such as dewatering. Three thickening methods were evaluated: gravity thickening, and mechanical thickening using either a screw press or a rotary drum.

a) Gravity Thickening

Gravity thickening is a process used to concentrate solids in liquid by leveraging the natural tendency of higher-density solids to settle out by gravity. The process typically involves a circular tank, similar in design to clarifiers, which is fitted with collectors or scrapers at the bottom. These components help in gathering and removing the settled solids from the tank, ensuring efficient thickening. As the sludge enters the tank, the higher-density solids gradually settle to the bottom due to gravity, while the supernatant remains at the top and is decanted or exits the thickener via a weir trough.

Gravity thickening is favored for its simplicity and cost-effectiveness, requiring minimal energy, and providing a reliable means of reducing sludge volume. A summary of the advantages and disadvantages of gravity thickening is shown in Table 8-12.

Table 8-12. Advantages and Disadvantages of Gravity Thickening

Advantages	Disadvantages
• Generally less expensive than mechanical thickeners. • Has a simple design and is easy to operate, requiring minimal maintenance and operator attention. • Operates without the need for mechanical agitation or other energy-intensive processes, reducing energy consumption. • Solids concentration is the thickened solids are usually lower than mechanical thickeners (better for screw press dewatering). • Does not require polymer. • Does not require a building.	• Scum build-up causes odors. • Grease may build up in the lines and cause a blockage. • Septic conditions will generate sulfur-based odors. • May require more land area than required for mechanical thickeners.

b) Screw Press Thickening

Screw press thickening is a process that utilizes a slowly rotating screw to increase solids concentration in sludge. Inside a typical screw press thickener is a wedge section basket that serves as the main containment unit where the thickening process occurs. Within the basket, a screw, which rotates slowly and can be adjusted for variable speeds, conveys the sludge gently upward through the inclined basket. As the sludge moves upward, it encounters increasing pressure, which helps to expel water from the sludge. Water drains through the basket, leaving behind a thicker, more concentrated sludge.

This method of thickening is advantageous due to its low energy consumption, minimal operational maintenance, and ability to handle a wide range of sludge concentrations and compositions. The variable speed of the screw allows for precise control over the thickening process, making it adaptable to different sludge types and treatment requirements. A summary of the advantages and disadvantages of screw press thickening is shown in Table 8-13.

Table 8-13. Advantages and Disadvantages of Screw Press Thickening

Advantages	Disadvantages
• Sludge volume reduction to up to 90%. • Can handle high solids loads and coarse material containing sludge. • No need for lubrication. • Completely encapsulated, odor-free plant. • Low noise < 68 dB(A).	• The maximum size, and hence maximum solids and volumetric throughput, is lower than the other technologies. • Less flexible to handle changing sludge parameters. • Requires some washwater. • The screw press requires some labor for occasional cleanup. • Requires polymer. • Requires a building.

c) Rotary Drum Thickening

Rotary drum thickening is a process used in wastewater treatment to increase the concentration of sludge solids. This is achieved by agitating the sludge within a slowly rotating cylindrical vessel, commonly referred to as a drum. The drum is designed with porous walls that allow water, known as filtrate, to pass through while retaining the solid particles inside.

The thickening process begins as sludge is fed into the drum. The drum then rotates at a slow, controlled speed, causing the sludge to gently tumble and agitate. This agitation helps to separate the water from the solids. As the drum rotates, the water drains through the porous walls of the drum and is collected as filtrate. Meanwhile, the concentrated sludge solids are retained within the drum and gradually move towards the discharge end.

The primary goal of rotary drum thickening is to reduce the volume of sludge by increasing its solids concentration. This makes subsequent handling, treatment, and disposal of the sludge more efficient and cost-effective. The process is widely used in wastewater treatment plants due to its simplicity, reliability, and effectiveness in enhancing sludge management operations. A summary of the advantages and disadvantages of rotary drum thickening is shown in Table 8-14.

Table 8-14. Advantages and Disadvantages of Rotary Drum Thickening

Advantages	Disadvantages
• Sludge volume reduction to up to 90%. • Low power requirements. • High capacity. • Clean, enclosed, odor-free solution. • Filter cloth with a long service life. • One-piece cover with direct access to complete drum.	• Requires polymer (able to use powder polymer instead of liquid). • Adding large amounts of polymer may increase shear potential in the rotating drum, breaking down the polymer floc and decreasing thickening effectiveness. • For best possible flocculation, an optional flocculation reactor would need to be installed. • Requires a building.

d) Cost Comparison of Sludge Thickening Alternatives

The cost of a gravity thickener was estimated at approximately $10,000 per foot of diameter, as suggested by a manufacturer, resulting in a total estimated cost of $350,000. The cost of three screw thickeners, specifically the HUBER Rotary Screw Thickener S-DRUM Size 4L, include three thickening units, three flocculation reactors, one thickened sludge hopper, three control panels, and all ancillary equipment. The cost of two drum thickeners (ALDRUM G3 MEGADUO) includes the two thickeners and their associated controls and ancillaries.

Operational costs for a gravity thickener are significantly lower than those for mechanical thickeners, as no polymer is required, and energy consumption is considerably lower in comparison. The estimated amount of polymer utilization per year would be approximately $35,000 for all three units combined. The estimated amount of polymer utilization per year would be approximately $42,500 for both units combined (See Appendix K for supporting documentation for cost estimates).

Table 8-15: Sludge Thickening Alternatives Cost Comparison

	Gravity	Screw Press	Rotary Drum
Estimated Construction Cost	$350,000	$847,000	$678,000
Estimated Yearly Operation Costs	Negligible	$35,000	$42,500

9) RECOMMENDED PLAN

A. Highest Ranked Recommendation

Each technology alternative was evaluated on a scale from 1 (worst) to 10 (best) for each criterion (Table 9-1). The alternative with the highest total score was deemed the most favorable and was included in the preliminary site layout and planning-level opinion of probable construction cost.

1500 County Road 269
Leander, TX 78641

P.O. Box 2029
Leander, TX 78646-2029

Table 9-1. Ranking Criteria

	Criteria						
Rank	Capital Costs	Yearly Operational Costs	Performance	Noise Control	Odor Control	Ease of Operation and Maintenance	Reliability
1 (worst)	≥ $ 2,000,000.00	≥ $ 175,000.00	Poor	Painful/Harmful	Putrid	Very Difficult	Abysmal
2	$ 1,500,000.00	$ 150,000.00					
3	$ 1,000,000.00	$ 125,000.00	Unsatisfactory				Fair
4	$ 900,000.00	$ 100,000.00					
5	$ 800,000.00	$ 80,000.00	Satisfactory	Loud	Unpleasant	Moderate	Average
6	$ 700,000.00	$ 60,000.00					
7	$ 600,000.00	$ 40,000.00					
8	$ 500,000.00	$ 20,000.00	Very Satisfactory				Great
9	$ 350,000.00	$ 10,000.00					
10 (best)	≤ $ 250,000.00	≤ $ 5,000.00	Outstanding	Faint	Neutral	Very Easy	Best

Table 9-2 explains the overall score of screening equipment, with the drum screen having a higher overall score of 54. In terms of capital costs, the bar screen costs $350,000, while the drum screen is priced at $850,000, indicating a higher initial investment for the drum screen. However, the operational costs for both screens (electricity consumption) are estimated to be under $5,000 per year, ranking them equally in this category.

The drum screen outperforms the bar screen in terms of removing smaller solids, earning a higher performance score and reducing the organic loading to the aeration basins. When considering the removal of rags and fibrous materials, the drum screen excels due to its finer screening capabilities, which helps prevent excessive ragging, clogging, and wear in downstream equipment. The bar screen, with its larger spacing, may miss these smaller materials. Noise control is better with the bar screen, as it operates without a continuously running motor, unlike the drum screen. For odor control, the drum screen ranks significantly higher because the wastewater is fully enclosed during the screening process, whereas the bar screen remains open to the atmosphere.

Regarding ease of operation and maintenance, the drum screen is favored due to its fewer moving parts. The drum screen also ranks highly in this category because its operation demands minimal operator attention and is relatively simple. Both screens score well for reliability, with the drum screen slightly ahead as it is less prone to clogging and in its ability to prevent wear in downstream equipment.

Table 9-2. Screening Alternatives Rankings

Screening Alternatives		
Criteria	**Bar Screen**	**Drum Screen**
Capital Costs	9	5
Operational Costs	10	10
Performance	5	9
Noise Control	9	5
Odor Control	3	9
Ease of Operation and Maintenance	7	8
Reliability	7	8
Total Score	**50**	**54**

Table 9-3 presents the results of the disinfection alternatives' rankings, comparing in-line UV, open channel UV, and a chlorination/de-chlorination system. Both in-line UV and chlorine disinfection ranked slightly higher than open channel UV in terms of capital costs. The estimated costs for in-line UV and chlorine disinfection were each slightly below $1,500,000, while chlorine disinfection was estimated to cost $3,750,000 to implement. Operational costs favored open channel UV, with an annual electric consumption of $33,600, significantly lower than the $280,000 for chlorine disinfection and $60,000 for in-line UV.

Performance was high for all three alternatives, although open channel UV ranked slightly lower due to its susceptibility to dead zones and uneven velocity profiles. Noise control was relatively even across the board, with open channel UV and chlorine disinfection ranking slightly lower because of the noise from flowing water. Odor control was best managed by in-line UV, as its equipment is completely enclosed, while chlorine disinfection ranked higher than open channel UV due to the chemical's odor-eliminating properties. In terms of ease of operation and maintenance, chlorine disinfection was the simplest to operate and maintain, lacking the lamps that require constant maintenance in UV systems. Finally, reliability was highest for chlorine disinfection, given its flexible dosing control and well-established, widely available technology. Open channel UV ranked lowest in reliability due to its dependence on the flow's velocity profile. Overall, in-line UV ranked the highest out of the three alternatives at 52.

Table 9-3. Disinfection Alternatives Rankings

Disinfection Alternatives			
Criteria	**In-Line UV**	**Open Channel UV**	**Chlorine**
Capital Costs (Equipment)	2	1	2
Operational Costs	6	7	1
Performance	10	9	10
Noise Control	9	8	8
Odor Control	10	8	9
Ease of Operation and Maintenance	8	7	9
Reliability	7	6	9
Total Score	52	46	48

Table 9-4 presents the ranking results for the sludge thickening alternatives. Gravity thickening ranks best in terms of capital cost, with an estimate of $350,000, while rotary drum thickening and screw press thickening are estimated at $678,000 and $847,000, respectively. Gravity thickening also has the lowest operational costs, as it does not incur polymer consumption costs associated with mechanical thickening. In terms of performance, mechanical thickeners rank higher than gravity thickening because they can reduce sludge volume by up to 90%, whereas gravity thickening achieves only about a 67% reduction.

Gravity thickening ranks highest for noise control due to having fewer moving parts compared to mechanical thickeners. However, it ranks lowest for odor control since it is open to the atmosphere, whereas the other two alternatives are completely enclosed. Gravity thickening is also ranked highest in ease of operation and maintenance due to its simplicity and fewer mechanical components. Reliability is similar across all options, but gravity thickening has a slight edge due to its straightforward design. Overall, gravity thickening achieved the highest score of 56.

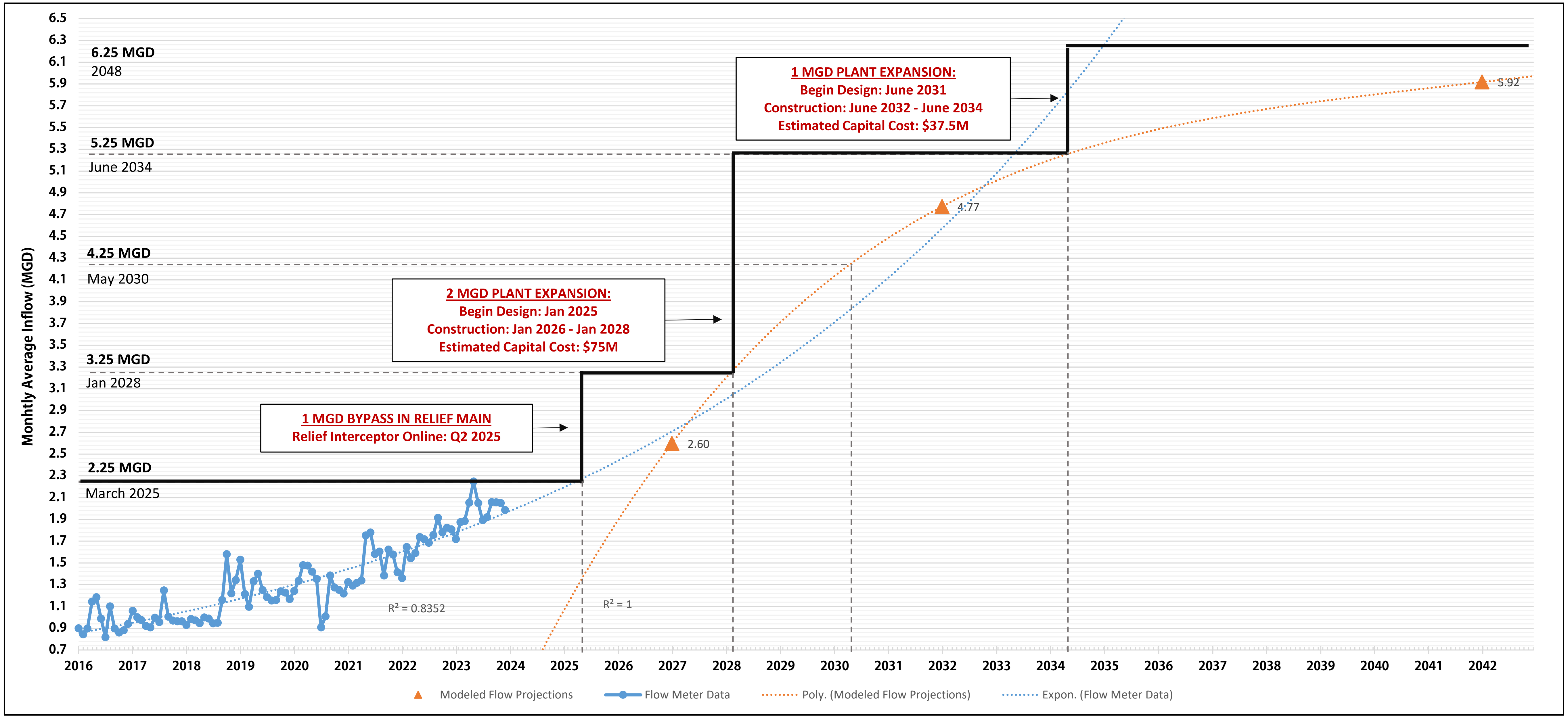
Table 9-4. Sludge Thickening Alternatives Rankings

Sludge Thickening Alternatives			
Criteria	**Gravity**	**Drum**	**Screw**
Capital Costs	9	6	5
Operational Costs	9	6	7
Performance	7	9	9
Noise Control	10	7	8
Odor Control	3	9	9
Ease of Operation and Maintenance	9	7	7
Reliability	9	8	8
Total Score	**56**	**52**	**53**

B. Timing of the Expansion

It is projected that the 2.25 MGD capacity will be reached by March 2025. The bypass relief main to the BCRWWS is planned to be online at this time, with a capacity of up to 2 MGD. Utilizing 1 MGD of this capacity would postpone the need for further expansion until 2028. Therefore, a two-phased approach to the expansion is recommended: a 2 MGD expansion to begin design in 2025 to be online by 2028 for Interim Phase II, followed by an additional 1 MGD expansion to begin design in 2031 for the ultimate phase of the expansion (Figure 9-1).

As noted in Figure 9-1, the design phase for these expansions is estimated to take one year, while construction is expected to require two years. The construction costs shown in the figure were conceptually estimated using a unit cost of $25 per gallon of wastewater treated per day (See Section 9-G for more detailed cost estimates). Additionally, capital costs are projected by adding 30% for soft costs and a 20% contingency to the construction costs.



- *Design Phase = 1 year*
- *Construction Phase = 2 years*
- *Estimated Construction Cost = $25/gpd*
- *Estimated Capital Cost = Estimated Construction Cost + 30% Soft Costs + 20% Contingency*

Figure 9-1: Timing of the RM 2243 WWTP Expansion

C. Proposed Site Layout

The proposed site layout is illustrated in Figure 9-2, with the associated dimensions detailed in Table 9-1. This layout includes new treatment trains, which are similar to the existing ones, and features the highest-ranked equipment as well as the lower ranked alternatives. The new treatment plant is proposed to be located south of the existing plant, currently the site of the Leander Police Department gun range. The site layout was developed with the assumption that the gun range, PEECO plant, and the racetrack plant would be decommissioned. The gun range must be decommissioned before constructing the new treatment plant, while the old treatment units currently being used for sludge processing would be decommissioned once the new treatment plant solids processing units are operational.

Units required for the Interim II phase (4.25 MGD) are highlighted in blue, units for the ultimate phase (5.25 MGD), including a third treatment train and a fourth filter, are shown in green, and the alternative equipment is shown in pink (Figure 9-2). The lower ranked alternatives for sludge thickening, the rotary drum and screw press thickener, both require a shelter. If implemented, the proposed location is within the existing sludge dewatering building, in the space designated for a third dewatering unit. The third dewatering unit is proposed for redundancy and is not required.

The current phase of expansion involves directing up to 2.25 MGD of flows to the existing treatment plant, with any excess flow (up to 2.0 MGD) diverted to the BCRWWS. In the Interim II phase, a 2.0 MGD plant will be constructed, maintaining the 2.25 MGD flow to the existing plant while directing up to 2.0 MGD to the new treatment plant. The final/ultimate expansion phase involves constructing the third treatment train at the new plant, with up to 2.25 MGD flowing to the existing plant and up to 3.0 MGD directed to the new plant.

Refer to Figure 7-2, the expanded plant model, for a process flow diagram of the overall plant. All of the raw influent from the master lift station will pass through the new rotary drum screens. From there, up to 2.25 MGD will be diverted to the existing treatment plant, while the remaining flow—up to 2.0 MGD for Interim II and up to 3.0 MGD for the ultimate phase—will be directed to the new treatment plant. The flow schematic mirrors that of the existing plant, with the exception that wasting will occur from all three clarifiers in the new plant, whereas the existing plant wastes from only one of its two clarifiers. Both treatment plant flows will converge before the in-line UV units prior to the outfall.

Table 9-5. Proposed 3.0 MGD Phased Wastewater Treatment Plant

Treatment Unit Type	Number of Units	Dimensions (L x W x D)
Rotary Drum Screens	3	16' x 7.5 ' x 6.7'
Grit Basin	1	20' x 20' x 22'
Rapid Mix / Anoxic Basin	1	70' x 25' x 22'
Anaerobic Basins	3	58' x 15' x 22'
Aeration Basins	3	58' x 18' x 22'
Clarifiers	3	58'x 58' x 16'
Disc Filters	4	24' x12' x10'
UV Disinfection	3	20" In-Line UV Units
WAS Lift Station	1	0.1 MGD Firm Capacity
Pre-Mix	1	36 x 20' x 22'
Sludge Thickener	1	35' x 35' x 22'
Digesters	2	6450 SF, 22' Depth 1.05 MG
Operations Center	1	6,000 SF

City of Leander

GBA

0 0.01 0.01 Miles

RM2243 Facilities Master Plan

July 2024

Preliminary Site Layout Exhibit

Facility map depicting the preliminary site layout drafted by GBA.

City of Leander RM2243 WWTP
10201 Ranch to Market Road 2243
Leander, Williamson County, TX

Filepath: G:\15393.02\GIS\RM2243_WWTP\RM2243_WWTP.aprx User: preddehase

D. Hydraulic Analysis (Proposed Plant)

A hydraulic analysis was conducted for the expanded plant using the ultimate design flow rate of 3.0 MGD and a peaking factor of 3. This analysis of the expanded plant was important to ensure successful integration with the existing treatment plant, confirming that flow from the new plant can effectively transition to the new plant and merge for UV disinfection. The total head loss through each element was calculated using specific design criteria and relevant calculations for weirs, channels, and pipes. The upstream and downstream water surface elevations for each unit are shown in Table 9-6, along with the available freeboard, the distance between the water surface and the top of wall at peak flow conditions. The new treatment plant is positioned higher than the existing, to allow gravity flow from the drum screen effluent to the existing treatment plant, providing an additional foot of head.

Table 9-6: Hydraulic Grade Line of Proposed 3.0 MGD Phased WWTP

Element	**Upstream WS Elev. (AMSL)**	**Downstream WS Elev. (AMSL)**	**Head Loss Through Element (ft)**	**Slab Elevation (AMSL)**	**Depth of Water (ft)**	**Top of Wall (AMSL)**	**Wall Height (ft)**	**Freeboard (ft)**
Drum Screen	956.14	955.64	0.500	-	-	-	-	-
Grit Basin	955.64	955.15	0.486	936.00	19.64	958.00	22.00	2.36
Rapid Mix Basin	955.15	954.66	0.495	935.00	20.15	957.00	22.00	1.85
Anaerobic / Aeration Basins	954.66	954.16	0.495	935.00	19.66	957.00	22.00	2.34
Mixed Liquor Basin	954.16	953.66	0.500	940.00	14.16	956.00	16.00	1.84
Clarifier	953.66	952.78	0.879	940.00	13.66	956.00	16.00	2.34
Filters	952.78	949.04	3.742	-	-	-	-	-
In-Line UV	949.04	946.29	2.746	-	-	-	-	-
Outfall Piping	930.29	928.25	2.044	-	-	-	-	-
Existing Plant Bar Screen Channel	*954.23*	*953.81*	*0.419*	*953.00*	*1.23*	*957.00*	*4.00*	*2.77*

E. Preliminary Process and Instrumentation

Table 9-7 provides a list of essential processes at both the existing and proposed wastewater treatment plants that are recommended for monitoring. These processes are crucial for the proper functioning of the facility to ensure compliance with permit limitations.

Table 9-7: Preliminary Process and Instrumentation List

Equipment	Process/Instrumentation Monitoring
Influent Lift Station	
Control Panel	Wet well level, high-level alarm, pump fail alarm, pump over-temp alarm, pump seal failure alarm
Headworks	
Drum Screen	General alarm
Air Supply	
Heat Exchanger	High temperature alarm
Coarse Air Blowers	General alarm, low pressure alarm
Fine Air Bubble Blowers	General alarm, low pressure alarm
Clarifier	
Control Panel	General alarm, high torque alarm
RAS Flow Metering	Instantaneous rate and totalized flow
Filters	
Control Panel	General alarm
Flow Metering	
Influent Lift Station	Bypass instantaneous flow rate and totalized flow, plant instantaneous rate and totalized flow
Headworks	Instantaneous and totalized flow
Treatment Train	Instantaneous and totalized flow
Effluent	Instantaneous and totalized flow
UV	
Control Panel	Lamp failure alarm, UV intensity, lamp status, high temperature alarm
Emergency Power Generation	
Genset Control Panel	General alarm
Automatic Transfer Switch	Power failure, emergency power
Chemical Feed	
Alum Pump Control Panel	Treatment train instantaneous flow rate
Non-Potable System	
Diversion Flow Meter	Instantaneous and totalized flow
Chlorine Analyzer	Chlorine residual
Sodium Hypochlorite Pump Control Panel	Chlorine residual

Transfer Station	Wet well level, high-level alarm, pump fail alarm, pump over-temp alarm, pump seal failure alarm
Ground Storage Tank	High level, low level, SCADA monitoring of tank level
High Service Pump Station	Low clearwell level, pump fail alarm, pump over-temp alarm, inlet pressure, outlet pressure, pump control valve position
Hydrotank	Level sensor
WAS Lift Station	
Control Panel	Wet well level, high-level alarm, pump fail alarm, pump over-temp alarm, pump seal failure alarm
WAS Flow Metering	Totalized flow
Sludge Dewatering	
Screw Press Control Panel	General alarm
Level Lodor Control Panel	Full roll-off signal

F. Emergency Power Resources

The Leander RM 2243 WWTP Facilities Plan Emergency Power Evaluation conducted by GBA determined that the equipment requiring emergency power is situated in two areas approximately 400 feet apart (See Appendix L for a list of emergency loads). To ensure reliable backup power, it is recommended to install two generators for redundancy and a portable generator tap box for backup power in case of a generator failure. The West side loads include blowers, clarifier drives, and mixers, while the East side loads include chemical feed, non-potable pumps, filters, and master lift station #39. For the West side, a 300 kW, 480 V, 3 Phase diesel generator is recommended, and for the East side, a 500 kW, 480 V, 3 Phase diesel generator is advised for the existing plant, with an option to upsize to a 1000 kW generator to accommodate emergency loads at the new plant (Appendix L). Additionally, the City desires to use Pedernales Electric Cooperative (PEC) on automating the dual-circuit feed on the plant site as well as coordinate circuit capacities to meet facility amperage loads. A manual transfer switch is currently installed between the Block House and Leander substation circuits, providing flexibility and redundancy in power distribution. The City desires to install an automatic transfer switch to further enhance backup power reliability between these circuits. Coordination with PEC during plant expansion will ensure adequate power availability for both circuits to support the plant's full operational capacity.

G. Planning-Level OPCC

Two planning-level Opinions of Probable Construction Cost were prepared, one for Interim II (4.25 MGD) and one for ultimate (5.25 MGD) (refer to Tables 9-8 and 9-9). Cost estimates were generated utilizing inflation-adjusted costs from other regional projects, and quotes from manufacturers.

Table 9-8: Planning Level OPCC for Interim II Expansion

ITEM	DESCRIPTION	QTY.	UNIT	UNIT PRICE		CONTRACT TOTAL	
PLANNING LEVEL ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST FOR INTERIM II							
EROSION CONTROL							
1	SILT FENCE, ROCK BERM, STABILIZED CONSTRUCTION ENTRANCE, REVEGETATION, CONCRETE WASHOUT AREA, SWPP, ETC.	1	LS	0.01% of WWTP Expansion		$	50,000.00
				EROSION CONTROLS SUBTOTAL		**$**	**50,000.00**
ITEM	**DESCRIPTION**	**QTY.**	**UNIT**	**UNIT PRICE**		**CONTRACT TOTAL**	
FILL & DEMOLITION							
2	Waiting on Kenley's Response						
3	Waiting on Kenley's Response						
				DEMOLITION SUBTOTAL			**$0.00**
ITEM	**DESCRIPTION**	**QTY.**	**UNIT**	**UNIT PRICE**		**CONTRACT TOTAL**	
WWTP EXPANSION							
4	WWTP INCLUDING FOUNDATIONS, SLABS, YARD PIPING, ADDITIONAL 2 MGD TREATMENT TRAINS (ANOXIC BASINS, AERATION BASINS, CLARIFIERS, FILTERS, SLUDGE DIGESTION, SLUDGE HOLDING BASINS) TREATMENT EQUIPMENT, CHEMICAL FEED PUMPS, ELECTRICAL CONTROLS, ANCILLARY SYSTEMS AND APPURTENANCES (EXCLUDES ITEMS 3-5)	2,000,000	GAL	$	25.00	$	50,000,000.00
5A	IN-LINE UV DISINFECTION SYSTEM	1	LS	$	1,405,000.00	$	1,405,000.00
6A	DRUM SCREENS (INCLUDES MANUAL BAR SCREEN)	1	LS	$	590,000.00	$	590,000.00
7A	GRAVITY THICKENER SYSTEM	1	LS	$	350,000.00	$	350,000.00
8	OPERATIONS BUILDING (INCLUDES PARKING LOT/DRIVEWAY, UTILITES, FOUNDATION, ALL APPURTENANCES ETC.)	6,000	SF	$	115.00	$	690,000.00
9	WAS LIFT STATION (0.1 MGD)	1	LS	$	360,000.00	$	360,000.00
10	EMERGENCY GENERATOR - EAST (500 KW) w/ SLAB	1	LS	$	412,000.00	$	412,000.00
11	EMERGENCY GENERATOR - WEST (1000 KW) w/ SLAB	1	LS	$	787,000.00	$	787,000.00
				WWTP EXPANSION SUBTOTAL		**$**	**54,594,000.00**
				ENGR/SURVEY (20%)		$	10,928,800.00
				CONTINGENCIES (30%)		$	16,393,200.00
				GRAND TOTAL		**$**	**81,966,000.00**

ITEM	DESCRIPTION	QTY.	UNIT	UNIT PRICE		CONTRACT TOTAL	
ALTERNATIVE EQUIPMENT/TECHNOLOGY							
5B	CHLORINE DISINFECTION SYSTEM (2 MGD)	1	LS	$	934,000.00	$	934,000.00
5C	OPEN CHANNEL UV SYSTEM (4.25 MGD)	1	LS	$	3,414,000.00	$	3,414,000.00
6B	BAR SCREENS (INCLUDES MANUAL BAR SCREEN AND WASHER/COMPACTOR)	1	LS	$	350,000.00	$	350,000.00
7B	DRUM THICKENER SYSTEM	1	LS	$	678,000.00	$	678,000.00
7C	SCREW THICKENER SYSTEM	1	LS	$	847,000.00	$	847,000.00

NOTE: THE ABOVE PRELIMINARY "OPINION OF PROBABLE CONSTRUCTION COST" IS MADE BY AN ENGINEER, NOT A PROFESSIONAL CONSTRUCTION ESTIMATOR. THE ACCURACY OF CONSTRUCTION COSTS CANNOT BE GUARANTEED.

Table 9-9: Planning Level OPCC for Ultimate Expansion

PLANNING LEVEL ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST ULTIMATE						
ITEM	**DESCRIPTION**	**QTY.**	**UNIT**	**UNIT PRICE**		**CONTRACT TOTAL**
EROSION CONTROL						
1	SILT FENCE, ROCK BERM, STABILIZED CONSTRUCTION ENTRANCE, REVEGETATION, CONCRETE WASHOUT AREA, SWPP, ETC.	1	LS	0.01% of WWTP Expansion	$	22,000.00
				EROSION CONTROLS SUBTOTAL	**$**	**22,000.00**
ITEM	**DESCRIPTION**	**QTY.**	**UNIT**	**UNIT PRICE**		**CONTRACT TOTAL**
WWTP EXPANSION						
2	WWTP INCLUDING FOUNDATIONS, SLABS, YARD PIPING, ADDITIONAL 1 MGD TREATMENT TRAINS (ANOXIC BASINS, AERATION BASINS, CLARIFIERS, FILTERS) TREATMENT EQUIPMENT, CHEMICAL FEED PUMPS, ELECTRICAL CONTROLS, ANCILLARY SYSTEMS AND APPURTENANCES	1,000,000	GAL	$ 22.00	$	22,000,000.00
				WWTP EXPANSION SUBTOTAL	**$**	**22,000,000.00**
				ENGR/SURVEY (20%)	$	4,404,400.00
				CONTINGENCIES (30%)	$	6,606,600.00
				GRAND TOTAL	**$**	**33,033,000.00**
ITEM	**DESCRIPTION**	**QTY.**	**UNIT**	**UNIT PRICE**		**CONTRACT TOTAL**
ALTERNATIVE EQUIPMENT/TECHNOLOGY						
5B	CHLORINE DISINFECTION SYSTEM (1 MGD)	1	LS	$ 467,000.00	$	467,000.00
5C	OPEN CHANNEL UV (1 MGD)	1	LS	$ 608,200.00	$	608,200.00

NOTE: THE ABOVE PRELIMINARY "OPINION OF PROBABLE CONSTRUCTION COST" IS MADE BY AN ENGINEER, NOT A PROFESSIONAL CONSTRUCTION ESTIMATOR. THE ACCURACY OF CONSTRUCTION COSTS CANNOT BE GUARANTEED.

H. Conclusion

This facility plan addressed the critical need to expand the Leander wastewater treatment plant (WWTP) to accommodate projected population growth and provide specific process enhancements to screening, liquid stream treatment, disinfection, and sludge thickening processes. The current capacity of 2.25 million gallons per day (MGD) will be increased to 5.25 MGD through a two-phased expansion plan. The first phase, Interim II, increases the AADF capacity from 2.25 MGD to 4.25 MGD by 2028, while the final phase would accommodate an ultimate AADF of 5.25 MGD by 2033, both phases have a peaking factor of 3.

The wastewater treatment plant model identified potential issues with nitrification and inconsistent alkalinity levels. Although the plant meets current discharge limits, further testing is recommended to confirm these findings and explore ways to improve nitrification and overall treatment efficiency. This may involve collecting more internal process data and analyzing factors such as dissolved oxygen levels and mixing within the treatment plant.

After evaluating alternative technologies for screening, disinfection, and sludge thickening, the most suitable and cost-effective technologies were selected. Rotary drums screens were recommended for screening, in-line UV disinfection for disinfection, and a gravity thickener for sludge thickening. A process flow diagram, hydraulic profile, and a preliminary process and instrumentation equipment list were developed based on the selected technologies. A planning-level opinion of probable construction cost (OPCC) was developed for both phases of the expansion and includes the technologies that were not selected as alternatives.

I. Recommendations

The following recommendations are made to accommodate projected growth, optimize the plant's performance, and ensure compliance with permit limits:

- Capacity Expansion
  - Adopt a two-phased approach to expanding the plant's capacity
    - Phase 1 (Interim Phase II): Begin design of 2 MGD expansion, including two new treatment trains and the proposed equipment upgrades in 2025 to increase capacity from 2.25 to 4.25 MGD by 2028
      - Treatment trains include a rapid mix/anoxic basin, anaerobic basins, aeration basins, clarifiers, and disc filters
      - Equipment upgrades include rotary drum screens, in-line UV disinfection, and a gravity sludge thickener
      - Additional upgrades to be completed in Phase 1 include an operations center, a WAS lift station, a sludge pre-mix basin, and aerobic digestors
    - Phase 2 (Ultimate Phase): Begin design in 2031 for the final 1 MGD treatment train, to reach a total capacity of 5.25 MGD by 2034

- Testing and Data Collection
    - Implement regular testing of internal processes to gather more consistent and extensive data
    - Further refinement of GPS-X wastewater plant model for facility expansion design
- Equipment Upgrades
    - Implement rotary drum screens to reduce organic loading, as the existing aeration basins exceed organic loading requirements
    - Install in-line UV disinfection for greater disinfection efficiency and simplicity
    - Implement a gravity sludge thickener to enhance sludge management efficiency
- Emergency Power Generation
    - Install two generators to supply emergency power to the existing plant
        - A 300 kW for the loads on the west side of the plant site
        - A 500 kW for the loads on the east side of the plant site
    - Replace/upsize the generator for the west loads to a 1000 kW to provide emergency power to the new plant loads
    - Work with PEC to get an automatic transfer switch installed between the Leander and Block House circuits
- Facility Plan Updates
    - Ensure the facility plan is updated concurrently with plant expansions to reflect current operational needs and capacities
    - Review and/or update the facility plan every five years, or more frequently as needed, to effectively anticipate and accommodate future growth and operational requirements

Appendix A: Correspondence with TCEQ

Paige Reddehase

From: Josi Robertson <Josi.Robertson@tceq.texas.gov>
Sent: Friday, January 12, 2024 10:47 AM
To: Frank Phelan; Paige Reddehase
Subject: {External} City of Leander TPDES permit 12644-001 renewal

Hello,

I'm one of the technical staff who has looked into your inquiry about the City of Leander's TPDES permit (12644-001) limits changing upon next renewal.

Typically, effluent limits for renewal application do not change unless something drastic has changed regarding the downstream waterbodies.
That is not the case in this situation and so you should expect that the existing effluent limits would still apply.

Sincerely,

Josi Robertson
Water Quality Assessment Team
Texas Commission on Environmental Quality
MC-150
P.O. Box 13087
Austin, Texas 78711-3087
josi.robertson@tceq.texas.gov

Appendix B: BCRWWS Flow Projections Memorandum

MEMORANDUM

To: City of Leander, TX

From: GBA

Date: 11/1/2023

Subject: PWWF Projections to Brushy Creek Regional Wastewater System (BCRWWS)

Purpose

This memorandum provides preliminary projections of the peak dry weather flows (PDWF) and peak wet weather flows (PWWF) estimated to be conveyed to BCRWWS from the City of Leander (City).

Background

On behalf of BCRWWS, K Friese and Associates (KFA) requested projections of flow to be conveyed to BCRWWS from the City of Leander as part of a master planning project for the regional system. KFA requested projections of peak dry weather flows (PDWF) and peak wet weather flows (PWWF) for the time horizons of 2030, 2040 and 2070 from each of the BCRWWS partner cities (Austin, Cedar Park, Leander, and Round Rock). The City has retained GBA to assist in developing the preliminary PDWF and PWWF projections requested by BCRWWS.

Projections

Projections of PDWF were developed using the design criteria equations found in the Austin Utilities Criteria Manual (UCM). This involved calculating a peaking factor and utilizing the average daily dry weather flow (ADDF) projections previously developed for BCRWWS in July 2023. Table 1 shows the design criteria equations used to calculate the peaking factor. Table 2 shows the values used to calculate the PDWF.

Table 1: Design Criteria Equations (Austin UCM)

Criteria	Value
Peaking Factor (PF)	$PF = \dfrac{18 + \sqrt{0.0206 * ADDF}}{4 + \sqrt{0.0206 * ADDF}}$
Peak Dry Weather Flow (PDWF)	PDWF = ADDF * PF

Table 2: PDWF Projections from City of Leander

Time Horizon	ADDF (MGD)	Peaking Factor	PDWF (MGD)
2023	2.1	2.5	5.3
2030	4.0	2.2	8.8
2040	4.2	2.2	9.2
2070	4.2	2.2	9.2

Projections of PWWF were developed by using the inflow and infiltration (I/I) estimation method required by BCRWWS. This method involved establishing a sanitary sewer service area for each time horizon, which was then used to estimate I/I by assuming 800 gallons per day per acre (gpd/ac) of service area. The resulting I/I flow estimate was then summed with the PDWF to estimate PWWF for each time horizon.

To determine future service areas, GBA compiled data on the existing service area and projected developments. First, GBA established the existing Brushy Creek Basin service area within Leander city limits using Leander GIS data and aerial imagery. Then GBA generated 2030 and 2040 growth areas using information from previous Leander Wastewater Master Plans, CIP projects, and information from the City. GBA projected that the Leander Brushy Creek Service Area will be at complete build out by 2070 based on population projections provided by the City. Please see Figure 1, which provides a map of the approximate BCRWWS service areas within Leander city limits at each time horizon.

After determining an estimated Brushy Creek Basin service area for each time horizon, the determined acreages were used to estimate the I/I. Using the 800 gpd/ac assumption chosen by BCRWWS, a value for PWWF was calculated. Table 3 shows the design criteria used to calculate I/I. Table 4 shows the values used to calculate the PWWF.

Table 3: Design Criteria

Criteria	Value
Inflow and Infiltration (I/I)	800 gpd/acre
Peak Wet Weather Flow (PWWF)	PWWF = PDWF + I/I

Table 4: PWWF Projections from City of Leander to BCRWWS

Time Horizon	PDWF (MGD)	Service Area (acre)	I/I (MGD)	PWWF (MGD)
2023	5.3	3,861	3.1	8.3
2030	8.8	5,896	4.7	13.5
2040	9.2	7,082	5.7	14.9
2070	9.2	10,152	8.1	17.4

A diversion structure at the RM2243 WWTP has been designed to convey up to 2 MGD of untreated flow to BCRWWS in the future. Therefore, in addition to the existing flows from the City's Brushy Creek sewer basin, it was assumed the City would send the maximum diversion capacity of 2 MGD from the RM2243 plant to BCRWWS during peak wet weather events via the diversion structure soon to be constructed. Diversion of flow from RM2243 to BCRWWS will be utilized during both dry weather and wet weather events but the estimates provided here assume an estimated average contribution of 2 MGD during wet weather.

Projections provided to BCRWWS are as follows:

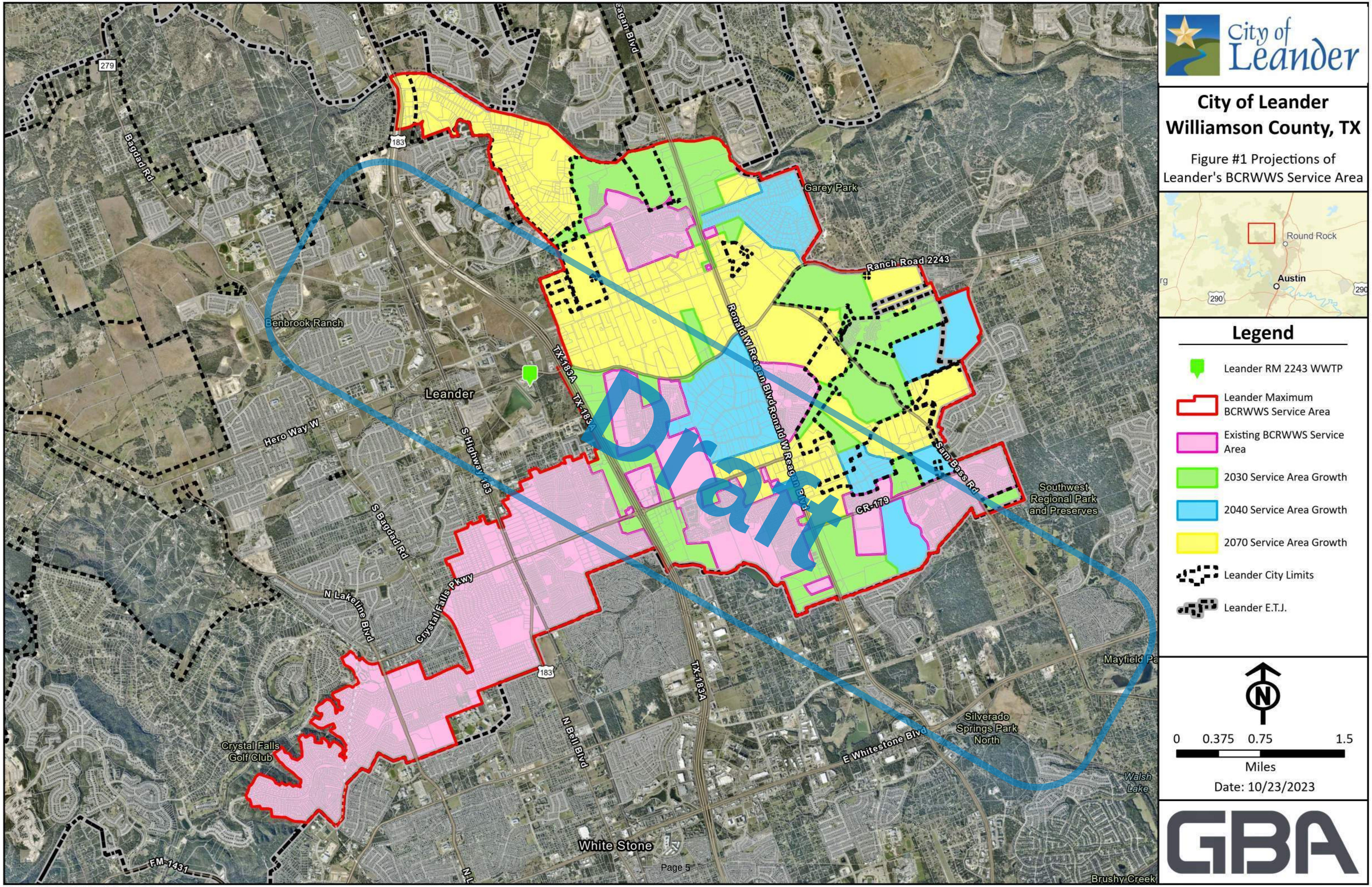
Table 5. PWWF Projections from City of Leander

Time Horizon	Total PWWF to BCRWWS, Estimated (MGD)	PWWF with additional 2 MGD from RM2243 WWTP (MGD)
2023	8.3	10.3
2030	13.5	15.5
2040	14.9	16.9
2070	17.4	19.4

Attachments:

Figure 1. Map of Projections of Leander's BCRWWS Service Area

(Please see next page)



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Appendix C: Population Projections Provided by City

Paige Reddehase

From: Robin Griffin <rgriffin@leandertx.gov>
Sent: Thursday, October 12, 2023 10:56 AM
To: Ethan Voyles; Sarvesh Dhakal; Ashish Pant; Gina Ellison; Kenley Crowder
Cc: Emily Truman; Frank Phelan; Kate Johnson; Victor Ibarra; Paige Reddehase; Ricki Kuvach
Subject: {External} RE: Growth Assumptions for Wastewater Planning
Attachments: Population Estimate 2023 updated 10.10.2023.xlsx; Residential Development Map 8.17.2023.pdf; Future Land Use 10.12.2021.pdf

Follow Up Flag: Follow up
Flag Status: Flagged

WARNING: The sender of this email could not be validated and may not match the person in the ""From"" field.

CAUTION: This email originated from outside the organization. Do not click or open attachments unless you recognize the sender and know the content is safe.

Hi Ethan,

I apologize for the delay, please see attached and my responses below. Please let me know if I am missing anything.

- Population Projections (citywide)
  - Reviewed population growth projections table from Feb 2023 draft of Water CIP (KFA)
  - 2022 population shown in this table was higher than the City expected
  - City will share an updated table of population projections to ensure alignment with other planning efforts **Attached**
  - Buildout population listed in this table comes from Comprehensive Plan and Water Board **Here is a link to the Comprehensive Plan: https://www.leandertx.gov/planning/page/2020-leander-comprehensive-plan. Chapter 2, Page 22 (PDF page 29) includes the demographics**
- Time Horizons to be used for Collection System Master Plan:
  - Current: 2023
  - 5-yr: 2028
  - 10-yr: 2033
  - 20-yr: 2043
- Planned Developments
  - City will provide an updated map, as well as a link to a recently launched dashboard **Here is a link to the Dashboard: https://www.leandertx.gov/planning/page/current-developments. I have also attached the Residential Development Map.**
  - City said it makes sense to use these known developments to create projections for the 5 year time horizon
- Future Land Use Map
  - Most recent future land use map is found in the Comp Plan, updated in 2021 **Attached**
  - City is preparing to update this map in next couple months
  - City will provide notes on upcoming revisions to future land use map before a draft is finalized so GBA can maintain forward progress. **We are still working on the draft. The goal is to reduce the amount of residential encouraged in centers.**
- LUE per Acre Density Estimates
  - City will provide estimates recently used for residential densities
- Average Daily Flow (gpd) per LUE and Persons per LUE

- 200 gpd/LUE has been used for capacity sizing on past projects such as the Benbrook Interceptor
- City is comfortable with using 200 gpd/LUE, but would like to verify this estimate against available flow meter data
- GBA will compare 200 gpd/LUE estimate against available flow data from 2022 flow monitoring
- 3.28 persons per household is the average from the most recent census
- Based on census, City is comfortable assuming approximately 3.28 persons per LUE

- Septic Areas
  - Falcon Oaks (on FY23-24 CIP)
    - As part of an annexation agreement, City is installing wastewater lines in this neighborhood but is not requiring connection to City sewer
    - If residents would like to switch to City sewer service, they would need to pay impact fee
    - Project is under construction now and approximately 70% complete
    - There is growing interest in redevelopment of some lots and if redevelopment takes place, they would likely switch to City sewer service at that time
    - The exact number of lots that will switch to City sewer service is unknown and could be spread out over a number of years
  - Update: 9/29/23 Call to discuss septic areas with Sarvesh and Ashish:
    - Assume connection to City sewer by the 10 year time horizon: Falcon Oaks, Greatwood and Greatwood South, Whitt Ranch (plan to serve northwest area within 10 years)
    - Assume connection to City sewer by the 20 year time horizon: Grand Mesa, Ridgmar Landing, Valley View, Reagans Overlook, unplatted areas outside City Limits (ex: area just north of Grand Mesa)
- Next Steps:
  - After receiving more info from City, GBA will develop growth projections for each time horizon and send to City for review and comment; we will then meet again to discuss, if needed
  - GBA will use growth projections to inform the area estimates necessary for the BCRWWS Peak Wet Weather flow projections

Please do not hesitate to contact me if you have any questions.

Thanks,

Robin M. Griffin, AICP

Executive Director of Development Services | City of Leander
PO Box 319, Leander TX 78641
512-528-2763 | rgriffin@leandertx.gov

From: Ethan Voyles <evoyles@gbateam.com>
Sent: Friday, September 29, 2023 10:08 AM
To: Sarvesh Dhakal <SDhakal@leandertx.gov>; Ashish Pant <APant@leandertx.gov>; Gina Ellison <gellison@leandertx.gov>; Robin Griffin <rgriffin@leandertx.gov>; Kenley Crowder <kcrowder@leandertx.gov>
Cc: Emily Truman <ETruman@leandertx.gov>; Frank Phelan <fphelan@gbateam.com>; Kate Johnson <kjohnson@gbateam.com>; Victor Ibarra <vibarra@gbateam.com>; Paige Reddehase <preddehase@gbateam.com>; Ricki Kuvach <rkuvach@gbateam.com>
Subject: Growth Assumptions for Wastewater Planning

Hello all,

Thank you again for your time last Friday (9/22) as we discussed growth assumptions to be used for wastewater planning efforts. Below is a summary of main takeaways from the meeting. Action items are highlighted blue.

- Population Projections (citywide)
  - Reviewed population growth projections table from Feb 2023 draft of Water CIP (KFA)
  - 2022 population shown in this table was higher than the City expected
  - City will share an updated table of population projections to ensure alignment with other planning efforts
  - Buildout population listed in this table comes from Comprehensive Plan and Water Board
- Time Horizons to be used for Collection System Master Plan:
  - Current: 2023
  - 5-yr: 2028
  - 10-yr: 2033
  - 20-yr: 2043
- Planned Developments
  - City will provide an updated map, as well as a link to a recently launched dashboard
  - City said it makes sense to use these known developments to create projections for the 5 year time horizon
- Future Land Use Map
  - Most recent future land use map is found in the Comp Plan, updated in 2021
  - City is preparing to update this map in next couple months
  - City will provide notes on upcoming revisions to future land use map before a draft is finalized so GBA can maintain forward progress
- LUE per Acre Density Estimates
  - City will provide estimates recently used for residential densities
- Average Daily Flow (gpd) per LUE and Persons per LUE
  - 200 gpd/LUE has been used for capacity sizing on past projects such as the Benbrook Interceptor
  - City is comfortable with using 200 gpd/LUE, but would like to verify this estimate against available flow meter data
  - GBA will compare 200 gpd/LUE estimate against available flow data from 2022 flow monitoring
  - 3.28 persons per household is the average from the most recent census
  - Based on census, City is comfortable assuming approximately 3.28 persons per LUE
- Septic Areas
  - Falcon Oaks (on FY23-24 CIP)
    - As part of an annexation agreement, City is installing wastewater lines in this neighborhood but is not requiring connection to City sewer
    - If residents would like to switch to City sewer service, they would need to pay impact fee
    - Project is under construction now and approximately 70% complete
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    - The exact number of lots that will switch to City sewer service is unknown and could be spread out over a number of years
  - Update: 9/29/23 Call to discuss septic areas with Sarvesh and Ashish:
    - Assume connection to City sewer by the <u>10</u> year time horizon: Falcon Oaks, Greatwood and Greatwood South, Whitt Ranch (plan to serve northwest area within 10 years)
    - Assume connection to City sewer by the <u>20</u> year time horizon: Grand Mesa, Ridgmar Landing, Valley View, Reagans Overlook, unplatted areas outside City Limits (ex: area just north of Grand Mesa)
- Next Steps:

- After receiving more info from City, GBA will develop growth projections for each time horizon and send to City for review and comment; we will then meet again to discuss, if needed
- GBA will use growth projections to inform the area estimates necessary for the BCRWWS Peak Wet Weather flow projections

Please let us know if you have any questions or additions to the summary above.

Thank you,
Ethan

Ethan Voyles PE*, PMP (he/him) Senior Engineer | Water Environment Group
9801 Renner Boulevard | Lenexa, Kansas
d 913.577.8429
*Licensed in Kansas, Missouri

CITY OF LEANDER - MODIFIED POPULATION AND WATER DEMAND PROJECTIONS

Population/Connections/LUEs							Internal Leander Demand			Total Leander Demand with Wholesale		
End of Year		No. of Domestic Units	Population	No. of Water Connections	Connection Growth Rate	No. of LUEs	Average Day Internal Leander Demand (MGD)	Max Day Internal Leander Demand (MGD)	Average Flow per Person per Day (gpcd)	Total Wholesale Contracts - Max Day Demand (MGD)	Average Day Demand with Wholesale (MGD)	Max Day Demand with Wholesale (MGD)
2015	Historical	12,922	43,418	13,092		15,449	4.75	11.90	109.46	0.00	4.75	11.90
2016		14,729	49,489	14,703	12.3%	17,350	5.50	11.50	111.19	0.00	5.50	11.50
2017		15,279	51,337	16,463	12.0%	19,426	6.16	10.90	119.90	0.00	6.16	10.90
2018		16,217	54,489	18,063	9.7%	21,314	6.89	12.42	126.41	0.32	7.05	12.74
2019		18,156	59,552	19,887	10.1%	23,467	7.87	14.94	132.10	0.35	8.16	15.29
2020		20,945	68,700	22,971	15.5%	27,106	9.77	17.63	142.20	0.52	9.49	16.79
2021		24,014	78,766	26,026	13.3%	30,711	8.34	14.44	105.88	0.64	8.66	14.74
2022		26,443	86,733	28,548	9.7%	33,687	10.00	17.77	115.30	3.43	11.01	20.46
2023		28,725	94,218	30,179	5.7%	35,611	10.54	17.26	111.87	2.69	11.37	18.74
2024	Projected	31,598	103,640	33,197	10.0%	39,172	13.28	24.90	128.12	4.00	15.41	28.90
2025		34,757	114,004	36,517	10.0%	43,090	14.61	27.39	128.12	4.00	16.74	31.39
2026		37,364	122,554	39,255	7.5%	46,321	15.70	29.44	128.12	4.00	17.84	33.44
2027		40,166	131,746	42,199	7.5%	49,795	16.88	31.65	128.12	4.00	19.01	35.65
2028		43,179	141,627	45,364	7.5%	53,530	18.15	34.02	128.12	4.00	20.28	38.02
2029		45,338	148,708	47,633	5.0%	56,207	19.05	35.72	128.12	1.00	19.59	36.72
2030		47,605	156,143	50,014	5.0%	59,017	20.01	37.51	128.12	1.00	20.54	38.51
2031		49,985	163,950	52,515	5.0%	61,968	21.01	39.39	128.12	1.00	21.54	40.39
2032		51,484	168,869	54,090	3.0%	63,827	21.64	40.57	128.12	1.00	22.17	41.57
2033		53,029	173,935	55,713	3.0%	65,742	22.29	41.78	128.12	1.00	22.82	42.78
2034		54,620	179,153	57,385	3.0%	67,714	22.95	43.04	128.12	1.00	23.49	44.04
2035		56,258	184,528	59,106	3.0%	69,745	23.64	44.33	128.12	1.00	24.18	45.33
2036		57,946	190,063	60,879	3.0%	71,838	24.35	45.66	128.12	1.00	24.89	46.66
2037		59,105	193,865	62,097	2.0%	73,274	24.84	46.57	128.12	1.00	25.37	47.57
2038		60,287	197,742	63,339	2.0%	74,740	25.34	47.50	128.12	1.00	25.87	48.50
2039		61,493	201,697	64,606	2.0%	76,235	25.84	48.45	128.12	1.00	26.38	49.45
2040		62,108	203,714	65,252	1.0%	76,997	26.10	48.94	128.12	1.00	26.63	49.94
2041		62,729	205,751	65,904	1.0%	77,767	26.36	49.43	128.12	1.00	26.90	50.43
2042		63,356	207,808	66,563	1.0%	78,545	26.63	49.92	128.12	1.00	27.16	50.92

1. Population = 3.28 people/Domestic Unit for 2019 and beyond, and 3.36 before 2019
2. No. of LUEs = 1.18 x No. of Water Connections (based on 2020 review of actual connections/meters)
3. Assume Average Day Demand = 400 gpd/Connection (~340 gpd/LUE)
4. Max Day Demand = 750 gpd/Connection (~635 gpd/LUE)
5. For population and water projections, utilizing a modified growth rate that is more aggressive than Comp Plan, updated for 2023
6. Projections are based on demands with no watering restrictions, impacts of new irrigation and tiered rate ordinances are not factored in currently, pending data
7. Assume buildout of City is 225,000 population
8. 2023 data is extrapolated from the end of September to the end of the year

Appendix D: Facility Mapping Memorandum

9801 Renner Boulevard
Lenexa, KS 66219

MEMORANDUM

To: City of Leander

From: Benjamin Grover

Date: November 7, 2023

Subject: Leander, TX Wastewater Treatment Facility Mapping Technical Memo

Introduction

As part of Phase 2 of the Leander Wastewater Master Plan, a preliminary site utility map was developed within GIS for all underground utility and process lines using historical plant data. The project involved seven project plan sets and CAD base DWGs prepared by JAECO and GBA.

Review of Construction Drawings and As-built Records

GBA acquired and processed the latest CAD .dwg base files and as-built and construction drawing plan set PDFs on file. After review, it was determined that the CAD base file did not include sufficient attribute data for use as a base for the GIS mapping as it lacked line type details, materials, diameters, and elevations, among other details. As a result, the site layout sheets from each contract were the primary source of geometry and attribute data for the utility and process piping. The site layout sheets for several contracts lacked complete piping schematics and/or attribute data. In such cases, additional effort was put forth to investigate detail and building section sheets to locate the necessary pipe geometry and attribute data. These sheets were also used to map piping and other linework near buildings and process structures that did not appear in the site layout sheets.

Creation of 3D above-ground structure representations

The entire facility property was flown by Alynix, a GBA affiliate, using drone technology to acquire imagery and 3D surface/above-ground data. From this, GBA received a 3D CAD drawing populated with z-values for all above-ground structures and surfaces. We were able to use this data to generate 3D representations for most of the existing above-ground structures. These representations are included in the GIS database in a building footprints layer, with 3D properties that can be used to represent the footprint and height of the structures.

Mapping of Construction Drawings and As-built Records in GIS

The facility mapping process involves the creation of points, lines, and polygons within GIS representing the pipes, valves, utilities, and other features present in the construction drawings and as-built records. The process began with georeferencing the drawings and as-built records using existing building and structure corners identifiable in the acquired orthorectified drone imagery, so they were spatially accurate when viewed in GIS. GBA then digitized the identified features in the available documents thereby storing the spatial and attribute data in a geodatabase. The digitization process began with the oldest available documents and proceeded through to the files associated with projects currently under design.

GBA made every effort to collect all available and relevant attribute data present in the construction drawings and as-built records. Many features, like piping, were given a status of active, abandoned, or removed based on the information available in the contract currently being digitized. Piping associated with the contract being digitized was considered to be active unless otherwise noted. The status was updated if more recent contracts included callouts indicating that the pipe was abandoned or removed. This workflow ensures that all pipes, including those marked as "removed", are still present in the database for reference in the event the line is found to have been abandoned instead.

Despite a thorough review of all available records, some data gaps were identified pertaining to unclear or unspecified feature locations and/or attributes within the records. The data gaps primarily involved pipe materials and pipe diameters, valve types, and in some cases type of feature (e.g., valve, handhole, etc) or type of pipe (e.g., sludge, drain, water, etc.). Other data gaps involved inconsistencies in pipe position/location and building positions/locations between contracts. For example, a process line drawn in Contract No. 1 may not match the exact path/routing of the existing (same) line shown in Contract No. 3.

Newer contracts were assumed to contain better surveying accuracy and were used to adjust the location of lines and nodes when discrepancies were identified relative to older contracts. Exceptions were made when critical details appeared in older drawings but were absent or in conflict with more recent contracts. This can happen with features such as pressurized pipes when the older contract denotes a turn/bend composed of two 45-degree bends while the most recent contract denotes a single 90-degree bend. The original detail is included in this case unless a more recent contract includes notes indicating that the original pipe installation was replaced.

Structure and Pipe elevations were included where noted in the as-built drawings, but elevations were not located for every structure point and line that was mapped. In some cases, the feature referenced by a flow line elevation callout was unclear because of congestion in the drawing. In these situations, no elevation was assigned to avoid populating incorrect/erroneous flow line elevation data in the database.

QAQC Process

Throughout the mapping process, periodic QAQC was performed to ensure consistency and accuracy in the resulting database. Once all as-built records and construction drawings were reviewed and mapped the linework was compared to the most current CAD dwg base file. This helped to fill in several routing and/or connectivity data gaps and allowed us to check the completeness of process and utility networks throughout the plant.

Summary

In Summary, the resulting database contains eight GIS layers including:

Process_Piping_LINES

Process_Piping_POINTS

Utility_LINES, Utility_POINTS

Instrumentation_and_Controls_LINES

Instrumentation_and_Controls_POINTS

Building_Footprints

Plant_Boundary

Each point and line layer is divided into subtypes that further define the line/point type (i.e., Water, Gas, Sewer, Chemical, etc.). Each layer record (point and line) contains a unique identifier containing text codes unique to the subtype the record was created in, as well as the as-built/construction drawing project the feature was mapped from complete with the plan set PDF page number. Lines contain upstream and downstream structure ID attribution, in addition to material, diameter, and other details where available. Points contain feature type information such as manhole, tee, valve, valve type, etc.

Appendix E: RM2243 WWTP Flow Data

Appendix C: RM 2243 WWTP Flow Data

Monthly Averages

** all measurements in MGD*

Date	Avg Inflow	Date	Avg Inflow	Date	Avg Inflow	Date	Avg Inflow	Date	Avg Inflow
Jan-16	0.899	Jan-18	0.93	Jan-20	1.242	Jan-22	1.360	Jan-24	2.455
Feb-16	0.843	Feb-18	0.985	Feb-20	1.335	Feb-22	1.646	Feb-24	
Mar-16	0.898	Mar-18	0.972	Mar-20	1.479	Mar-22	1.543	Mar-24	
Apr-16	1.144	Apr-18	0.946	Apr-20	1.476	Apr-22	1.590	Apr-24	
May-16	1.185	May-18	0.999	May-20	1.420	May-22	1.738	May-24	
Jun-16	0.989	Jun-18	0.989	Jun-20	1.353	Jun-22	1.716	Jun-24	
Jul-16	0.817	Jul-18	0.945	Jul-20	0.907	Jul-22	1.686	Jul-24	
Aug-16	1.100	Aug-18	0.95	Aug-20	1.009	Aug-22	1.756	Aug-24	
Sep-16	0.897	Sep-18	1.159	Sep-20	1.385	Sep-22	1.915	Sep-24	
Oct-16	0.86	Oct-18	1.58	Oct-20	1.274	Oct-22	1.781	Oct-24	
Nov-16	0.88	Nov-18	1.22	Nov-20	1.252	Nov-22	1.824	Nov-24	
Dec-16	0.94	Dec-18	1.342	Dec-20	1.219065	Dec-22	1.808	Dec-24	
Jan-17	1.059	Jan-19	1.53	Jan-21	1.323	Jan-23	1.718	Jan-25	
Feb-17	1.001	Feb-19	1.214	Feb-21	1.292	Feb-23	1.874	Feb-25	
Mar-17	0.975	Mar-19	1.096	Mar-21	1.317	Mar-23	1.883	Mar-25	
Apr-17	0.921	Apr-19	1.331	Apr-21	1.338	Apr-23	2.054	Apr-25	
May-17	0.908	May-19	1.401	May-21	1.752	May-23	2.248	May-25	
Jun-17	0.997	Jun-19	1.25	Jun-21	1.780	Jun-23	2.050	Jun-25	
Jul-17	0.956	Jul-19	1.184	Jul-21	1.582	Jul-23	1.892	Jul-25	
Aug-17	1.247	Aug-19	1.154	Aug-21	1.604	Aug-23	1.920	Aug-25	
Sep-17	1.005	Sep-19	1.159	Sep-21	1.384	Sep-23	2.058	Sep-25	
Oct-17	0.970	Oct-19	1.238	Oct-21	1.622	Oct-23	2.056	Oct-25	
Nov-17	0.964	Nov-19	1.227	Nov-21	1.577	Nov-23	2.050	Nov-25	
Dec-17	0.963	Dec-19	1.167	Dec-21	1.414	Dec-23	1.985	Dec-25	

Daily Flow Data from Plant Operation Reports

	Jan-16	Feb-16	Mar-16	Apr-16	May-16	Jun-16	Jul-16	Aug-16	Sep-16	Oct-16	Nov-16	Dec-16	Jan-17	Feb-17	Mar-17	Apr-17	May-17	Jun-17	Jul-17	Aug-17	Sep-17	Oct-17	Nov-17	Dec-17
1	0.899	0.714	0.865	0.511	1.048	1.215	0.769		0.848				0.918	0.948	0.824	0.893	0.709	1.313	0.966	0.807	1.061	1.007	0.902	0.731
2	0.976	0.888	0.892	0.810	0.879	1.668	0.846		1.026				1.133	1.014	1.11	0.943	0.892	0.742	0.962	0.966	1.101	0.966	1.049	0.986
3	1.192	0.786	0.836	1.130	1.026	1.837	0.900		0.873				1.01	0.818	0.756	1.000	1.181	1.099	0.978	1.228	1.061	1.141	0.926	1.236
4	0.918	0.747	0.802	0.796	0.986	1.558	1.115		0.962				0.612	1	1.07	0.952	0.629	1.18	1.025	1.063	1.173	1.135	1.044	0.92
5	0.941	0.793	0.838	0.712	0.755	1.370	0.884		0.973				0.892	1.122	1.593	0.785	0.607	1.041	0.825	0.973	1.015	1.037	1.085	1.021
6	0.707	0.791	0.988	0.814	0.846	1.113	0.878		0.984				0.66	0.933	1.123	0.86	0.984	1.002	1.07	1.547	0.924	0.996	1.019	1.175
7	0.996	0.868	0.740	0.773	0.929	0.900	0.844		0.998				1.034	0.824	0.966	1.023	0.943	1.04	0.893	2.167	0.947	0.989	0.978	0.836
8	0.819	0.985	0.839	0.586	1.012	1.126	0.573		0.929				0.983	1.004	0.828	0.823	0.847	1.076	0.824	1.581	0.895	1.103	0.936	0.992
9	0.922	0.720	0.962	0.755	0.822	0.087	1.208		0.797				0.967	0.933	1.151	1.063	0.891	0.78	1.116	1.232	0.963	1.032	1.183	1.006
10	1.118	0.889	1.402	0.892	0.889	0.812	0.946		0.828				0.918	0.682	0.608	0.824	0.73	0.933	0.945	1.36	1.141	0.906	0.932	1.011
11	0.822	0.840	1.163	0.888	0.878	1.013	0.650		1.004				0.888	0.943	1.032	0.75	0.887	1.096	0.87	0.679	0.989	0.852	0.933	0.989
12	0.965	0.632	1.095	0.702	0.964	1.188	1.052		0.991				0.83	1.099	1.115	0.891	0.862	0.976	1.008	1.008	0.996	1.061	1.047	0.918
13	0.923	0.910	0.841	0.692	0.716	0.863	0.789		0.757				0.863	0.945	1.063	0.896	0.742	1	0.961	1.151	0.866	0.981	0.919	0.945
14	1.001	0.960	0.915	0.759	1.219	0.998	0.733		0.923				0.96	1.016	0.974	0.934	1.016	0.903	0.859	0.877	1.034	0.993	0.999	0.929
15	0.589	0.805	0.804	0.721	1.551	0.869	0.922		0.874				1.054	0.927	0.95	0.912	0.724	0.959	1.178	0.994	1.022	1.104	0.889	0.788
16	0.905	0.799	0.956	0.849	0.970	0.780	0.747		0.768				1.183	0.85	0.942	1.242	0.9	0.921	1.321	1.058	0.909	0.772	0.99	1.041
17	0.914	0.785	0.872	3.234	1.003	0.884	0.860		0.828				1.303	0.89	0.88	0.93	0.667	0.975	0.821	0.807	1.039	1.036	0.794	1.217
18	1.004	0.803	0.872	2.119	1.834	0.891	0.635		1.268				1.773	0.947	1	0.977	0.933	1.251	0.996	0.958	1.025	0.781	0.89	1.057
19	0.877	0.697	0.872	1.886	2.680	1.066	0.920		0.863				1.593	1.35	1.201	1.029	0.85	1.035	0.982	0.954	0.878	1.117	1.026	0.949
20	0.893	0.877	0.872	1.801	1.500	1.023	0.670		0.860				1	1.583	0.829	1.118	0.952	1.144	1.051	1.174	0.939	0.627	0.893	1.004
21	0.810	0.990	0.872	1.881	1.907	0.756	0.730		0.883				1.228	0.919	1.091	0.985	1.015	0.83	0.628	0.89	0.972	0.948	0.927	1.037
22	0.702	0.859	0.798	1.782	2.266	0.964	0.680		0.702				1.44	0.966	0.735	0.563	0.81	0.971	0.9	1.138	0.866	1.036	0.964	0.873
23	0.899	1.034	0.903	1.555	1.170	0.813	0.793		0.650				1.139	1.0112	0.914	1.157	1.127	0.922	0.964	0.821	0.925	1.043	0.953	0.935
24	1.078	0.813	0.906	1.321	1.303	0.591	0.892		0.910				0.968	0.761	0.946	0.781	0.855	1.07	1.051	0.769	1.095	0.841	0.866	0.885
25	0.942	0.873	0.740	1.093	1.308	0.868	0.640		1.250				1.165	1.086	0.799	0.868	1.269	1.09	1.072	0.981	0.784	0.938	0.966	0.859
26	0.755	0.703	0.878	1.056	0.913	1.133	0.805		0.869				1.112	1.116	1.179	0.87	0.739	1.113	0.784	2.089	1.039	0.849	1.111	0.873
27	0.871	0.910	1.123	1.200	1.039	0.682	0.789		1.078				0.873	1.09	0.858	0.777	0.889	0.82	0.924	3.02	0.972	0.864	0.85	0.868
28	0.882	1.146	0.661	1.046	0.914	0.870	0.639		0.777				1.017	1.151	0.988	0.859	1.048	0.858	0.838	2.169	1.041	0.939	0.934	0.93
29	0.788		0.855	0.871	0.982	0.868	0.762		0.856				1.211		1.092	0.904	1.294	0.982	0.904	1.484	1.363	1.014	0.927	0.912
30	0.840		0.751	1.074	1.394	0.862	0.775		0.577				1.114		0.684	1.031	1.218	0.797	1.025	1.455	1.109	1.017	0.974	0.988
31	0.929		0.923		1.040		0.884						0.996		0.927		0.939		0.887	1.256		0.932		0.875

	Jan-18	Feb-18	Mar-18	Apr-18	May-18	Jun-18	Jul-18	Aug-18	Sep-18	Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Oct-19	Nov-19	Dec-19
1	0.943	0.869	0.96	1.056	0.931	0.92	1.03	0.846	0.986	0.982	1.19	1.07	1.286	1.327	1.057	1.049	1.28	1.25	1.306	1.141	1.16	1.146	1.147	1.37
2	0.92	0.974	1.103	0.929	1.852	0.933	0.933	0.881	0.964	1.173	1.089	1.258	2.869	1.337	1.165	1.045	1.384	1.28	1.279	1.091	1.247	1.124	1.289	1.274
3	0.899	0.94	1.236	0.916	0.922	1.528	0.929	0.776	1.155	1.06	1.23	1.057	2.746	0.681	1.19	1.09	1.643	1.191	1.248	1.161	1.107	1.105	1.308	1.039
4	0.929	1.111	0.0893	1.026	1.227	1.368	1.134	0.894	0.947	1.02	1.426	1.13	2.1	1.98	1.093	1.091	1.626	1.181	1.157	1.282	1.085	1.086	1.243	1.058
5	0.886	0.961	1.083	0.977	1.076	1.105	0.851	0.975	1.028	0.981	1.164	1.036	1.947	1.297	0.982	1.106	1.652	1.246	1.21	1.092	1.052	1.165	1.338	1.064
6	0.957	0.815	0.936	0.947	1.097	1.018	0.973	0.819	1.046	1.129	1.301	1	1.983	1.243	1.081	1.175	1.455	1.195	1.226	1.127	1.164	1.235	1.184	1.157
7	1.112	0.946	0.958	0.897	0.876	0.949	0.97	0.938	1.216	1.045	1.029	1.238	1.719	1.153	1.123	1.297	1.467	1.25	1.277	1.214	1.102	1.109	1.296	1.076
8	1.025	0.947	0.941	1.192	0.983	1.0796	0.236	0.818	1.243	1.802	1.291	1.685	1.562	1.066	1.069	1.243	1.653	1.242	1.238	1.194	1.349	1.113	1.105	1.3258
9	0.847	0.838	0.845	0.868	0.968	1	1.689	0.878	1.817	1.891	1.394	1.648	1.522	1.171	1.146	1.169	1.689	1.574	1.2	1.105	1.147	1.039	1.198	1.165
10	0.866	0.976	1.028	1.057	0.861	1.133	0.961	0.866	1.177	1.587	1.277	1.486	1.343	1.348	1.275	1.136	1.501	1.254	1.163	1.139	1.117	1.131	1.505	1.365
11	0.952	1	0.988	0.941	0.973	0.937	0.923	0.95	1.116	1.392	1.589	1.504	1.599	1.317	1.161	1.108	1.371	1.147	1.134	1.181	1.111	1.132	1.123	0.801
12	0.723	0.834	0.891	0.955	0.985	0.921	0.934	1.206	1.099	1.167	0.882	1.411	1.546	1.186	1.14	1.099	1.553	0.8	1.122	1.245	1.097	1.189	1.494	1.142
13	0.889	0.979	0.941	0.89	1.114	1.064	0.862	0.977	0.992	1.314	1.52	1.35	1.45	1.156	1.188	1.155	1.421	1.131	1.164	1.094	1.107	1.271	0.851	1.061
14	1.005	0.744	0.06	0.936	0.951	0.856	0.917	0.907	1.123	1.401	1.219	1.329	1.413	1.364	1.079	1.263	1.381	1.245	1.281	1.224	1.249	1.201	1.104	1.183
15	1	0.929	0.941	0.962	0.954	0.873	1.035	1.132	1.165	2.21	1.221	1.242	1.367	1.132	1.068	1.099	1.349	1.219	1.145	1.116	1.252	1.344	1.089	1.647
16	0.919	0.934	0.943	0.95	0.986	0.967	1.09	0.966	1.369	2.737	1.119	1.375	1.301	1.201	1.083	1.129	1.38	1.222	1.142	1.159	1.181	1.328	1.266	1.076
17	0.932	0.939	0.86	0.972	0.866	0.937	0.859	1.001	1.009	2.387	1.221	1.235	1.463	1.275	0.725	1.818	1.369	1.266	1.14	1.133	1.041	0.84	1.52	0.834
18	0.895	1.008	1.191	0.942	0.938	0.949	0.856	0.98	1.012	1.535	1.206	1.269	1.251	1.195	1.466	1.864	1.487	1.11	1.04	1.259	1.107	1.109	1.148	1.023
19	0.879	0.973	1.069	0.908	0.955	0.848	0.909	1.065	1.053	2.75	1.128	1.303	1.318	1.168	0.947	1.625	1.385	1.252	1.851	1.147	1.148	1.262	1.216	1.159
20	0.967	0.96	0.834	0.782	1.527	0.909	0.931	1.04	1.04	1.098	1.114	1.257	1.333	1.148	1.045	1.701	1.365	1.065	1.186	1.109	1.122	2.627	1.381	1.177
21	0.986	0.934	0.926	0.993	1.088	0.995	0.903	1.1	1.149	1.933	2.08	1.266	1.385	1.169	0.994	1.536	1.322	1.132	1.154	1.087	1.204	1.191	1.186	1.21
22	0.967	0.96	0.927	1.083	1.099	0.933	0.983	0.957	1.803	1.686	1.179	1.254	1.266	1.226	0.97	1.231	1.362	1.18	1.153	1.148	1.293	1.178	1.051	1.148
23	0.936	0.955	0.767	0.882	0.882	0.958	1.231	0.931	1.38	1.459	1.051	1.19	1.197	1.132	1.068	1.192	1.35	1.287	1.024	0.998	1.184	1.201	1.172	1.241
24	0.904	1.106	0.9296	0.965	1.019	1.015	0.759	1.002	1.226	2.112	1.115	1.264	1.157	1.26	1.261	2.148	1.217	1.214	1.021	1.145	1.152	1.448	1.311	1.274
25	0.958	1.391	1.081	0.806	1	0.901	0.882	1.024	1.038	2.112	1.117	1.211	1.24	1.167	1.046	1.685	1.26	1.161	1.039	1.297	1.119	1.26	1.213	1.132
26	0.839	1.224	0.971	0.844	1.057	1.042	0.933	1.11	1.078	1.375	1.186	1.762	1.41	1.13	1.097	1.602	1.223	1.404	1.031	1.216	1.178	1.289	1.267	1.235
27	0.942	1.121	1.061	0.811	0.953	0.792	0.939	0.292	1.039	1.588	0.999	1.822	1.695	1.114	1.06	1.404	1.358	1.584	1.11	1.111	1.082	1.423	1.414	1.192
28	1.084	0.983	1.5	0.912	1.026	0.933	0.909	0.767	1.146	1.413	1.122	1.533	1.292	1.044	1.048	1.279	1.236	1.279	1.197	1.248	1.163	1.308	1.01	1.223
29	0.893		1.162	1.118	0.935	0.875	1.027	0.878	1.073	1.3	1.056	1.436	1.257		1.058	1.298	1.246	1.621	1.171	1.082	1.267	1.241	1.111	1.22
30	0.924		1.01	0.926	1.055	0.941	0.967	0.874	1.284	1.249	1.103	1.42	1.226		1.079	1.293	1.235	1.524	1.168	1.139	1.87	1.151	1.268	1.095
31	0.847		1.083		0.885		0.785	0.919		1.28		1.564	1.181		1.198		1.212		1.129	1.081		1.118		1.204

Daily Flow Data from Plant Operation Reports

	Jan-20	Feb-20	Mar-20	Apr-20	May-20	Jun-20	Jul-20	Aug-20	Sep-20	Oct-20	Nov-20	Dec-20
1	1.198	1.276	1.478	1.389	1.315	1.421	1.306	1.266	1.259	1.32	1.741	1.199
2	1.159	1.491	1.291	1.366	1.417	1.421	1.429	1.115	1.289	1.222	0.913	1.159
3	1.149	1.371	1.432	1.526	1.413	1.4271	1.265	0.719	1.238	1.302	1.002	1.055
4	1.226	1.181	1.469	1.647	1.366	1.444	1.321	1.121	1.318	1.446	1.259	1.156
5	1.309	1.08	1.518	1.686	1.295	1.339	1.301	0.628	1.32	1.327	1.28	1.156
6	1.26	1.18	1.324	1.584	1.249	1.437	1.372	0.524	1.336	1.4	1.292	1.32
7	1.13	1.044	1.47	1.493	1.302	1.492	1.323	0.502	1.406	1.34	1.262	1.243
8	1.162	1.275	1.61	1.589	1.297	1.398	1.286	0.36	1.38	1.323	1.327	1.18
9	1.275	1.446	1.429	1.811	1.288	1.319	1.341	0.836	1.648	1.228	1.254	1.169
10	1.099	1.603	1.449	1.587	1.337	1.285	1.275	0.557	1.387	1.367	1.304	1.246
11	1.194	1.047	1.389	1.616	1.222	1.325	1.231	0.531	1.309	1.394	1.142	1.269
12	1.385	1.497	1.369	1.574	1.317	1.273	0.697	0.467	1.444	1.226	1.305	1.214
13	1.296	1.659	1.322	1.561	1.374	1.365	0.965	0.433	1.526	1.229	1.205	1.245
14	1.178	1.235	1.438	1.469	1.398	1.313	0.363	1.063	1.397	1.239	1.289	1.153
15	1.219	1.401	1.533	1.5	1.53	1.34	0.956	1.418	1.382	1.237	1.315	1.128
16	1.15	1.514	1.524	1.39	1.499	1.274	0.479	1.566	1.33	1.406	1.212	1.022
17	1.2	1.438	1.278	1.46	1.513	1.227	0.455	1.412	1.357	1.196	1.22	1.156
18	1.242	1.408	1.322	1.412	1.45	1.404	0.301	1.357	1.339	1.348	1.231	1.25
19	1.269	1.368	1.751	1.559	1.467	1.226	0.048	1.291	1.261	1.322	1.181	1.323
20	1.276	1.22	1.078	1.466	1.446	1.326	0.41	1.375	1.338	1.211	1.272	1.254
21	1.248	1.265	1.706	1.461	1.35	1.389	0.369	bad meter	1.493	1.286	1.285	1.167
22	1.252	1.42	1.818	1.362	1.402	1.401	1.279	bad meter	1.594	1.316	1.306	1.24
23	1.403	1.603	1.666	1.337	1.388	1.392	0.912	bad meter	1.523	1.198	1.254	1.269
24	1.258	1.362	1.569	1.308	1.714	1.311	0.63	bad meter	1.45	1.184	1.25	1.217
25	1.185	1.307	1.597	1.345	1.629	1.322	0.485	bad meter	1.43	1.387	1.29	1.147
26	1.444	1.248	1.575	1.443	1.566	1.336	0.611	1.25	1.432	1.154	1.341	1.26
27	1.305	1.397	1.527	1.323	1.538	1.343	0.588	1.2	1.546	1.143	1.12	1.301
28	1.333	1.071	1.506	1.404	1.534	1.352	0.528	1.179	1.306	1.098	1.209	1.235
29	1.296	1.309	1.536	1.277	1.552	1.325	1.246	1.339	1.191	1.155	1.313	1.305
30	1.231		1.482	1.33	1.396	1.348	0.945	1.438	1.314	1.207	1.197	1.228
31	1.162		1.381		1.462		1.394	1.274		1.274		1.525

	Jan-21	Feb-21	Mar-21	Apr-21	May-21	Jun-21	Jul-21	Aug-21	Sep-21	Oct-21	Nov-21	Dec-21
1	1.372	1.258	1.298	1.271	2.259	2.22	1.543	1.5252	1.259	1.628	1.513	1.379
2	1.376	1.304	1.381	1.203	2.256	2.543	1.585	1.813	1.289	1.575	1.49	1.433
3	1.417	1.167	1.35	1.331	1.971	2.583	1.464	1.67	1.238	1.577	2.31	1.36
4	1.333	1.305	1.273	1.429	1.744	2.251	1.579	1.66	1.318	1.49	1.84	1.453
5	1.42	1.208	1.381	1.313	1.648	2.046	1.546	1.621	1.32	1.418	1.83	1.674
6	1.326	1.27	1.275	1.364	1.603	2.093	1.655	1.655	1.336	1.475	1.87	1.355
7	1.272	1.413	1.364	1.383	1.766	1.951	1.554	1.644	1.406	1.434	1.734	1.313
8	1.164	1.247	1.355	1.382	1.463	1.879	1.614	1.666	1.38	1.436	1.651	1.361
9	1.31	1.223	1.311	1.384	1.514	1.85	1.656	1.626	1.648	1.715	1.787	1.438
10	1.289	1.129	1.283	1.348	1.533	1.788	1.545	1.479	1.387	1.32	1.783	1.863
11	1.439	1.354	1.386	1.358	1.511	1.715	1.729	1.639	1.309	1.448	1.448	0.945
12	1.315	1.38	1.306	1.384	1.435	1.749	1.537	1.512	1.44	1.483	1.534	1.366
13	1.29	1.469	1.311	1.301	1.48	1.764	1.57	1.702	1.526	2.24	1.486	1.313
14	1.294	1.139	1.385	1.308	1.432	1.667	1.463	1.586	1.397	2.112	1.719	1.419
15	1.296	1.215	1.321	1.302	1.439	1.615	1.566	1.594	1.382	1.709	1.574	1.394
16	1.436	0.56	1.329	1.236	1.682	1.496	1.443	1.582	1.33	1.615	1.557	1.392
17	1.371	0.402	1.167	1.38	1.694	1.611	1.552	1.654	1.357	1.802	1.569	1.413
18	1.253	0.905	1.203	1.33	1.603	1.612	1.66	1.449	1.339	1.616	1.34	1.434
19	1.333	1.407	1.269	1.281	1.631	1.54	2.018	1.523	1.261	1.696	1.409	1.406
20	1.247	1.555	1.232	1.284	1.6	1.502	1.653	1.515	1.338	1.605	1.529	1.45
21	1.312	1.881	1.331	1.184	1.618	1.677	1.803	1.761	1.493	1.686	1.424	1.363
22	1.343	1.388	1.444	1.277	1.676	1.616	1.5	2.289	1.594	1.535	1.362	1.454
23	1.285	1.577	1.246	1.29	1.682	1.648	1.604	1.548	1.523	1.534	1.424	1.44
24	1.504	1.555	1.191	1.359	1.994	1.54	1.644	1.507	1.45	1.721	1.685	1.599
25	1.362	1.402	1.399	1.505	1.86	1.543	1.566	1.51	1.43	1.629	1.312	1.275
26	1.329	1.413	1.384	1.279	1.901	1.608	1.5	1.56	1.432	1.761	1.268	1.142
27	1.243	1.563	1.51	1.302	1.796	1.592	1.466	1.372	1.546	1.661	1.433	1.566
28	1.149	1.482	1.261	1.38	2.295	1.576	1.439	1.493	1.306	1.552	1.55	1.397
29	1.244		1.337	1.485	2.105	1.56	1.454	1.63	1.191	1.594	1.396	1.443
30	1.278		1.278	1.493	1.892	1.563	1.546	1.516	1.306	1.564	1.48	1.539
31	1.414		1.252		2.221		1.577	1.425		1.64		1.464

	Jan-22	Feb-22	Mar-22	Apr-22	May-22	Jun-22	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22	Dec-22
1	1.285	1.757	1.608	1.555	1.753	1.713	1.630	1.729	1.740	1.608	1.776	1.754
2	1.353	1.72	1.554	1.53	1.594	1.765	1.728	1.744	1.868	1.907	1.857	1.863
3	1.367	2.013	1.626	1.714	1.665	1.730	1.674	1.652	2.225	1.698	1.689	1.901
4	1.336	1.804	1.575	1.545	1.638	1.814	1.739	1.719	2.076	1.653	1.986	1.975
5	1.362	1.63	1.574	1.622	1.788	1.928	1.702	1.794	2.347	1.674	1.623	1.917
6	1.326	1.911	1.727	1.493	1.782	1.778	1.681	1.459	1.988	1.753	2.040	1.861
7	1.169	1.924	1.536	1.524	1.876	1.785	1.680	1.943	2.107	1.667	1.816	1.929
8	1.423	1.247	1.544	1.463	1.859	1.753	1.676	1.840	2.050	1.719	1.842	1.922
9	1.477	1.748	1.444	1.62	1.746	1.636	1.705	1.576	1.970	1.679	1.779	1.773
10	1.356	1.733	1.543	1.643	1.765	1.763	1.758	1.624	2.045	1.685	1.816	1.859
11	1.318	2.085	1.317	1.554	1.705	1.762	1.701	1.672	2.202	1.709	1.868	1.951
12	1.371	1.25	1.493	1.765	1.751	1.869	1.692	1.382	1.864	1.878	1.758	1.811
13	1.316	1.785	1.512	1.531	1.600	1.656	1.717	1.690	1.943	1.596	1.916	1.875
14	1.449	1.586	1.465	1.537	1.702	1.682	1.578	2.062	1.798	1.661	1.705	1.824
15	1.277	1.712	1.478	1.512	1.799	1.710	1.665	1.643	1.817	1.874	1.670	1.627
16	1.405	1.75	1.52	1.659	1.778	1.643	1.708	1.810	1.897	2.026	1.682	1.655
17	1.385	1.51	1.482	1.652	1.609	1.699	1.730	1.335	1.959	1.935	1.720	1.640
18	1.39	1.447	1.455	1.581	1.681	1.627	1.643	1.749	2.056	1.721	1.717	1.630
19	1.296	1.557	1.456	1.515	1.665	1.724	1.653	1.773	1.911	1.665	1.568	1.620
20	1.311	1.769	1.668	1.505	1.743	1.756	1.630	1.755	1.867	1.739	1.737	1.673
21	1.054	1.753	1.532	1.646	1.606	1.657	1.737	1.862	1.890	1.841	1.677	1.630
22	1.311	1.615	1.514	1.562	1.683	1.655	1.746	1.702	1.749	1.780	1.731	1.965
23	1.471	1.402	1.594	1.577	1.522	1.687	1.684	1.808	1.751	1.959	1.937	1.902
24	1.343	1.378	1.501	1.727	1.891	1.643	1.674	1.772	1.875	1.799	1.865	2.044
25	1.394	1.527	1.632	1.642	1.898	1.668	1.797	1.747	1.915	1.865	2.114	1.779
26	1.258	1.351	1.528	1.555	1.800	1.730	1.581	1.787	1.750	1.675	2.082	1.873
27	1.271	1.582	1.721	1.561	1.793	1.654	1.711	1.984	1.805	1.671	1.977	1.613
28	1.253	1.533	1.631	1.655	1.722	1.670	1.531	2.048	1.575	1.929	2.017	1.775
29	1.366		1.542	1.55	1.791	2.020	1.657	1.920	1.689	1.937	1.918	1.795
30	1.612		1.555	1.7	1.853	1.313	1.700	1.950	1.713	2.022	1.838	1.742
31	1.869		1.512		1.811		1.743	1.915		1.887		1.870

	Jan-23	Feb-23	Mar-23	Apr-23	May-23	Jun-23	Jul-23	Aug-23	Sep-23	Oct-23	Nov-23	Dec-23
1	1.729	1.393	1.953	1.732	2.212				1.926	1.783	2.096	1.851
2	1.867	2.281	2.126	1.988	2.180				1.891	1.958	2.051	1.964
3	1.861	1.981	2.040	1.888	2.047				1.848	2.027	2.071	2.038
4	1.680	1.991	2.131	1.876	2.059				2.031	2.17	2.206	1.881
5	1.684	2.099	2.199	1.800	2.416				2.000	2.078	2.349	1.855
6	1.709	1.941	2.107	1.953	2.373				1.953	2.037	2.109	1.805
7	1.767	2.005	2.047	2.210	2.076				1.969	1.975	2.062	1.931
8	1.864	1.997	1.935	2.035	2.192				1.888	2.062	2.116	1.942
9	1.702	1.967	1.994	1.899	2.106				1.938	1.966	2.238	1.849
10	1.768	1.857	2.050	1.885	2.254				2.059	1.961	2.17	1.906
11	1.765	1.892	1.722	2.014	2.005				1.816	1.854	2.189	1.782
12	1.635	1.957	2.004	2.032	2.226				1.853	1.962	2.28	1.805
13	1.605	1.988	1.746	1.969	2.474				2.051	2.02	2.297	1.793
14	1.703	1.829	1.772	1.896	2.467				2.198	1.922	2.045	1.887
15	1.805	1.849	1.697	1.932	2.489				2.110	2.013	2.06	1.912
16	1.820	1.657	1.746	2.021	2.460				2.360	1.878	2.015	1.939
17	1.745	1.664	1.712	1.846	2.369				2.354	1.952	2.137	1.911
18	1.677	1.687	1.666	1.867	2.350				2.153	1.8	2.007	1.836
19	1.628	1.838	1.847	1.954	2.385				2.078	1.932	2.018	1.844
20	1.595	1.924	1.779	2.547	2.330				2.066	1.93	2.079	1.88
21	1.739	1.844	1.827	2.197	2.057				2.089	2.017	1.861	2.001
22	1.760	1.790	1.907	2.257	2.191				2.051	2.099	1.943	2.033
23	1.619	1.732	1.863	2.005	2.193				2.147	2.29	1.893	2.021
24	1.615	2.020	1.979	2.002	2.177				2.186	2.078	1.865	2.946
25	1.579	1.683	1.809	2.024	2.164				2.116	2.213	1.866	2.292
26	1.586	2.005	1.947	2.304	2.241				2.120	2.479	1.98	2.187
27	1.648	1.755	1.709	2.391	2.477				2.052	2.307	1.98	2.169
28	1.772	1.845	1.726	2.369	2.179				2.050	2.348	1.795	2.021
29	1.780		1.731	2.324	2.235				2.101	2.306	1.828	2.008
30	1.558		1.802	2.388	2.100				2.284	2.259	1.898	2.087
31	1.998		1.814		2.209					2.071		2.17

Daily Flow Data from Plant Operation Reports

	Jan-24	Feb-24	Mar-24	Apr-24	May-24	Jun-24	Jul-24	Aug-24	Sep-24	Oct-24	Nov-24	Dec-24	Jan-25	Feb-25	Mar-25	Apr-25	May-25	Jun-25	Jul-25	Aug-25	Sep-25	Oct-25	Nov-25	Dec-25
1	1.97	2.45																						
2	2.192	2.442																						
3	2.32	2.532																						
4	2.292	2.423																						
5	2.326	2.245																						
6	2.301	2.237																						
7	2.409	2.199																						
8	2.304	2.201																						
9	2.05	2.139																						
10	2.132	2.533																						
11	2.132	2.49																						
12	2.097	2.279																						
13	2.269	2.189																						
14	2.282	2.212																						
15	2.436	2.236																						
16	2.319	2.265																						
17	2.193	2.044																						
18	2.145	2.057																						
19	1.916	2.234																						
20	1.785	2.094																						
21	2.693	2.18																						
22	3.105	2.069																						
23	3.959	2.068																						
24	3.351	2.178																						
25	3.335	2.296																						
26	2.885	1.731																						
27	2.874	2.48																						
28	2.749	1.836																						
29	2.539	1.705																						
30	2.427																							
31	2.327																							

Raw Influent

Monthly Averages

Date	CBOD (mg/l)	TSS (mg/l)	NH3-N (mg/l)	TP (mg/l)	TKN (mg/l)	Alkalinity (mg/l)
Jan-17	159.00	230.25	41.05	6.05	46.65	447.25
Feb-17	152.50	219.25	38.85	5.55	47.50	384.50
Mar-17	185.40	228.60	42.98	6.96	46.96	386.80
Apr-17	142.00	202.25	38.35	6.50	49.23	321.25
May-17	175.50	170.00	33.68	6.90	40.45	347.75
Jun-17	165.80	288.60	36.80	7.00	48.62	357.00
Jul-17	129.25	227.00	35.35	6.81	38.43	368.00
Aug-17	130.80	186.60	28.80	8.03	33.50	319.60
Sep-17	188.00	230.75	35.35	7.08	42.63	343.75
Oct-17	182.75	263.75	31.80	6.30	40.43	374.00
Nov-17	185.80	245.80	34.42	5.83	49.30	350.00
Dec-17	180.50	207.25	36.08	7.04	54.50	377.50

Weekly Test Results

Date	CBOD (mg/l)	TSS (mg/l)	NH3-N (mg/l)	TP (mg/l)	TKN (mg/l)	Alkalinity (mg/l)
1/4/2017						
1/5/2017	166	315	56.2	9.6	58.3	460
1/11/2017						
1/12/2017	244	273	48.7	7.31	55.4	483
1/18/2017						
1/19/2017	123	126	25.1	3.37	27.6	380
1/25/2017						
1/26/2017	103	207	34.2	3.92	45.3	466
2/1/2017						
2/2/2017	174	206	38.9	5.13	49.7	407
2/8/2017						
2/9/2017	201	230	42.2	6.81	50.3	451
2/15/2017						
2/16/2017	98	205	20.5	6.04	31.3	330
2/22/2017						
2/23/2017	137	236	53.8	4.21	58.7	350
3/1/2017						
3/2/2017	138	183	39.9	4.88	45.2	325
3/8/2017						
3/9/2017	208	250	31.6	6.61	33.1	353
3/15/2017						
3/16/2017	172	202	45.6	8.02	47.7	425
3/22/2017						
3/23/2017	235	243	53.1	8.42	62.4	432
3/29/2017						
3/30/2017	174	265	44.7	6.88	46.4	399
4/5/2017						
4/6/2017	123	113	66.3	8.17	75	418
4/12/2017						
4/13/2017	164	188	25	6.71	32.5	290
4/19/2017						
4/20/2017	135	263	30.7	4.41	44.2	308
4/26/2017						
4/27/2017	146	245	31.4	6.71	45.2	269
5/3/2017						
5/4/2017	232	140	49.6	4.94	51.8	378
5/10/2017						
5/11/2017	184	182	32.7	7.72	41.7	296
5/17/2017						
5/18/2017	140	190	37.3	7.97	43.9	362
5/24/2017						
5/25/2017	146	168	15.1	6.98	24.4	355
5/31/2017						
6/1/2017	250	273	35.7	8.42	41.3	385
6/7/2017						
6/8/2017	166	275	29.8	7.39	48.4	350
6/14/2017						
6/15/2017	103	278	23.5	6.5	37.7	341
6/21/2017						
6/22/2017	96	320	41.7	6.52	47.6	330
6/28/2017						
6/29/2017	214	297	53.3	6.17	68.1	379
7/5/2017						
7/6/2017	133	253	38.9	5.98	45.6	395
7/12/2017						
7/13/2017	164	206	31	6.95	33.4	356
7/19/2017						
7/20/2017	76	226	35.6	6.84	37.4	300
7/26/2017						
7/27/2017	144	223	35.9	7.48	37.3	421
8/2/2017						
8/3/2017	106	150	20.9	8.48	25.1	283
8/9/2017						
8/10/2017	80	160	21	8.82	24.8	281
8/16/2017						
8/17/2017	208	235	52.1	5.71	54.5	425
8/23/2017						

Treated Effluent

Monthly Averages

Date	CBOD (mg/l)	TSS (mg/l)	NH3-N (mg/l)	TP (mg/l)	TKN (mg/l)	Alkalinity (mg/l)	F.COL. (N/100 ml)	*E.Coli* (MPN/100 ml)
Jan-17	3.50	4.00	1.07	0.21	2.70	193.25	#DIV/0!	3.00
Feb-17	4.25	3.13	0.67	0.14	1.38	168.75	1.00	#DIV/0!
Mar-17	3.80	4.10	1.09	0.14	1.75	176.00	#DIV/0!	5.00
Apr-17	3.13	3.50	0.21	0.09	0.73	130.25	2.00	1.00
May-17	3.67	3.56	0.10	0.10	1.11	121.75	12.67	1.33
Jun-17	4.33	4.00	0.16	0.10	0.97	131.20	9.67	7.00
Jul-17	3.88	4.50	0.13	0.17	1.17	143.25	3.00	1.00
Aug-17	4.80	6.30	0.10	0.91	1.08	139.40	9.50	10.75
Sep-17	5.75	3.13	0.58	1.02	1.53	136.50	10.50	7.50
Oct-17	5.38	3.38	0.15	0.20	1.02	118.50	13.00	5.67
Nov-17	4.70	4.10	0.33	0.17	1.41	153.60	11.33	7.67
Dec-17	4.75	4.38	0.14	0.17	1.01	155.25	5.00	7.00

Weekly Test Results

Date	CBOD (mg/l)	TSS (mg/l)	NH3-N (mg/l)	TP (mg/l)	TKN (mg/l)	Alkalinity (mg/l)	F.COL. (N/100 ml)	*E.Coli* (MPN/100 ml)
1/4/2017	3	4	2.5	0.26				
1/5/2017	3	5	2.29	0.45	6.4	208	<1	<1
1/11/2017	3	4	1.6	<0.06				
1/12/2017	3	5	1.62	0.09	2.8	194	<1	<1
1/18/2017	4	3	0.13	0.13				
1/19/2017	4	4	0.11	0.1	0.99	184	<1	<1
1/25/2017	4	4	0.14	<0.06				
1/26/2017	4	3	0.17	<0.06	0.6	187	<1	3
2/1/2017	4	3	0.21	<0.06				
2/2/2017	4	3	0.19	<0.06	1.51	183	<1	<1
2/8/2017	4	3	<0.1	0.15				
2/9/2017	4	3	0.1	<0.06	0.53	168	<1	<1
2/15/2017	4	3	0.2	0.18				
2/16/2017	4	3	0.1	0.09	1.08	173	1	<1
2/22/2017	5	3	1.9	0.07				
2/23/2017	5	4	1.99	0.21	2.4	151	<1	<1
3/1/2017	4	7	<0.1	0.15				
3/2/2017	4	6	<0.1	0.13	1.43	160	<1	5
3/8/2017	3	4	1.54	<0.06				
3/9/2017	3	3	1.62	<0.06	2	202	<1	<1
3/15/2017	4	3	0.13	0.13				
3/16/2017	4	5	<0.1	<0.06	1.13	173	<1	<1
3/22/2017	6	3	1.5	<0.06				
3/23/2017	5	3	1.64	<0.06	3.23	185	<1	<1
3/29/2017	2	3	0.13	<0.06				
3/30/2017	3	4	<0.1	<0.06	0.95	160	<1	<1
4/5/2017	2	3	<0.1	<0.06				
4/6/2017	2	4	<0.1	<0.06	0.4	138	<1	<1
4/12/2017	4	3	<0.1	0.09				
4/13/2017	5	4	<0.1	<0.06	1.14	126	<1	<1
4/19/2017	2	3	<0.1	0.07				
4/20/2017	3	4	<0.1	0.11	0.56	134	2	1
4/26/2017	4	3	0.31	<0.06				
4/27/2017	3	4	0.1	<0.06	0.8	123	<1	<1
5/3/2017	4	4	<0.1	0.14				
5/4/2017	6	3	<0.1	0.1	1.38	128	5	2
5/10/2017	4	3	<0.1	<0.06				
5/11/2017	3	4	0.1	<0.06	0.65	123	3	<1
5/17/2017	2	4	<0.1	<0.06				
5/18/2017	3	3	<0.1	<0.06	1.63	120	30	1
5/24/2017	3	4	0.1	<0.06				
5/25/2017	3	3	<0.1	<0.06	0.77	116	<1	1
5/31/2017	5	4	<0.1	0.06				
6/1/2017	4	3	<0.1	<0.06	1.23	134	1	1
6/7/2017	4	4	<0.1	<0.06				
6/8/2017	3	4	<0.1	<0.06	0.64	142	12	8
6/14/2017	4	3	<0.1	<0.06				
6/15/2017	5	3	<0.1	<0.06	0.99	130	<1	5
6/21/2017	5	5	<0.1	0.12				
6/22/2017	5	4	<0.1	0.08	0.9	120	16	14
6/28/2017	5	5	0.15	<0.06				
6/29/2017	4	5	0.16	<0.06	1.11	130	<1	<1
7/5/2017	4	3	0.1	<0.06				
7/6/2017	4	4	0.1	<0.06	1.07	164	<1	<1
7/12/2017	5	3	<0.1	<0.06				
7/13/2017	5	4	<0.1	<0.06	1.41	148	4	1
7/19/2017	4	5	0.19	0.13				
7/20/2017	3	4	0.14	0.08	1	136	<1	<1
7/26/2017	3	7	0.12	0.26				
7/27/2017	3	6	0.12	0.21	1.21	125	2	<1
8/2/2017	4	5	0.1	0.31				
8/3/2017	3	6	0.1	0.34	0.96	112	4	17
8/9/2017	4	5	<0.1	0.23				
8/10/2017	4	5	<0.1	0.37	0.92	144	<1	<1
8/16/2017	5	9	<0.1	0.24				
8/17/2017	4	7	0.11	0.16	1.25	127	5	3
8/23/2017	6	9	<0.1	1.88				

Raw Influent

Date	Weekly Test Results CBOD (mg/l)	TSS (mg/l)	NH3-N (mg/l)	TP (mg/l)	TKN (mg/l)	Alkalinity (mg/l)
8/24/2017	140	230	29.6	10.6	36.5	290
8/30/2017						
8/31/2017	120	158	20.4	6.55	26.6	319
9/6/2017						
9/7/2017	198	240	30.2	7.8	42.7	358
9/13/2017						
9/14/2017	139	183	32.3	7.9	36.6	284
9/20/2017						
9/21/2017	114	263	38.9	5.95	46.1	355
9/27/2017						
9/28/2017	301	237	40	6.68	45.1	378
10/4/2017						
10/5/2017	142	250	25.1	5.92	31.9	361
10/11/2017						
10/12/2017	130	148	19.9	6.33	27.7	351
10/18/2017						
10/19/2017	278	437	42.1	6.43	43.3	385
10/25/2017						
10/26/2017	181	220	40.1	6.51	58.8	399
11/1/2017						
11/2/2017	152	178	24.1	8.16	45.8	285
11/8/2017						
11/9/2017	248	234	39.1	4.69	59.1	391
11/15/2017						
11/16/2017	176	230	35.6	4.55	50.2	397
11/21/2017						
11/22/2017	179	350	39.5	6.46	51.3	365
11/29/2017						
11/30/2017	174	237	33.8	5.28	40.1	312
12/6/2017						
12/7/2017	204	192	42.7	6.6	49	362
12/13/2017						
12/14/2017	216	273	34.9	6.39	49.7	400
12/20/2017						
12/21/2017	156	220	28.5	6.67	49.8	324
12/27/2017						
12/28/2017	146	144	38.2	8.5	69.5	424

Treated Effluent

Date	Weekly Test Results CBOD (mg/l)	TSS (mg/l)	NH3-N (mg/l)	TP (mg/l)	TKN (mg/l)	Alkalinity (mg/l)	F.COL. (N/100 ml)	*E.Coli* (MPN/100 ml)
8/24/2017	6	7	<0.1	1.6	0.92	130	9	7
8/30/2017	8	5	<0.1	1.82				
8/31/2017	4	5	<0.1	2.1	1.36	184	20	16
9/6/2017	7	3	0.11	1.43				
9/7/2017	7	3	0.1	1.51	1.14	148	11	8
9/13/2017	7	4	0.1	0.38				
9/14/2017	8	3	0.22	0.74	1.3	130	10	7
9/20/2017	3	3	1.96	<0.06				
9/21/2017	5	3	1.77	<0.06	2.68	134	<1	<1
9/27/2017	5	3	0.17	<0.06				
9/28/2017	4	3	0.21	<0.06	0.99	134	<1	<1
10/4/2017	6	4	0.17	0.08				
10/5/2017	8	4	0.13	<0.06	0.84	166	13	6
10/11/2017	5	3	<0.1	0.09				
10/12/2017	6	3	<0.1	0.06	0.95	143	<1	2
10/18/2017	7	4	<0.1	0.17				
10/19/2017	6	3	<0.1	0.14	1.1	69	10	9
10/25/2017	3	3	<0.1	0.43				
10/26/2017	2	3	<0.1	0.4	1.2	96	16	<1
11/1/2017	2	5	0.15	0.44				
11/2/2017	3	5	0.15	0.28	1.69	112	27	21
11/8/2017	5	4	0.24	0.11				
11/9/2017	5	3	0.22	0.15	0.631	147	<1	<1
11/15/2017	7	5	1.04	<0.06				
11/16/2017	7	5	1.02	<0.06	3.39	166	<1	<1
11/21/2017	5	3	0.1	0.07				
11/22/2017	5	4	0.1	0.15	0.98	172	5	1
11/29/2017	4	3	0.1	0.06				
11/30/2017	4	4	0.14	0.07	0.38	171	2	1
12/6/2017	4	4	0.12	0.26				
12/7/2017	4	3	<0.1	0.17	0.84	182	8	7
12/13/2017	4	3	0.14	0.21				
12/14/2017	6	3	0.1	0.3	1.03	141	<1	<1
12/20/2017	6	3	0.13	0.09				
12/21/2017	6	5	0.15	<0.06	1.01	146	<1	<1
12/27/2017	4	7	0.17	0.08				
12/28/2017	4	7	0.17	0.08	1.15	152	2	<1

Raw Influent

Monthly Averages

Date	CBOD (mg/l)	TSS (mg/l)	NH3-N (mg/l)	TP (mg/l)	TKN (mg/l)	Alkalinity (mg/l)
Jan-18	178.75	210.50	47.00	7.11	59.65	357.50
Feb-18	217.25	292.50	49.33	7.44	55.30	403.50
Mar-18	169.00	249.80	40.46	6.53	47.58	360.40
Apr-18	160.50	214.00	39.08	7.86	44.38	382.50
May-18	244.80	248.40	39.68	7.65	46.00	365.60
Jun-18	231.25	272.00	47.28	7.11	51.73	390.00
Jul-18	162.50	919.50	42.90	6.72	49.75	412.00
Aug-18	213.20	237.40	49.00	5.91	54.16	412.40
Sep-18	166.25	240.00	43.88	6.97	47.15	376.00
Oct-18	77.25	182.75	28.80	5.67	32.60	343.00
Nov-18	179.80	342.00	47.52	6.81	51.38	388.00
Dec-18	149.50	267.00	38.08	5.33	52.95	309.50
Jan-19	188.00	247.20	34.54	5.45	41.96	361.20
Feb-19	176.50	261.25	38.68	7.08	46.68	374.50
Mar-19	233.25	246.00	49.68	8.12	52.55	397.00
Apr-19	224.75	270.25	34.38	6.13	41.13	383.00
May-19	198.20	244.20	41.06	6.87	52.00	408.00
Jun-19	261.75	281.00	42.63	6.98	78.23	376.50
Jul-19	196.75	284.00	47.58	7.19	59.93	348.50
Aug-19	212.80	249.40	39.50	5.61	53.92	357.20
Sep-19	188.75	259.25	38.33	7.03	60.78	314.00
Oct-19	153.60	216.80	38.94	7.04	61.98	361.60
Nov-19	164.00	239.75	34.65	6.52	50.85	331.50
Dec-19	187.75	574.50	39.58	7.55	81.78	378.50

Weekly Test Results

Date	CBOD (mg/l)	TSS (mg/l)	NH3-N (mg/l)	TP (mg/l)	TKN (mg/l)	Alkalinity (mg/l)
1/3/2018						
1/4/2018	210	85	43.9	6.26	68.4	410
1/10/2018						
1/11/2018	116	233	43.9	7	61.9	314
1/17/2018						
1/18/2018	155	180	53.9	6.45	57.6	342
1/24/2018						
1/25/2018	234	344	46.3	8.73	50.7	364
1/31/2018						
2/1/2018	217	310	60.8	7.2	67.6	424
2/7/2018						
2/8/2018	291	250	41.6	7.95	55.9	444
2/14/2018						
2/15/2018	179	327	39.6	8.25	41.5	382
2/21/2018						
2/22/2018	182	283	55.3	6.37	56.2	364
3/1/2018	211	256	45.3	5.49	49.3	310
3/7/2018						
3/8/2018	258	233	42.9	7.28	49.5	382
3/14/2018						
3/15/2018	103	413	42.9	4.95	55.4	396
3/21/2018						
3/22/2018	117	293	42.4	7.76	51.3	418
3/28/2018						
3/29/2018	156	54	28.8	7.19	32.4	296
4/4/2018						
4/5/2018	123	167	30.7	7.02	35.3	348
4/11/2018						
4/12/2018	140	138	41.7	7.16	46.9	390
4/18/2018						
4/19/2018	235	480	44.3	9.02	53	380
4/25/2018						
4/26/2018	144	71	39.6	8.25	42.3	412
5/2/2018						
5/3/2018	278	187	41.4	9.23	44.2	324
5/9/2018						
5/10/2018	294	480	45.1	8.31	49.4	428
5/16/2018						
5/17/2018	246	224	47.5	6.39	57.8	358
5/23/2018						
5/24/2018	116	193	36.3	7.58	44.6	334
5/30/2018						
5/31/2018	290	158	28.1	6.73	34	384
6/6/2018						
6/7/2018	227	297	45.7	6.71	51.5	420
6/13/2018						
6/14/2018	166	173	36.4	6.49	41.9	362
6/20/2018						
6/21/2018	267	313	42.2	7.44	46.5	368
6/27/2018						
6/28/2018	265	305	64.8	7.79	67	410
7/4/2018						
7/5/2018	212	167	48.5	3.96	56.6	396
7/11/2018						

Treated Effluent

Monthly Averages

Date	CBOD (mg/l)	TSS (mg/l)	NH3-N (mg/l)	TP (mg/l)	TKN (mg/l)	Alkalinity (mg/l)	F.COL. (N/100 ml)	*E.Coli* (MPN/100 ml)
Jan-18	5.78	9.11	0.60	0.20	1.40	144.50	1.00	1.00
Feb-18	4.43	5.29	0.69	0.13	1.73	156.25	1.50	1.00
Mar-18	5.00	5.33	0.40	0.14	1.93	146.40	12.25	10.25
Apr-18	4.75	3.88	0.33	0.18	1.38	152.50	4.67	1.33
May-18	4.30	4.50	1.34	0.21	2.22	148.40	3.50	3.50
Jun-18	3.88	3.25	2.99	0.12	3.84	175.50	4.00	2.00
Jul-18	4.13	3.13	2.58	0.07	4.16	167.00	18.50	28.00
Aug-18	4.80	3.70	0.57	0.34	1.66	148.80	6.00	3.50
Sep-18	4.25	4.13	0.70	0.16	1.29	142.50	8.67	9.00
Oct-18	3.44	3.22	0.59	0.30	1.55	183.00	24.00	14.25
Nov-18	3.44	3.11	2.06	0.18	2.56	182.80	10.00	12.00
Dec-18	4.13	3.25	3.42	0.06	4.06	176.00	48.33	57.00
Jan-19	3.67	3.10	2.26	0.07	2.59	164.80	4.25	3.00
Feb-19	4.50	3.88	3.47	#DIV/0!	4.38	163.00	7.67	8.00
Mar-19	4.50	4.00	1.76	#DIV/0!	2.86	146.00	8.00	4.50
Apr-19	3.13	3.50	0.23	#DIV/0!	1.75	135.50	19.33	25.50
May-19	4.00	3.60	1.35	#DIV/0!	2.41	157.20	3.00	2.33
Jun-19	5.00	4.50	7.21	0.09	7.80	169.00	3.00	2.00
Jul-19	4.00	3.00	2.35	#DIV/0!	3.44	126.50	5.25	3.00
Aug-19	4.78	3.11	1.40	0.10	2.90	141.20	4.75	2.75
Sep-19	3.50	3.13	2.23	#DIV/0!	3.79	134.00	17.50	14.50
Oct-19	3.25	3.30	1.76	0.09	3.18	149.60	3.00	2.50
Nov-19	4.33	3.00	2.19	#DIV/0!	5.35	183.00	45.67	40.67
Dec-19	3.63	3.00	1.24	#DIV/0!	3.14	151.00	4.67	2.67

Weekly Test Results

Date	CBOD (mg/l)	TSS (mg/l)	NH3-N (mg/l)	TP (mg/l)	TKN (mg/l)	Alkalinity (mg/l)	F.COL. (N/100 ml)	*E.Coli* (MPN/100 ml)
1/3/2018	5	10	0.38	0.12				
1/4/2018	5	10	0.42	0.08	1.96	151	<1	<1
1/10/2018	3	7	0.96	0.07				
1/11/2018	3	8	0.95	0.08	2.17	144	<1	<1
1/17/2018	9	10	0.1	0.24				
1/18/2018	9	9	0.1	0.22	0.56	135	1	1
1/24/2018	7	11	0.29	0.53				
1/25/2018	6	10	0.24	0.42	0.91	148	<1	1
1/31/2018	5	7	1.94	0.07				
2/1/2018	5	7	1.88	<0.06	4.02	201	<1	<1
2/7/2018	5	6	0.41	<0.06				
2/8/2018	5	6	0.23	0.1	0.55	146	1	1
2/14/2018	3	6	0.88	0.13				
2/15/2018	3	6	0.82	0.17	0.98	140	2	<1
2/21/2018	5	3	0.32	<0.06				
2/22/2018	5	3	0.3	<0.06	1.35	138	<1	<1
3/1/2018	5	6	1.83	0.13	3.79	153	<1	<1
3/7/2018	6	8	0.15	0.18				
3/8/2018	6	5	0.14	0.12	1.04	152	7	6
3/14/2018	4	6	0.16	<0.06				
3/15/2018	4	6	0.14	<0.06	1.77	135	12	9
3/21/2018	4	4	0.64	<0.06				
3/22/2018	4	4	0.24	<0.06	1.76	148	13	11
3/28/2018	6	5	0.16	<0.06				
3/29/2018	6	4	0.13	<0.06	1.31	144	17	15
4/4/2018	6	4	0.17	<0.06				
4/5/2018	5	4	0.17	0.07	1.58	152	8	1
4/11/2018	3	3	0.22	<0.06				
4/12/2018	3	4	0.14	<0.06	1.4	156	<1	<1
4/18/2018	6	4	0.19	0.36				
4/19/2018	7	4	0.26	0.19	1.34	150	4	2
4/25/2018	4	4	0.74	0.08				
4/26/2018	4	4	0.76	0.2	1.2	152	2	1
5/2/2018	5	3	0.27	<0.06				
5/3/2018	5	3	0.27	<0.06	1.57	142	6	5
5/9/2018	4	5	0.73	<0.06				
5/10/2018	5	5	0.51	<0.06	1.42	140	4	2
5/16/2018	5	7	1.1	<0.06				
5/17/2018	5	5	1.22	<0.06	2.02	160	<1	<1
5/23/2018	4	5	1.32	0.27				
5/24/2018	4	5	1.28	0.2	2.39	146	2	<1
5/30/2018	3	3	3.34	0.2				
5/31/2018	3	4	3.39	0.17	3.72	154	2	<1
6/6/2018	4	3	7.66	0.16				
6/7/2018	5	5	7.45	0.14	8.41	210	<1	<1
6/13/2018	3	3	2.31	0.07				
6/14/2018	3	3	1.96	0.14	3.42	180	<1	<1
6/20/2018	4	3	0.11	0.14				
6/21/2018	4	3	0.1	0.13	0.92	158	<1	<1
6/27/2018	4	3	2.12	0.09				
6/28/2018	4	3	2.21	0.1	2.59	154	4	2
7/4/2018	5	4	8.72	0.06				
7/5/2018	5	3	8.45	0.07	9.05	190	2	<1
7/11/2018	3	3	0.5	<0.06				

Raw Influent

Weekly Test Results

Date	CBOD (mg/l)	TSS (mg/l)	NH3-N (mg/l)	TP (mg/l)	TKN (mg/l)	Alkalinity (mg/l)
7/12/2018	93	242	37.2	8.56	49.3	440
7/18/2018						
7/19/2018	66	400	31.6	9.31	36.9	350
7/25/2018						
7/26/2018	279	2869	54.3	5.03	56.2	462
8/1/2018						
8/2/2018	239	285	47.3	7.16	48.1	430
8/8/2018						
8/9/2018	268	196	48.5	4.96	46.4	420
8/15/2018						
8/16/2018	230	255	51.1	4.87	62.5	430
8/22/2018						
8/23/2018	127	186	45.5	4.3	49.8	388
8/29/2018						
8/30/2018	202	265	52.6	8.27	64	394
9/5/2018						
9/6/2018	139	252	46.1	8.75	49.1	400
9/12/2018						
9/13/2018	181	280	44.7	3.15	48	332
9/19/2018						
9/20/2018	212	220	45.4	7.01	49.9	352
9/26/2018						
9/27/2018	133	208	39.3	8.97	41.6	420
10/3/2018						
10/4/2018	102	243	29.9	8.18	33.8	302
10/10/2018						
10/11/2018	62	186	31.3	6.66	36.8	304
10/17/2018						
10/18/2018	80	108	18.5	3.45	22.5	342
10/24/2018						
10/25/2018	65	194	35.5	4.38	37.3	424
10/31/2018						
11/1/2018	107	268	58.6	7.42	61.4	402
11/7/2018						
11/8/2018	169	392	46.6	7.3	53.3	424
11/14/2018						
11/15/2018	97	237	30.7	4.87	35.3	332
11/20/2018						
11/21/2018	306	433	50.4	6.67	54	378
11/28/2018						
1/29/2018	220	380	51.3	7.81	52.9	404
12/5/2018						
12/6/2018	163	296	37.4	6.33	42	388
12/12/2018						
12/13/2018	153	285	40.3	6.25	73.3	368
12/19/2018						
12/20/2018	148	206	39.2	2.71	44.9	396
12/26/2018						
12/27/2018	134	281	35.4	6.02	51.6	86
1/2/2019						
1/3/2019	132	108	14.6	1.32	18.7	274
1/9/2019						
1/10/2019	140	310	40.1	7.45	50.1	378
1/16/2019						
1/17/2019	200	313	37.5	6.27	41	390
1/23/2019						
1/24/2019	211	173	35.1	6.09	52	336
1/30/2019						
1/31/2019	257	332	45.4	6.14	48	428
2/6/2019						
2/7/2019	156	220	37.6	5.11	43.4	380
2/13/2019						
2/14/2019	170	280	29.9	7.89	47.3	372
2/20/2019						
2/21/2019	219	288	41.4	7.42	46.4	378
2/27/2019						
2/28/2019	161	257	45.8	7.88	49.6	368
3/6/2019						
3/7/2019	188	253	36.2	6.51	37.5	356
3/13/2019						
3/14/2019	231	100	55.6	8.31	58.8	378
3/20/2019						
3/21/2019	278	383	53.7	8.38	55.1	422
3/27/2019						
3/28/2019	236	248	53.2	9.26	58.8	432
4/3/2019						
4/4/2019	130	193	36	7.27	38.2	390
4/10/2019						
4/11/2019	195	400	46	6.6	47.1	404
4/17/2019						
4/18/2019	195	228	26.5	5.47	42.7	390
4/24/2019						

Treated Effluent

Weekly Test Results

Date	CBOD (mg/l)	TSS (mg/l)	NH3-N (mg/l)	TP (mg/l)	TKN (mg/l)	Alkalinity (mg/l)	F.COL. (N/100 ml)	*E.Coli* (MPN/100 ml)
7/12/2018	3	3	0.56	<0.06	1.75	156	<1	<1
7/18/2018	5	3	0.42	<0.06				
7/19/2018	4	3	0.6	<0.06	2.41	160	35	28
7/25/2018	4	3	0.75	0.07				
7/26/2018	4	3	0.62	0.08	3.41	162	<1	<1
8/1/2018	4	3	0.75	<0.06				
8/2/2018	4	4	0.77	<0.06	2.19	164	<1	<1
8/8/2018	5	4	0.48	<0.06				
8/9/2018	5	3	0.53	<0.06	1.54	148	10	6
8/15/2018	4	4	0.25	<0.06				
8/16/2018	4	4	0.18	0.13	1.62	144	<1	<1
8/22/2018	5	3	0.73	0.31				
8/23/2018	5	3	0.85	0.35	1.07	156	<1	<1
8/29/2018	6	5	0.56	0.5				
8/30/2018	6	4	0.59	0.41	1.88	132	2	1
9/5/2018	5	4	0.3	0.1				
9/6/2018	5	4	0.3	<0.06	1.25	130	14	10
9/12/2018	3	4	0.57	<0.06				
9/13/2018	3	3	0.59	<0.06	1.28	156	2	<1
9/19/2018	5	4	1.4	<0.06				
9/20/2018	5	4	1.44	<0.06	1.76	140	<1	<1
9/26/2018	4	5	0.53	0.17				
9/27/2018	4	5	0.46	0.2	0.88	144	10	8
10/3/2018	5	3	1.26	0.31				
10/4/2018	5	4	1.28	0.21	1.61	156	4	3
10/10/2018	3	3	0.61	0.21				
10/11/2018	3	3	0.66	0.24	1.42	176	24	20
10/17/2018	2	3	0.11	0.36				
10/18/2018	2	3	0.11	0.45	1.39	182	60	28
10/24/2018	5	3	0.57	<0.06				
10/25/2018	4	3	0.56	<0.06	1.76	218	8	6
10/31/2018	2	4	0.16	<0.06				
11/1/2018	2	3	0.14	<0.06	1.72	178	26	23
11/7/2018	4	3	1.39	<0.06				
11/8/2018	5	3	1.38	<0.06	2.36	174	2	1
11/14/2018	4	4	3.72	0.31				
11/15/2018	4	3	4.02	0.1	2.71	202	<1	<1
11/20/2018	3	3	0.95	0.18				
11/21/2018	3	3	0.92	0.12	2.25	182	2	<1
11/28/2018	3	3	2.9	<0.06				
1/29/2018	3	3	3.11	<0.06	3.75	178	<1	<1
12/5/2018	5	3	1.04	<0.06				
12/6/2018	5	4	1.04	<0.06	2.34	170	<1	<1
12/12/2018	5	3	0.9	<0.06				
12/13/2018	5	3	0.88	<0.06	2.04	172	1	<1
12/19/2018	3	3	4.34	0.06				
12/20/2018	3	3	4.36	<0.06	4.44	178	30	5
12/26/2018	4	3	7.48	<0.06				
12/27/2018	3	4	7.32	<0.06	7.41	184	114	109
1/2/2019	4	3	5.56	<0.06				
1/3/2019	3	3	0.32	<0.06	1.28	160	8	6
1/9/2019	3	3	4.46	<0.06				
1/10/2019	3	3	2.38	<0.06	3.08	168	1	<1
1/16/2019	4	3	1.79	0.07				
1/17/2019	3	3	1.93	<0.06	2.2	186	<1	<1
1/23/2019	3	3	2.2	<0.06				
1/24/2019	<2	3	1.4	<0.06	3.72	166	4	2
1/30/2019	4	3	1.48	<0.06				
1/31/2019	6	4	1.03	<0.06	2.69	144	4	1
2/6/2019	2	3	11.2	<0.06				
2/7/2019	4	4	11.1	<0.06	13.4	196	3	2
2/13/2019	4	4	<0.1	<0.06				
2/14/2019	4	3	0.39	<0.06	1.58	156	18	14
2/20/2019	4	4	0.19	<0.06				
2/21/2019	4	4	0.11	<0.06	1.36	150	2	<1
2/27/2019	7	5	0.51	<0.06				
2/28/2019	7	4	0.78	<0.06	1.17	150	<1	<1
3/6/2019	5	5	5.73	<0.06				
3/7/2019	5	4	6.12	<0.06	6.61	154	6	4
3/13/2019	4	4	1.02	<0.06				
3/14/2019	4	3	0.7	<0.06	1.48	156	<1	<1
3/20/2019	4	3	0.1	<0.06				
3/21/2019	5	5	0.12	<0.06	1.72	136	<1	<1
3/27/2019	5	4	0.15	<0.06				
3/28/2019	4	4	0.12	<0.06	1.61	138	10	5
4/3/2019	3	3	0.11	<0.06				
4/4/2019	3	5	0.19	<0.06	1.3	144	4	2
4/10/2019	4	4	0.13	<0.06				
4/11/2019	3	3	0.13	<0.06	1.29	122	1	<1
4/17/2019	2	3	0.17	<0.06				
4/18/2019	2	3	0.2	<0.06	2.9	130	53	49
4/24/2019	4	4	0.49	<0.06				

Raw Influent

Weekly Test Results

Date	CBOD (mg/l)	TSS (mg/l)	NH3-N (mg/l)	TP (mg/l)	TKN (mg/l)	Alkalinity (mg/l)
4/25/2019	379	260	29	5.16	36.5	348
5/1/2019						
5/2/2019	171	260	34.2	5.32	40.2	390
5/8/2019						
5/9/2019	134	243	34.6	5.91	45.7	376
5/15/2019						
5/16/2019	312	285	46.3	7.22	63.5	420
5/22/2019						
5/23/2019	154	227	46.6	8.21	57	440
5/29/2019						
5/30/2019	220	206	43.6	7.7	53.6	414
6/5/2019						
6/6/2019	316	246	45.2	5.97	47.8	366
6/12/2019						
6/13/2019	238	276	41.1	7.28	135	390
6/19/2019						
6/20/2019	204	360	41.4	7.19	75.4	380
6/26/2019						
6/27/2019	289	242	42.8	7.47	54.7	370
7/3/2019						
7/4/2019	162	233	41.6	5.37	55.7	466
7/10/2019						
7/11/2019	269	316	45.5	8.81	61.1	172
7/17/2019						
7/18/2019	172	349	61.2	8.57	71.2	396
7/24/2019						
7/25/2019	184	238	42	6	51.7	360
7/31/2019						
8/1/2019	279	169	47.2	6.49	66.7	364
8/7/2019						
8/8/2019	132	240	33.8	6.02	50.5	342
8/14/2019						
8/15/2019	134	260	34.5	6	43.1	342
8/21/2019						
8/22/2019	305	300	39	5.3	50.9	338
8/28/2019						
8/29/2019	214	278	43	4.22	58.4	400
9/4/2019						
9/5/2019	244	200	37.7	5.11	58.9	302
9/11/2019						
9/12/2019	177	260	40.5	8.54	64.2	312
9/18/2019						
9/19/2019	206	253	42.9	7.88	58.2	370
9/25/2019						
9/26/2019	128	324	32.2	6.57	61.8	272
10/2/2019						
10/3/2019	203	315	41.6	8.6	66.7	376
10/9/2019						
10/10/2019	170	206	39.4	7.59	57.6	360
10/16/2019						
10/17/2019	128	223	43.5	8.14	85	376
10/23/2019						
10/24/2019	160	160	38.7	7.11	55.3	352
10/30/2019						
10/31/2019	107	180	31.5	3.78	45.3	344
11/6/2019						
11/7/2019	98	213	29.4	6.51	45.2	292
11/13/2019						
11/14/2019	189	312	40	5.86	54.4	340
11/20/2019						
11/21/2019	172	203	34.9	5.19	55.2	370
11/26/2019						
11/27/2019	197	231	34.3	8.51	48.6	324
12/4/2019						
12/5/2019	162	248	37.7	5.27	40.8	376
12/11/2019						
12/12/2019	117	180	40.1	7.05	51.7	344
12/18/2019						
12/19/2019	279	300	46.7	7.97	96.6	394
12/25/2019						
12/26/2019	193	1570	33.8	9.9	138	400

Treated Effluent

Weekly Test Results

Date	CBOD (mg/l)	TSS (mg/l)	NH3-N (mg/l)	TP (mg/l)	TKN (mg/l)	Alkalinity (mg/l)	F.COL. (N/100 ml)	*E.Coli* (MPN/100 ml)
4/25/2019	4	3	0.43	<0.06	1.52	146	<1	<1
5/1/2019	3	3	0.38	<0.06				
5/2/2019	2	3	0.1	<0.06	1.16	140	6	5
5/8/2019	4	3	0.47	<0.06				
5/9/2019	4	3	0.7	<0.06	1.81	152	2	<1
5/15/2019	5	3	1.34	<0.06				
5/16/2019	5	3	1.24	<0.06	2.31	180	<1	<1
5/22/2019	4	3	1.95	<0.06				
5/23/2019	4	4	1.59	<0.06	3.65	150	2	1
5/29/2019	5	5	3.43	<0.06				
5/30/2019	4	6	2.34	<0.06	3.14	164	2	1
6/5/2019	5	6	1.37	<0.06				
6/6/2019	4	4	0.79	<0.06	1.83	162	4	2
6/12/2019	7	6	22.3	<0.06				
6/13/2019	7	6	20.5	<0.06	21.8	188	3	3
6/19/2019	2	4	5.94	<0.06				
6/20/2019	3	3	2.62	<0.06	4.71	166	<1	<1
6/26/2019	6	4	2.39	0.09				
6/27/2019	6	3	1.77	<0.06	2.86	160	2	1
7/3/2019	2	3	2.47	<0.06				
7/4/2019	2	3	2.48	<0.06	3.63	178	2	<1
7/10/2019	5	3	3.82	<0.06				
7/11/2019	5	3	3.81	<0.06	4.86	48	8	5
7/17/2019	<2	3	1.96	<0.06				
7/18/2019	<2	3	1.73	<0.06	3.05	156	6	1
7/24/2019	5	3	1.57	<0.06				
7/25/2019	5	3	1.09	<0.06	2.23	124	5	3
7/31/2019	4	3	2.26	<0.06				
8/1/2019	4	4	1.73	<0.06	2.78	134	2	1
8/7/2019	3	3	1.33	<0.06				
8/8/2019	3	3	0.65	<0.06	2.25	140	8	4
8/14/2019	4	3	1.27	<0.06				
8/15/2019	3	3	1.31	<0.06	2.78	138	<1	<1
8/21/2019	10	3	1.52	<0.06				
8/22/2019	8	3	1.7	<0.06	3	140	3	2
8/28/2019	4	3	1.51	0.1				
8/29/2019	4	3	1.61	<0.06	3.7	154	6	4
9/4/2019	3	3	3.37	<0.06				
9/5/2019	3	3	2.37	<0.06	4.28	142	2	1
9/11/2019	<2	3	2.18	<0.06				
9/12/2019	<2	3	1.78	<0.06	3.41	124	<1	<1
9/18/2019	4	3	1.62	<0.06				
9/19/2019	4	3	1.06	<0.06	3.35	128	<1	<1
9/25/2019	<2	4	2.77	<0.06				
9/26/2019	<2	3	2.72	<0.06	4.11	142	33	28
10/2/2019	4	3	2.17	<0.06				
10/3/2019	4	3	1.57	<0.06	3.69	138	4	3
10/9/2019	2	3	1.6	<0.06				
10/10/2019	2	3	1.62	<0.06	2.96	144	<1	<1
10/16/2019	4	3	2.23	0.08				
10/17/2019	4	3	1.39	0.09	3.12	136	1	<1
10/23/2019	<2	3	2.46	<0.06				
10/24/2019	<2	3	2.39	<0.06	4.03	170	<1	<1
10/30/2019	3	5	1.84	<0.06				
10/31/2019	3	4	0.28	<0.06	2.08	160	4	2
11/6/2019	4	3	2.31	<0.06				
11/7/2019	3	3	2.36	<0.06	4.3	178	21	14
11/13/2019	5	3	0.31	<0.06				
11/14/2019	6	3	0.34	<0.06	1.95	144	59	56
11/20/2019	4	3	2.26	<0.06				
11/21/2019	4	3	1.88	<0.06	7.35	220	57	52
11/26/2019	<2	3	3.95	<0.06				
11/27/2019	<2	3	4.09	<0.06	7.79	190	<1	<1
12/4/2019	4	3	0.66	<0.06				
12/5/2019	3	3	0.61	<0.06	2.48	142	4	3
12/11/2019	4	3	1.12	<0.06				
12/12/2019	4	3	0.62	<0.06	1.89	146	6	4
12/18/2019	4	3	0.84	<0.06				
12/19/2019	4	3	0.83	<0.06	2.88	140	4	1
12/25/2019	3	3	2.62	<0.06				
12/26/2019	3	3	2.63	<0.06	5.32	176	<1	<1

Raw Influent

Monthly Averages

Date	CBOD (mg/l)	TSS (mg/l)	NH3-N (mg/l)	TP (mg/l)	TKN (mg/l)	Alkalinity (mg/l)
Jan-20	168.60	233.20	48.68	7.21	73.04	362.00
Feb-20	151.00	267.00	44.53	7.58	69.85	358.50
Mar-20	172.50	294.50	45.08	7.36	60.25	329.50
Apr-20	206.40	267.80	50.60	10.10	63.22	388.00
May-20	155.50	258.75	51.68	4.92	82.80	378.50
Jun-20	207.25	255.50	55.13	8.34	68.68	410.50
Jul-20	175.40	247.40	53.98	6.78	74.06	268.00
Aug-20	192.50	240.00	53.18	6.72	70.25	263.00
Sep-20	122.75	266.25	36.78	9.08	64.80	393.50
Oct-20	149.80	223.60	42.64	8.34	58.66	650.40
Nov-20	296.00	214.25	43.33	8.47	48.78	383.50
Dec-20	256.80	255.00	49.10	7.45	56.90	393.20
Jan-21	195.00	360.00	55.75	9.69	65.63	403.50
Feb-21	264.00	312.33	51.03	5.67	71.97	412.67
Mar-21	179.25	247.50	29.54	4.60	70.75	445.50
Apr-21	248.20	373.00	60.04	12.44	77.98	451.20
May-21	175.50	313.50	44.25	5.17	64.80	393.50
Jun-21	164.75	233.50	38.65	4.83	59.90	359.50
Jul-21	267.40	330.00	51.12	7.32	73.72	409.60
Aug-21	168.00	184.25	50.13	20.60	64.53	322.00
Sep-21	168.75	303.75	56.03	6.92	78.35	259.50
Oct-21	153.50	272.50	50.65	13.80	77.20	356.00
Nov-21	166.50	253.75	41.88	8.89	75.08	338.00
Dec-21	169.00	297.40	51.80	90.32	325.60	9.42

Weekly Test Results

Date	CBOD (mg/l)	TSS (mg/l)	NH3-N (mg/l)	TP (mg/l)	TKN (mg/l)	Alkalinity (mg/l)
1/1/2020						
1/2/2020	289	68	56.9	8.34	95.6	390
1/8/2020						
1/9/2020	178	256	40.9	7.76	63.4	304
1/15/2020						
1/16/2020	137	268	53.3	5.98	77.8	428
1/22/2020						
1/23/2020	155	364	41.7	9.48	59.2	358
1/29/2020						
1/30/2020	84	210	50.6	4.51	69.2	330
2/5/2020						
2/6/2020	153	217	33.6	6.48	62.5	312
2/12/2020						
2/13/2020	196	287	56.3	7.78	78.9	380
2/19/2020						
2/20/2020	147	260	41.4	8.22	69.1	364
2/26/2020						
2/27/2020	108	304	46.8	7.83	68.9	378
3/4/2020						
3/5/2020	150	224	31.9	9.88	23.1	314
3/11/2020						
3/12/2020	177	284	51.4	7.51	79	390
3/18/2020						
3/19/2020	246	336	55.4	5.69	83.1	284
3/25/2020						
3/26/2020	117	334	41.6	6.36	55.8	330
4/1/2020						
4/2/2020	248	196	53.2	9.93	92.1	312
4/8/2020						
4/9/2020	163	190	39.1	14.4	56.9	360
4/15/2020						
4/16/2020	104	312	43.4	12.9	81.4	382
4/22/2020						
4/23/2020	322	163	62.8	8.76	46.9	356
4/29/2020						
4/30/2020	195	478	54.5	4.53	38.8	530
5/6/2020						
5/7/2020	182	263	48.7	4.49	76.9	320
5/13/2020						
5/14/2020	121	297	48.5	5.45	67.6	392
5/20/2020						
5/21/2020	174	285	54.8	4.8	116	372
5/27/2020						
5/28/2020	145	190	54.7	4.92	70.7	430
6/3/2020						
6/4/2020	196	228	48.2	7.79	63.2	380
6/10/2020						
6/11/2020	230	252	47.8	9.46	54.7	402
6/17/2020						
6/18/2020	180	230	66.5	9.57	75.2	480
6/24/2020						
6/25/2020	223	312	58	6.52	81.6	380
7/1/2020						

Treated Effluent

Monthly Averages

Date	CBOD (mg/l)	TSS (mg/l)	NH3-N (mg/l)	TP (mg/l)	TKN (mg/l)	Alkalinity (mg/l)	F.COL. (N/100 ml)	*E.Coli* (MPN/100 ml)
Jan-20	3.10	3.00	0.73	0.07	2.60	167.20	10.25	16.50
Feb-20	3.00	3.00	0.84	0.06	2.04	145.00	21.00	18.50
Mar-20	3.63	3.25	0.65	#DIV/0!	4.04	158.50	3.50	2.00
Apr-20	3.00	4.20	1.51	#DIV/0!	4.06	154.80	13.00	10.00
May-20	2.63	3.75	1.76	#DIV/0!	4.39	165.00	29.33	27.00
Jun-20	2.88	5.00	2.19	0.09	3.91	148.50	2.00	1.00
Jul-20	3.10	3.90	2.54	#DIV/0!	6.16	116.40	6.00	4.60
Aug-20	3.38	4.25	1.20	0.11	3.73	120.00	7.00	5.00
Sep-20	2.56	3.22	1.20	0.11	3.21	167.00	2.33	2.50
Oct-20	3.00	4.67	1.49	0.12	5.29	263.20	3.50	2.00
Nov-20	4.88	3.00	1.48	0.11	4.47	168.50	4.75	9.00
Dec-20	4.80	4.20	2.51	0.13	4.22	168.80	8.40	7.50
Jan-21	4.63	5.13	1.14	0.07	4.52	172.00	20.50	16.25
Feb-21	4.33	5.00	1.48	0.09	6.23	200.00	18.50	11.00
Mar-21	5.11	5.11	1.79	0.13	5.30	165.00	4.75	3.00
Apr-21	5.22	5.22	2.46	0.09	8.63	186.00	19.80	17.50
May-21	5.63	4.00	1.76	0.15	6.21	204.50	3.50	1.67
Jun-21	5.38	5.75	2.13	0.24	17.23	253.00	24.50	15.75
Jul-21	5.00	5.44	2.20	0.08	25.82	220.40	42.00	37.00
Aug-21	5.63	4.50	1.58	0.49	24.38	238.50	87.00	60.75
Sep-21	6.50	3.80	1.75	0.08	26.58	195.20	19.20	17.80
Oct-21	4.38	4.88	1.55	0.18	11.53	171.50	49.25	41.25
Nov-21	3.83	3.50	0.91	0.17	3.96	159.50	50.00	66.33
Dec-21	3.90	4.50	1.58	0.06	7.35	155.80	16.00	12.20

Weekly Test Results

Date	CBOD (mg/l)	TSS (mg/l)	NH3-N (mg/l)	TP (mg/l)	TKN (mg/l)	Alkalinity (mg/l)	F.COL. (N/100 ml)	*E.Coli* (MPN/100 ml)
1/1/2020	4	3	1.31	0.07				
1/2/2020	4	3	1.16	<0.06	4.12	180	1	<1
1/8/2020	2	3	1.19	<0.06				
1/9/2020	2	3	1.11	<0.06	3.06	184	4	3
1/15/2020	4	3	0.66	<0.06				
1/16/2020	2	3	0.63	<0.06	2	176	1	<1
1/22/2020	4	3	0.13	<0.06				
1/23/2020	3	3	0.13	<0.06	1.47	150	<1	<1
1/29/2020	3	3	0.5	<0.06				
1/30/2020	3	3	0.52	<0.06	2.36	146	35	30
2/5/2020	2	3	1.83	<0.06				
2/6/2020	2	3	1.65	<0.06	2.2	152	35	32
2/12/2020	4	3	0.13	0.06				
2/13/2020	6	3	0.11	<0.06	1.76	140	<1	<1
2/19/2020	3	3	0.73	<0.06				
2/20/2020	3	3	0.63	<0.06	2.65	146	7	5
2/26/2020	2	3	1.46	<0.06				
2/27/2020	2	3	0.17	<0.06	1.56	142	<1	<1
3/4/2020	3	3	0.33	<0.06				
3/5/2020	4	3	0.22	<0.06	9.91	156	<1	<1
3/11/2020	4	3	1.25	<0.06				
3/12/2020	4	3	1.42	<0.06	3.15	170	<1	<1
3/18/2020	4	3	0.27	<0.06				
3/19/2020	4	3	0.3	<0.06	1.42	160	5	3
3/25/2020	4	4	0.15	<0.06				
3/26/2020	2	4	1.22	<0.06	1.67	148	2	1
4/1/2020	3	5	1.09	<0.06				
4/2/2020	3	5	1.14	<0.06	3.31	146	4	2
4/8/2020	5	5	1.17	<0.06				
4/9/2020	4	3	1.17	<0.06	2.66	200	2	1
4/15/2020	2	5	1.22	<0.06				
4/16/2020	2	5	0.57	<0.06	2.65	172	41	34
4/22/2020	2	4	1.63	<0.06				
4/23/2020	2	3	1.83	<0.06	4.24	160	<1	<1
4/29/2020	3	4	2.81	<0.06				
4/30/2020	4	3	2.43	<0.06	7.44	96	5	3
5/6/2020	2	3	3.2	<0.06				
5/7/2020	2	4	1.62	<0.06	5.47	168	4	4
5/13/2020	2	4	2.04	<0.06				
5/14/2020	2	4	1.42	<0.06	3.57	158	<1	<1
5/20/2020	4	5	2.79	<0.06				
5/21/2020	4	4	1.54	<0.06	6.4	152	2	1
5/27/2020	3	3	0.71	<0.06				
5/28/2020	2	3	0.75	<0.06	2.13	182	82	76
6/3/2020	4	4	2.36	<0.06				
6/4/2020	4	5	1.93	<0.06	2.91	178	<1	<1
6/10/2020	2	3	2.23	<0.06				
6/11/2020	3	3	2.6	<0.06	2.92	126	2	1
6/17/2020	3	8	2.22	0.09				
6/18/2020	3	6	0.98	0.08	4.64	132	<1	<1
6/24/2020	2	5	3.01	<0.06				
6/25/2020	2	6	2.17	<0.06	5.15	158	2	1
7/1/2020	3	4	3.16	<0.06				

Raw Influent

Weekly Test Results

Date	CBOD (mg/l)	TSS (mg/l)	NH3-N (mg/l)	TP (mg/l)	TKN (mg/l)	Alkalinity (mg/l)
7/2/2020	163	256	64.4	6.72	106	460
7/8/2020						
7/9/2020	174	279	54.2	7.07	55.3	360
7/15/2020						
7/16/2020	156	162	54.9	7.31	82.5	324
7/22/2020						
7/23/2020	288	300	51.5	5.83	66	116
7/29/2020						
7/30/2020	96	240	44.9	6.98	60.5	80
8/5/2020						
8/6/2020	339	284	30	5.35	63.1	136
8/12/2020						
8/13/2020	92	163	62.3	7.77	75.8	236
8/19/2020						
8/20/2020	164	293	62.7	7.51	70.1	320
8/26/2020						
8/27/2020	175	220	57.7	6.26	72	360
9/2/2020						
9/3/2020	136	352	42.7	10.6	84.1	336
9/9/2020						
9/10/2020	93	270	37.2	9.97	67.8	460
9/16/2020						
9/17/2020	109	210	27.7	9.09	60.1	382
9/23/2020						
9/24/2020	153	233	39.5	6.64	47.2	396
9/30/2020						
10/1/2020	86	193	34.8	10.3	58.8	682
10/7/2020						
10/8/2020	198	142	23.8	4.85	58.6	720
10/14/2020						
10/15/2020	156	307	55.7	9.57	61.2	780
10/21/2020						
10/22/2020	176	216	49.6	11.6	55.3	648
10/28/2020						
10/29/2020	133	260	49.3	5.4	59.4	422
11/4/2020						
11/5/200	347	140	46	7.98	50.5	388
11/11/2020						
11/12/2020	172	227	33.9	9.59	38.3	360
11/18/2020						
11/19/2020	151	340	53.4	7.28	60.4	424
11/24/2020						
11/25/2020	514	150	40	9.04	45.9	362
12/2/2020						
12/3/2020	345	315	44.8	5.42	50.6	322
12/9/2020						
12/10/2020	395	260	48.2	4.91	61.8	462
12/16/2020						
12/17/2020	192	267	48.4	9.68	57.3	390
12/22/2020						
12/23/2020	206	78	45.2	8.54	49.1	420
12/29/2020						
12/30/2020	146	355	58.9	8.72	65.7	372
1/6/2021						
1/7/2021	238	245	58.7	5.74	66.8	456
1/13/2021						
1/14/2021	148	257	54.2	18.7	64.2	332
1/20/2021						
1/21/2021	188	505	52.7	5.87	62.5	396
1/27/2021						
1/28/2021	206	433	57.4	8.46	69	430
2/3/2021						
2/4/2021	241	380	58.3	5.61	92.9	460
2/10/2021						
2/11/2021	297	317	50.9	7.45	65.4	420
2/24/2021						
2/25/2021	254	240	43.9	3.96	57.6	358
3/3/2021						
3/4/2021	231	177	58.8	0.55	84.6	560
3/10/2021						
3/11/2021	122	193	45.8	4.28	46.9	440
3/17/2021						
3/18/2021	183	370	5.63	5.63	62.4	386
3/24/2021						
3/25/2021	181	250	7.93	7.93	89.1	396
3/31/2021						
4/1/2021	256	360	58.4	8.3	74.6	444
4/7/2021						
4/8/2021	227	237	56.1	15.4	79.2	472
4/14/2021						
4/15/2021	295	350	73	7.91	90.4	480
4/21/2021						

Treated Effluent

Weekly Test Results

Date	CBOD (mg/l)	TSS (mg/l)	NH3-N (mg/l)	TP (mg/l)	TKN (mg/l)	Alkalinity (mg/l)	F.COL. (N/100 ml)	*E.Coli* (MPN/100 ml)
7/2/2020	2	4	3.18	<0.06	4.62	140	5	4
7/8/2020	4	5	1.84	<0.06				
7/9/2020	6	5	2.94	<0.06	9.55	176	11	10
7/15/2020	2	4	5.17	<0.06				
7/16/2020	2	3	5.05	<0.06	5.91	144	5	3
7/22/2020	4	4	0.11	<0.06				
7/23/2020	4	4	1.2	<0.06	5.64	70	2	1
7/29/2020	2	3	2.25	<0.06				
7/30/2020	2	3	0.47	<0.06	5.07	52	7	5
8/5/2020	3	3	0.97	<0.06				
8/6/2020	3	4	1.48	<0.06	5.09	70	8	6
8/12/2020	4	8	1.77	<0.06				
8/13/2020	5	5	0.97	<0.06	4.03	176	8	5
8/19/2020	3	3	0.82	<0.06				
8/20/2020	3	3	0.76	<0.06	2.91	96	4	3
8/26/2020	3	4	1.82	0.11				
8/27/2020	3	4	1.04	<0.06	2.9	138	8	6
9/2/2020	2	3	0.82	<0.06				
9/3/2020	2	3	0.58	<0.06	3.07	140	2	1
9/9/2020	2	3	1.79	0.1				
9/10/2020	2	3	1.05	<0.06	3.85	180	4	4
9/16/2020	3	3	1.3	<0.06				
9/17/2020	3	3	1.39	0.07	1.6	178	1	<1
9/23/2020	4	3	1.42	0.08				
9/24/2020	3	3	1.09	0.11	4.31	170	<1	<1
9/30/2020	2	5	1.33	0.19				
10/1/2020	<2	7	1.31	0.22	2.58	240	4	2
10/7/2020	4	7	1.41	0.11				
10/8/2020	5	7	1.75	0.06	3.76	284	<1	<1
10/14/2020	2	3	1.62	0.09				
10/15/2020	2	3	1.04	<0.06	7.54	322	<1	<1
10/21/2020	3	4	2.17	<0.06				
10/22/2020	2	3	0.99	<0.06	9.2	284	3	<1
10/28/2020	<2	4	1.57	<0.06				
10/29/2020	<2	4	1.57	<0.06	3.36	186	<1	<1
11/4/2020	6	3	1.7	0.18				
11/5/200	5	3	0.74	<0.06	3.45	184	6	<1
11/11/2020	5	3	1.74	<0.06				
11/12/2020	6	3	1.74	<0.06	6.87	202	1	<1
11/18/2020	4	3	1.46	<0.06				
11/19/2020	5	3	1.34	<0.06	2.24	164	1	<1
11/24/2020	4	3	1.58	0.08				
11/25/2020	4	3	1.5	0.07	5.31	124	11	9
12/2/2020	5	3	1.73	0.08				
12/3/2020	4	5	1.91	0.07	3.51	180	2	1
12/9/2020	6	3	1.47	0.11				
12/10/2020	6	3	2.32	0.07	2.94	156	1	<1
12/16/2020	4	3	0.34	0.14				
12/17/2020	3	3	0.98	0.22	1.31	148	8	6
12/22/2020	5	6	1.52	<0.06				
12/23/2020	5	6	1.71	<0.06	4.97	140	25	19
12/29/2020	5	5	4.96	0.1				
12/30/2020	5	5	8.11	0.23	8.37	220	6	4
1/6/2021	3	6	1.48	<0.06				
1/7/2021	4	5	1.28	0.07	3.78	168	48	40
1/13/2021	4	7	1	0.07				
1/14/2021	4	5	1.03	<0.06	3.64	164	7	4
1/20/2021	7	6	1.29	<0.06				
1/21/2021	8	4	0.81	<0.06	4.04	166	23	19
1/27/2021	3	4	1.22	<0.06				
1/28/2021	4	4	1.04	<0.06	6.61	190	4	2
2/3/2021	4	3	1.52	<0.06				
2/4/2021	3	4	1.82	<0.06	4.84	170	4	2
2/10/2021	4	8	1.72	<0.06				
2/11/2021	4	9	0.79	<0.06	8.03	210	33	20
2/24/2021	6	3	1.81	0.11				
2/25/2021	5	3	1.19	0.06	5.81	220	<1	<1
3/3/2021	4	5	2.5	0.1				
3/4/2021	4	4	2.17	0.12	3.21	200	2	1
3/10/2021	5	5	1.05	<0.06				
3/11/2021	4	3	1.28	<0.06	6.57	186	2	1
3/17/2021	6	4	1.27	<0.06				
3/18/2021	6	5	1.59	<0.06	7.72	194	4	1
3/24/2021	6	10	1.96	<0.06				
3/25/2021	5	7	2.73	0.18	3.69	80	11	9
3/31/2021	6	3	1.57	<0.06				
4/1/2021	7	3	1.55	<0.06	7.61	180	8	<1
4/7/2021	5	8	1.68	<0.06				
4/8/2021	5	4	2	<0.06	13.3	188	58	48
4/14/2021	5	5	4.22	0.08				
4/15/2021	6	5	4.2	0.13	5.13	196	9	5
4/21/2021	4	4	1.58	<0.06				

Raw Influent

Weekly Test Results

Date	CBOD (mg/l)	TSS (mg/l)	NH3-N (mg/l)	TP (mg/l)	TKN (mg/l)	Alkalinity (mg/l)
4/22/2021	260	203	59.4	22.9	67.8	440
4/28/2021						
4/29/2021	203	715	53.3	7.67	77.9	420
5/5/2021						
5/6/2021	190	243	51.5	6.94	77	332
5/12/2021						
5/13/2021	267	200	33.4	2.12	57.1	372
5/19/2021						
5/20/2021	185	211	49.7	3.16	70	410
5/26/2021						
5/27/2021	60	600	42.4	8.46	55.1	460
6/2/2021						
6/3/2021	180	287	34.6	3.68	41	386
6/9/2021						
6/10/2021	46	112	29.4	4.09	62.7	344
6/16/2021						
6/17/2021	176	280	50.3	9.43	82.6	396
6/23/2021						
6/24/2021	257	255	40.3	2.13	53.3	312
7/1/2021	301	385	52.4	5.2	47.7	348
7/7/2021						
7/8/2021	185	273	44.2	6.16	79.8	380
7/14/2021						
7/15/2021	269	417	46.1	8.84	94.5	384
7/21/2021						
7/22/2021	289	269	53.7	5.82	67.8	456
7/28/2021						
7/29/2021	293	306	59.2	10.6	78.8	480
8/4/2021						
8/5/2021	208	266	45.4	11.2	66.9	162
8/11/2021						
8/12/2021	121	240	47.8	44.5	64.3	364
8/18/2021						
8/19/2021	141	68	50.7	7.59	63.6	384
8/25/2021						
8/26/2021	202	163	56.6	19.1	63.3	378
9/1/2021						
9/2/2021	125	287	63.1	9.13	76.8	420
9/8/2021						
9/9/2021	136	317	47.4	5.01	70.7	174
9/15/2021						
9/16/2021	215	288	51.3	4.02	81	406
9/22/2021						
9/23/2021	199	323	62.3	9.51	84.9	38
9/29/2021						
9/30/2021						
10/6/2021						
10/7/2021	137	148	64.8	11.7	95.7	370
10/13/2021						
10/14/2021	128	240	29	6.51	34.6	266
10/20/2021						
10/21/2021	174	347	57.3	10.6	87.5	386
10/27/2021						
10/28/2021	175	355	51.5	26.4	91	402
11/3/2021						
11/4/2021	97	220	44.3	5.12	71.4	340
11/9/2021						
11/10/2021	157	257	49.9	9.65	61.6	310
11/17/2021						
11/18/2021	315	375	40.5	12.5	72.4	360
11/23/2021						
11/24/2021	97	163	32.8	8.29	94.9	342
12/1/2021						
12/2/2021	104	520	49.7	107	372	7.03
12/8/2021						
12/9/2021	221	335	68.3	111	196	8.57
12/15/2021						
12/16/2021	199	132	49.7	101	372	16.1
12/21/2021						
12/22/2021	135	263	38	62.9	348	10.2
12/28/2021						
12/29/2021	186	237	53.3	69.7	340	5.21

Treated Effluent

Weekly Test Results

Date	CBOD (mg/l)	TSS (mg/l)	NH3-N (mg/l)	TP (mg/l)	TKN (mg/l)	Alkalinity (mg/l)	F.COL. (N/100 ml)	*E.Coli* (MPN/100 ml)
4/22/2021	5	6	1.98	<0.06	3.42	186	16	11
4/28/2021	5	6	2.28	0.07				
4/29/2021	5	6	2.64	0.08	13.7	180	8	6
5/5/2021	5	5	2.79	0.23				
5/6/2021	7	5	1.98	0.07	7.79	212	<1	1
5/12/2021	3	4	1.3	<0.06				
5/13/2021	4	6	1.05	<0.06	6.41	190	6	3
5/19/2021	7	3	1.52	<0.06				
5/20/2021	8	3	1.49	<0.06	6.6	206	<1	<1
5/26/2021	6	3	1.72	<0.06				
5/27/2021	5	3	2.23	<0.06	4.05	210	1	1
6/2/2021	4	6	1.51	<0.06				
6/3/2021	5	3	1.53	<0.06	9.82	220	2	1
6/9/2021	4	7	3.88	<0.06				
6/10/2021	4	7	1.99	<0.06	14.5	256	17	12
6/16/2021	7	5	2.55	0.23				
6/17/2021	6	4	2.04	0.59	20.3	278	44	20
6/23/2021	6	8	1.81	0.06				
6/24/2021	7	6	1.7	0.08	24.3	258	35	30
7/1/2021	6	9	2.29	0.06	32.7	244	48	63
7/7/2021	7	6	4.52	0.13				
7/8/2021	7	6	2.87	0.16	5.9	92	20	16
7/14/2021	5	4	1.38	0.06				
7/15/2021	5	4	1.45	0.06	34.5	266	44	32
7/21/2021	4	7	1.78	0.06				
7/22/2021	3	4	1.9	0.06	26.2	270	55	36
7/28/2021	5	5	1.85	0.06				
7/29/2021	3	4	1.73	0.06	29.8	230	43	38
8/4/2021	5	3	1.11	<0.06				
8/5/2021	5	3	1.37	<0.06	26.8	262	104	68
8/11/2021	6	5	1.84	0.4				
8/12/2021	6	4	1.97	0.87	25	246	102	96
8/18/2021	4	5	1.46	0.26				
8/19/2021	4	5	1.52	0.43	19.9	226	<1	39
8/25/2021	7	4	1.53	<0.06				
8/26/2021	8	7	1.82	<0.06	25.8	220	55	40
9/1/2021	7	5	1.84	0.17				
9/2/2021	8	5	1.63	0.16	29.2	220	15	10
9/8/2021	4	3	1.96	0.06				
9/9/2021	5	3	2.36	0.06	27	212	9	6
9/15/2021	9	3	1.24	0.06				
9/16/2021	8	3	1.2	0.06	21.9	174	21	15
9/22/2021	6	3	2.25	0.06				
9/23/2021	7	3	1.3	0.06	26.5	164	2	20
9/29/2021	5	5	1.82	0.06				
9/30/2021	6	5	1.93	0.06	28.3	206	49	38
10/6/2021	4	3	1.5	<0.06				
10/7/2021	4	3	1.48	<0.06	17.4	222	22	13
10/13/2021	5	5	1.83	<0.06				
10/14/2021	5	10	1.5	<0.06	21.8	182	8	5
10/20/2021	4	5	1.31	<0.06				
10/21/2021	5	3	1.37	<0.06	3.47	140	57	54
10/27/2021	4	5	1.7	0.24				
10/28/2021	4	5	1.72	0.11	3.45	142	110	93
11/3/2021	5	3	0.81	0.17				
11/4/2021	4	3	0.65	<0.06	2.43	140	120	179
11/9/2021	4	3	0.1	<0.06				
11/10/2021	4	3	0.1	<0.06	1.33	165	10	5
11/17/2021	3	5	1.79	<0.06				
11/18/2021	3	5	1.65	<0.06	7.39	168		
11/23/2021	<2	3	0.72	<0.06			20	15
11/24/2021	<2	3	1.46	<0.06	4.68	165		
12/1/2021	5	3	2.34	0.06			12	10
12/2/2021	5	3	2.37	0.06	6.26	160		
12/8/2021	4	5	1.51	0.06				
12/9/2021	4	5	1.61	0.06	7.14	157	10	7
12/15/2021	3	3	1.31	0.06			8	3
12/16/2021	3	3	1.2	0.06	6.93	166		
12/21/2021	3	5	0.75	0.08				
12/22/2021	3	5	1.1	0.08	4.43	144	34	29
12/28/2021	4	5	1.64	0.06				
12/29/2021	5	8	2.01	0.06	12	152	16	12

Raw Influent

Monthly Averages

Date	CBOD (mg/l)	TSS (mg/l)	NH3-N (mg/l)	TP (mg/l)	TKN (mg/l)	Alkalinity (mg/l)
Jan-22	237	390	67.6	11.9	105	392
Feb-22	161	354	48.2	14.3	67.3	478
Mar-22	237	350	64.7	9.63	76.1	567
Apr-22	282	394	56.1	9.48	92.7	356
May-22	186	273	43.7	8.66	64.6	395
Jun-22	192	289	46.1	7.88	63.6	295
Jul-22	256	267	49.0	9.12	75.5	384
Aug-22	205	241	53.7	6.55	35.6	345
Sep-22	277	296	57.4	10.9	62.7	389
Oct-22	277	307	60.2	11.6	85.2	435
Nov-22	141	299	50.8	10.6	75.5	362
Dec-22	174	211	47.2	6.90	64.6	298
Jan-23	189	211	48.5	9.11	66.7	317
Feb-23	Missing					
Mar-23	232	324	55.7	10.0	79.7	370
Apr-23	193	274	47.4	7.22	58.7	274
May-23	176	207	48.1	7.58	71.9	365
Jun-23	130	178	41.7	3.78	61.7	369
Jul-23	200	264	47.7	9.34	72.5	366
Aug-23	282	266	58.5	8.93	89.8	414
Sep-23	297	319	59.7	9.84	82.0	358
Oct-23	242.5	333.5	52.2	10.395	88.3	426

Weekly Test Results

Date	CBOD (mg/l)	TSS (mg/l)	NH3-N (mg/l)	TP (mg/l)	TKN (mg/l)	Alkalinity (mg/l)
1/6/2022	244	400	67.9	14.4	118	388
1/13/2022	269	383	59.2	8.79	108	352
1/20/2022	174	340	67.6	9.34	80.7	396
1/27/2022	261	438	75.8	14.9	115	430
2/5/2022	120	410	40.5	11.2	77.7	272
2/10/2022	227	339	60.3	14.4	68.7	488
2/17/2022	154	310	51.8	7.2	48.6	536
2/26/2022	143	358	40.2	24.2	74	614
3/3/2022	313	368	57.4	11.8	75.5	644
3/10/2022	233	284	61.4	10	60	620
3/17/2022	122	300	65.7	9.76	61.4	660
3/24/2022	217	378	75.6	9.94	87.6	450
3/31/2022	300	420	63.6	6.63	96	460
4/7/2022	141	321	56.6	10.1	69.1	400
4/14/2022	202	348	69.4	8.1	124	446
4/21/2022	768	392	26.2	8.6	70.5	396
4/28/2022	16	515	72.2	11.1	107	182
5/5/2022	18	294	55.1	7.15	60	390
5/12/2022	259	236	48.4	7.4	61.1	380
5/19/2022	277	322	14.4	11.3	76.8	430
5/26/2022	190	238	56.8	8.79	60.4	380
6/2/2022	252	229	38.9	6.91	37.4	84
6/9/2022	169	210	47.6	8.17	70.3	320
6/16/2022	210	446	51.2	6.7	82.3	380
6/23/2022	144	233	46.9	8.35	55.5	380
6/30/2022	184	325	45.9	9.29	72.6	310
7/7/2022	177	309	17.2	7.94	53.6	382
7/14/2022	197	304	68	6.72	101	372
7/21/2022	384	342	52.3	10.7	57	340
7/28/2022	264	113	58.3	11.1	90.2	440
8/3/2022	171	210	47.8	6.55	77.1	354
8/11/2022	155	197	50.5	5.75	51.6	268
8/18/2022	322	292	59	7.9	7.9	362
8/25/2022	172	263	57.3	5.98	5.98	396
9/1/2022	443	284	46.7	5.23	59	398
9/8/2022	243	308	41.1	11.5	64.9	330
9/15/2022	298	330	61.7	16.5	58.4	374
9/22/2022	259	291	100	12.2	60	450
9/29/2022	141	266	37.7	8.84	71.1	394
10/6/2022	279	305	57.1	13.7	74.6	440
10/13/2022	337	284	64.5	11.8	74	440
10/20/2022	154	266	56.9	10.2	84.1	420
10/27/2022	339	373	62.2	10.7	108	440
11/3/2022	166	316	58.4	12.5	76.6	422
11/10/2022	102	317	59.9	10.6	92.7	434
11/17/2022	196	294	57.5	9.5	104	348
11/23/2023	98	268	27.2	9.77	28.8	242
12/1/2022	144	244	50	7.08	60.7	274
12/8/2022	157	216	53.2	7.51	67.2	332
12/15/2022	266	223	44.6	8.05	73.8	272
12/22/2022	132	132	33.8	3.83	39.8	290
12/29/2022	172	238	54.5	8.04	81.4	322
1/5/2023	219	245	56.4	18.1	71.5	368
1/12/2023	200	285	48.4	11.3	60.3	342
1/19/2023	299	594	48.5	6.49	70.8	322
1/26/2023	323	463	56.2	13.2	51.1	382
			Missing February			

Treated Effluent

Monthly Averages

Date	CBOD (mg/l)	TSS (mg/l)	NH3-N (mg/l)	TP (mg/l)	TKN (mg/l)	Alkalinity (mg/l)	F.COL. (N/100 ml)	*E.Coli* (MPN/100 ml)
Jan-22	4.38	3.00	1.49	0.07	7.44	155	25	8
Feb-22	3.38	3.00	1.47	0.11	4.58	209	12	6
Mar-22	3.70	3.00	2.26	0.35	11.16	282	2	1
Apr-22	3.50	3.50	1.28	0.06	18.59	239	5	4
May-22	3.88	3.00	1.66	0.06	10.53	199	35	30
Jun-22	3.60	3.00	1.75	0.07	9.87	179	42	37
Jul-22	3.50	3.25	1.98	0.12	8.85	179	28	26
Aug-22	9.73	9.36	10.08	0.74	35.45	288	170	111
Sep-22	4.22	3.00	0.58	0.72	2.94	126	53	83
Oct-22	4.50	3.38	0.55	0.79	2.44	123	8	8
Nov-22	3.44	3.00	0.37	0.52	2.26	132	53	104
Dec-22	3.89	2.89	0.77	0.21	4.21	119	5	60
Jan-23	4.25	3.00	0.91	0.08	3.61	124	42	69
Feb-23	Missing							
Mar-23	4.70	2.90	0.64	0.22	3.64	128	36	35
Apr-23	5.00	2.63	1.53	0.26	4.65	170	108	92
May-23	6.11	2.78	1.25	0.16	4.86	144	90	85
Jun-23	5.33	2.00	0.56	0.14	3.70	#DIV/0!	24	21
Jul-23	4.63	2.63	1.13	0.12	3.70	151.50	10.67	8.33
Aug-23	6.70	2.30	1.31	1.29	8.82	138.40	25.67	21.33
Sep-23	2.63	2.50	1.61	0.48	3.96	101.50	26.00	23.67
Oct-23	2	3	0.5075	0.62	2.95	133	58.5	56

Weekly Test Results

Date	CBOD (mg/l)	TSS (mg/l)	NH3-N (mg/l)	TP (mg/l)	TKN (mg/l)	Alkalinity (mg/l)	F.COL. (N/100 ml)	*E.Coli* (MPN/100 ml)
1/5/2022	3	3	1.01	<0.06				
1/6/2022	3	3	0.84	<0.06	9.92	160	12	9
1/12/2022	6	3	1.39	<0.06				
1/13/2022	7	3	1.64	<0.06	6.82	156	<1	1
1/19/2022	2	3	1.97	0.06				
1/20/2022	3	3	1.89	0.07	6.56	154	60	17
1/26/2022	4	3	1.8	<0.06				
1/27/2022	7	3	1.34	<0.06	6.45	150	4	3
2/4/2022	2	3	2.17	0.07				
2/5/2022	2	3	2.2	0.11	3.8	130	4	1
2/9/2022	4	3	1.16	0.09				
2/10/2022	5	3	1.56	0.08	5.36	208	30	20
2/16/2022	4	3	1.49	0.06				
2/17/2022	4	3	1.22	0.06	5.16	251	4	3
2/25/2022	3	3	1	0.19				
2/26/2022	3	3	0.92	0.23	3.98	246	10	1
3/2/2022	3	3	1.23	0.13				
3/3/2022	4	3	1.11	0.07	8.74	404	4	<1
3/9/2022	5	3	1.04	0.54				
3/10/2022	5	3	1.47	0.6	5.27	310	2	2
3/16/2022	2	3	4.39	0.14				
3/17/2022	2	3	1.33	0.22	7.29	284	1	1
3/23/2022	4	3	2.2	0.86				<1
3/24/2022	4	3	8.08	0.81	11.6	194	2	<1
3/30/2022	4	3	0.81	0.06				
3/31/2022	4	3	0.92	0.06	22.9	218	2	1
4/6/2022	3	3	0.96	0.06				
4/7/2022	3	3	1.4	0.06	35.4	226	4	2
4/13/2022	4	3	1.76	0.06				
4/14/2022	3	3	1.1	0.06	17.9	181	6	4
4/20/2022	6	3	0.87	0.06				
4/21/2022	4	3	1.15	0.06	9.74	190	<1	3
4/27/2022	3	7	1.64	0.06				
4/28/2022	2	3	1.32	0.06	11.3	360		8
5/4/2022	3	3	1.8	<0.06				
5/5/2022	4	3	1.57	<0.06	8.93	180	6	3
5/11/2022	3	3	2.03	<0.06				
5/12/2022	3	3	1.68	<0.06	11.6	156	36	31
5/18/2022	5	3	1.93	<0.06				
5/19/2022	4	3	1.26	<0.06	5.08	230	30	26
5/25/2022	4	3	2.08	<0.06				
5/26/2022	5	3	0.96	<0.06	16.5	230	68	61
6/1/2022	4	3	1	0.06				
6/2/2022	4	3	1.25	0.06	11.7	218	12	9
6/8/2022	3	3	1.55	0.09				
6/9/2022	4	3	1.92	0.06	12.5	204	120	115
6/15/2022	3	3	1.33	0.06				
6/16/2022	3	3	3.25	0.16	7.02	150	34	28
6/22/2022	4	3	1.67	0.06				
6/23/2022	3	3	1.64	0.06	7.41	152	21	12
6/29/2022	4	3	1.82	0.06				
6/30/2022	4	3	2.02	0.06	10.7	170	24	21
7/6/2022	5	6	1.72	0.06				
7/7/2022	5	3	1.98	0.06	7.9	166	20	19
7/13/2022	2	3	1.73	0.23				
7/14/2022	3	3	1.66	0.25	7.02	170	63	57
7/20/2022	2	3	2.47	0.14				

Raw Influent

Weekly Test Results

Date	CBOD (mg/l)	TSS (mg/l)	NH3-N (mg/l)	TP (mg/l)	TKN (mg/l)	Alkalinity (mg/l)
3/2/2023	264	432	61.5	6.85	68.2	368
3/9/2023	293	269	55.1	12.4	107	376
3/16/2023	128	324	48.5	5.42	64.2	380
3/23/2023	242	270	57.7	15.4	79.2	356
3/20/2023	124	286	52	10.4	92.3	320
4/6/2023	209	280	49.1	8.4	64.1	300
4/13/2023	188	320	43.5	6.92	26	118
4/20/2023	224	263	57.7	8.75	80.2	376
4/27/2023	149	232	39.2	4.8	64.3	302
5/4/2023	226	249	51.9	8.49	77.7	376
5/11/2023	253	312	53.1	7.5	92.3	386
5/18/2023	129	20	45.1	7.02	55.4	324
5/25/2023	97	248	42.3	7.29	62.3	374
6/1/2023	181	232	50.3	5.32	77.4	396
6/8/2023	78	123	33.1	2.24	45.9	342
7/6/2023	138	231	46.2	10.1	63.2	374
7/13/2023	239	252	52.2	11.2	63.3	362
7/20/2023	362	331	53.4	11.5	103	398
7/27/2023	60	240	39	4.56	60.3	328
8/3/2023	309	209	50.2	6.6	94.4	390
8/10/2023	245	238	47.3	10.3	69.9	492
8/17/2023	313	337	61.1	9.71	68.3	462
8/24/2023	281	276	67.3	0.44	97.6	334
8/31/2023	261	270	66.4	17.6	119	392
9/7/2023	299	302	70.6	11.4	110	398
9/14/2023	294	302	52.2	8.34	72.9	218
9/21/2023	302	305	55	9.83	65.1	414
9/28/2023	292	367	60.9	9.79	80	402
10/5/2023	190	314	51.8	11.2	103	304
10/12/2023	295	353	52.6	9.59	73.6	548

Treated Effluent

Weekly Test Results

Date	CBOD (mg/l)	TSS (mg/l)	NH3-N (mg/l)	TP (mg/l)	TKN (mg/l)	Alkalinity (mg/l)	F.COL. (N/100 ml)	*E.Coli* (MPN/100 ml)
7/21/2022	4	3	2.15	0.07	10.8	184	10	15
7/27/2022	3	2	2.09	0.07				
7/28/2022	4	3	2	0.08	9.67	194	18	13
8/3/2022	3	3	1.15	0.06				
8/4/2022	3	3	2.46	0.06	22.8	240	112	96
8/10/2022	19	12	7.97	1.37				
8/11/2022	23	13	7.85	1.48	43.9	358	280	137
8/17/2022	13	19	22.4	1.44				
8/18/2022	14	21	22.5	1.54	47.7	320	250	208
8/24/2022	8	10	19.3	0.85				
8/25/2022	9	11	21.5	0.8	27.4	234	36	2
8/29/2022	3	4	4.34	0.19				
8/30/2022	7	5	1.16	0.29				
8/31/2022	5	2	0.28	0.1				
9/1/2022	3	3	0.16	0.09	2.32	124	50	125
9/7/2022	4	2	0.1	0.42				
9/8/2022	4	2	0.11	0.69	2.3	122	12	9
9/14/2022	6	4	0.88	0.82				
9/15/2022	7	3	0.86	0.94	3.7	112	110	80
9/21/2022	5	4	1.7	0.67				
9/22/2022	5	4	1.17	0.9	3.8	126	40	31
9/28/2022	2	2	0.1	0.94				
9/29/2022	2	3	0.11	0.97	2.6	144		172
10/5/2022	5	4	0.79	0.75				
10/6/2022	4	5	1.26	1.27	3.52	112	10	7
10/12/2022	6	3	0.51	0.77				
10/13/2022	7	3	0.29	0.82	1.15	124	6	5
10/19/2022	2	3	0.12	0.67				
10/20/2022	2	3	0.1	0.7	2.25	120	1	< 1
10/26/2022	5	3	0.67	0.67				
10/27/2022	5	3	0.65	0.64	2.85	136	15	12
11/2/2022	3	3	0.37	0.35				
11/3/2022	3	3	0.33	0.57	2.51	118	118	114
11/9/2022	3	3	0.17	0.7				
11/10/2022	4	2	0.14	0.71	2.28	148	2	< 1
11/16/2022	5	4	0.36	0.67				
11/17/2022	4	3	0.3	0.52	2.53	138	1	< 1
11/22/2022	2	3	0.24	0.28				
11/23/2022	2	3	0.24	0.21	1.71	124	92	93
11/30/2022	5	3	1.14	0.68				
12/1/2022	3	2	0.51	0.53	3.44	114	4	110
12/7/2022	4	3	0.57	0.17				
12/8/2022	5	3	1.27	0.2	4.16	110	12	10
12/14/2022	4	3	0.75	0.25				
12/15/2022	5	3	0.67	0.23	4.13	98	2	< 1
12/21/2022	4	3	0.1	0.16				
12/22/2022	4	3	0.1	0.21	1.86	126	< 1	< 1
12/28/2022	3	3	1.67	0.06				
12/29/2022	3	3	1.33	0.06	7.48	148	2	< 1
1/4/2023	5	3	1.12	0.06				
1/5/2023	6	3	1.51	0.06	5.81	140	< 1	9
1/11/2023	3	3	0.2	0.07				
1/12/2023	3	3	0.53	0.06	3.1	116	2	121
1/18/2023	5	3	1.82	0.11				
1/19/2023	3	3	1.73	0.1	3.61	124	82	76
1/25/2023	5	3	0.22	0.07				
1/26/2023	4	3	0.18	0.07	1.9	116	< 1	< 1
					Missing February			
3/1/2023	3	3	1.37	0.12				
3/2/2023	4	3	1.27	0.14	2.31	136	10	10
3/8/2023	4	3	1.02	0.2				
3/9/2023	5	3	0.77	0.21	4.35	132	50	44
3/15/2023	6	3	0.13	0.06				
3/16/2023	6	3	0.13	0.06	4.64	144	3	< 1
3/22/2023	4	3	0.76	0.21				
3/23/2023	4	3	0.67	0.16	3.13	114	58	48
3/29/2023	6	2	0.11	0.37				
3/30/2023	5	3	0.12	0.68	3.79	112	60	37
4/5/2023	4	3	1.58	0.11				
4/6/2023	5	3	1.82	0.2	3.55	86	120	93
4/12/2023	4	3	1.91	0.8				
4/13/2023	6	3	1.98	0.1	7.76	344	41	27
4/19/2023	6	3	2.1	0.26				
4/20/2023	5	3	2.01	0.47	2.92	122	130	124
4/26/2023	6	2	0.44	0.06				
4/27/2023	4	1	0.38	0.06	4.38	126	140	125
5/3/2023	6	2	2.88	0.47				
5/4/2023	5	4	2.9	0.12	8.56	146	92	88
5/10/2023	7	3	0.89	0.11				
5/11/2023	7	3	0.66	0.28	2.89	146	31	27
5/17/2023	6	4	0.36	0.12				
5/18/2023	6	3	0.58	0.1	4.52	136	132	124

Treated Effluent

Weekly Test Results

Date	CBOD (mg/l)	TSS (mg/l)	NH3-N (mg/l)	TP (mg/l)	TKN (mg/l)	Alkalinity (mg/l)	F.COL. (N/100 ml)	*E.Coli* (MPN/100 ml)
5/24/2023	6	2	0.76	0.09				
5/25/2023	7	3	0.85	0.09	3.45	146	104	99
5/31/2023	5	1	1.41	0.08				
6/1/2023	5	1	1.04	0.12	3.77		44	40
6/7/2023	6	2	0.41	0.21				
6/8/2023	5	3	0.23	0.09	3.62		4	2
6/14/2023								
6/15/2023								
6/21/2023								
6/22/2023								
6/28/2023								
6/29/2023								
7/5/2023	6	3	1.6	0.12				
7/6/2023	6	3	1.51	0.06	4.78	156	20	16
7/12/2023	4	3	1.24	0.14				
7/13/2023	4	2	1.64	0.09	3.47	142	4	4
7/19/2023	4	2	0.95	0.13				
7/20/2023	5	2	0.74	0.07	3.79	146	8	5
7/26/2023	4	3	0.74	0.19				
7/27/2023	4	3	0.58	0.15	2.77	162	<1	<1
8/2/2023	9	3	1.51	0.1				
8/3/2023	8	3	1.35	0.11	5.76	164	<1	<1
8/9/2023	7	1	0.87	0.36				
8/10/2023	7	1	1.04	0.57	4.85	198	14	12
8/16/2023	3	2	1.57	4.72				
8/17/2023	12	3	1.89	5.52	3.55	116	42	34
8/23/2023	3	2	1.44	0.21				
8/24/2023	3	3	1.49	0.52	26.3	112	21	18
8/30/2023	7	2	0.85	0.15				
8/31/2023	8	3	1.07	0.64	3.64	102	<1	<1
9/6/2023	3	2	0.81	0.26				
9/7/2023	2	3	1.97	0.82	4.58	90	<1	<1
9/13/2023	3	3	1.61	0.17				
9/14/2023	3	3	1.93	0.16	2.85	104	58	56
9/20/2023	3	3	1.87	0.6				
9/21/2023	2	2	1.63	0.9	2.64	104	4	3
9/27/2023	2	2	1.52	0.34				
9/28/2023	3	2	1.56	0.59	5.77	108	16	12
10/4/2023	2	3	0.52	0.29				
10/5/2023	2	3	0.7	0.53	4.27	104	37	34
10/11/2023	2	3	0.41	0.78				
10/12/2023	2	3	0.4	0.88	1.63	162	80	78

Appendix F: Hydraulic Analysis

Wastewater Treatment Plant Hydraulic Analysis

Project: **RM2243 Wastewater Treatment Plant, 2.25 MGD**

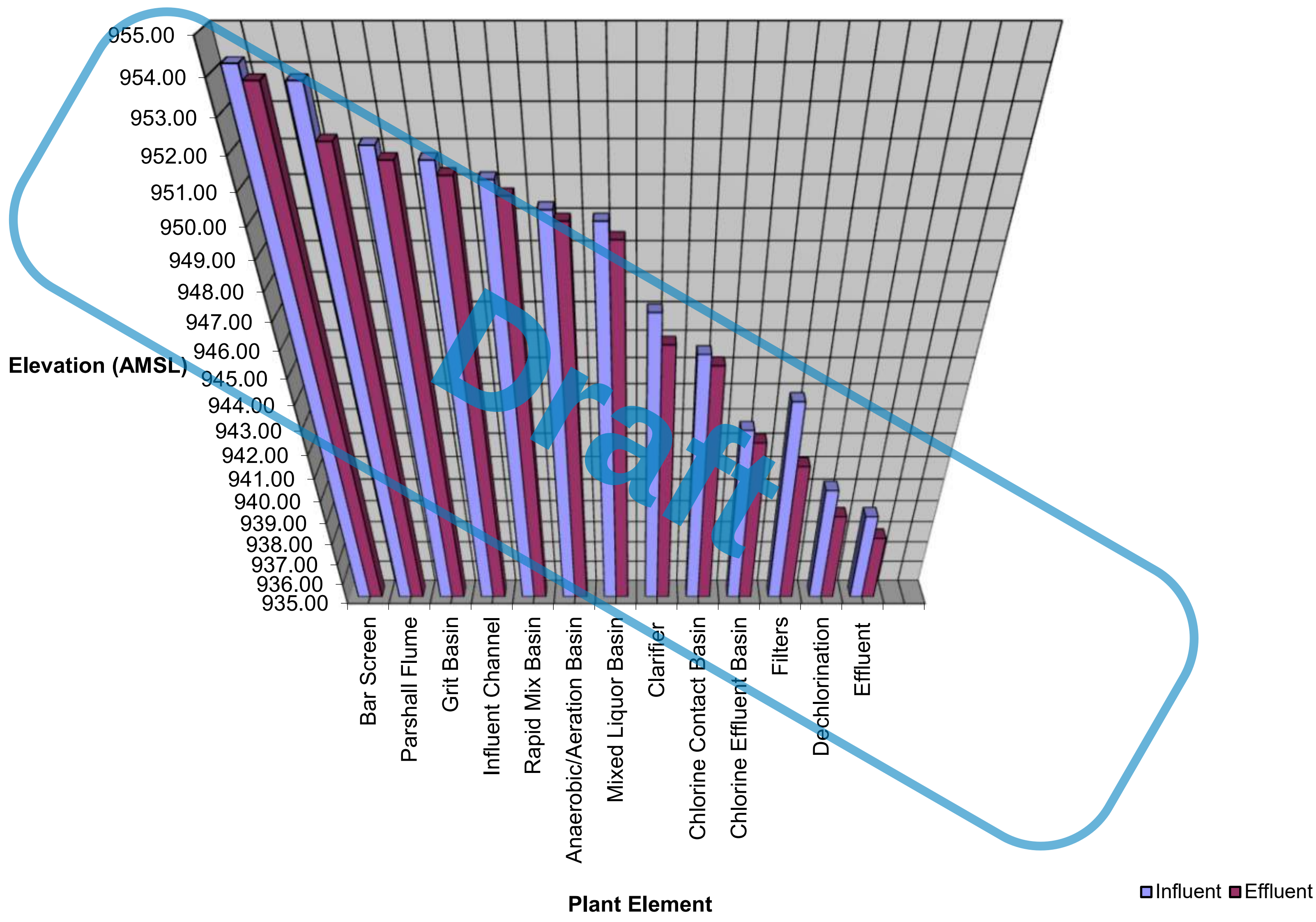
Date: **February 21, 2024**

Generated By: **Paige Reddehase**

Design Flow =	**2.25**	**MGD**
Peaking Factor =	**3**	
Peak Flow =	**4,687.5**	**GPM**
Peak Flow =	**10.4**	**CFS**
Plant Floor Slab Elevation =	**953**	**ft**

Element	Upstream WS Elev. (AMSL)	Downstream WS Elev. (AMSL)	Head Loss Through Element (ft)	Depth of Water (upper) (ft)	Top of Wall (AMSL)	Wall Height (ft)	Freeboard (ft)	Check	Notes
Bar Screen	954.23	953.81	0.419	1.23	957.00	4.00	2.77	OK	Headworks on slab elevation at 953 AMSL.
Parshall Flume	953.81	952.25	1.560	1.81	957.00	5.00	3.19	OK	Drops to slab elevation of 952 AMSL downstream of parshall flume.
Grit Basin	952.15	951.75	0.401	20.15	954.00	22.00	1.85	OK	Base of hopper at 932 AMSL.
Influent Channel	951.75	951.33	0.421	1.75	954.00	4.00	2.25	OK	On slab elevation of 950 AMSL.
Rapid Mix Basin	951.21	950.75	0.462	23.21	953.00	25.00	1.79	OK	Slab elevation of 928 AMSL.
Anaerobic/Aeration Basin	950.35	950.01	0.340	22.35	952.00	24.00	1.65	OK	
Mixed Liquor Basin	950.01	949.45	0.556	14.01	952.00	16.00	1.99	OK	Clarifier and downstream units on slab elevation at 936 AMSL.
Clarifier	947.12	946.00	1.122	11.12	952.00	16.00	4.88	OK	
Chlorine Contact Basin	945.66	945.25	0.409	9.66	949.00	13.00	3.34	OK	
Chlorine Effluent Basin	942.76	942.25	0.507	6.76	946.00	10.00	3.24	OK	
Filters	943.90	941.25	2.648	7.90	946.00	10.00	2.10	WARNING	Could back up into chlorine effluent basin, but 18" freeboard requirements are met
Dechlorination	940.20	939.00	1.204	4.20	946.00	10.00	5.80	OK	
Effluent	939.00	937.97	1.027	-	-	-	-	OK	

City of Leander
RM2243 Wastewater Treatment Plant



Headworks

Flows

Design Flow =	**2.25**	**MGD**
Peaking Factor =	**3.0**	
Peak Flow =	**4,687.5**	**GPM**
Peak Flow =	**10.4**	**CFS**

Design Criteria

Bar Size

Bar Width =	0.40	in.
Depth =	1.25	in.
Clear Space =	1.6	in.
Slope =	30	degrees
Desired Approach Velocity =	2.625	fps
Allowable Headloss =	24	in.

Channel Dimensions

Channel Width =	30	in.
Height of Water in Channel =	15	in.
Desired Freeboard =	33.24	in.
Length of Channel =	16.7	ft

Number of Bars =	(Width - Clear Space)/(Bar Width+Clear Space) =	15
Number of Clear Spaces =	Number of Bars + 1 =	16

Head Loss Calculations (Clean Bar Rack)

Head Loss in Feet = $(1/0.7)*((V^2-v^2)/2g)$

V = velocity through rack openings =	3.98	fps
v = upstream channel velocity =	3.40	fps
g = acceleration of gravity =	32.2	ft/s^2
Head Loss =	**1.15**	**in**

Headloss in Channel

A = Basin X-Section Area =	3.08	sqft
P = Basin Wetted Perimeter =	59.52	ft
k =	1.49	conversion factor
Manning's n =	0.014	

Slope = $(((Q*n)/(k*A))*(A/P)^{3/2}))^{1/2}$ **=**	1.94E-02	
Head Loss = Slope * Length =	**3.88**	**in**

Total Headloss

Head Loss through Bar Rack =	1.146	in
Head Loss in Channel =	3.880	in
Total Head Loss =	5.026	in
Total Head Loss =	$\boxed{\textbf{0.419}}$	**ft**

Grit Basin

Design Flow =	**2.25**	**MGD**
Peaking Factor =	**3.0**	
Peak Flow =	**4,688**	**GPM**
Peak Flow =	**10.44**	**CFS**

Nappe over Rectangular Sharp Crested Weir

Head Loss Formula =	$Q = C_w L h^{3/2}$	
Q =	10.44	cfs
C_w =	3.33	
Length L =	12.33	ft
Head Loss =	4.8	in
Head Loss =	$\boxed{\mathbf{0.40}}$	ft

Draft

Influent Effluent Channel

Design Flow =	**2.25**	**MGD**
Peaking Factor =	**3.0**	
Peak Flow =	**4,688**	**GPM**
Peak Flow =	**10.44**	**CFS**
Channel Width =	**3**	**ft**

Nappe over Rectangular Sharp Crested Weir

Head Loss Formula =	$Q = C_w L h^{3/2}$	
Q =	10.44	cfs
C_w =	3.33	
Length L =	11.5	ft
Head Loss =	5.0	in
Head Loss =	**0.42**	**ft**

Draft

Rapid Mix Basin

Design Flow =	**2.25**	**MGD**
Peaking Factor =	**3.0**	
Peak Flow =	**4,688**	**GPM**
Peak Flow =	**10.44**	**CFS**

Basin Length =	46.7	ft
Basin Width =	10	ft
Basin Depth =	23	ft

Nappe over Rectangular Sharp Crested Weir

Head Loss Formula =	$Q = C_w L h^{3/2}$	
Q =	10.44	cfs
C_w =	3.33	
Length L =	10	ft
Head Loss =	5.5	in
Head Loss =	**0.46**	**ft**

Anaerobic/Aeration Basin

Design Flow =	**2.25**	**MGD**
Peaking Factor =	**3.0**	
Peak Flow =	**4,688**	**GPM**
Peak Flow =	**10.44**	**CFS**
Basin Length =	70.0	ft
Basin Width =	32	ft
Basin Depth =	22	ft

Nappe over Rectangular Sharp Crested Weir

Head Loss Formula =	$Q = C_w L h^{3/2}$	
Q =	5.22	cfs
C_w =	3.33	
Length L =	8	ft
Head Loss =	4.1	in
Head Loss =	**0.34**	**ft**

Mixed Liquor/Clarifier Loading Basin

Design Flow =	**2.25**	**MGD**
Peaking Factor =	**3.0**	
Peak Flow =	**4,688**	**GPM**
Peak Flow =	**10.44**	**CFS**
Length of A =	16.9	ft
Length of B =	16.9	ft
Basin Depth =	13.8	ft
A = Basin X-Section Area =	169.00	sqft
P = Basin Wetted Perimeter = a + b + SQRT ($a^2 + b^2 + 4h^2$) =	70.23	ft
k =	1.49	conversion factor
Manning's n =	0.014	
Slope = $(((Q*n)/(k*A))*(A/P)^{3/2}))^{1/2}$ =	3.29E-02	
Head Loss = Slope * Length =	**0.556**	**ft**

Clarifier Feed Pipe

Design Flow =	**2.25**	**MGD**
Peaking Factor =	**3.0**	
Peak Flow =	**4,687.5**	**GPM**
Peak Flow =	**10.44**	**CFS**

Headloss Due to Friction and Minor Losses :

Feed Pipe Material =	DI	
Feed Pipe Length =	39	feet
Feed Pipe Diameter =	24	inches
Roughness Coefficient, c =	130	
Flow in Discharge Pipe =	2344	gallons/minute
Velocity in Discharge Pipe =	3.325	feet/second
f =	0.04	feet/100 ft of pipe

	#	K	# x K
# of 90 deg. bends =	1	0.34	0.30
# of 45 deg. bends =	0	0.25	0.00
# of 22.5 deg. bends =	0	0.20	0.00
# of tees (branch flow) =	1	1.02	1.00
# of Swing CVs =	0	0.85	0.00
# of Gate Valves =	0	0.14	0.00
# of Entrances =	1	0.50	0.50
# of Exits =	1	1.00	1.00
		Sum of K's =	**2.80**

Friction Losses =	0.02	feet
Minor Losses =	0.48	feet
Total Head Losses =	**0.497**	**feet**

Clarifier Effluent Pipe

Design Flow =	**2.25**	**MGD**
Peaking Factor =	**3.0**	
Peak Flow =	**4,687.5**	**GPM**
Peak Flow =	**10.44**	**CFS**

Headloss Due to Friction and Minor Losses :

Feed Pipe Material =	DI	
Feed Pipe Length =	4	ft
Feed Pipe Diameter =	20	in
Roughness Coefficient, c =	130	
Flow in Discharge Pipe =	2344	gpm
Velocity in Discharge Pipe =	2.394	fps
f =	0.10	ft/100ft

	#	K	# x K
# of 90 deg. bends =	1	0.34	0.30
# of 45 deg. bends =	0	0.25	0.00
# of 22.5 deg. bends =	0	0.20	0.00
# of tees (branch flow) =	0	1.02	0.00
# of Swing CVs =	0	0.85	0.00
# of Gate Valves =	0	0.14	0.00
# of Entrances =	1	0.50	0.50
# of Exits =	1	1.00	1.00
		Sum of K's =	**1.80**

Friction Losses =	0.00	ft
Minor Losses =	0.16	ft
Total Head Losses =	**0.164**	**ft**

Clarifier Effluent Basin

Design Flow =	**2.25**	**MGD**
Peaking Factor =	**3.0**	
Peak Flow =	**4,687.5**	**GPM**
Peak Flow =	**10.44452**	**CFS**

Nappe over Rectangular Sharp Crested Weir

Head Loss Formula =	$Q = C_w L h^{3/2}$	
Q =	5.22	cfs
C_w =	3.33	
Length L =	5	ft
Head Loss =	5.5	in
Head Loss =	**0.46**	**ft**

Total Head Losses through Clarifier =	**1.12**	**ft**

Chlorine Contact Basin

Design Flow =	**2.25**	**MGD**
Peaking Factor =	**3.0**	
Peak Flow =	**4,687.5**	**GPM**
Peak Flow =	**10.44**	**CFS**
Basin Length =	44	ft
Basin Width =	12	ft
Basin Depth =	12	ft

Nappe over Rectangular Sharp Crested Weir

Head Loss Formula =	$Q = C_w L h^{3/2}$	
Q =	10.44	cfs
C_w =	3.33	
Length L =	12	ft
Head Loss =	4.9	in
Head Loss =	**0.41**	**ft**

Draft

Chlorination Effluent Basin

Design Flow =	**2.25**	**MGD**
Peaking Factor =	**3.00**	
Peak Flow =	**4,687.50**	**GPM**
Peak Flow =	**10.44**	**CFS**

Basin Length =	6.0	ft
Basin Width =	9.8	ft
Basin Depth =	7	ft

A = Basin X-Section Area =	65.37	sqft
P = Basin Wetted Perimeter =	23.14	ft
k =	1.49	conversion factor
Manning's n =	0.014	

Slope = $(((Q*n)/(k*A))*(A/P)^{3/2}))^{1/2}$ =	8.44E-02	
Head Loss = Slope * Length =	$\boxed{\textbf{0.507}}$	**ft**

Draft

Filters

Design Flow =	**2.25**	**MGD**
Peaking Factor =	**3.0**	
Peak Flow =	**4,688**	**GPM**
Peak Flow =	**10.44**	**CFS**

Filter Feed Pipes

Headloss Due to Friction and Minor Losses :

Number of Feed Pipes =	55	
Discharge Pipe Material =	DI	
Discharge Pipe Length =	1	ft
Discharge Pipe Diameter =	4	in
Roughness Coefficient, c =	130	
Flow in Discharge Pipe =	85	gpm
Flow in Discharge Pipe =	0.190	gpm
Velocity in Discharge Pipe =	2.176	fps
f =	0.56	ft/100 ft of pipe

	#	K	# x K
# of 90 deg. bends =	0	0.34	0.00
# of 45 deg. bends =	0	0.25	0.00
# of 22.5 deg. bends =	0	0.20	0.00
# of tees (branch flow) =	0	1.02	0.00
# of Swing CVs =	0	0.85	0.00
# of Gate Valves =	0	0.14	0.00
# of Entrances =	1	0.50	0.50
# of Exits =	1	1.00	1.00
		Sum of K's =	**1.50**

Friction Losses =	0.01	ft
Minor Losses =	0.11	ft
Head Loss =	**0.12**	**ft**

Filter Feed Weir

Number of Filters = 5

Nappe over Rectangular Sharp Crested Weir

Head Loss Formula =	$Q = C_w L h^{3/2}$	
Q =	2.09	cfs
C_w =	3.33	
Length L =	4	ft
Head Loss =	**0.29**	**ft**
Head Loss =	3.5	in

Head Loss Through Filters

Headloss Through Filter = 1.1 ft

Filter Effluent Weir

Number of Trains = 2

Nappe over Rectangular Sharp Crested Weir

Head Loss Formula = $Q = C_w L h^{3/2}$

Q =	5.22	cfs
C_w =	3.33	
Length L =	5.71	ft
Head Loss =	**0.42**	**ft**
Head Loss =	5.1	in

Filter Effluent Pipe

Headloss Due to Friction and Minor Losses :

Number of Filter Effluent Pipes =	5	
Discharge Pipe Material =	DI	
Discharge Pipe Length =	8	ft
Discharge Pipe Diameter =	12	in
Roughness Coefficient, c =	130	
Flow in Discharge Pipe =	938	gpm
Flow in Discharge Pipe =	2.089	gpm
Velocity in Discharge Pipe =	2.660	fps
f =	0.23	ft/100 ft of pipe

	#	K	# x K
# of 90 deg. bends =	0	0.34	0.00
# of 45 deg. bends =	0	0.25	0.00
# of 22.5 deg. bends =	0	0.20	0.00
# of tees (branch flow) =	0	1.02	0.00
# of Swing CVs =	0	0.85	0.00
# of Gate Valves =	0	0.14	0.00
# of Entrances =	1	0.50	0.50
# of Exits =	1	1.00	1.00
		Sum of K's =	**1.50**

Friction Losses =	0.02	ft
Minor Losses =	0.16	ft
Head Losses =	**0.18**	**ft**

Filters

Filter Effluent Channel

Number of Trains = 2

Nappe over Rectangular Sharp Crested Weir

Head Loss Formula =	$Q = C_w L h^{3/2}$	
Q =	5.22	cfs
C_w =	3.33	
Length L =	4	ft
Head Loss =	**0.54**	**ft**
Head Loss =	6.4	in

Total Head Loss Through Filtration

Head Loss from Filter Feed Pipes =	0.12	ft
Head Loss from Filter Feed Weir =	0.29	ft
Head Loss through Filters =	1.1	ft
Head Loss from Filter Effluent Weir =	0.42	ft
Head Loss from Filter Effluent Pipe =	0.18	ft
Head Loss from Filter Effluent Channel =	0.54	ft
Total Head Losses =	**2.65**	**ft**

Dechlorination Basin

Design Flow =	**2.25**	**MGD**
Peaking Factor =	**3.0**	
Peak Flow =	**4,687.5**	**GPM**
Peak Flow =	**10.44452**	**CFS**
Basin Length =	12.5	ft
Basin Width =	4	ft
Basin Depth =	4.14	ft
A = Basin X-Section Area =	16.56	sqft
P = Basin Wetted Perimeter =	12.28	ft
k =	1.49	conversion factor
Manning's n =	0.014	
Slope = $(((Q*n)/(k*A))*(A/P)^{3/2}))^{1/2}$ =	9.63E-02	
Head Loss = Slope * Length =	$\boxed{\textbf{1.20}}$	**ft**

Draft

Effluent

Plant Effluent Pipe

Design Flow =	**2.25**	**MGD**
Peaking Factor =	**3.0**	
Peak Flow =	**4,687.5**	**GPM**
Peak Flow =	**10.44**	**CFS**

Headloss Due to Friction and Minor Losses :

Discharge Pipe Material =	DI	
Discharge Pipe Length =	342	ft
Discharge Pipe Diameter =	24	in
Roughness Coefficient, c =	130	
Flow in Discharge Pipe =	4688	gpm
Velocity in Discharge Pipe =	3.325	fps
f =	0.15	ft/100ft

	#	K	
# of 90 deg. bends =	2	0.34	# x K
# of 45 deg. bends =	1	0.25	0.70
# of 22.5 deg. bends =	1	0.20	0.30
# of tees (branch flow) =	0	1.02	0.20
# of Swing CVs =	0	0.85	0.00
# of Gate Valves =	0	0.14	0.00
# of Entrances =	1	0.50	0.00
# of Exits =	1	1.00	0.50
		Sum of K's =	1.00
			2.70

Friction Losses =	0.521	ft
Minor Losses =	0.463	ft
Total Head Loss =	**0.985**	**ft**

Plant Outfall Channel

Design Flow =	**2.25**	**MGD**
Peaking Factor =	**3.0**	
Peak Flow =	**4,688**	**GPM**
Peak Flow =	**10.44**	**CFS**
Channel Length =	225.5	ft
Channel Width =	4	ft
Channel Depth =	2.50	ft
A = Channel X-Section Area =	10.00	SF
P = Channel Wetted Perimeter =	9.00	ft
R_h = Hydraulic Radius =	1.11	ft
Manning's n =	0.014	
Slope = $((Q^*n)/(A^*(R_h^{2/3})))^2$	1.86E-04	
f = Friction Factor = $(8)(g)((n^2)/(R_h)^{1/3}))$	0.0487	
Velocity = $(R_h^{2/3})^*(S^{1/2})/n$ =	1.04	fps
Head Loss in Channel = $(f)^*(L/4R_h)^*(V^2/2g)$ =	**0.042**	**ft**
Total Head Losses =	**1.027**	**ft**

Appendix G: Capacity Analysis

RM2243 Capacity Analysis at Current Conditions:

Flow =	2.25	MGD
Peaking Factor =	3	

Influent Waste Characterization:

BOD_5 Concentration =	211	mg/l
TSS Concentration =	266	mg/l
$(NH_3\text{-}N)_0$ Concentration =	51	mg/l
P Concentration =	9	mg/l
BOD_5 Loading =	3959	lb/d
TSS Loading =	4991	lb/d
$(NH_3\text{-}N)_0$ Loading =	966	lb/d
P Loading =	165	lb/d

Parameter	TCEQ Requirement	Calculated Value
Aeration:		
Max. Organic Loading (lb BOD5/d/1000CF) =	35	40
Required Air Flow (SCFM) =	4034	5,200
Clarifiers:		
Peak Max. Surface Loading (gpd/SF) =	1200	877
Peak Min. Detention Time (hr) =	1.8	2.9
Design Max. Surface Loading (gpd/SF) =	600	292
Design Min. Detention Time (hr) =	3	9
Peak Max. Weir Loading (gpd/ft) =	20000	15,800
Peak Max. Solids Loading (lb/d/SF) =	50	25
Filters:		
Peak Max. Filtration Rate (gpm/SF) =	6.5	5.2
Disinfection:		
Peak Detention Time (min) =	20	21
Dechlorination:		
Peak Detention Time (min) =	0.33	0.33

Capacity Analysis Calculations For
RM 2243 Wastewater Treatment Plant

Design Type:	**CAS**		**Plant Location:**	**10201 RM2243, Leander TX 78641**	
Phase:	**Interim**		**Latitude:**	**30°34'49.60**	
Design Flow:	**2.25**	**MGD**	**Longitude:**	**97°50'30.59**	
Design Flow :	**1560**	**gpm**	**Elevation:**	**939**	AMSL
Peak Factor:	**3**				
2-Hour Peak Flow	**4670**	**gpm**			

Design Parameters

Influent Waste Characterization			Waste Loading		
BOD_5 Concentration =	211	mg/l	$CBOD_5$ Loading =	3,959	lb/d
TSS Concentration =	266	mg/l	TSS Loading =	4,991	lb/d
$(NH_3\text{-}N)_0$ Concentration =	51	mg/l	NH_3-N Loading =	966	lb/d
P Concentration =	9	mg/l	P Loading =	165	lb/d
Effluent Parameter Set			**Required Removal Efficiencies**		
BOD_5 Concentration (Daily Ave.) =	5	mg/l	$CBOD_5$ =	97.63%	
TSS Concentration (Daily Ave.) =	5	mg/l	TSS =	98.12%	
$(NH_3\text{-}N)_e$ Concentration (Daily Ave.) =	2	mg/l	NH_3-N =	96.11%	
P Concentration (Daily Ave.)=	1		P =	88.60%	
pH =	6.0-9.0				
D.O. =	6	mg/l			

Rapid Mix

There are currently no TCEQ requirements on Rapid Mix Basins.

Rapid Mix Design Flow =	2.25	(MGD)
Rapid Mix Peak Flow =	6.75	(MGD)
Flow Rate at Peak Flow =	281250	(gal/hr)
Width of Rapid Mix =	10	(ft)
Depth of Rapid Mix =	22	(ft)
Length of Rapid Mix =	46.8	(ft)
Actual Volume of Rapid Mix =	10296.0	(CF)
Actual Volume of Rapid Mix =	77014.1	(gal)
Actual Detention Time at Design Flow =	0.8	(hr)
Actual Detention Time at PF =	0.3	(hr)

Aeration

Flow (Wet Weather 30 Day ave.) =	2.25	(MGD)
Peak Flow =	6.75	(MGD)
BOD Loading to Aeration =	211	(mg/l)
Length =	70	(ft)
Width =	32	(ft)
Water Depth Pk. =	22	(ft)
Number of Trains =	2	
Freeboard (TOS - WSE) =	18.72	(in)

TCEQ Criteria

Minimum Depth (ft) =	8	
Minimum Freeboard (in) =	18	OK
Max. Organic Loading (lb BOD5/d/1000ft^3) =	35	

Aeration Volume Each Train =	(Length)(Width)(Depth) =	49280	CF
Organic Loading Each Train =	(BOD Loading)(Flow)(8.34)/ (No. of Trains) =	1,980	lb/d
Organic Loading Each Train per 1000CF =	(Organic Loading)/(Length)Width)(Depth)/(1000) =	**40**	lb/d/1000CF
	Equal or Less Than TCEQ Criteria =	**Warning**	

F/M Ratio

MLSS =	5,100	(mg/l)
MLVSS = 0.8 MLSS =	4,080	(mg/l)

F/M Ratio =	(Flow)(BOD Conc.)/(Vol Aer)(MLVSS) =	0.16
	For Single Stage Nitrification between 0.10 and 0.25 =	**OK**

RAS & WAS

60 Minute Set	300	(ml)
RVSS (RAS VSS) =	13,600	(mg/l)
WAS =	0.108	(MGD)

Approximate MCRT =	(Vol Aer)(MLVSS)/(WAS)(RVSS) =	2.05	d

TCEQ 217 Airflow Requirements

O_2R Oxygen Reqirements =	{[1.2(BOD_5)]+[4.3(NH_3-N)]}/BOD5 =	2.25	lb O_2/lb BOD_5
TCEQ Total Required Airflow =	((PPD BOD5)*(lb O2/ lb BOD5)) / (WOTE*0.23*0.075&1440) =	**4034**	**SCFM**

Air Supplied

BOD_5 Oxygen Requirement =	1.2	(lbs O_2/lb BOD_5)
NH_3-N Oxygen Requirement =	4.3	(lbs O_2/lb NH_3-N)
1SCFM =	0.01725	(lb/O_2)

Total BOD_5 Oxygen Requirement =	(BOD_5 Loading)(BOD_5 O_2 Requirement) =	4,751	lb/d
Total NH_3-N Concentration (Daily Ave.) =	(NH_3-N Loading)(NH_3-N Requirement) =	4,154	lb/d
Total Actual Oxygen Requirement =	(BOD_5)+(Nh_3-N) Oxygen Rqmt Totals =	**8,905**	**lb/d**

Coarse Bubble System

Diffuser Type =	Coarse	
Mixing Air Rate =	20	(SCFM/1,000CF)
Coarse Bubble Diffuser Efficiency per Foot =	0.75%	
AOR/SOR =	0.65	
Submergance Depth =	14	(ft)

Clear Water Oxygen Transfer Efficiency (COTE) =	(Coarse Diffuser Eff./ft.)(Submergance Depth) =	10.50%	
Wastewater Oxygen Transfer Efficiency (WOTE) =	(COTE)(0.65) =	6.83%	
Air Flow Supplied =		3,400	SCFM
Mixing Air Required =	Mixing Air Rate x Volume =	1971	SCFM
	Check (Air Supplied must exceed Mixing Air Required) =	**OK**	
Actual Oxygen Transfer =	(Airflow)(AOR/SOR)(COTE)(0.23)(0.0752)(1440) =	5779	lb/d

Fine Bubble System

Diffuser Type =	Fine	
Mixing Air Rate =	0.12	(SCFM/sf)
AOR/SOR =	0.45	
Airflow / Plate =	25	(SCFM/Plate)
No. of Plates =	72	(Plates)

Clear Water Oxygen Transfer Efficiency (COTE) =		35.69%	
Wastewater Oxygen Transfer Efficiency (WOTE) =	(COTE)(0.45) =	16.06%	
Air Flow Supplied =	(Airflow/Plate) * (No. of Plates) =	1800	SCFM
Mixing Air Required =	Mixing Air Rate x SA =	538	SCFM
	Check (Air Supplied must exceed Mixing Air Required) =	**OK**	
Actual Oxygen Transfer =	(Airflow)(AOR/SOR)(COTE)(0.23)(0.0752)(1440) =	7200	lb/d

Combined Aeration System

Total Air Supplied =	**5,200**	SCFM
Check (Air Supplied must exceed 217 Air Requirements) =	**OK**	
Total Actual Oxygen Transfer Supplied =	**12980**	lb/d
Check (Oxygen Transfer must exceed Oxygen Rqmt Total =	**OK**	

Clarifier

Flow =	2.25	(MGD)
Flow =	1563	(gpm)
Peak Flow =	6.75	(MGD)
Peak Flow =	4688	(gpm)
Solids Loading to Clarifier =	5,100	(mg/l)
Diameter =	70	(ft)
Depth =	14	(ft)
Number of Trains =	2	
RAS Rate =	170%	Flow
Inlet Pipe Diameter =	24	(in)
RAS Pipe Diameter =	14	(in)

TCEQ Criteria

Max. Surface Loading @ Peak (gpd/SF) =	1200
Min. Detention Time @ Peak (hr) =	1.8
Max. Surface Loading @ Design (gpd/SF) =	600
Min. Detention Time @ Design (hr) =	3
Max. Weir Loading @ Peak (gpd/ft) =	20,000
Max. Solids Loading @ Peak (lb/d/SF) =	50

Peak Surface Loading =	(Peak Flow)(1440)/(Surface Area) =	877	lb/d/SF per clarifier
	Equal to or less than TCEQ Requirements =	OK	
Detention Time at Peak =	(Actual Volume)/(Peak Flow) =	2.87	hours each clarifier
	Greater than or equal to TCEQ Requirements =	OK	
Design Surface Loading =	(Design Flow)(1440)/(Surface Area) =	292	lb/d/SF per clarifier
	Equal to or less than TCEQ Requirements =	OK	
Detention Time at Design =	(Actual Volume)/(Design Flow) =	8.59	hours each clarifier
	Greater than or equal to TCEQ Requirements =	OK	
Peak Weir Loading =	(Peak Flow)/((2)(PI)(Radius)) =	15,798	gpd/ft per clarifier
	Equal to or less than TCEQ Requirements =	OK	
Peak Solids Loading =	(Solids Loading To Clarifier)(Average Flow+RAS)(8.34) =	95,702	lb/d per clarifier
	(Solids Loading)/(Surface Area) =	25	lb/d/SF
	Equal to or less than TCEQ Requirements =	OK	

Clarifier Piping

Inlet Piping

Average Flow Plus RAS =	(Average Flow)+(RAS)	6.08	mgd
Average Flow Plus RAS =	((Average Flow)+(RAS))(1000000/1440)	4219	gpm
Peak Flow Plus RAS =	(Peak Flow)+(RAS)	10.58	mgd
Peak Flow Plus RAS =	((Peak Flow)+(RAS))(1000000/1440)	7344	gpm
Inlet Pipe Velocity at Ave. Flow =	(Avg. Flow Plus RAS)/(Pipe Area)	2.99	fps
Inlet Pipe Velocity at Peak Flow =	(Peak Flow Plus RAS)/(Pipe Area)	5.21	fps

RAS Piping

RAS Flow =	(Average Flow)(RAS rate) =	3.83	mgd
RAS Flow =		2656	gpm
RAS Velocity in RAS Pipe =	(RAS Flow Plus RAS)/(Pipe Area)	5.54	fps

Filtration

Cloth Filtration

Flow (Wet Weather 30 Day ave.) =	2.25	(MGD)	
Peak Flow w/ 3.0 Peak =	6.75	(MGD)	
Depth =	6	(ft)	
Number of Trains =	2		
Number of Filters =	5		
Width =	8.5	(ft)	

TCEQ Criteria

Filtration Rate (gpm/SF) <= 6.5

Filter Area =	(Peak Flow)(1,000,000)/((1440)(Filtration Rate) =	721	SF
Total Filter Area =	(Filter Area)(Number of Filters)/(Number of filters - 1) =	901	SF
Length =	(Filter Area)/(width)+1 =	107	ft
Filtration Rate =	(Peak Flow)/(Surface Area) =	**5.2**	gpm/SF
	Equal to or less than TCEQ Requirements =	**OK**	

Disinfection

Flow (Wet Weather 30 Day ave.) =	2.25	(MGD)
Peak Flow =	6.75	(MGD)
Depth =	12	(ft)
Length =	44	(ft)
Width =	12.5	
Number of Trains =	2	

TCEQ Criteria

Peak Detention Time (min) = 20

Disinfection Volume =	(Surface Area)(Depth) =	13200	CF
Actual Detention Time =	(Actual Volume)/(Peak Flow) =	21	min
	Equal to or greater than TCEQ Requirements =	**OK**	

Dechlorination

Flow AADF =	2.25	(MGD)
Peak Flow =	6.75	(MGD)
Depth =	4.14	(ft)
Width =	4	(ft)
Length =	12.5	(ft)
Number of Trains =	1	

TCEQ Criteria

Peak Detention Time (min) = 0.33

Dechlorination Volume =	(Length)(Width)(Height) =	207	ft3
Peak Detention Time =	(Volume) / (Peak Flow) =	0.33	min
	Equal to or greater than TCEQ Requirements =	**OK**	

Appendix H: RM2243 WWTP Testing Data

Appendix H - Testing Data

Influent Flows (MGD)	
1/9/2024	2.050
1/16/2024	2.319
1/30/2024	2.427
2/6/2024	2.237
Avg	*2.258*

Raw Influent

Date	CBOD (mg/l)	TSS (mg/l)	NH3-N (mg/l)	TP (mg/l)	TKN (mg/l)	Alkalinity (mg/l)
1/9/2024	336	220	36.4	4.9	49.7	296
1/16/2024	125	161	29.3	3.24	38.0	332
1/30/2024	191	357	39	4	74	272
2/6/2024	497	222	30.5	5.95	70.7	362
Avg	*287.3*	*240.0*	*33.7*	*4.4*	*58.1*	*315.5*
Std Dev	*165*	*83*	*4.5*	*1.2*	*17*	*40*

Grit Effluent

Date	CBOD (mg/l)	TSS (mg/l)	NH3-N (mg/l)	TP (mg/l)	TKN (mg/l)	Alkalinity (mg/l)
1/9/2024	272	121	39.2	2.21	292	368
1/16/2024	62	102	29.1	2.76	167	24
1/30/2024	146	261	38.9	4.74	70.5	334
2/6/2024	184	215	36.1	12.6	61	364
Avg	*166.0*	*174.8*	*35.8*	*5.6*	*147.6*	*272.5*
Std Dev	*87*	*76*	*4.7*	*4.8*	*108*	*166*

Rapid Mix Basin *- RAS is recycled into this basin at a rate 160% greater than the influent flow.*

Date	CBOD (mg/l)	TSS (mg/l)	NH3-N (mg/l)	TP (mg/l)	TKN (mg/l)	Alkalinity (mg/l)
1/9/2024	4180	9825	19.8	99.40	127	538
1/16/2024	5360	8880	8.1	10.80	267	304
1/30/2024	4850	7300	13.3	69.2	385	338
2/6/2024	6280	7580	11.7	99.4	496	438
Avg	*5167.5*	*8396.3*	*13.2*	*69.7*	*318.8*	*404.5*
Std Dev	*885*	*1175*	*4.9*	*41.8*	*158*	*106*

Anaerobic Basin 1

Date	CBOD (mg/l)	TSS (mg/l)	NH3-N (mg/l)	TP (mg/l)	TKN (mg/l)	Alkalinity (mg/l)
1/9/2024	3000	2003	25.5	77.6	450	482
1/16/2024	2930	5813	13.7	62.9	392	262
1/30/2024	4180	4590	20.3	56.2	387	348
2/6/2024	5760	9090	7.14	98.3	267	388
Avg	*3967.5*	*5374.0*	*16.7*	*73.8*	*374.0*	*370.0*
Std Dev	*1325*	*2943*	*8.0*	*18.6*	*77*	*91*

Anaerobic Basin 2

Date	CBOD (mg/l)	TSS (mg/l)	NH3-N (mg/l)	TP (mg/l)	TKN (mg/l)	Alkalinity (mg/l)
1/9/2024	3220	1508	25.2	94.8	364	478
1/16/2024	2540	4256	19.0	67.1	416	266
1/30/2024	3920	4280	23.8	50.6	296	350
2/6/2024	6010	8580	6.3	90	597	304
Avg	*3922.5*	*4656.0*	*18.6*	*75.6*	*418.3*	*349.5*
Std Dev	*1501*	*2922*	*8.6*	*20.6*	*129*	*92*

Anaerobic Basin Avg

Date	CBOD (mg/l)	TSS (mg/l)	NH3-N (mg/l)	TP (mg/l)	TKN (mg/l)	Alkalinity (mg/l)
Avg	*3945.0*	*5015.0*	*17.6*	*74.7*	*396.1*	*359.8*

Aeration Basin 1

Date	CBOD (mg/l)	TSS (mg/l)	NH3-N (mg/l)	TP (mg/l)	TKN (mg/l)	Alkalinity (mg/l)
1/9/2024	3150	1766	4.6	96.2	345	382
1/16/2024	3350	7600	2.0	55.9	430	332
1/30/2024	5980	6530	5.7	53.5	467	326
2/6/2024	3170	6370	2.2	76	464	468
Avg	*3912.5*	*5566.5*	*3.6*	*70.4*	*426.5*	*377.0*
Std Dev	*1381*	*2592*	*1.8*	*19.9*	*57*	*66*

Aeration Basin 2

Date	CBOD (mg/l)	TSS (mg/l)	NH3-N (mg/l)	TP (mg/l)	TKN (mg/l)	Alkalinity (mg/l)
1/9/2024	2830	2666	4.2	91.3	481	330
1/16/2024	2860	4293	1.6	57.5	461	278
1/30/2024	5020	6830	7.66	54.3	495	312
2/6/2024	3190	6400	1.9	84.5	408	464
Avg	*3475.0*	*5047.3*	*3.8*	*71.9*	*461.3*	*346.0*
Std Dev	*1043*	*1936*	*2.8*	*18.7*	*38*	*82*

Aeration Basin Avg

Date	CBOD (mg/l)	TSS (mg/l)	NH3-N (mg/l)	TP (mg/l)	TKN (mg/l)	Alkalinity (mg/l)
Avg	*3693.8*	*5306.9*	*3.7*	*71.2*	*443.9*	*361.5*

Mixed Liquor Basin 1 *- Alum is dosed in this basin.*

Date	CBOD (mg/l)	TSS (mg/l)	NH3-N (mg/l)	TP (mg/l)	TKN (mg/l)	Alkalinity (mg/l)
1/9/2024	3420	2540	4.3	98.9	361	346
1/16/2024	3050	6790	1.4	49.1	516	302
1/30/2024	3620	3270	5.86	52.7	465	242
2/6/2024	3820	9820	1.3	63.4	373	416
Avg	*3477.5*	*5605.0*	*3.2*	*66.0*	*428.8*	*326.5*
Std Dev	*328*	*3367*	*2.3*	*22.7*	*74*	*73*

Mixed Liquor Basin 2

Date	CBOD (mg/l)	TSS (mg/l)	NH3-N (mg/l)	TP (mg/l)	TKN (mg/l)	Alkalinity (mg/l)
1/9/2024	3030	2110	3.4	93.9	324	348
1/16/2024	2400	5008	1.8	42.2	281	264
1/30/2024	4570	6060	2.94	60.2	393	334
2/6/2024	3780	6990	1.2	72.1	444	438
Avg	*3445.0*	*5042.0*	*2.3*	*67.1*	*360.5*	*346.0*
Std Dev	*938*	*2116*	*1.0*	*21.7*	*72*	*71*

Mixed Liquor Basin Avg

Date	CBOD (mg/l)	TSS (mg/l)	NH3-N (mg/l)	TP (mg/l)	TKN (mg/l)	Alkalinity (mg/l)
Avg	*3461.3*	*5323.5*	*2.8*	*66.6*	*394.6*	*336.3*

Clarifier Effluent Basin 1

Date	CBOD (mg/l)	TSS (mg/l)	NH3-N (mg/l)	TP (mg/l)	TKN (mg/l)	Alkalinity (mg/l)
1/9/2024	11	21	2.4	0.4	7.3	156
1/16/2024	6	6	0.5	0.4	16.7	156
1/30/2024	4	8	2.21	0.14	6.72	154
2/6/2024	6	7	1.2	0.19	3.65	152
Avg	*6.8*	*10.5*	*1.6*	*0.3*	*8.6*	*154.5*
Std Dev	*3.0*	*7.0*	*0.9*	*0.1*	*5.6*	*1.9*

Clarifier Effluent Basin 2

Date	CBOD (mg/l)	TSS (mg/l)	NH3-N (mg/l)	TP (mg/l)	TKN (mg/l)	Alkalinity (mg/l)
1/9/2024	9	13	1.6	0.2	6.9	8
1/16/2024	6	7	0.7	0.1	19.8	118
1/30/2024	5	8	1.99	0.1	6.03	158
2/6/2024	7	11	0.81	0.2	2.7	178
Avg	*6.8*	*9.8*	*1.3*	*0.2*	*8.9*	*115.5*
Std Dev	*1.7*	*2.8*	*0.6*	*0.04*	*7.5*	*75.9*

Clarifier Effluent Basin Avg

Date	CBOD (mg/l)	TSS (mg/l)	NH3-N (mg/l)	TP (mg/l)	TKN (mg/l)	Alkalinity (mg/l)
Avg	*6.8*	*10.1*	*1.4*	*0.2*	*8.7*	*135.0*

Filter Feed Basin 1

Date	CBOD (mg/l)	TSS (mg/l)	NH3-N (mg/l)	TP (mg/l)	TKN (mg/l)	Alkalinity (mg/l)
1/9/2024	5	12	1.63	0.07	6.3	170
1/16/2024	6	6	0.68	0.22	15.4	146
1/30/2024	6	7	1.82	0.18	8.25	174
2/6/2024	10	6	0.5	18[(1)]	6.07	152
Avg	*6.8*	*7.8*	*1.2*	*0.2*	*9.0*	*160.5*
Std Dev	*2.2*	*2.9*	*0.7*	*0.1*	*4.4*	*13.6*

Filter Feed Basin 2

Date	CBOD (mg/l)	TSS (mg/l)	NH3-N (mg/l)	TP (mg/l)	TKN (mg/l)	Alkalinity (mg/l)
1/9/2024	8	13	1.55	0.05	7.1	182
1/16/2024	5	7	0.69	0.23	16.4	154
1/30/2024	8	10	2.03	0.42	7.16	162
2/6/2024	10	8	1.4	17.7 [(1)]	7.9	168
Avg	*7.8*	*9.5*	*1.4*	*0.2*	*9.6*	*166.5*
Std Dev	*2.1*	*2.6*	*0.6*	*0.2*	*4.5*	*11.8*

Filter Feed Basin Avg

Date	CBOD (mg/l)	TSS (mg/l)	NH3-N (mg/l)	TP (mg/l)	TKN (mg/l)	Alkalinity (mg/l)
Avg	*7.3*	*8.6*	*1.3*	*0.2*	*9.3*	*163.5*

Filter Effluent 1

Date	CBOD (mg/l)	TSS (mg/l)	NH3-N (mg/l)	TP (mg/l)	TKN (mg/l)	Alkalinity (mg/l)
1/9/2024	3	4	1.50	0.07	5.34	188
1/16/2024	4	3	0.83	0.15	14.30	158
1/30/2024	5	3	2.07	0.08	4.16	158
Avg	*4.0*	*3.3*	*1.5*	*0.1*	*7.9*	*168.0*
Std Dev	*1.0*	*0.6*	*0.6*	*0.0*	*5.5*	*17.3*

Filter Effluent 2

Date	CBOD (mg/l)	TSS (mg/l)	NH3-N (mg/l)	TP (mg/l)	TKN (mg/l)	Alkalinity (mg/l)
1/9/2024	3	3	1.68	0.3	4.55	166
1/16/2024	5	3	0.59	0.2	17	152
1/30/2024	4	4	1.93	0.1	5.19	198
Avg	*4.0*	*3.3*	*1.4*	*0.2*	*8.9*	*172.0*
Std Dev	*1.0*	*0.6*	*0.7*	*0.1*	*7.0*	*23.6*

Filter Effluent Basin Avg

Date	CBOD (mg/l)	TSS (mg/l)	NH3-N (mg/l)	TP (mg/l)	TKN (mg/l)	Alkalinity (mg/l)
Avg	*4.0*	*3.3*	*1.4*	*0.1*	*8.4*	*170.0*

Sludge Press Water

Date	NH3-N (mg/l)	TP (mg/l)	TKN (mg/l)
1/9/2024	<0.1	8.62	7.52
1/30/2024	0.98	2.08	10
2/6/2024	0.13	3.27	7.63
Avg	*0.6*	*4.7*	*8.4*
Std Dev	*0.6*	*3.5*	*1.4*

Thickener

Date	NH3-N (mg/l)	TP (mg/l)	TKN (mg/l)
1/11/2024	0.17	0.39	4.18
1/16/2024	0.44	0.28	22.4
1/30/2024	0.68	1.39	6.87
2/6/2024	1.57	0.68	7.9
Avg	*0.7*	*0.7*	*10.3*
Std Dev	*0.6*	*0.5*	*8.2*

(1) - Highlighted data points were considered outliers and were not used for calibration.

Appendix I: Modeling Results

Appendix I - Modeling Results

Existing Plant Calibration

9-Jan	CBOD (mg/l)	TSS (mg/l)	NH3-N (mg/l)	TP (mg/l)	TKN (mg/l)	Alkalinity (mg/l)
Raw Influent	336	220	36	5	50	296
Grit Effluent	272	121	39	2	292	368
Rapid Mix Basin	4180	9825	20	99	127	538
Anaerobic Effluent	3110	1756	25	86	407	480
Aeration Effluent	2990	2216	4	94	413	356
Mixed Liquor Basin	3225	2325	4	96	343	347
Clarifier Effluent	10	17	2	0	7	82
Filter Feed	7	13	2	0	7	176
Effluent	3	4	2	0	5	177

16-Jan	CBOD (mg/l)	TSS (mg/l)	NH3-N (mg/l)	TP (mg/l)	TKN (mg/l)	Alkalinity (mg/l)
Raw Influent	125	161	29	3	38	332
Grit Effluent	62	102	29	3	167	24
Rapid Mix Basin	5360	8880	8	11	267	304
Anaerobic Effluent	2735	5035	16	65	404	264
Aeration Effluent	3105	5947	2	57	446	305
Mixed Liquor Basin	2725	5899	2	46	399	283
Clarifier Effluent	6	7	1	0	18	137
Filter Feed	6	7	1	0	16	150
Effluent	5	3	1	0	16	155

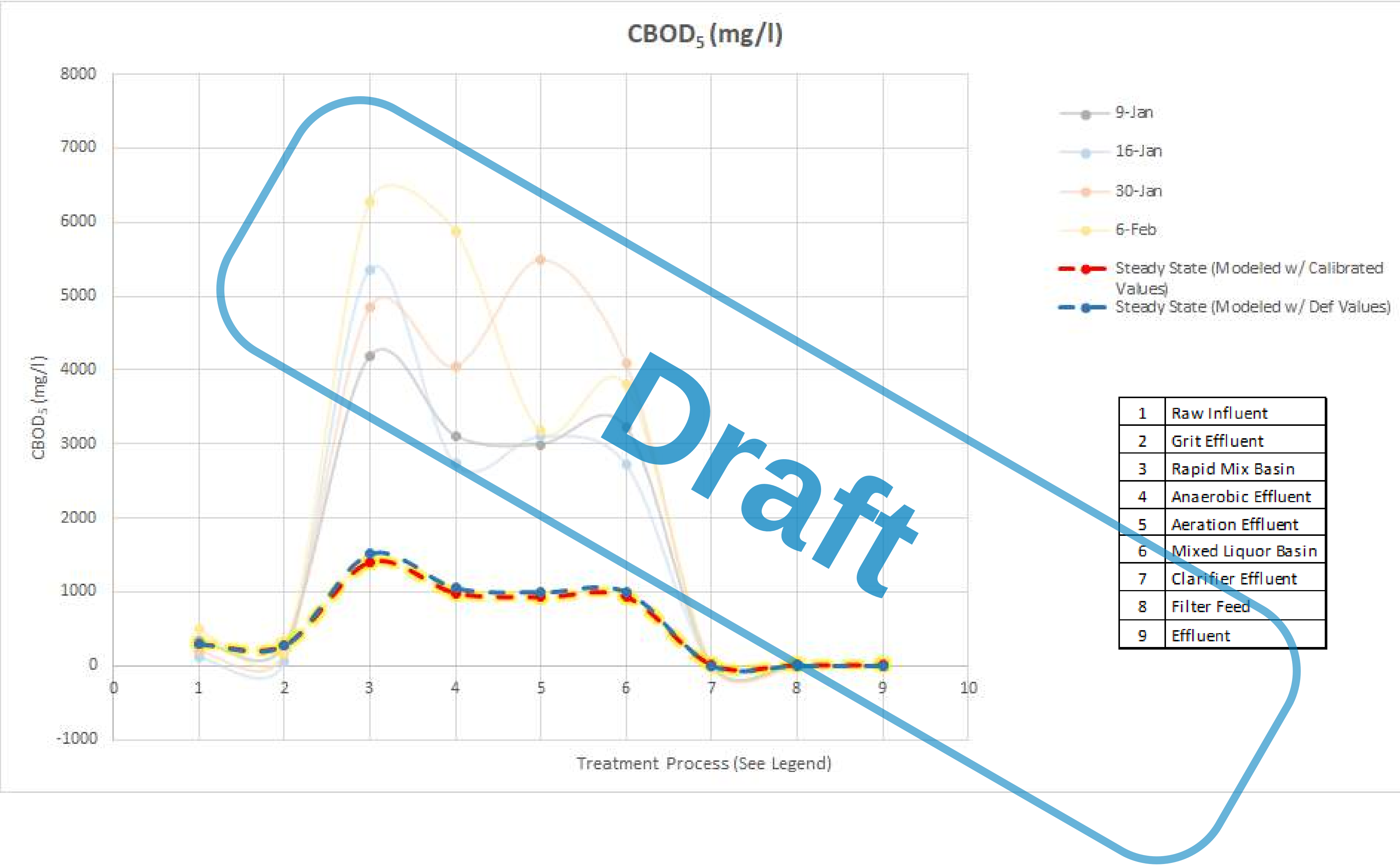
30-Jan	CBOD (mg/l)	TSS (mg/l)	NH3-N (mg/l)	TP (mg/l)	TKN (mg/l)	Alkalinity (mg/l)
Raw Influent	191	357	39	4	74	272
Grit Effluent	146	261	39	5	71	334
Rapid Mix Basin	4850	7300	13	69	385	338
Anaerobic Effluent	4050	4435	22	53	342	349
Aeration Effluent	5500	6680	7	54	481	319
Mixed Liquor Basin	4095	4665	4	56	429	288
Clarifier Effluent	5	8	2	0	6	156
Filter Feed	7	9	2	0	8	168
Effluent	5	4	2	0	5	178

6-Feb	CBOD (mg/l)	TSS (mg/l)	NH3-N (mg/l)	TP (mg/l)	TKN (mg/l)	Alkalinity (mg/l)
Raw Influent	497	222	31	6	71	362
Grit Effluent	184	215	36	13	61	364
Rapid Mix Basin	6280	7580	12	99	496	438
Anaerobic Effluent	5885	8835	7	94	432	346
Aeration Effluent	3180	6385	2	80	436	466
Mixed Liquor Basin	3800	8405	1	68	409	427
Clarifier Effluent	7	9	1	0	3	165
Filter Feed	10	7	1	18	7	160
Effluent						

Steady State (Modeled w/ Calibrated Values)	CBOD (mg/l)	TSS (mg/l)	NH3-N (mg/l)	TP (mg/l)	TKN (mg/l)	Alkalinity (mg/l)
Raw Influent	288.8	242.9	33.7	4.4	58.1	317.2
Grit Effluent	279.9	244.5	31.74	5.545	57.28	306.3
Rapid Mix Basin	1403	5204	3.065	113.4	358.7	168.5
Anaerobic Effluent	985.8	3422	14.15	74.67	250.4	231.7
Aeration Effluent	932.8	3405	2.647	74.67	237.8	146.6
Mixed Liquor Basin	931.2	3429	1.915	74.67	237	141.2
Clarifier Effluent	7.86	7.921	1.798	0.6565	4.871	122.4
Filter Feed	7.983	8.663	1.799	0.6692	4.903	125.8
Effluent	6.428	4.188	1.799	0.6115	4.744	125.8

Steady State (Modeled w/ Def Values)	CBOD (mg/l)	TSS (mg/l)	NH3-N (mg/l)	TP (mg/l)	TKN (mg/l)	Alkalinity (mg/l)
Raw Influent	288.8	242.9	33.7	4.4	58.1	317.2
Grit Effluent	279.90	243.30	31.70	5.56	57.50	300.40
Rapid Mix Basin	1516.00	4851.00	0.52	111.40	364.20	71.33
Anaerobic Effluent	1053.00	3198.00	12.28	73.35	254.00	174.70
Aeration Effluent	997.80	3171.00	0.53	73.35	240.50	73.15
Mixed Liquor Basin	997.80	3189.00	0.53	73.35	240.50	73.15
Clarifier Effluent	4.58	7.42	0.53	0.78	4.01	73.15
Filter Feed	4.65	7.66	0.53	0.78	4.03	73.15
Effluent	3.77	3.14	0.53	0.68	3.71	73.15

Existing Plant Calibration



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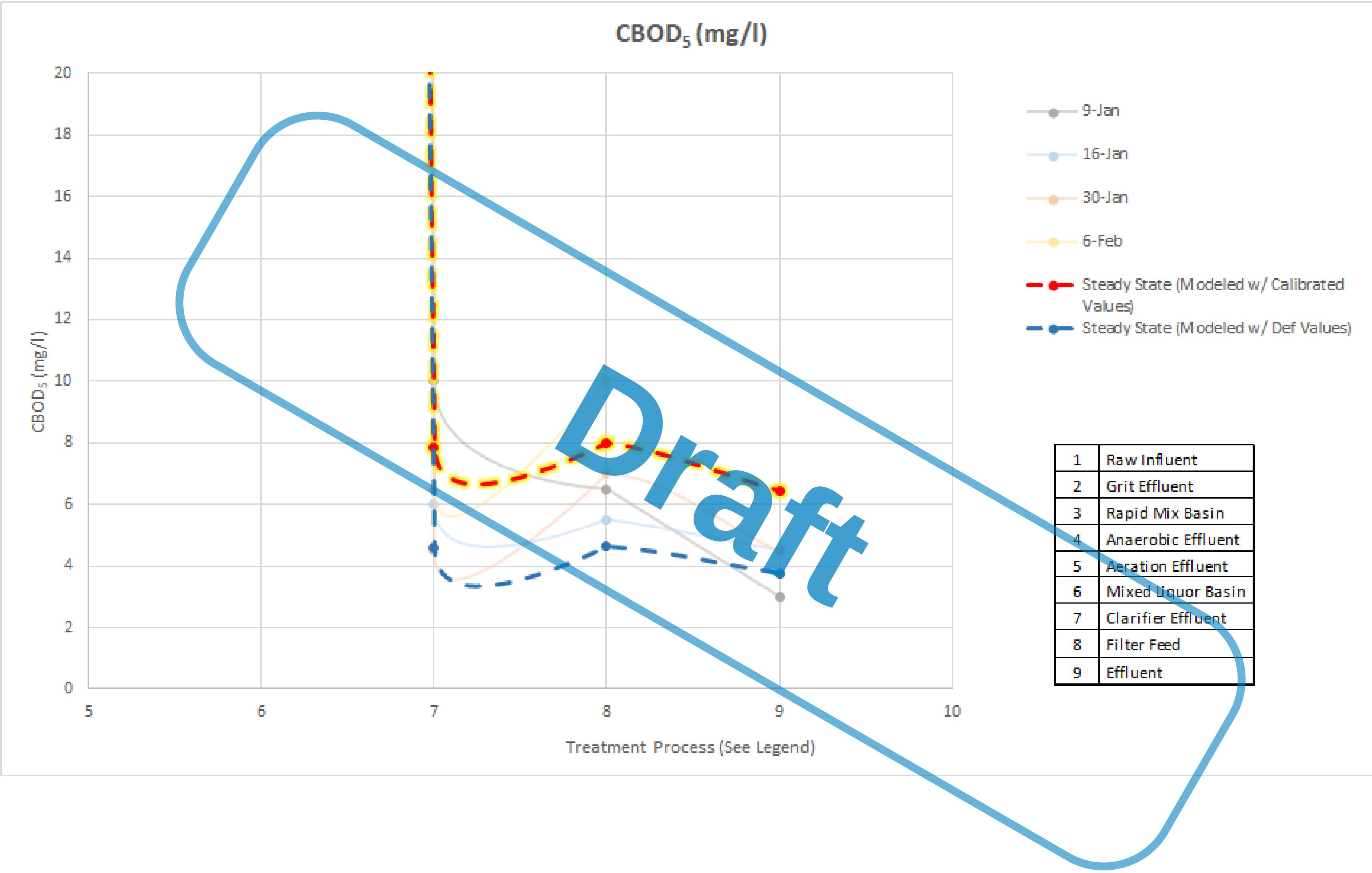

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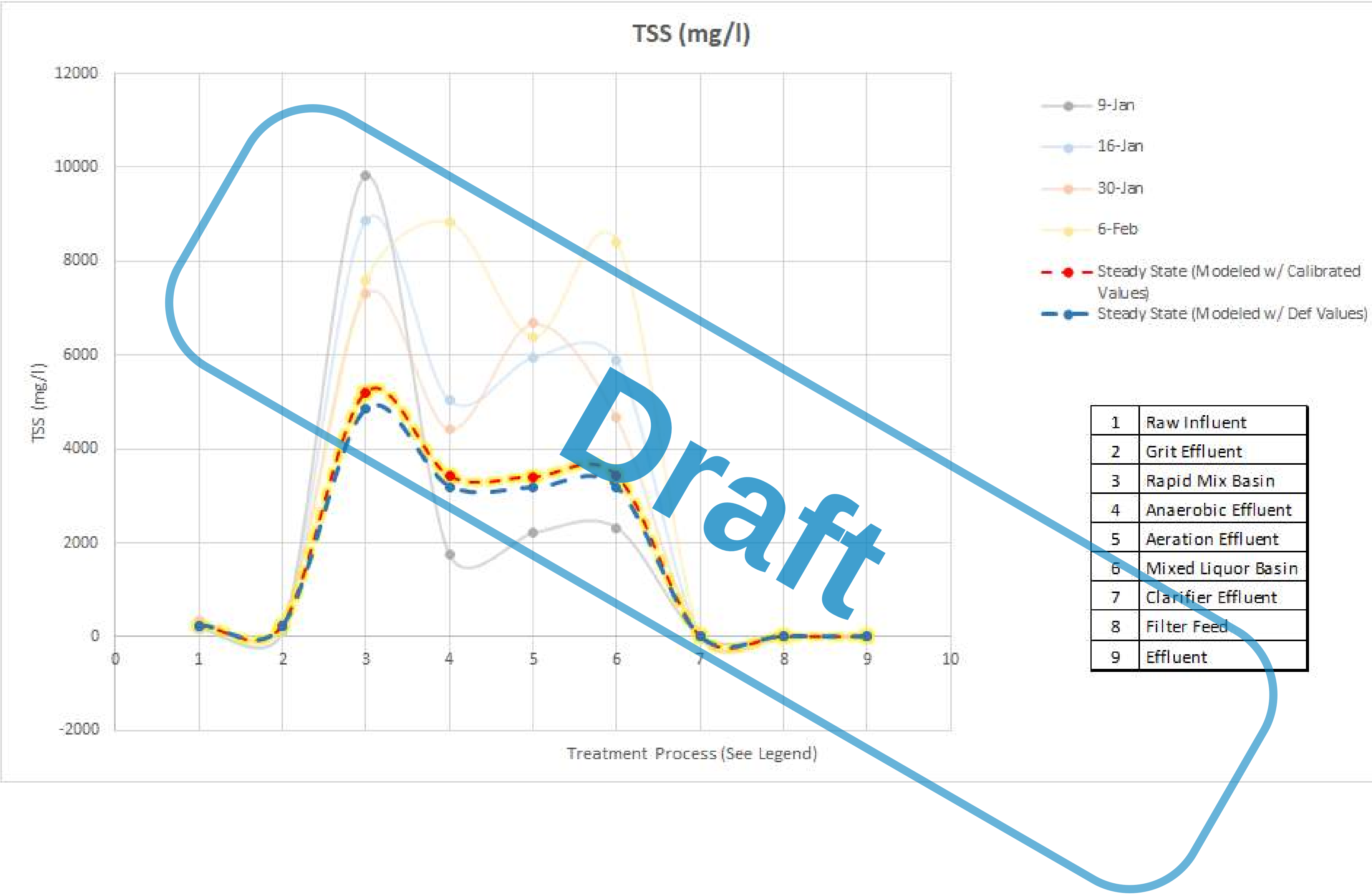

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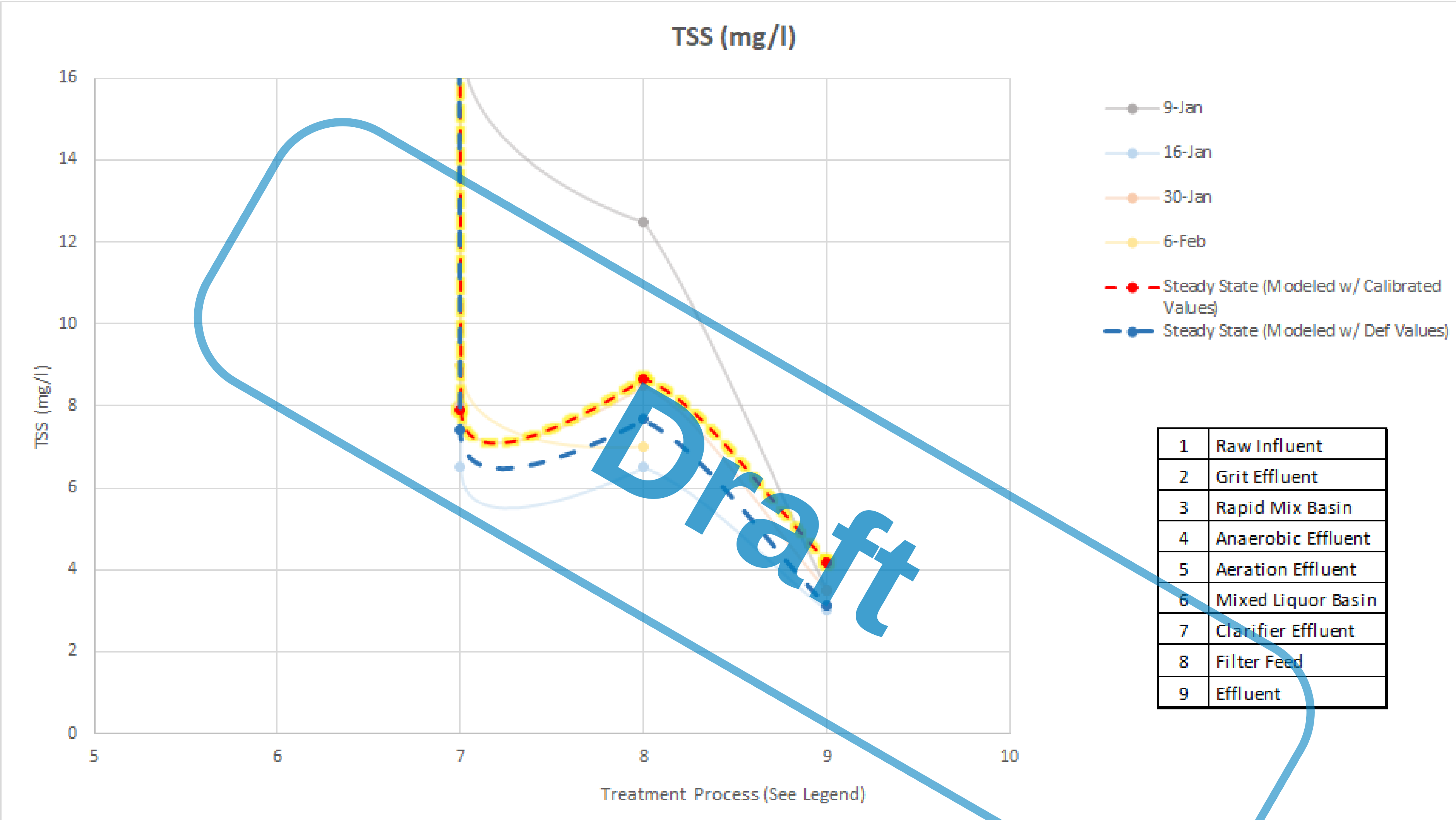
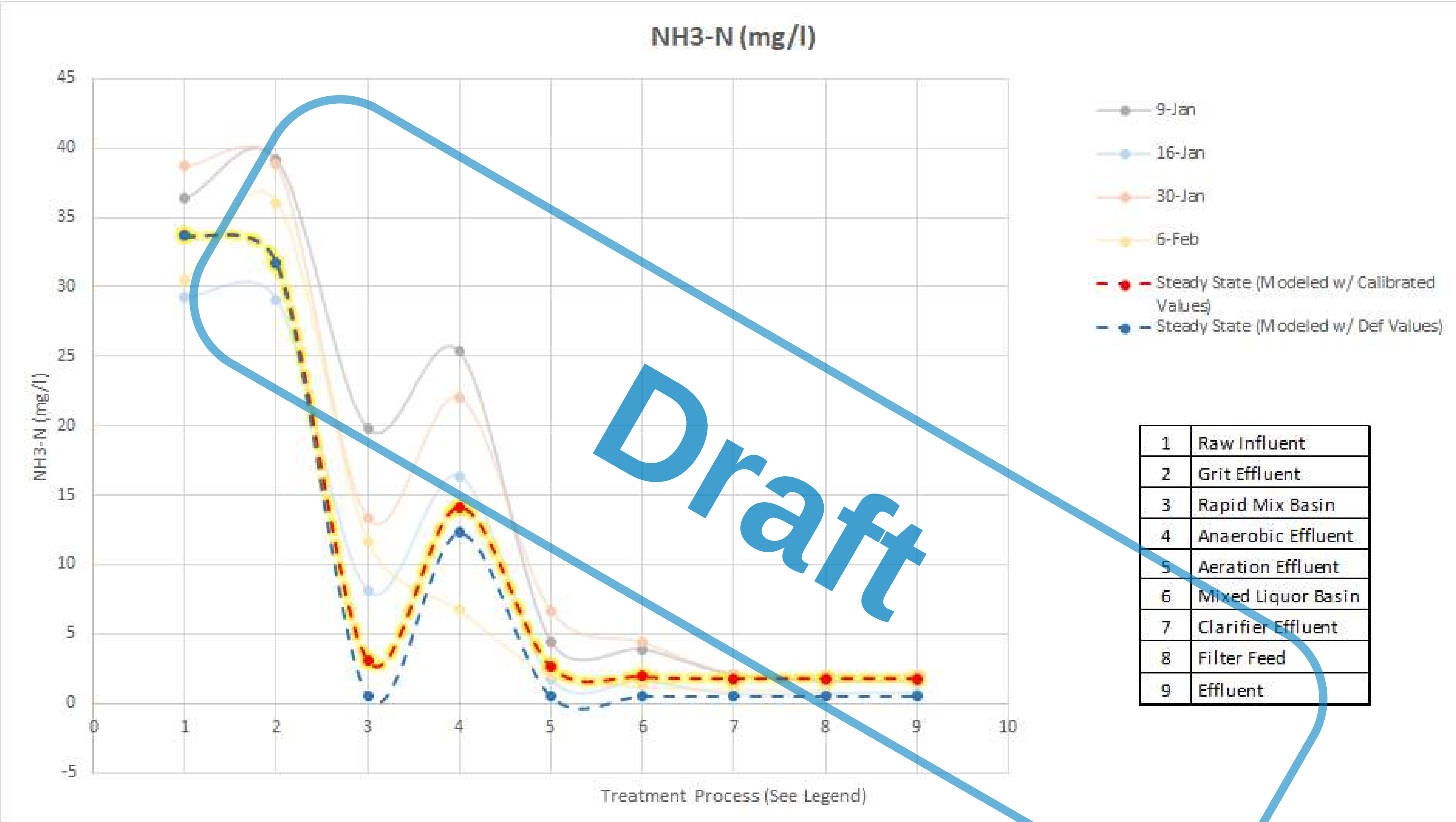


1	Raw Influent
2	Grit Effluent
3	Rapid Mix Basin
4	Anaerobic Effluent
5	Aeration Effluent
6	Mixed Liquor Basin
7	Clarifier Effluent
8	Filter Feed
9	Effluent

Existing Plant Calibration



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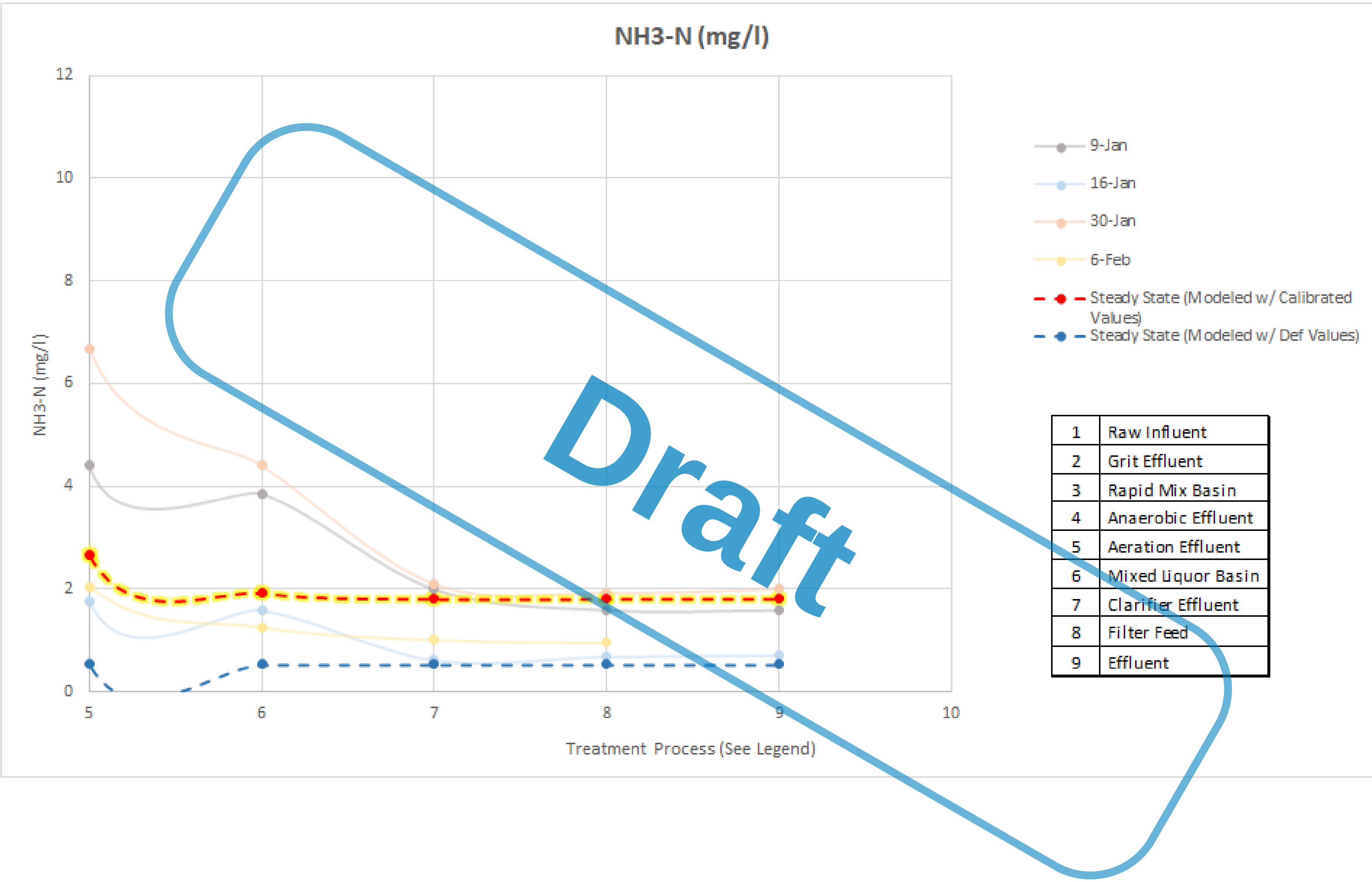

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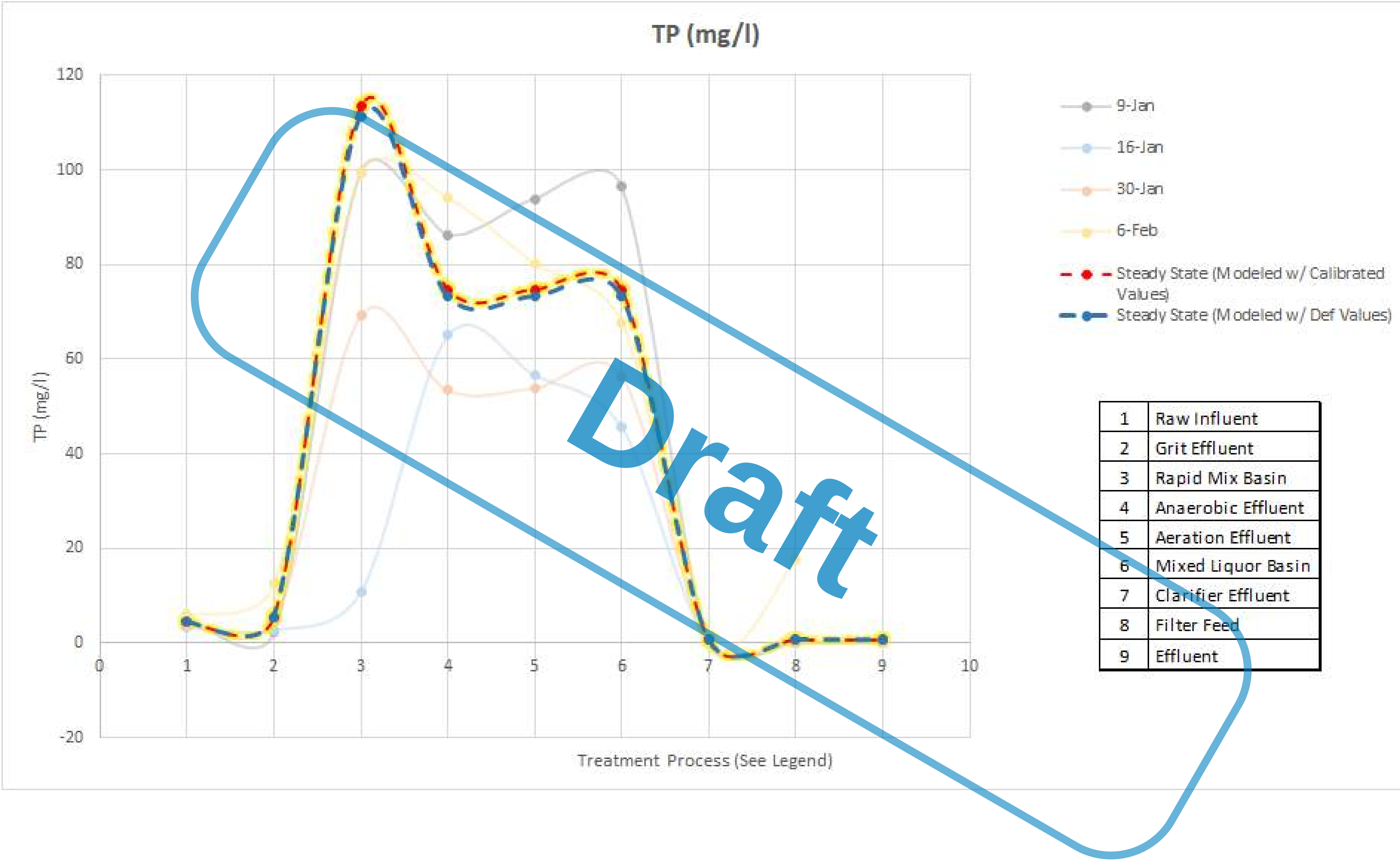

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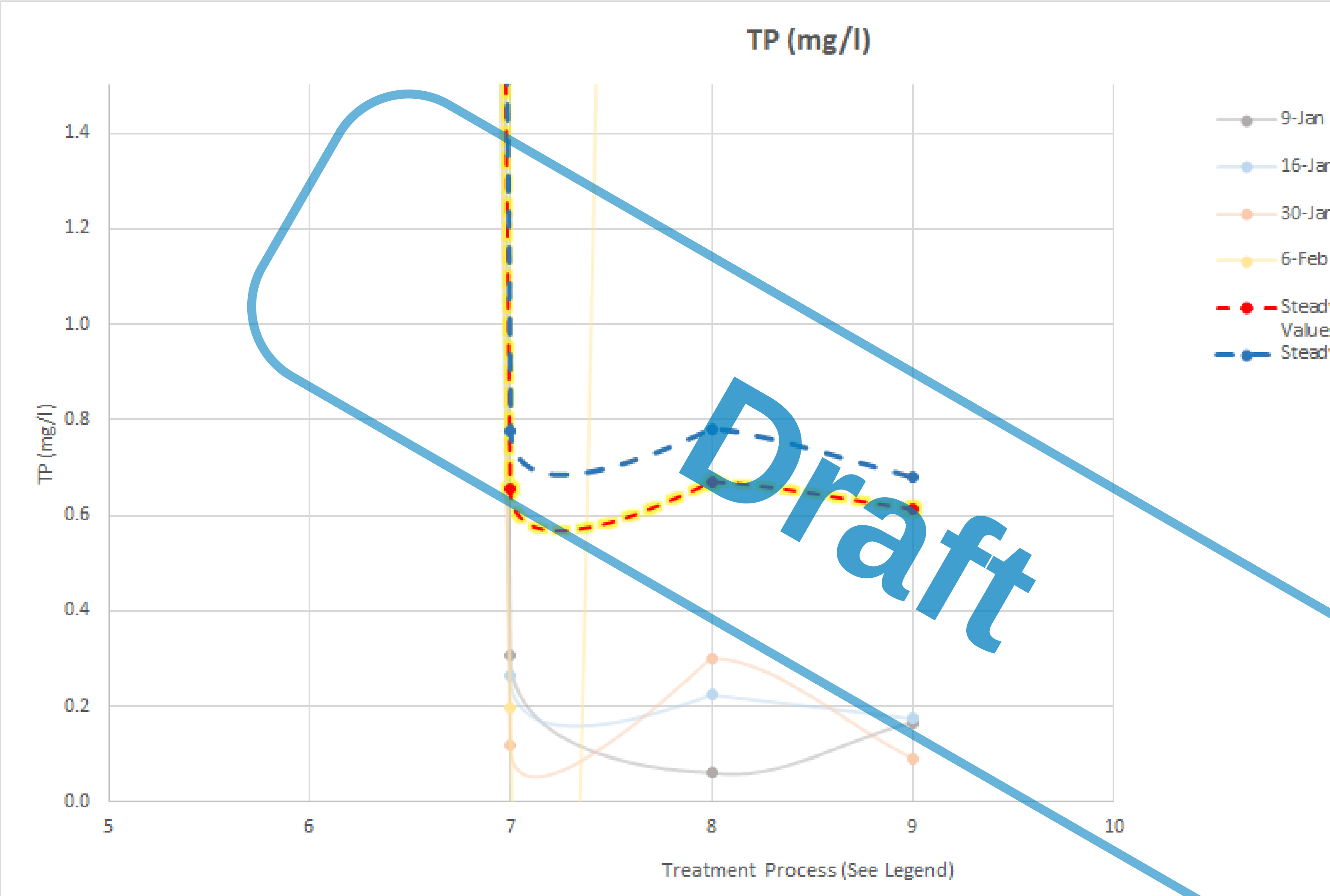
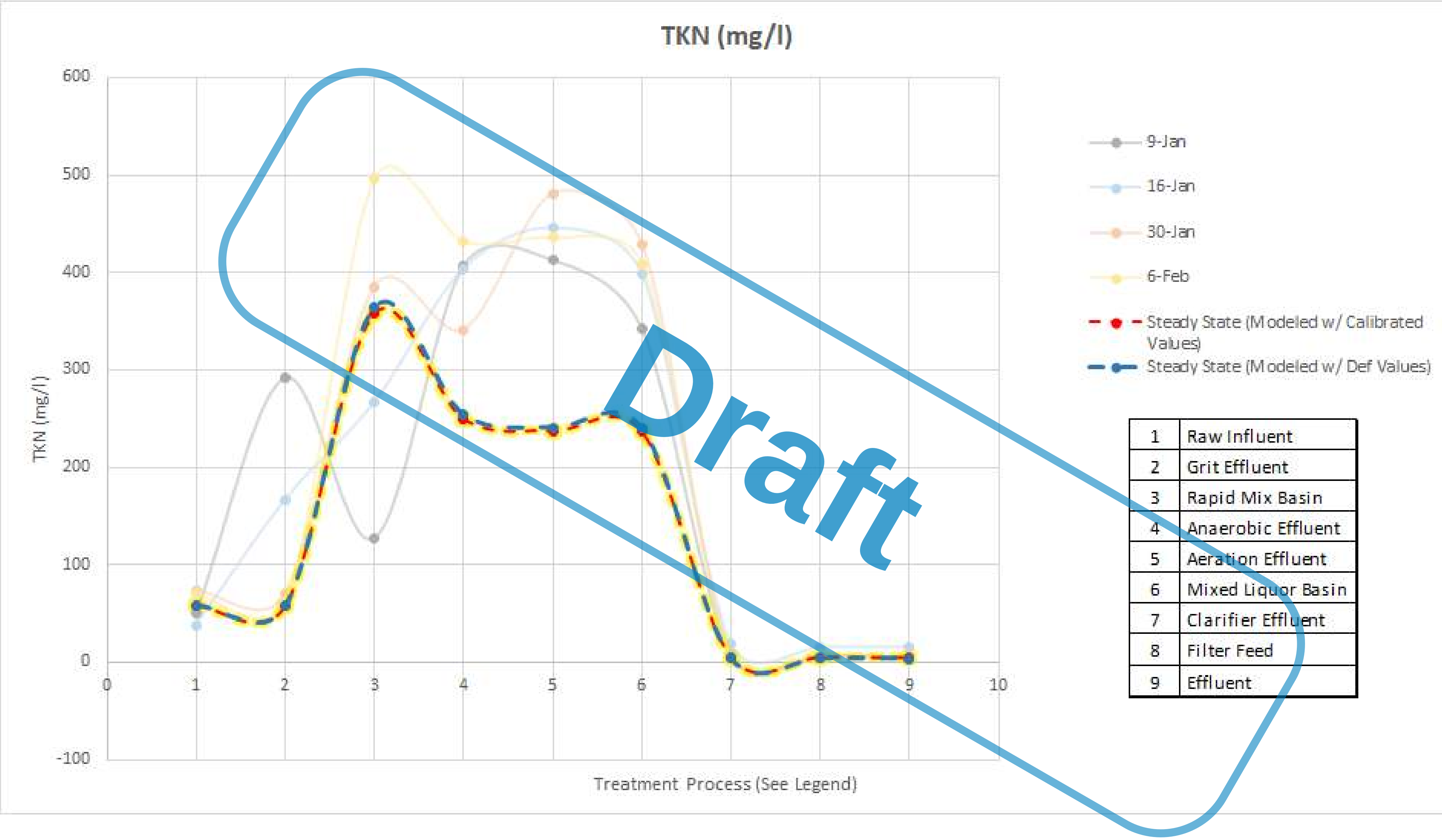


1	Raw Influent
2	Grit Effluent
3	Rapid Mix Basin
4	Anaerobic Effluent
5	Aeration Effluent
6	Mixed Liquor Basin
7	Clarifier Effluent
8	Filter Feed
9	Effluent

Existing Plant Calibration



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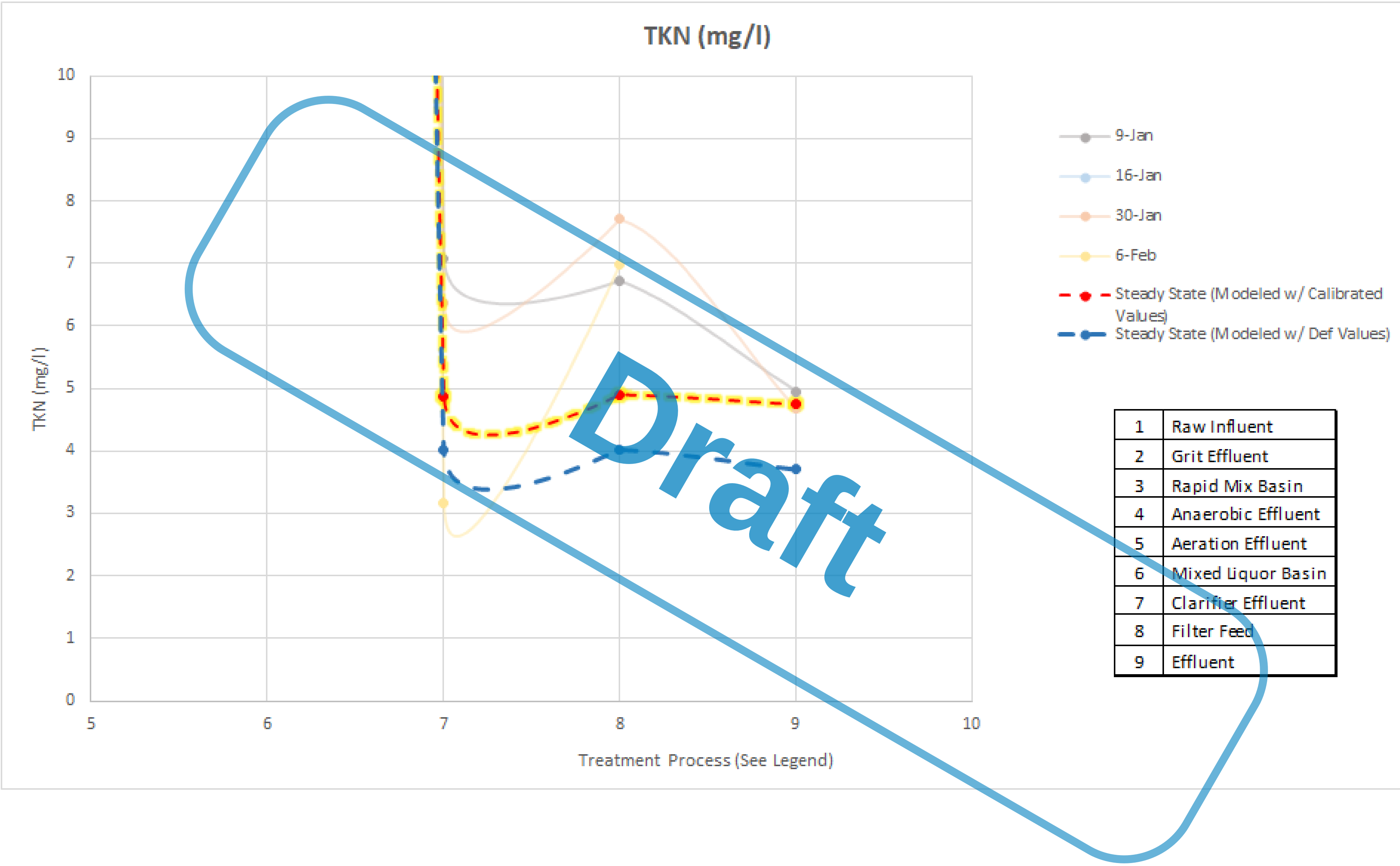

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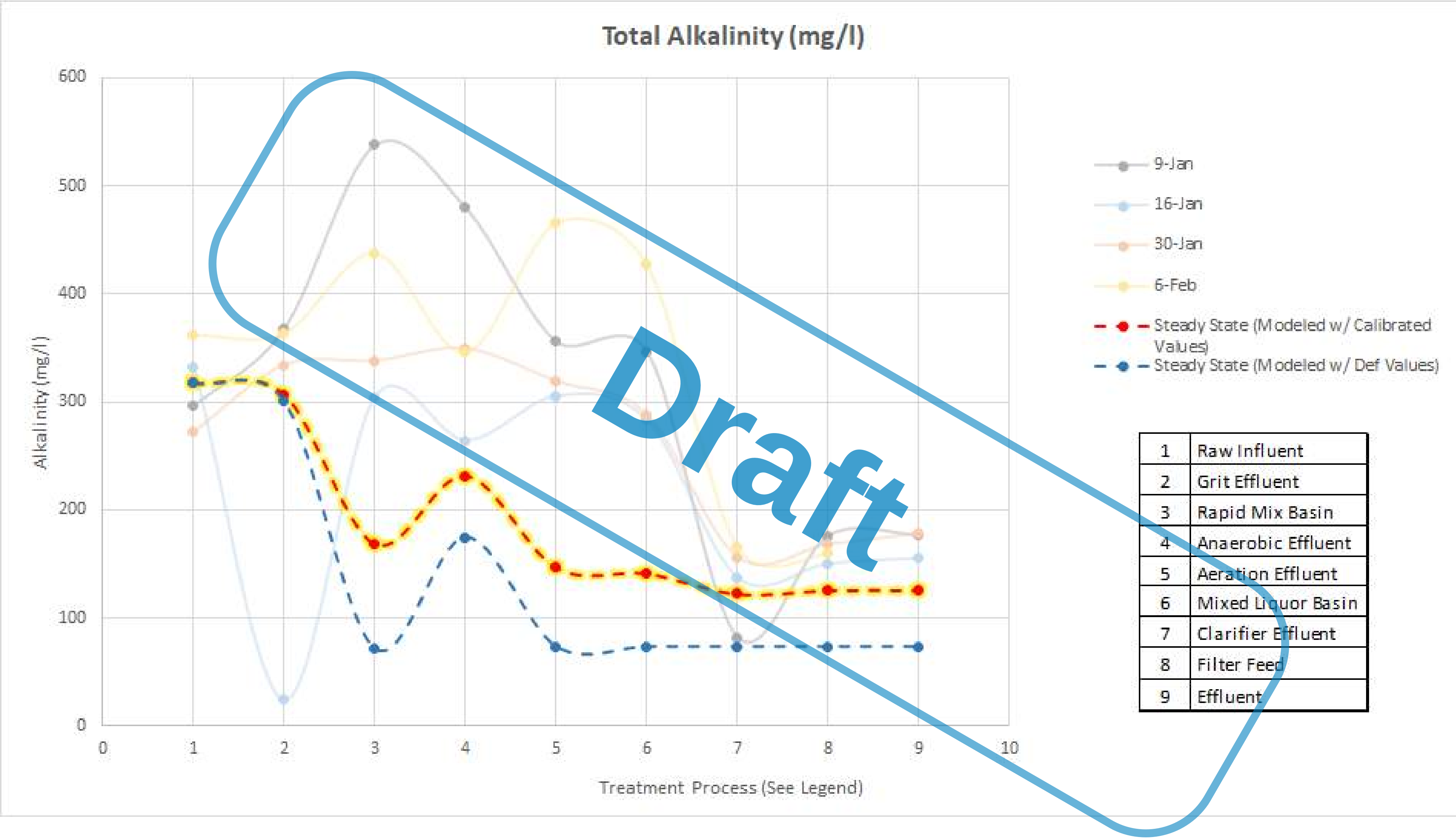
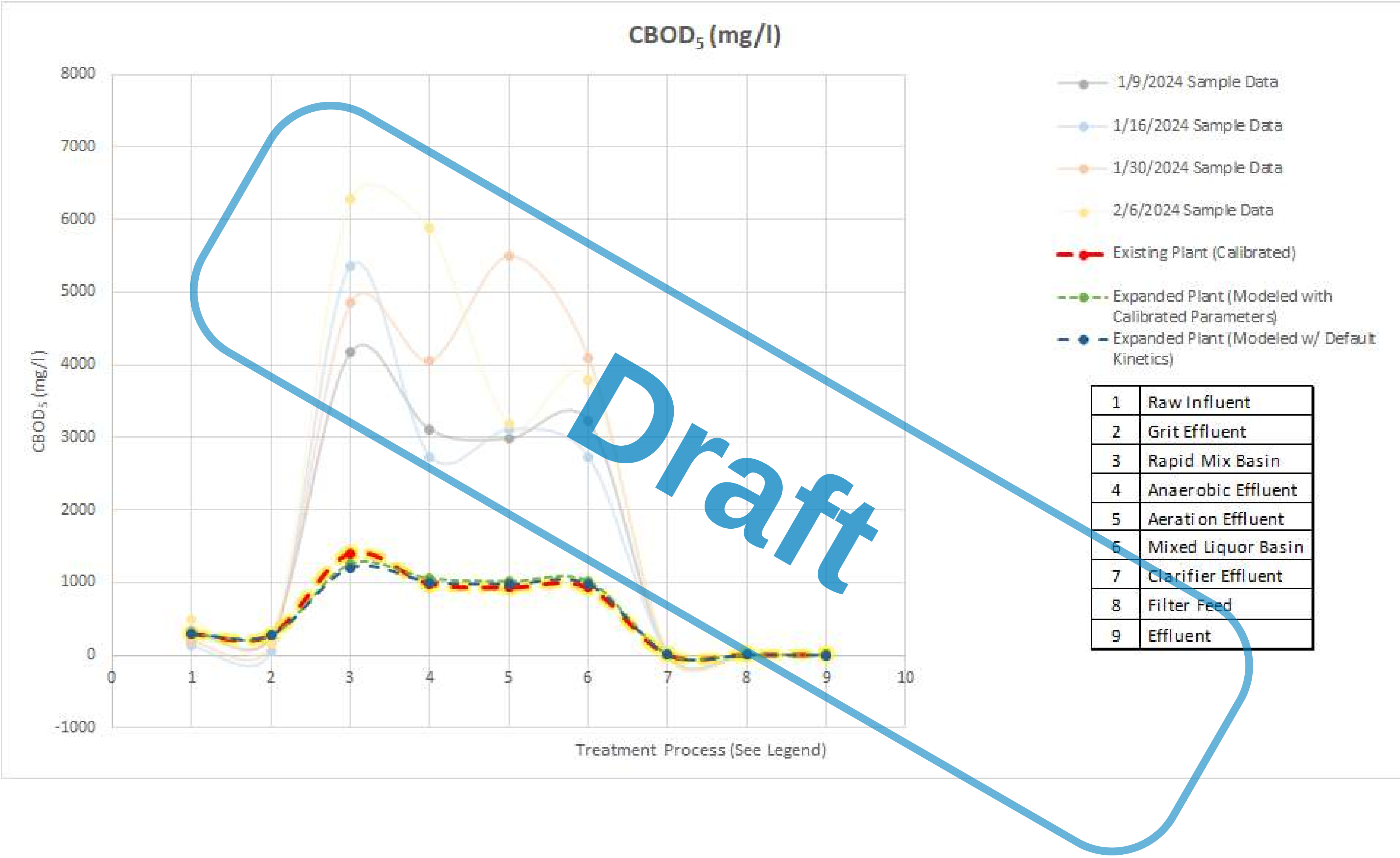


Expanded Plant Modeling

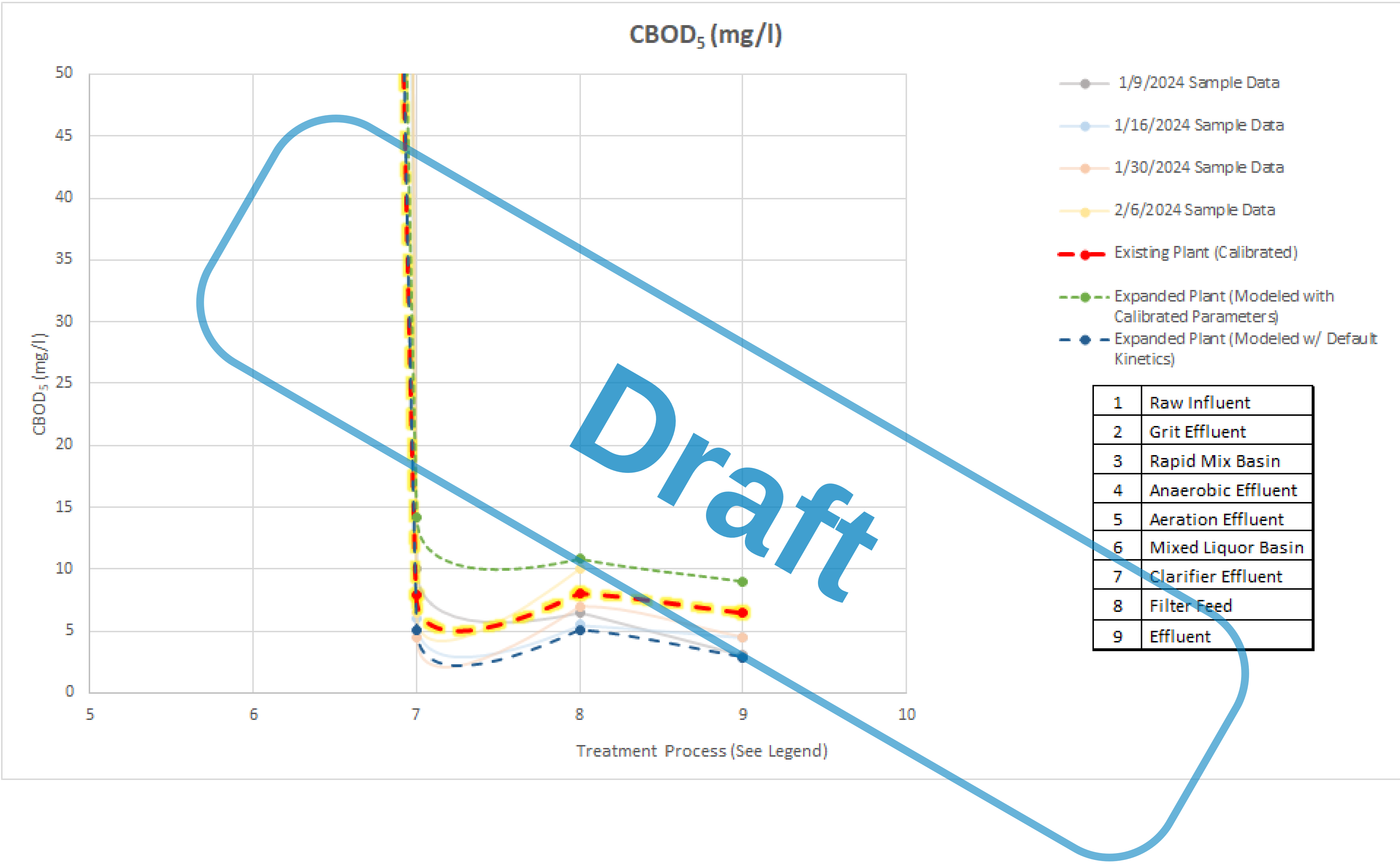
Existing Plant (Calibrated)	CBOD (mg/l)	TSS (mg/l)	NH3-N (mg/l)	TP (mg/l)	TKN (mg/l)	Alkalinity (mg/l)
Raw Influent	288.8	242.9	33.7	4.4	58.1	317.2
Grit Effluent	279.9	244.5	31.74	5.545	57.28	306.3
Rapid Mix Basin	1403	5204	3.065	113.4	358.7	168.5
Anaerobic Effluent	985.8	3422	14.15	74.67	250.4	231.7
Aeration Effluent	932.8	3405	2.647	74.67	237.8	146.6
Mixed Liquor Basin	931.2	3429	1.915	74.67	237	141.2
Clarifier Effluent	7.86	7.921	1.798	0.6565	4.871	122.4
Filter Feed	7.983	8.663	1.799	0.6692	4.903	125.8
Effluent	6.428	4.188	1.799	0.6115	4.744	125.8

Expanded Plant (Modeled with Calibrated Parameters)	CBOD (mg/l)	TSS (mg/l)	NH3-N (mg/l)	TP (mg/l)	TKN (mg/l)	Alkalinity (mg/l)
Raw Influent	288.8	242.9	33.7	4.4	58.1	317.2
Grit Effluent	281.10	235.10	32.42	4.65	56.83	307.40
Rapid Mix Basin	1264.00	4141.00	29.15	76.91	317.20	210.10
Anaerobic Effluent	1061.00	3345.00	32.43	62.61	265.70	233.70
Aeration Effluent	1023.00	3351.00	29.00	62.61	263.10	186.60
Mixed Liquor Basin	1021.00	3374.00	28.73	62.61	262.80	183.90
Clarifier Effluent	14.19	11.53	28.49	0.50	31.00	151.30
Filter Feed	10.83	11.53	28.49	0.50	30.90	151.30
Effluent	9.00	6.47	28.49	0.48	19.60	151.30

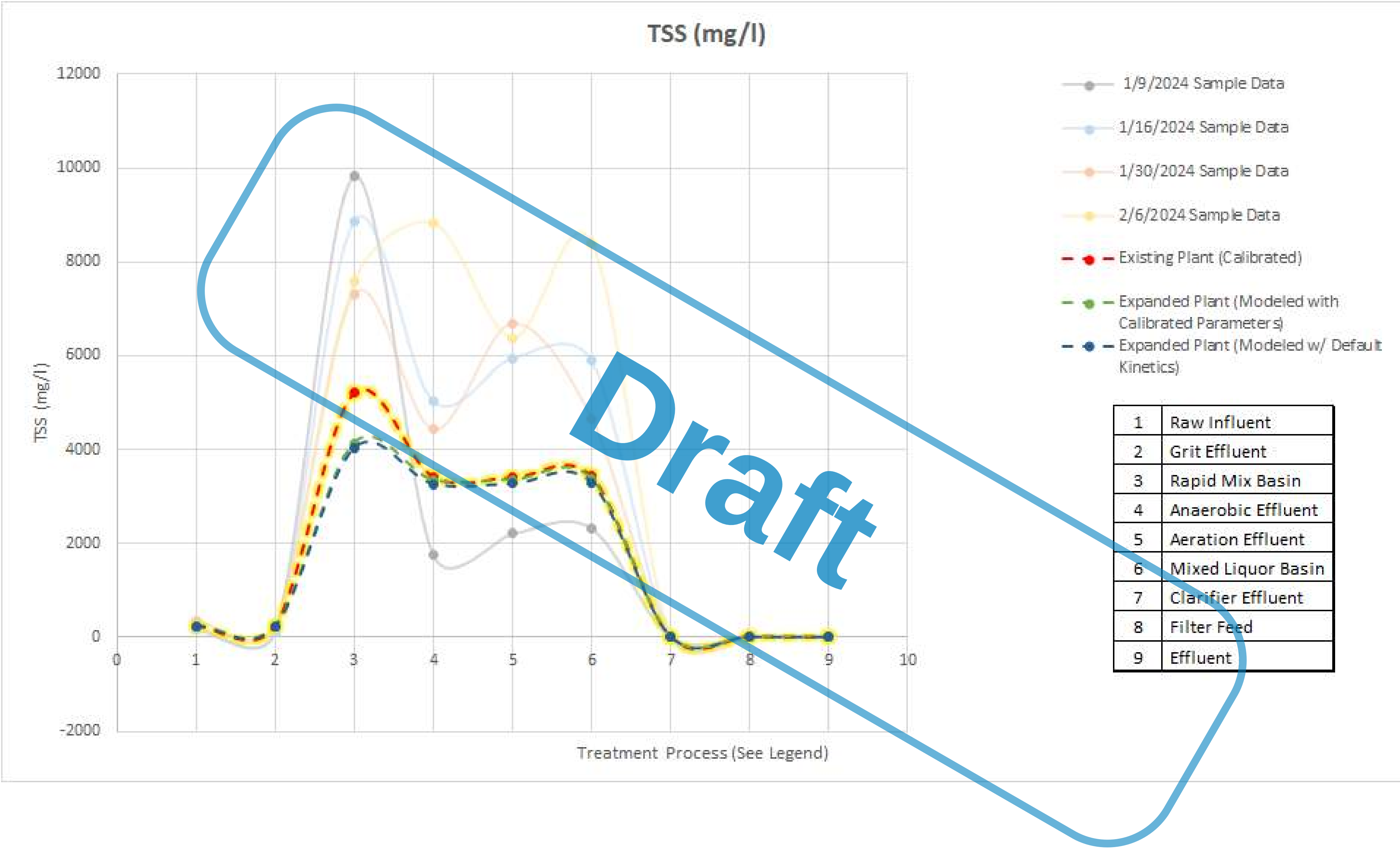
Expanded Plant (Modeled w/ Default Kinetics)	CBOD (mg/l)	TSS (mg/l)	NH3-N (mg/l)	TP (mg/l)	TKN (mg/l)	Alkalinity (mg/l)
Raw Influent	288.8	242.9	33.7	4.4	58.1	317.2
Grit Effluent	280.20	235.40	32.10	4.78	56.66	307.40
Rapid Mix Basin	1201.00	4040.00	1.50	77.71	280.90	183.90
Anaerobic Effluent	1005.00	3268.00	9.71	63.28	236.50	219.50
Aeration Effluent	972.80	3270.00	0.70	63.28	227.80	154.60
Mixed Liquor Basin	971.20	3294.00	0.39	63.28	227.40	152.10
Clarifier Effluent	5.08	8.72	0.20	0.60	3.08	127.40
Filter Feed	5.08	8.72	0.20	0.60	3.08	127.40
Effluent	2.86	2.60	0.20	0.49	2.68	127.4

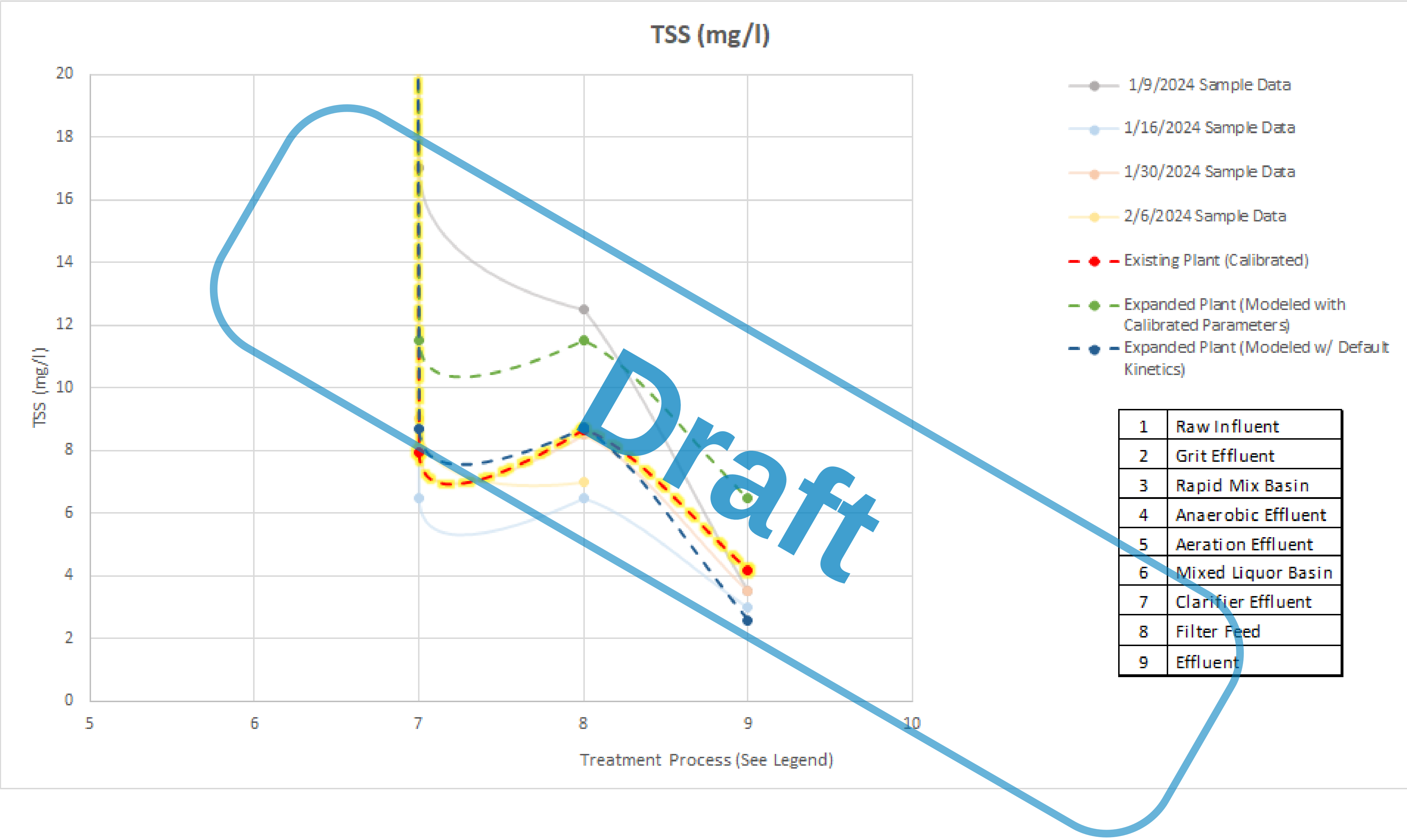


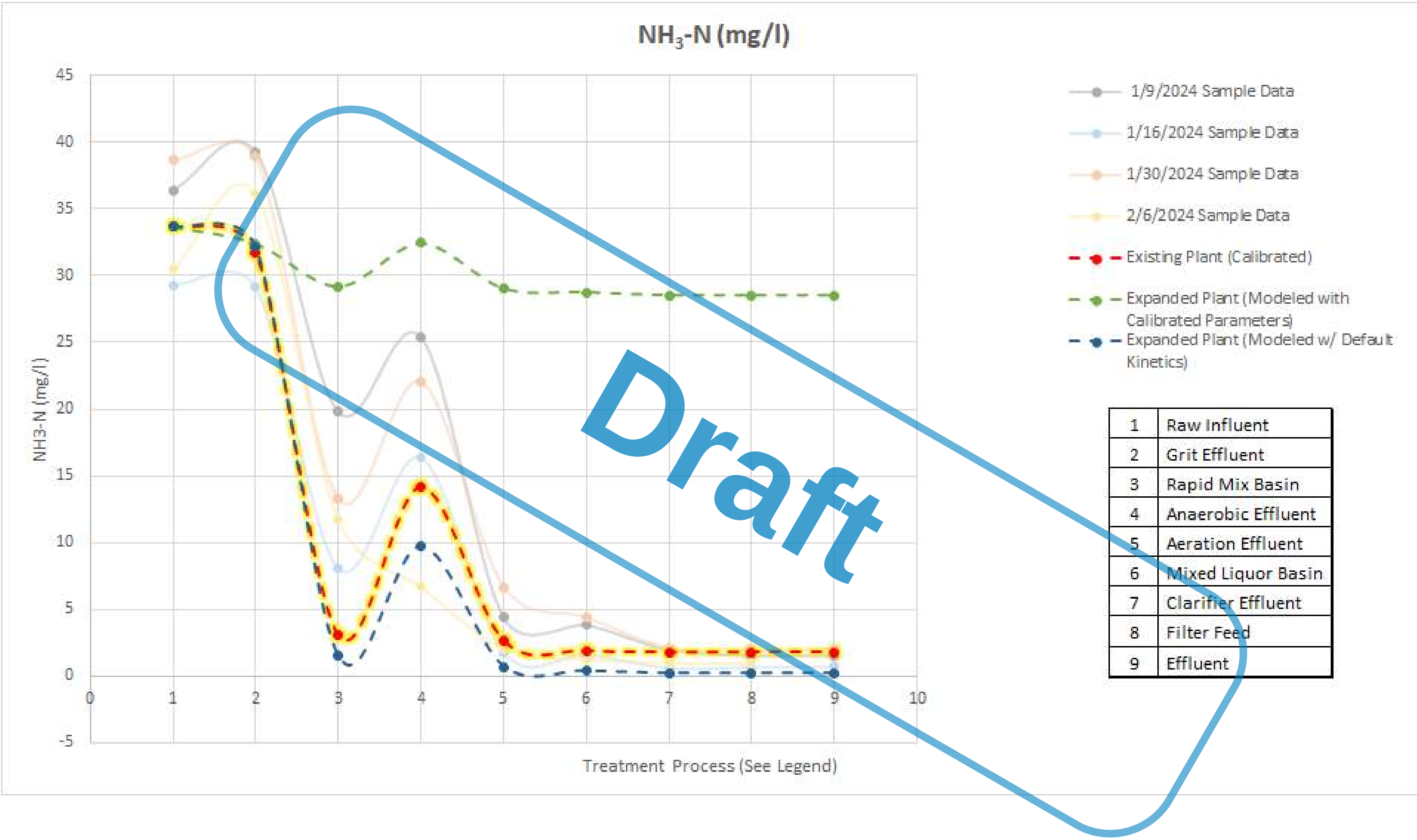
CBOD$_5$ (mg/l)
CBOD$_5$ (mg/l)
8000
7000
6000
5000
4000
3000
2000
1000
0
-1000
0 1 2 3 4 5 6 7 8 9 10
Treatment Process (See Legend)
1/9/2024 Sample Data
1/16/2024 Sample Data
1/30/2024 Sample Data
2/6/2024 Sample Data
Existing Plant (Calibrated)
Expanded Plant (Modeled with Calibrated Parameters)
Expanded Plant (Modeled w/ Default Kinetics)
1 Raw Influent
2 Grit Effluent
3 Rapid Mix Basin
4 Anaerobic Effluent
5 Aeration Effluent
6 Mixed Liquor Basin
7 Clarifier Effluent
8 Filter Feed
9 Effluent
Draft



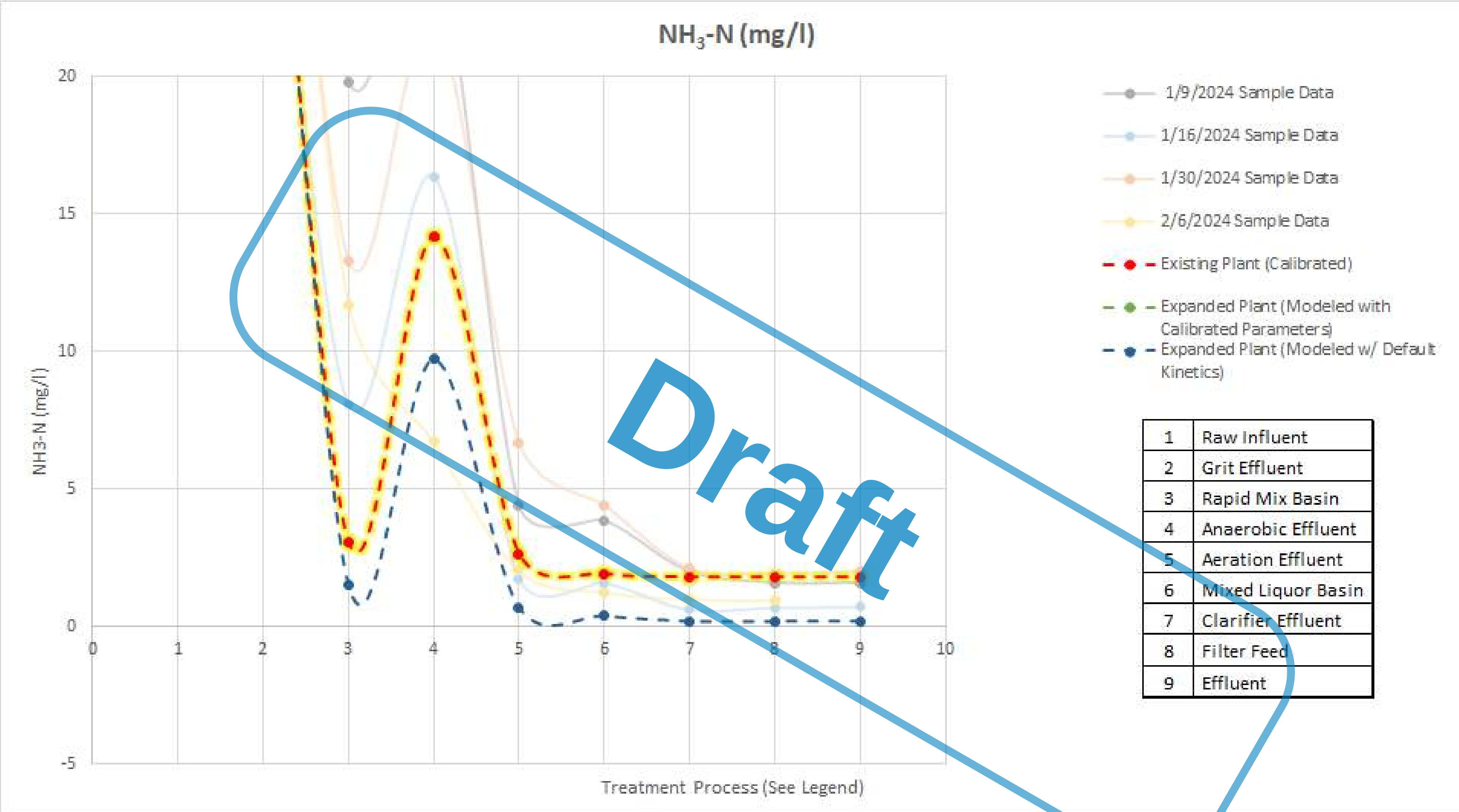
CBOD5 (mg/l)
CBOD5 (mg/l)
Treatment Process (See Legend)
1/9/2024 Sample Data
1/16/2024 Sample Data
1/30/2024 Sample Data
2/6/2024 Sample Data
Existing Plant (Calibrated)
Expanded Plant (Modeled with Calibrated Parameters)
Expanded Plant (Modeled w/ Default Kinetics)
1 Raw Influent
2 Grit Effluent
3 Rapid Mix Basin
4 Anaerobic Effluent
5 Aeration Effluent
6 Mixed Liquor Basin
7 Clarifier Effluent
8 Filter Feed
9 Effluent
Draft


TSS (mg/l)
12000
10000
8000
6000
4000
2000
0
-2000
TSS (mg/l)
0
1
2
3
4
5
6
7
8
9
10
Treatment Process (See Legend)
1/9/2024 Sample Data
1/16/2024 Sample Data
1/30/2024 Sample Data
2/6/2024 Sample Data
Existing Plant (Calibrated)
Expanded Plant (Modeled with Calibrated Parameters)
Expanded Plant (Modeled w/ Default Kinetics)
1 Raw Influent
2 Grit Effluent
3 Rapid Mix Basin
4 Anaerobic Effluent
5 Aeration Effluent
6 Mixed Liquor Basin
7 Clarifier Effluent
8 Filter Feed
9 Effluent
Draft

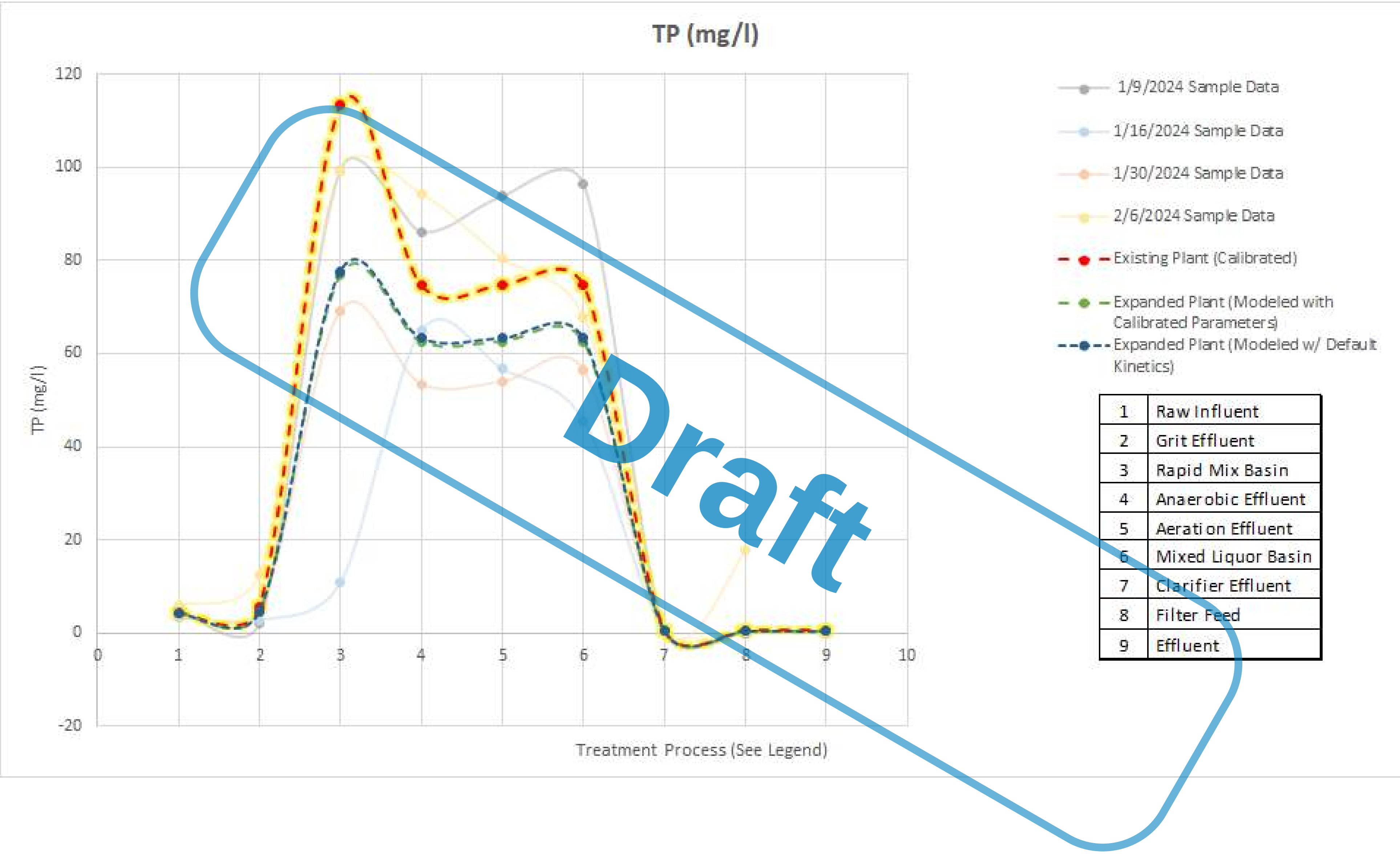

TSS (mg/l)
20
18
16
14
12
10
8
6
4
2
0
TSS (mg/l)
5
6
7
8
9
10
Treatment Process (See Legend)
1/9/2024 Sample Data
1/16/2024 Sample Data
1/30/2024 Sample Data
2/6/2024 Sample Data
Existing Plant (Calibrated)
Expanded Plant (Modeled with Calibrated Parameters)
Expanded Plant (Modeled w/ Default Kinetics)
1 Raw Influent
2 Grit Effluent
3 Rapid Mix Basin
4 Anaerobic Effluent
5 Aeration Effluent
6 Mixed Liquor Basin
7 Clarifier Effluent
8 Filter Feed
9 Effluent
Draft



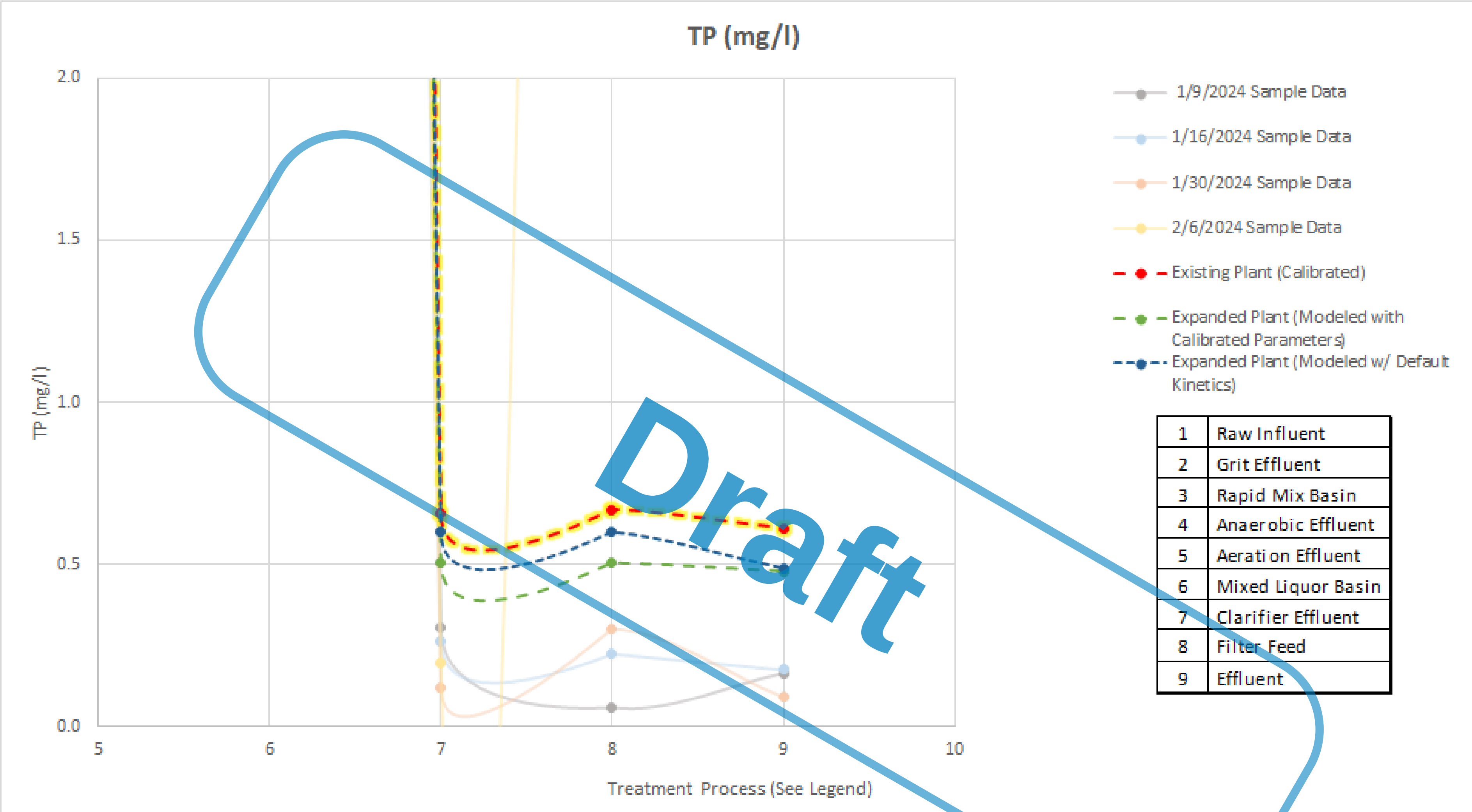
NH3-N (mg/l)
NH3-N (mg/l)
Treatment Process (See Legend)
1/9/2024 Sample Data
1/16/2024 Sample Data
1/30/2024 Sample Data
2/6/2024 Sample Data
Existing Plant (Calibrated)
Expanded Plant (Modeled with Calibrated Parameters)
Expanded Plant (Modeled w/ Default Kinetics)
1 Raw Influent
2 Grit Effluent
3 Rapid Mix Basin
4 Anaerobic Effluent
5 Aeration Effluent
6 Mixed Liquor Basin
7 Clarifier Effluent
8 Filter Feed
9 Effluent
Draft



1	Raw Influent
2	Grit Effluent
3	Rapid Mix Basin
4	Anaerobic Effluent
5	Aeration Effluent
6	Mixed Liquor Basin
7	Clarifier Effluent
8	Filter Feed
9	Effluent

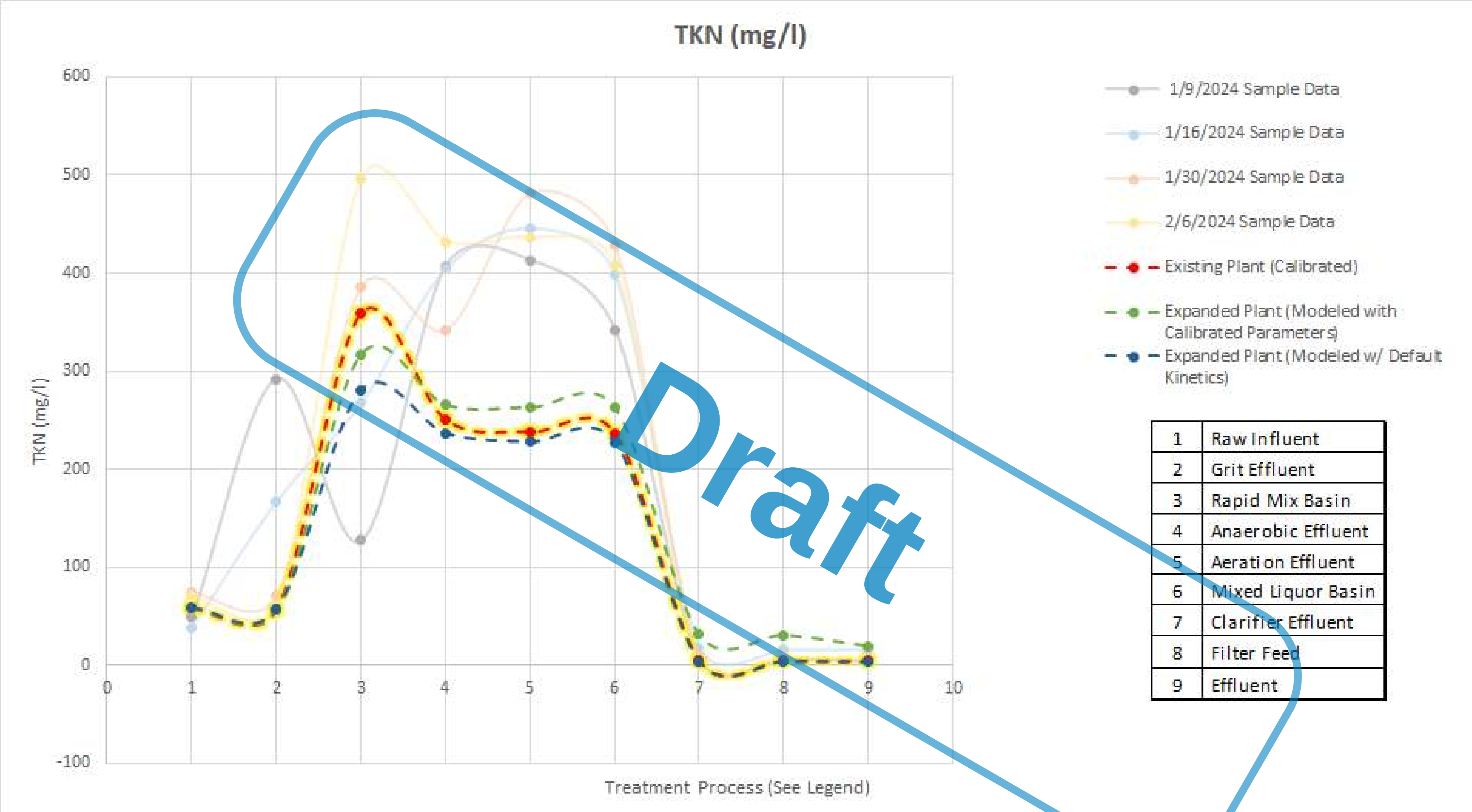

TP (mg/l)
120
100
80
60
40
20
0
-20
TP (mg/l)
0
1
2
3
4
5
6
7
8
9
10
Treatment Process (See Legend)
1/9/2024 Sample Data
1/16/2024 Sample Data
1/30/2024 Sample Data
2/6/2024 Sample Data
Existing Plant (Calibrated)
Expanded Plant (Modeled with Calibrated Parameters)
Expanded Plant (Modeled w/ Default Kinetics)
1 Raw Influent
2 Grit Effluent
3 Rapid Mix Basin
4 Anaerobic Effluent
5 Aeration Effluent
6 Mixed Liquor Basin
7 Clarifier Effluent
8 Filter Feed
9 Effluent
Draft

Expanded Plant Modeling

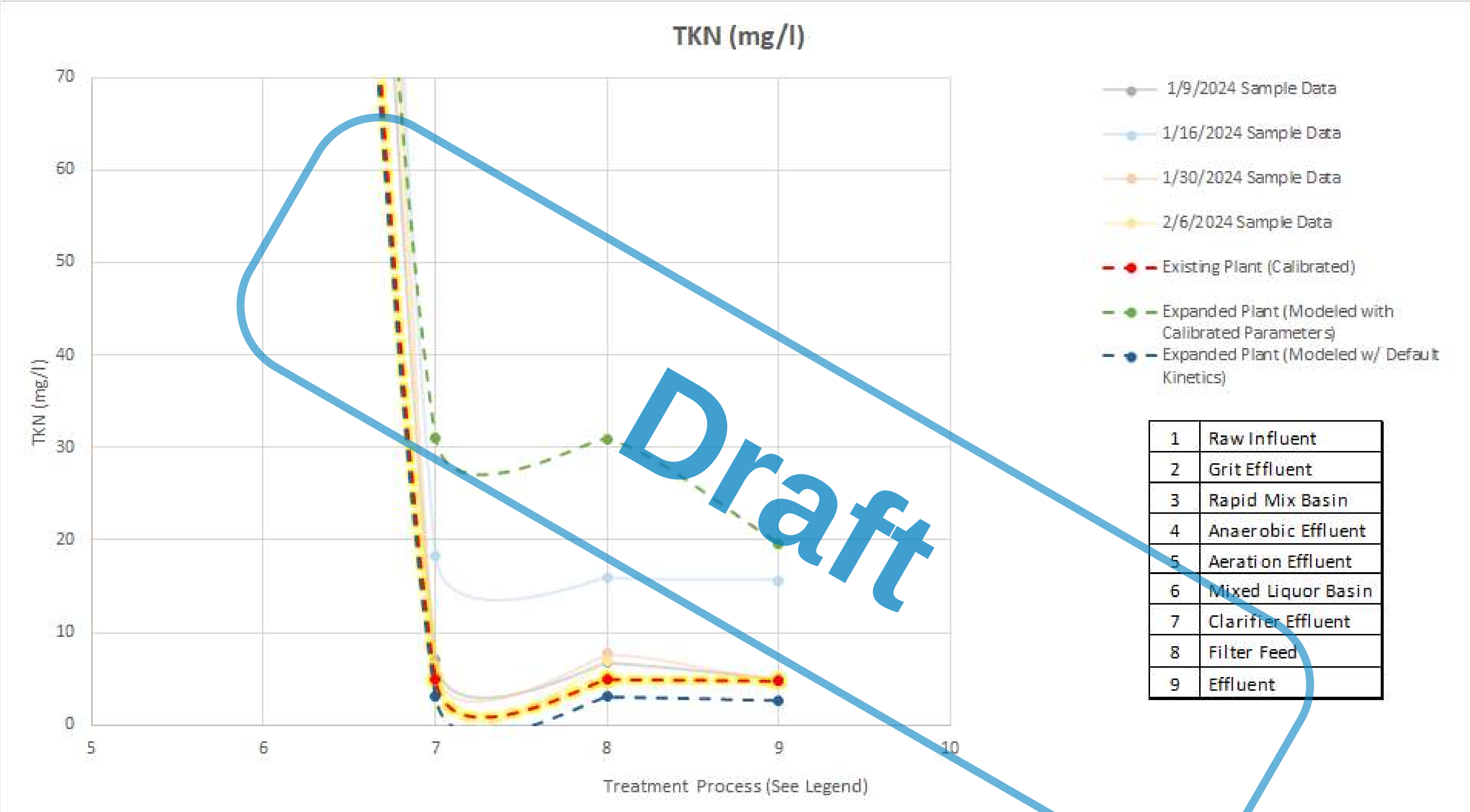


1	Raw Influent
2	Grit Effluent
3	Rapid Mix Basin
4	Anaerobic Effluent
5	Aeration Effluent
6	Mixed Liquor Basin
7	Clarifier Effluent
8	Filter Feed
9	Effluent

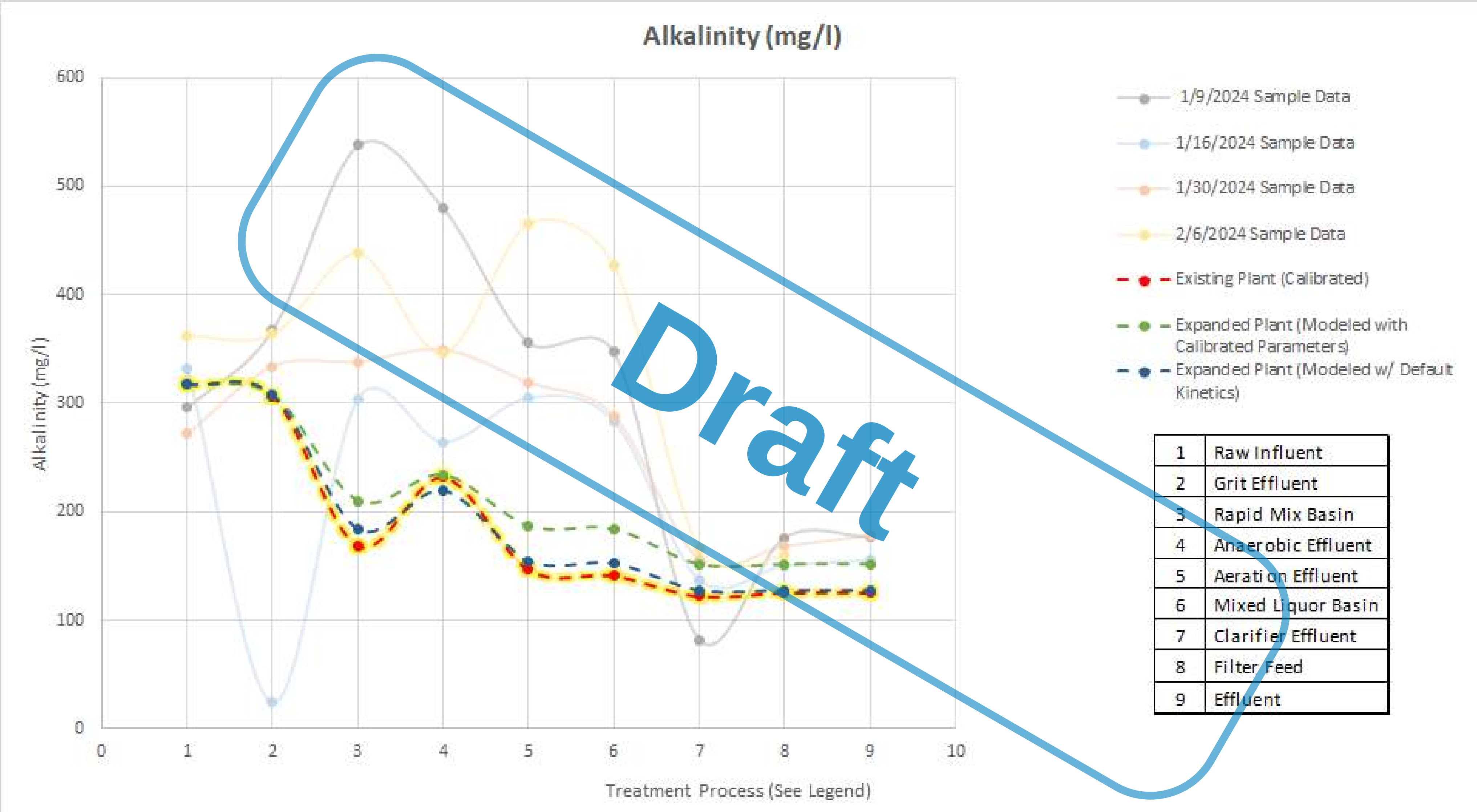
Expanded Plant Modeling



1	Raw Influent
2	Grit Effluent
3	Rapid Mix Basin
4	Anaerobic Effluent
5	Aeration Effluent
6	Mixed Liquor Basin
7	Clarifier Effluent
8	Filter Feed
9	Effluent



1	Raw Influent
2	Grit Effluent
3	Rapid Mix Basin
4	Anaerobic Effluent
5	Aeration Effluent
6	Mixed Liquor Basin
7	Clarifier Effluent
8	Filter Feed
9	Effluent

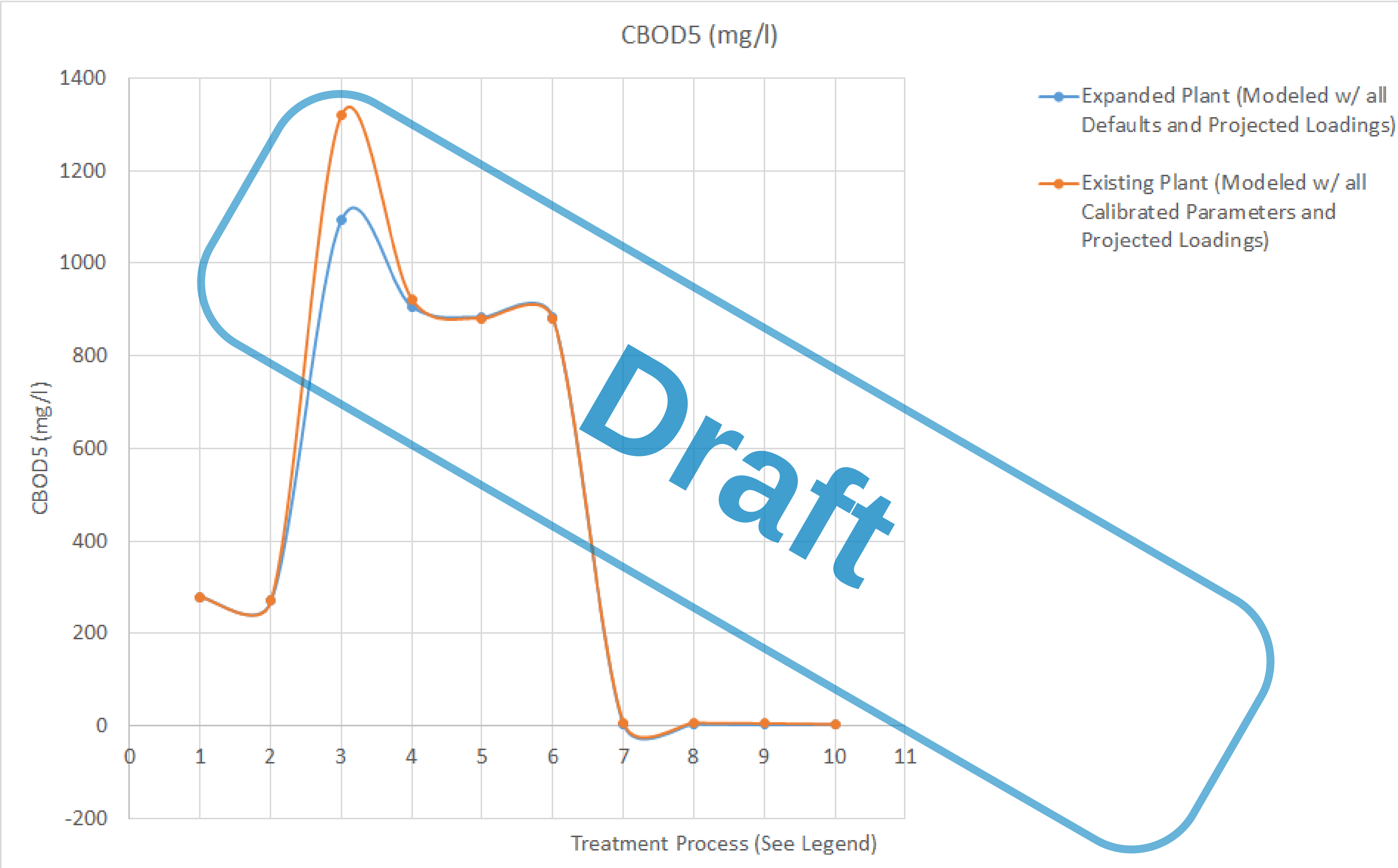

Alkalinity (mg/l)
600
500
400
300
200
100
0
Alkalinity (mg/l)
0
1
2
3
4
5
6
7
8
9
10
Treatment Process (See Legend)
1/9/2024 Sample Data
1/16/2024 Sample Data
1/30/2024 Sample Data
2/6/2024 Sample Data
Existing Plant (Calibrated)
Expanded Plant (Modeled with Calibrated Parameters)
Expanded Plant (Modeled w/ Default Kinetics)
1 Raw Influent
2 Grit Effluent
3 Rapid Mix Basin
4 Anaerobic Effluent
5 Aeration Effluent
6 Mixed Liquor Basin
7 Clarifier Effluent
8 Filter Feed
9 Effluent
Draft

Overall Plant Modeling

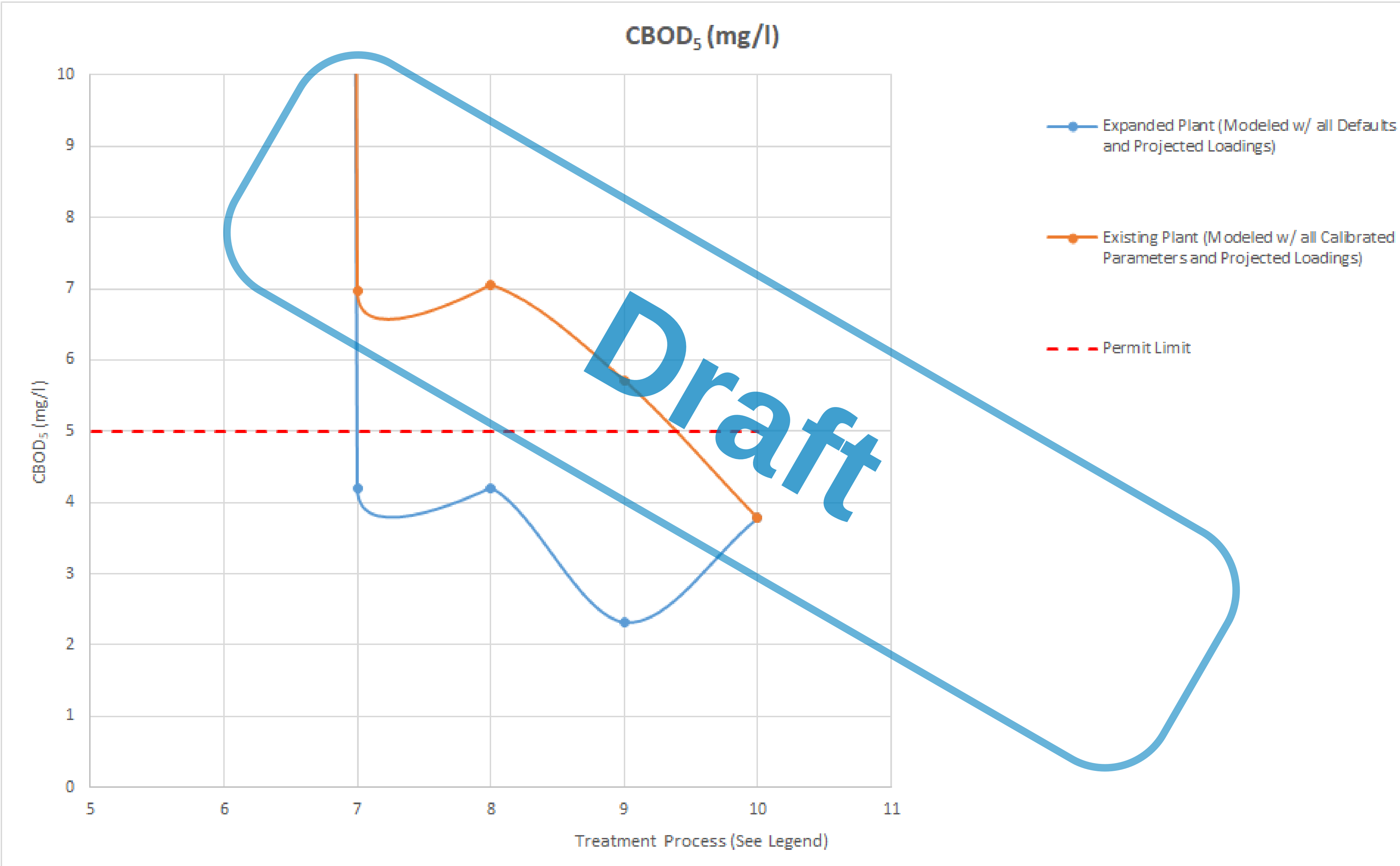
Expanded Plant (Modeled w/ all Defaults and Projected Loadings)	CBOD (mg/l)	TSS (mg/l)	NH3-N (mg/l)	TP (mg/l)	TKN (mg/l)	Alkalinity (mg/l)
Raw Influent	278.5	279.9	50	9	87	396
Grit Effluent	270.00	241.80	47.66	9.58	84.14	384.00
Rapid Mix Basin	1094.00	4298.00	1.77	164.20	269.10	174.90
Anaerobic Effluent	905.90	3487.00	13.73	133.70	232.50	244.80
Aeration Effluent	883.10	3474.00	0.71	133.70	217.50	149.50
Mixed Liquor Basin	882.10	3506.00	0.33	133.70	217.00	146.10
Clarifier Effluent	4.21	8.82	0.16	0.72	2.95	121.50
Filter Feed	4.21	8.82	0.16	0.72	2.95	121.50
Filter Effluent	2.32	2.64	0.16	0.48	2.60	121.5
Final Effluent	3.78	3.25	0.79	0.46	3.22	119.8

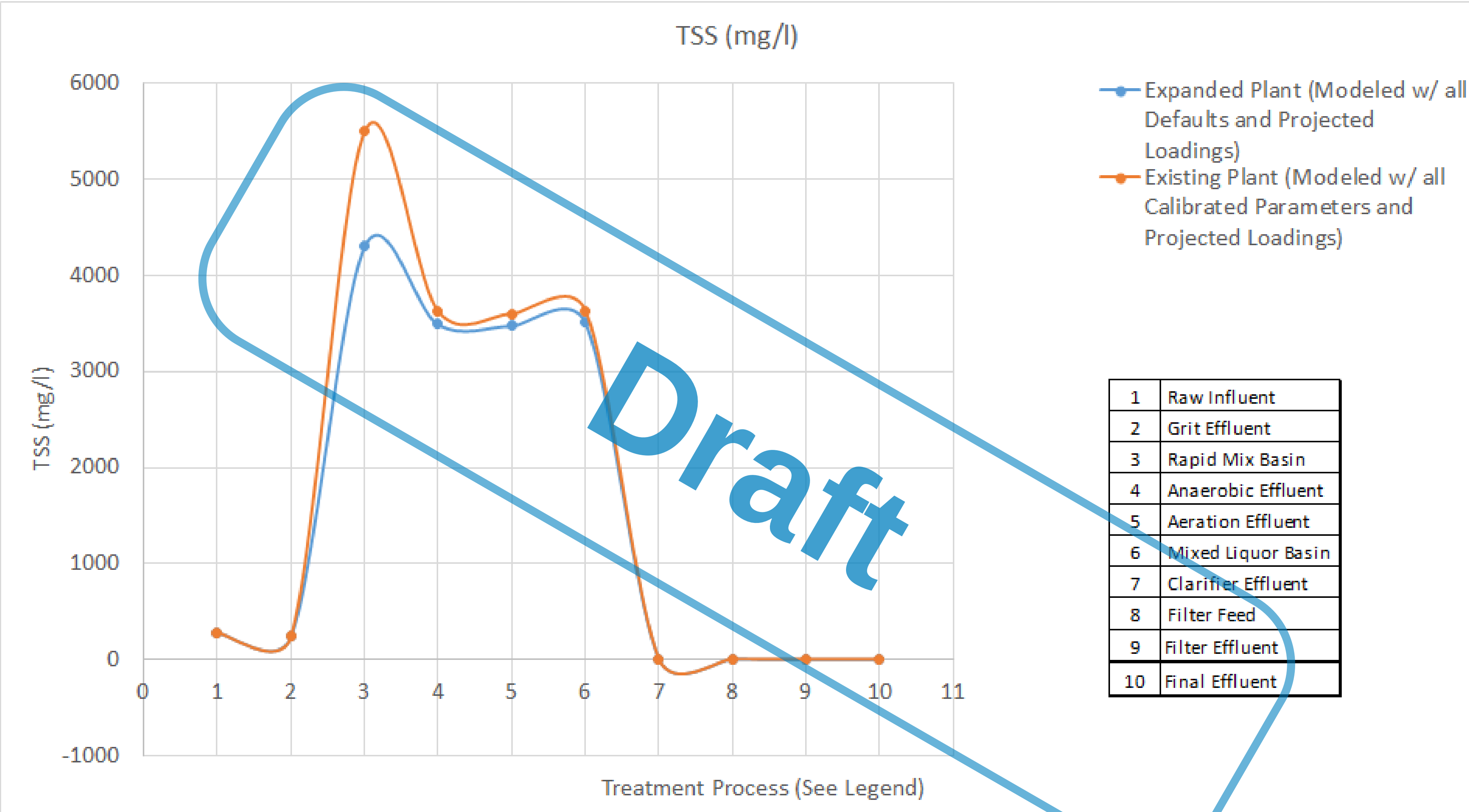
Existing Plant (Modeled w/ all Calibrated Parameters and Projected Loadings)	CBOD (mg/l)	TSS (mg/l)	NH3-N (mg/l)	TP (mg/l)	TKN (mg/l)	Alkalinity (mg/l)
Raw Influent	278.5	279.9	50	9	87	396
Grit Effluent	270.00	241.80	47.66	9.58	84.14	384.00
Rapid Mix Basin	1321.00	5490.00	3.39	206.55	336.40	157.90
Anaerobic Effluent	921.40	3622.00	20.32	136.10	246.30	265.40
Aeration Effluent	880.60	3595.00	2.96	136.10	224.10	139.50
Mixed Liquor Basin	879.50	3629.00	1.78	136.10	222.70	131.50
Clarifier Effluent	6.97	7.73	1.62	0.57	4.14	113.80
Filter Feed	7.06	8.51	1.63	0.60	4.18	117.40
Filter Effluent	5.72	4.06	1.63	0.44	4.05	117.4
Final Effluent	3.779	3.25	0.793	0.4626	3.223	119.8

Overall Plant Modeling



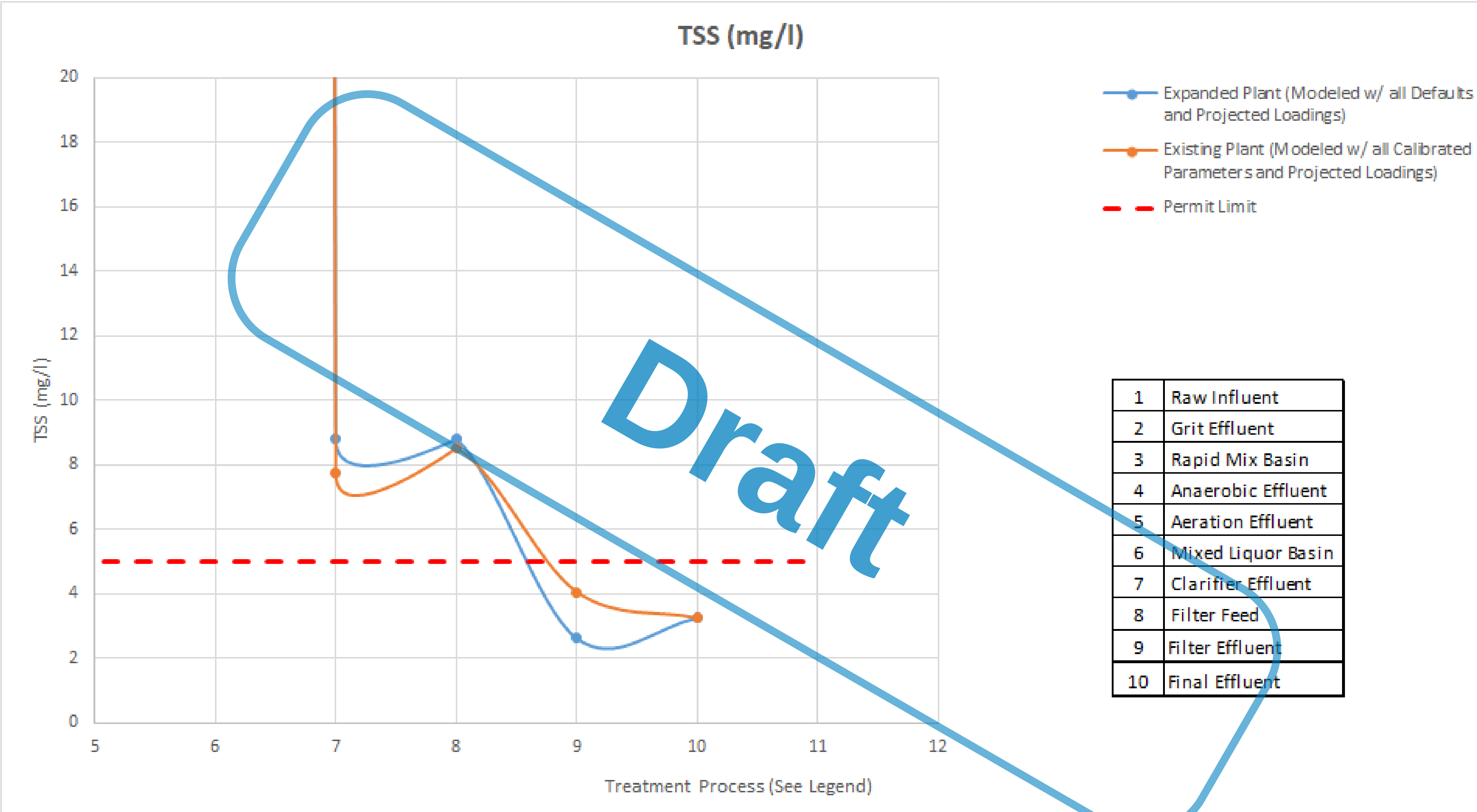
Overall Plant Modeling





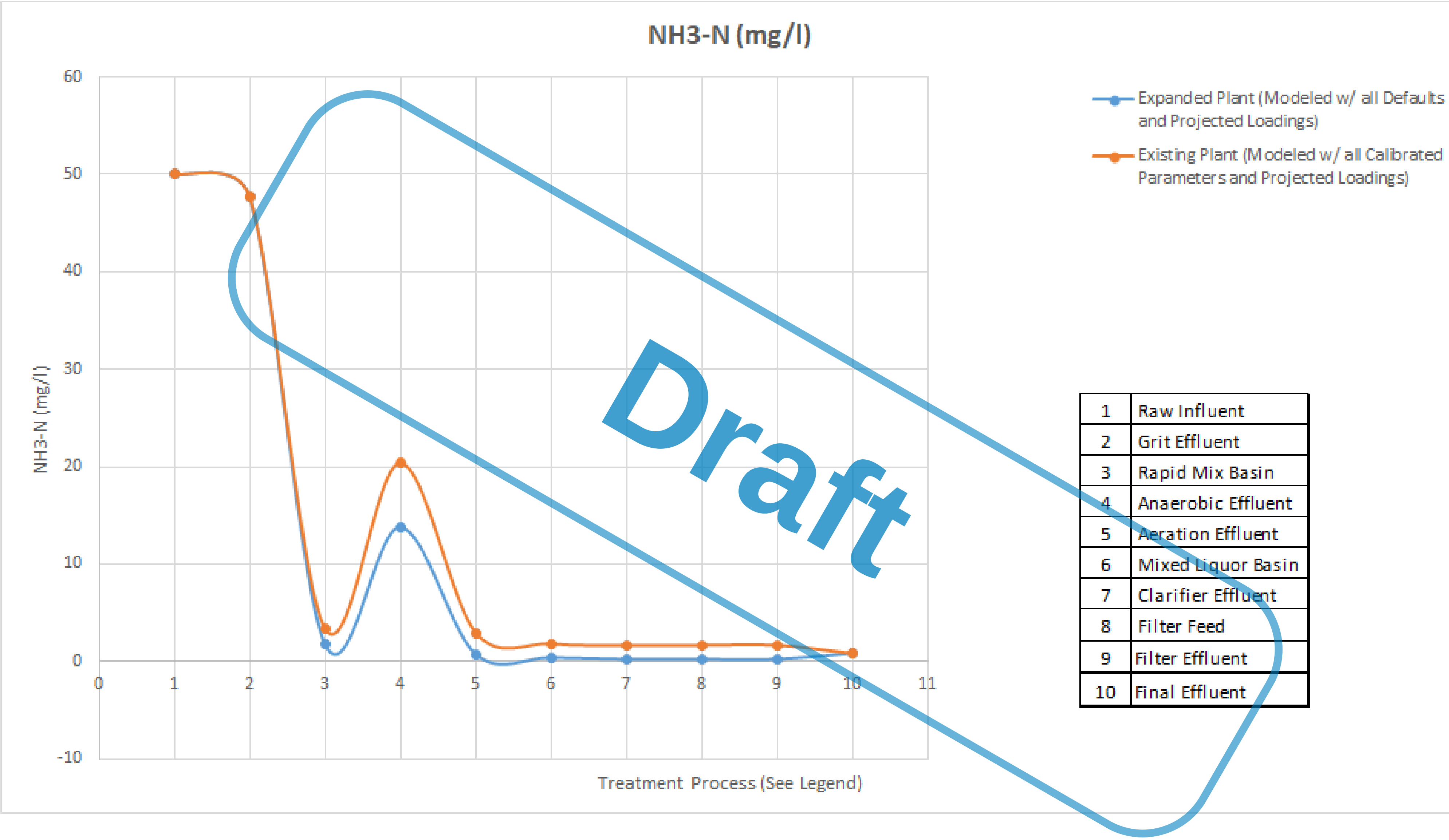
1	Raw Influent
2	Grit Effluent
3	Rapid Mix Basin
4	Anaerobic Effluent
5	Aeration Effluent
6	Mixed Liquor Basin
7	Clarifier Effluent
8	Filter Feed
9	Filter Effluent
10	Final Effluent

Overall Plant Modeling

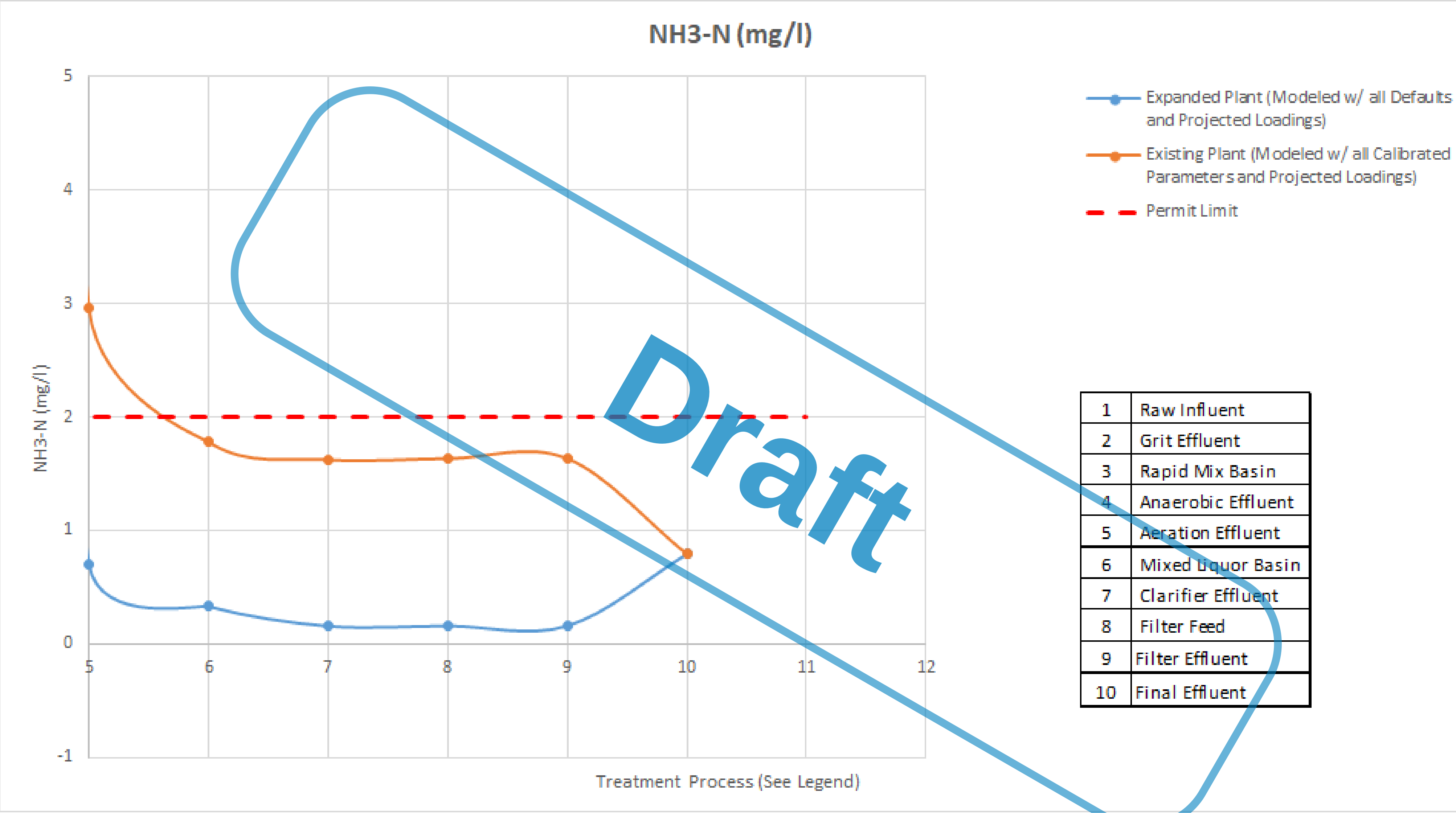


1	Raw Influent
2	Grit Effluent
3	Rapid Mix Basin
4	Anaerobic Effluent
5	Aeration Effluent
6	Mixed Liquor Basin
7	Clarifier Effluent
8	Filter Feed
9	Filter Effluent
10	Final Effluent

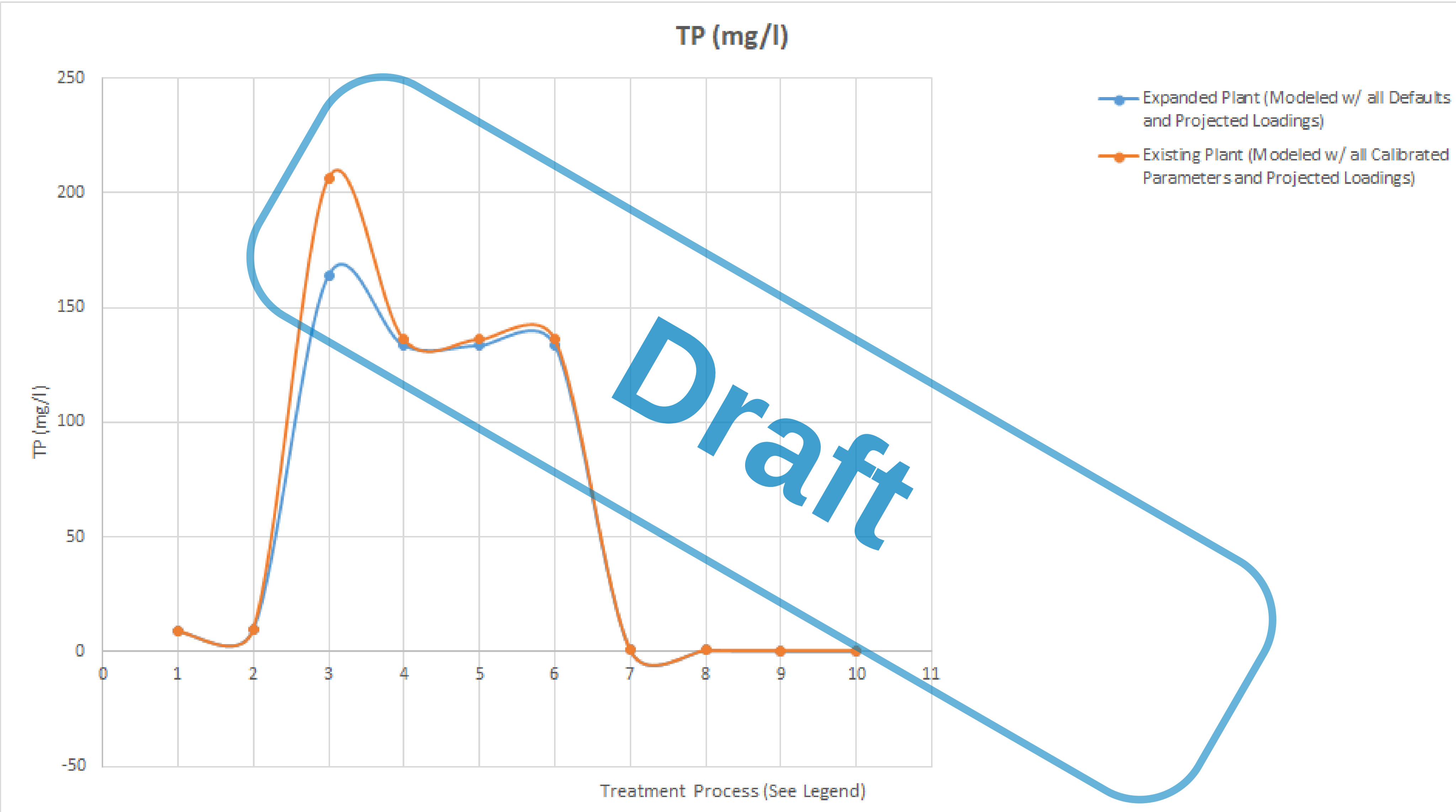
Overall Plant Modeling



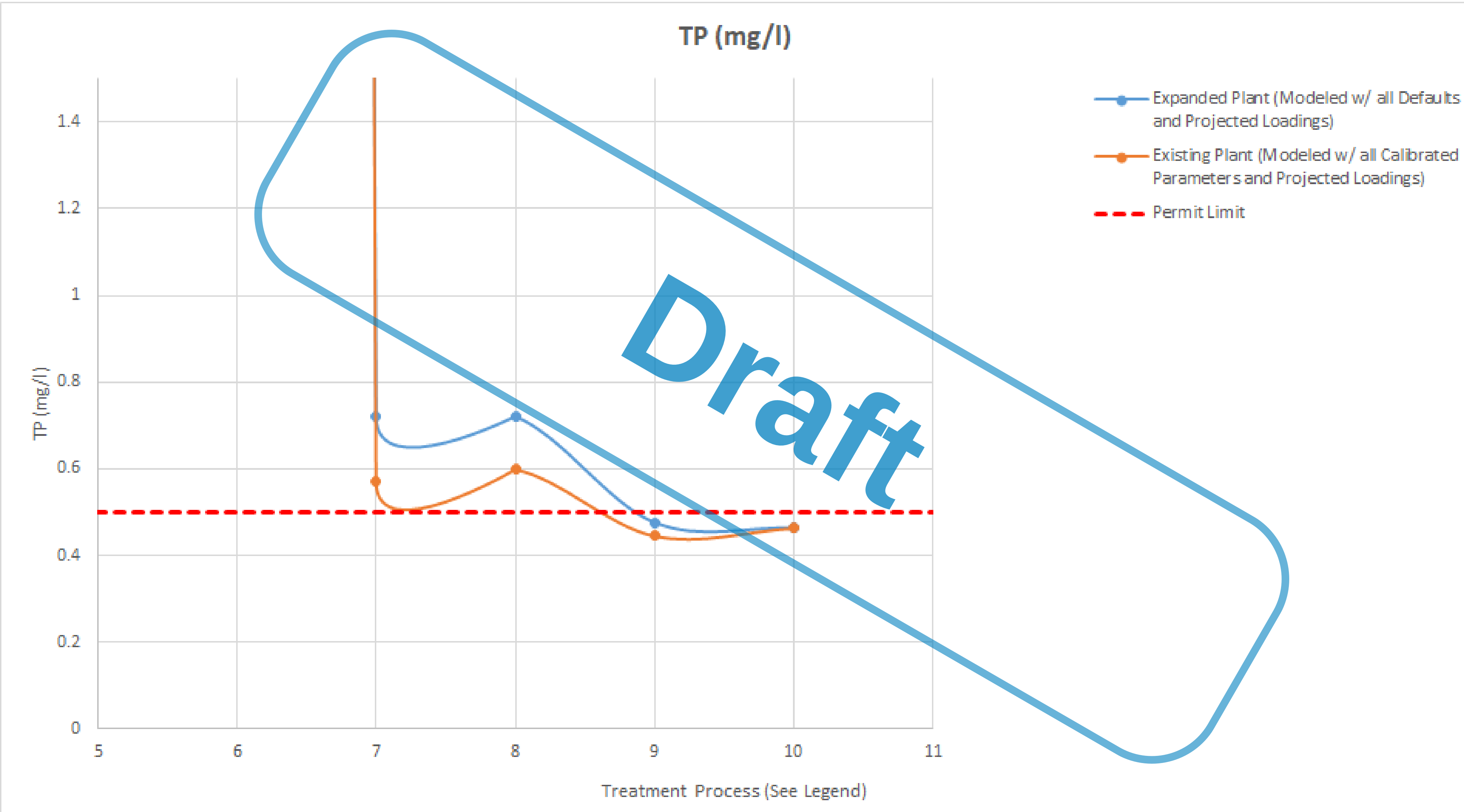
Overall Plant Modeling

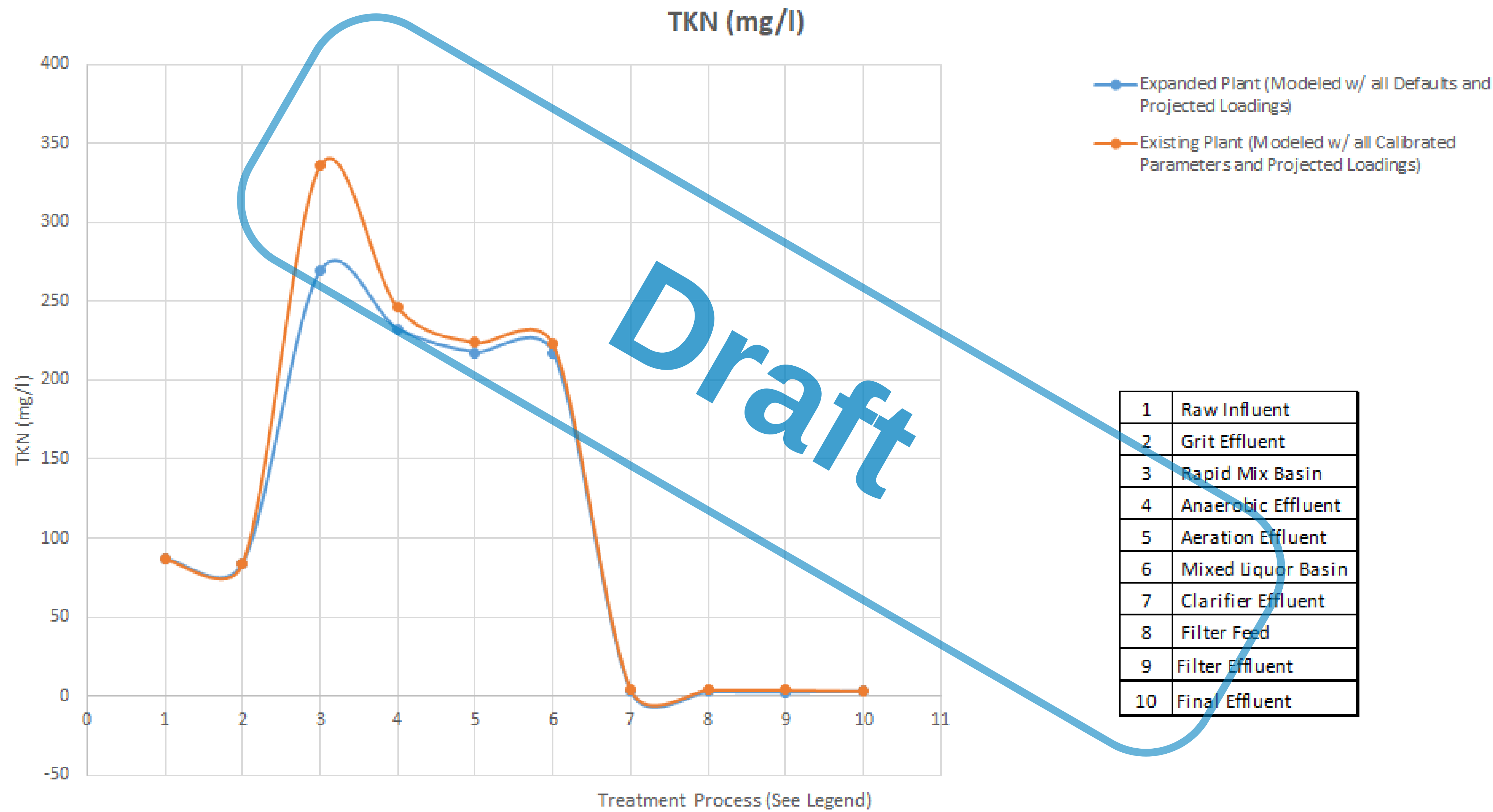


1	Raw Influent
2	Grit Effluent
3	Rapid Mix Basin
4	Anaerobic Effluent
5	Aeration Effluent
6	Mixed Liquor Basin
7	Clarifier Effluent
8	Filter Feed
9	Filter Effluent
10	Final Effluent


TP (mg/l)
250
200
150
100
50
0
-50
0
1
2
3
4
5
6
7
8
9
10
11
TP (mg/l)
Treatment Process (See Legend)
Expanded Plant (Modeled w/ all Defaults and Projected Loadings)
Existing Plant (Modeled w/ all Calibrated Parameters and Projected Loadings)
Draft

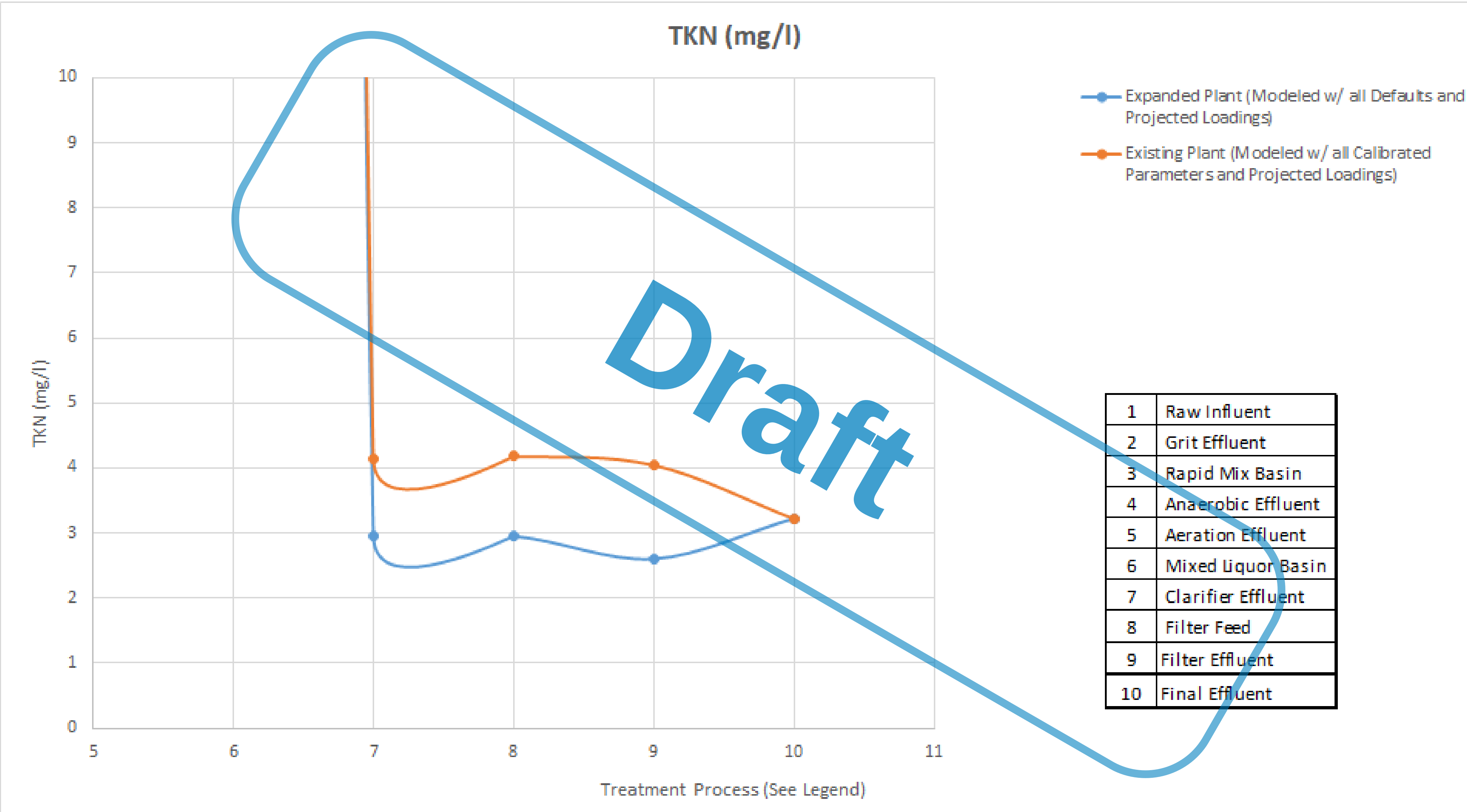
Overall Plant Modeling

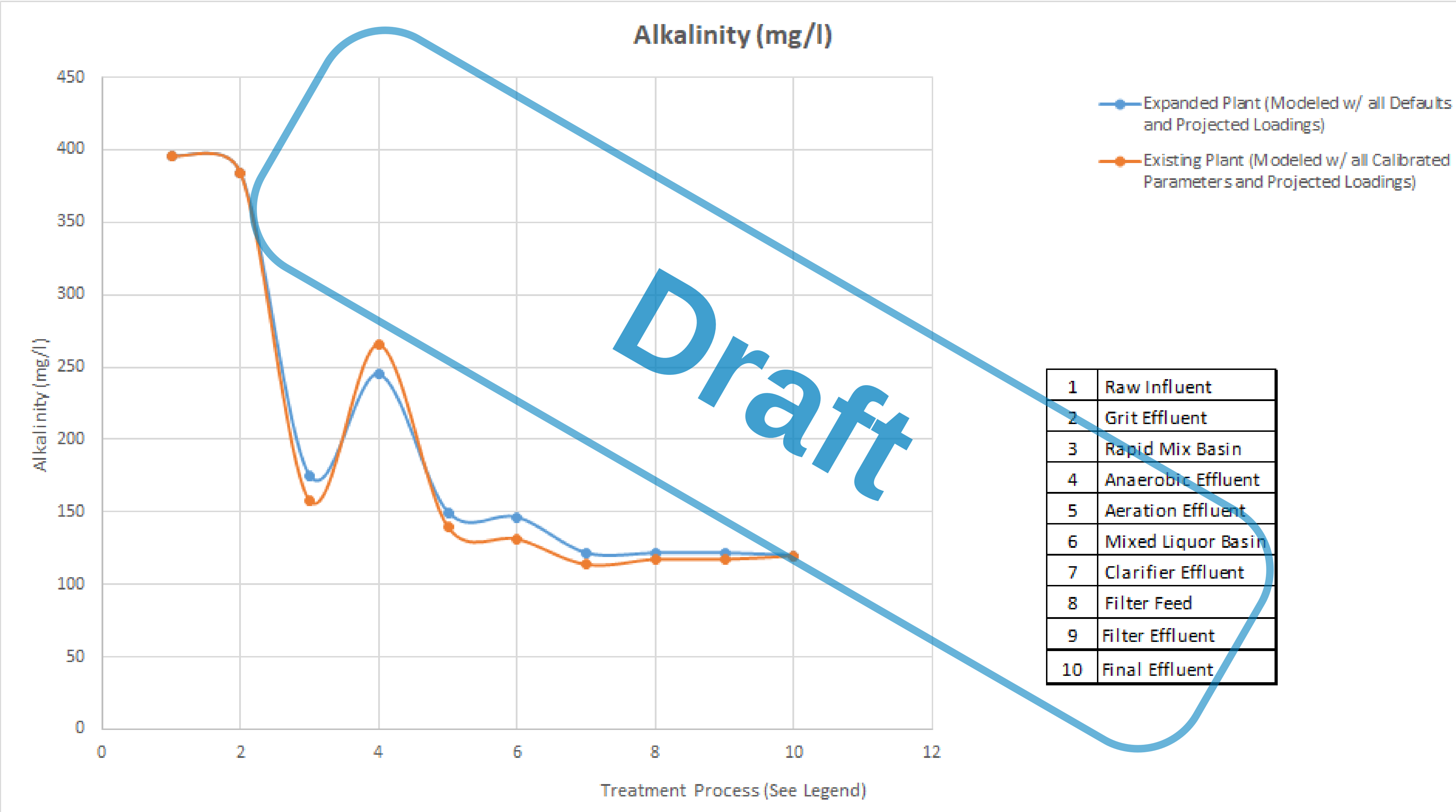




1	Raw Influent
2	Grit Effluent
3	Rapid Mix Basin
4	Anaerobic Effluent
5	Aeration Effluent
6	Mixed Liquor Basin
7	Clarifier Effluent
8	Filter Feed
9	Filter Effluent
10	Final Effluent

Overall Plant Modeling




Alkalinity (mg/l)
Alkalinity (mg/l)
Treatment Process (See Legend)
Expanded Plant (Modeled w/ all Defaults and Projected Loadings)
Existing Plant (Modeled w/ all Calibrated Parameters and Projected Loadings)
0
50
100
150
200
250
300
350
400
450
0
2
4
6
8
10
12
1 Raw Influent
2 Grit Effluent
3 Rapid Mix Basin
4 Anaerobic Effluent
5 Aeration Effluent
6 Mixed Liquor Basin
7 Clarifier Effluent
8 Filter Feed
9 Filter Effluent
10 Final Effluent
Draft

Appendix J: Unit Dimensions from TCEQ Permit Amendment Comment Response Package (November 2018)

ATTACHMENT A.2

Table 1.0(1) - Treatment Units

Proposed 3.0 MGD Wastewater Treatment Plant

Trement Unit Type	Number of Units	Dimensions (L x W x D)
Bar Screen	1	60' x 4' x 4
Grit Basin	1	20' x 20' x 22'
Anoxic Basin	1	70' x 25' x 22'
Anaerobic Basins	2	58' x 15' x 22'
Aeration Basins	2	58' x 18' x 22'
Clarifiers	2	58' x 16'
Chlorine Contact Basins	2	58' x 11' x 9.5'
Disc Filters	4	24' x12' x10'
Pre-Mix	1	20 x 35' x 22'
Sludge Thickener	1	35' x 35' x 22'
Digesters	2	100' x 58' x 22'
Declorination	1	10' x 10' x 3'

Appendix K: Supporting Documentation for Cost Estimates

Andrea Mendoza

From:	Andrea Mendoza
Sent:	Friday, July 5, 2024 10:12 AM
To:	Andrea Mendoza
Subject:	FW: Hycor Rotoshear Drum Screen - RM2243 WWTP

From: Marty Unger <MUnger@parkson.com>
Sent: Tuesday, April 23, 2024 8:41 AM
To: Paige Reddehase <preddehase@gbateam.com>
Cc: Marty Unger <MUnger@parkson.com>; Stewart Shaffer <sshaffer@globalwet.com>
Subject: RE: Hycor Rotoshear Drum Screen - RM2243 WWTP

CAUTION: **This email originated from outside the organization. Do not click or open attachments unless you recognize the sender and know the content is safe.**

Paige,

Two (2) 36" bar screen can handle 15.75 MGD....................Budget Price $387,550.00USD

Two (2) HRS60120DVT in 304 SS construction with standard NEMA 4X control panel................Budget Price $520,000USD

Marty Unger
Regional Sales Manager

Mobile: 954-383-1757
parkson.com

From: Marty Unger <MUnger@parkson.com>
Sent: Friday, April 19, 2024 2:25 PM
To: Paige Reddehase <preddehase@gbateam.com>
Cc: Marty Unger <MUnger@parkson.com>
Subject: RE: Hycor Rotoshear Drum Screen - RM2243 WWTP

Paige,

I have requested the information and once I receive it I will pas it on to you.

Marty Unger
Regional Sales Manager

Mobile: 954-383-1757
parkson.com

From: Paige Reddehase <preddehase@gbateam.com>
Sent: Thursday, April 18, 2024 9:03 AM
To: Marty Unger <MUnger@parkson.com>
Subject: RE: Hycor Rotoshear Drum Screen

Marty,

Here is the screen I was referring to: Schreiber Bar Screen - Rugged screen for large solids removal | Parkson Corporation

I'm mainly looking to do a high-level cost comparison of a bar screen vs a drum screen for the client.

Thanks,
Paige Reddehase EIT (she/her) Staff Engineer
d 737.247.7556

From: Marty Unger <MUnger@parkson.com>
Sent: Thursday, April 18, 2024 8:27 AM
To: Paige Reddehase <preddehase@gbateam.com>
Subject: RE: Hycor Rotoshear Drum Screen

Paige,

What type of Schreiber screen are you looking at?

Would you want to see a Parkson screen in lieu of a Schreiber screen.

Marty Unger
Regional Sales Manager

Mobile: 954-383-1757
parkson.com

From: Paige Reddehase <preddehase@gbateam.com>
Sent: Wednesday, April 17, 2024 4:05 PM
To: Marty Unger <MUnger@parkson.com>
Subject: RE: Hycor Rotoshear Drum Screen

Marty,

Would you also be able to provide a high-level cost estimate for both the Hycor Rotoshear drum screen and the Schrieber Bar Screen?

Thanks,

Paige Reddehase EIT (she/her) Staff Engineer
d 737.247.7556

From: Paige Reddehase <preddehase@gbateam.com>
Sent: Monday, April 15, 2024 1:39 PM
To: Marty Unger <MUnger@parkson.com>
Subject: RE: Hycor Rotoshear Drum Screen

Marty,

Thanks for the information. The name of the plant is the RM2243 WWTP.

Paige Reddehase EIT (she/her) Staff Engineer
d 737.247.7556

From: Marty Unger <MUnger@parkson.com>
Sent: Monday, April 15, 2024 1:19 PM
To: Paige Reddehase <preddehase@gbateam.com>
Cc: Marty Unger <MUnger@parkson.com>
Subject: FW: Hycor Rotoshear Drum Screen

You don't often get email from munger@parkson.com. Learn why this is important

CAUTION: This email originated from outside the organization. Do not click or open attachments unless you recognize the sender and know the content is safe.

Paige,

I have attached a couple of drawings (one with a drain pan and one with the drain pan excluded).

Can you give me the name of the plant so I can create a job folder for it.

HRS60120EZT with .060" wedgewire openings can handle a peak flow of 9.5 MGD, so 2 units could handle the peak flow and a third unit could be a standby if you require. Could be with or without drain pan.

Marty Unger
Regional Sales Manager

Mobile: 954-383-1757
parkson.com

From: Paige Reddehase <preddehase@gbateam.com>
Sent: Friday, April 12, 2024 10:48 AM
To: Marty Unger <MUnger@parkson.com>
Subject: Hycor Rotoshear Drum Screen

Good morning,

My colleague, Frank Phelan, spoke with you at TX Water and we are looking to obtain more information on the internally-fed rotating wedgewire drum screen, Hycor Rotoshear. We are currently doing a facility plan for a municipality and are looking for drum screens for a capacity of 5.25 MGD with a peaking factor of 3. Would you be able to provide me some conceptual information such as footprint, or any design guidance documentation you may have?

Thank you,

Paige Reddehase EIT (she/her) Staff Engineer
d 737.247.7556

Draft

Screening Alternatives Calculations

Assumptions	*Bar Screen*	*Drum Screen*	
Hours of Operation	4	24	h
Days of Week	7	7	d
1 HP =	745.7	745.7	Watts
Electric rate	0.14	0.14	$/kWh
Number of Units	2	3	

Parameters	*Bar Screen*	*Drum Screen*
Power (HP)	0.75	2
Volts	460	460
Hz	60	60
Phases	3	3

Calculations	*Bar Screen*	*Drum Screen*
kW	0.559275	1.4914
kWh/day	2.2371	35.7936

Yearly Cost per Unit	$ 114.32	$ 1,829.05
Overall Yearly Cost	**$ 228.63**	**$ 5,487.16**

Draft

PRELIMINARY ESTIMATE
ETS - UV SYSTEM

Project Name:	Leander, TX WWTP Expansion
Proposal No.:	24 UV 28 PB0
Proposal Date:	3-May-2024
Proposal Expires:	1-Aug-2024
Applications Engineer:	Martin Smith
Sales Manager:	Patrick Bollman, P.E.
Manufacturers Rep:	ETT
Contact:	Derek Shires
Phone:	(512) 941-2393
Email:	derek.shires@ett-llc.com

SCOPE OF SUPPLY

Qty	Description
	DESIGN CONSIDERATIONS
	Average flowrate: 5.25 MGD
	Peak flowrate: 15.75 MGD
	Transmittance (1 cm light cell): 65%
	TSS: <10 mg/l
	Iron concentration: <0.1 mg/l
	Manganese concentration: <0.1 mg/l
	End of lamp life: 0.85
	Fouling factor: 0.90
	Dose: >40 mJ/cm2
	Configuration: 3 parallel UVLW-30800-24 (5.25 MGD per reactor)
	UVLW-30800-24
	UV Chamber
3	ETS-UV UVLW-30800-24 UV chambers complete with:
	20" ANSI flange connections, 316L SS
	(30) 800 W low pressure high output UV lamps parallel to flow
	(30) Quartz thimbles
	Temperature sensor
	Automatic/Mechanical cleaning
	Access hatch
	(1) UV intensity sensor
	(1) Operation and maintenance manual
	Power/Control Cabinet
3	Free standing power/control panels, epoxy coated painted steel, complete with:
	Spectra 3, 7" touch screen
	Electronic ballast power supply
	Dimensions: H 79 x W 94 x D 24-in
	Power supply: 480V, 3ø, 4-Wire + GND (Wye), 60Hz
	NEMA12 enclosure
	Cables - UV chamber to power/control cabinet
3	30 ft cables
	Miscellaneous
1	Online UVT transmittance monitor
	Supplied Spares
9	UV lamps
5	Electronic ballasts
9	Quartz thimbles
9	Thimble seals
30	Wiper rings
1	UV intensity monitor
1	Wiper ring (UV intensity monitor)

SCOPE OF ENGINEERING

The following documentation shall be provided by Evoqua:

- Shop Drawing Submittal
  - Detailed Scope of Supply
  - Comments & Clarifications
  - Project Schedule
  - Technical Information / Equipment / Drawings
    Catalog Cutsheets
    Dimensional Drawings / General Assembly Drawings
    Functional Schematics / Piping and Instrumentation Diagrams (when applicable)
    Electrical Schematics (when applicable)
    Control Panel Layouts, Ladder Logic Diagrams (when applicable)
  - Receiving, Handling and Storage
  - Warranty Statement
- Operation and Maintenance Manuals
  - Ordering Information
  - Warranty Statement
  - Introduction
  - Safety Precautions
  - Preventive Maintenance General Information
  - Maintenance Record Card
  - Regional Offices
  - Technical Data
  - Installation
  - Operation
  - Service
  - Illustrations
  - Preventive Maintenance Kits and Spare Parts List
  - Additional Literature

NOTE - In an effort to be environmentally responsible, one (1) hard copy of the submittal and O+M will be supplied and up to eight (8) copies will be supplied on flash drive(s). Additional hardcopies of the submittal and O+M can be supplied at a cost of $50.00 each.

CLARIFICATIONS & EXCEPTIONS

Section	Part	Description
NOTICE		The scope of supply and pricing are based on Evoqua's standard equipment selection, standard terms of sale and warranty terms. Any variations from these standards may affect this quotation.

ITEMS NOT INCLUDED IN SCOPE

- Mechanical and electrical installation labor
- Civil work including supply of anchor bolts
- Interconnecting piping
- Interconnecting wiring (unless detailed above)
- Valves, fittings, appurtenances not specifically listed above
- Installation supervision
- All taxes, fees, lien waivers, certificates, bonds and licenses
- Room ventilation, air conditioning, or lighting
- Videotaping (unless a videotape agreement is signed)

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PRELIMINARY ESTIMATE
ETS - UV SYSTEM

COMMERCIAL OFFERING

Payment Terms:	30%	Due on Approval of Submittals
	60%	Due on Shipment of Equipment
	10%	Due on Startup (not to exceed 90 days after Equipment Shipment)
		All payments are due 30 days from date of invoice and are not subject to retention
EXW:	Factory	
Freight to Job Site:	Included	
Submittal:	4-6 weeks after receipt and approval of purchase order	
Shipment:	18-22 weeks after receipt of full information and approved drawings (when required)	
Startup:	8 On-site day(s) included over 3 Trip(s)	
Training:	Concurrent with startup	
Price:	**$941,910**	

Other Conditions:

1) Evoqua Water Technolgies, LLC (Evoqua) proposes to furnish materials, and/or equipment for the project identified at the beginning of this proposal. Any items not shown above as detailed under (i) 'SCOPE OF SUPPLY', (ii) 'SCOPE OF ENGINEERING', or (iii) other attachments to this proposal, are EXCLUDED. In addition:
   a. Evoqua' price will be held valid for a period of 90 days from the date of this proposal ("Proposal Date"); provided, however, in the event (A) Evoqua receives an order from Buyer within 90 days from the Proposal Date and the percentage change in the U.S. Department of Labor Consumer's Price Index (all items) (the "Index") as it existed two months prior to the Proposal Date and the Index as it existed two months preceding the month in which Evoqua receives Buyer's order is greater than 10%, then Evoqua shall have the right to reprice this proposal or (B) Buyer's order is received more than 90 days beyond the Proposal Date, then Evoqua shall have the right to reprice this proposal.
   b. Prices are in US Dollars.
   c. Local or state taxes are not included in this proposal.

2) This proposal by Evoqua is contingent upon: (i) Evoqua' written acceptance of the purchase order or other contractual document issued in response to this proposal; and (ii) Evoqua' satisfactory completion of an anti-corruption due diligence review, as applicable; and (iii) the enclosed terms and conditions contained in the following page(s) of this proposal, such terms to take precedence in the event of conflict with any other terms or documents incorporated into the contract arising out of this proposal unless otherwise agreed in writing.

3) All of the information supplied by Evoqua in connection with this proposal (including drawings, designs and specifications) (the "Information") is confidential and/or proprietary and has been prepared for your use solely in evaluating the purchase of the equipment and/or services described herein. Transmission of all or any part of the Information to others, or use by you for any purpose other than such evaluation, is expressly prohibited without Evoqua' prior written consent.

4) Please address & send your purchase order to:

   Neptune Benson Inc.
   334 Knight St Ste 3100
   Warwick, RI 02886-1286
   Attn: Martin Smith
   ph: 401.262.4731
   fax: 401.821.7129
   email: martin.smith@evoqua.com

Standard Terms & Conditions of Sale

1-May-15

1. Applicable Terms. These terms govern the purchase and sale of equipment, products, related services, leased products, and media goods if any (collectively herein "Work"), referred to in Seller's proposal ("Seller's Documentation"). Whether these terms are included in an offer or an acceptance by Seller, such offer or acceptance is expressly conditioned on Buyer's assent to these terms. Seller rejects all additional or different terms in any of Buyer's forms or documents.

2. Payment. Buyer shall pay Seller the full purchase price as set forth in Seller's Documentation. Unless Seller's Documentation specifically provides otherwise, freight, storage, insurance and all taxes, levies, duties, tariffs, permits or license fees or other governmental charges relating to the Work or any incremental increases thereto shall be paid by Buyer. If Seller is required to pay any such charges, Buyer shall immediately reimburse Seller. If Buyer claims a tax or other exemption or direct payment permit, it shall provide Seller with a valid exemption certificate or permit and indemnify, defend and hold Seller harmless from any taxes, costs and penalties arising out of same. All payments are due within 30 days after receipt of invoice. Buyer shall be charged the lower of 1 ½% interest per month or the maximum legal rate on all amounts not received by the due date and shall pay all of Seller's reasonable costs (including attorneys' fees) of collecting amounts due but unpaid. All orders are subject to credit approval by Seller. Back charges without Seller's prior written approval shall not be accepted.

3. Delivery. Delivery of the Work shall be in material compliance with the schedule in Seller's Documentation. Unless Seller's Documentation provides otherwise, delivery terms are ExWorks Seller's factory (Incoterms 2010). Title to all Work shall pass upon receipt of payment for the Work under the respective invoice. Unless otherwise agreed to in writing by Seller, shipping dates are approximate only and Seller shall not be liable for any loss or expense (consequential or otherwise) incurred by Buyer or Buyer's customer if Seller fails to meet the specified delivery schedule.

4. Ownership of Materials and Licenses. All devices, designs (including drawings, plans and specifications), estimates, prices, notes, electronic data, software and other documents or information prepared or disclosed by Seller, and all related intellectual property rights, shall remain Seller's property. Seller grants Buyer a non-exclusive, non-transferable license to use any such material solely for Buyer's use of the Work. Buyer shall not disclose any such material to third parties without Seller's prior written consent. Buyer grants Seller a non-exclusive, non-transferable license to use Buyer's name and logo for marketing purposes, including but not limited to, press releases, marketing and promotional materials, and web site content.

5. Changes. Neither party shall implement any changes in the scope of Work described in Seller's Documentation without a mutually agreed upon change order. Any change to the scope of the Work, delivery schedule for the Work, any Force Majeure Event, any law, rule, regulation, order, code, standard or requirement which requires any change hereunder shall entitle Seller to an equitable adjustment in the price and time of performance.

6. Force Majeure Event. Neither Buyer nor Seller shall have any liability for any breach or delay (except for breach of payment obligations) caused by a Force Majeure Event. If a Force Majeure Event exceeds six (6) months in duration, the Seller shall have the right to terminate the Agreement without liability, upon fifteen (15) days written notice to Buyer, and shall be entitled to payment for work performed prior to the date of termination. "Force Majeure Event" shall mean events or circumstances that are beyond the affected party's control and could not reasonably have been easily avoided or overcome by the affected party and are not substantially attributable to the other party. Force Majeure Event may include, but is not limited to, the following circumstances or events: war, act of foreign enemies, terrorism, riot, strike, or lockout by persons other than by Seller or its sub-suppliers, natural catastrophes or (with respect to on-site work), unusual weather conditions.

7. Warranty. Subject to the following sentence, Seller warrants to Buyer that the (i) Work shall materially conform to the description in Seller's Documentation and shall be free from defects in material and workmanship and (ii) the Services shall be performed in a timely and workmanlike manner. Determination of suitability of treated water for any use by Buyer shall be the sole and exclusive responsibility of Buyer. The foregoing warranty shall not apply to any Work that is specified or otherwise demanded by Buyer and is not manufactured or selected by Seller, as to which (i) Seller hereby assigns to Buyer, to the extent assignable, any warranties made to Seller and (ii) Seller shall have no other liability to Buyer under warranty, tort or any other legal theory. The Seller warrants the Work, or any components thereof, through the earlier of (i) eighteen (18) months from delivery of the Work or (ii) twelve (12) months from initial operation of the Work or ninety (90) days from the performance of services (the "Warranty Period"). If Buyer gives Seller prompt written notice of breach of this warranty within the Warranty Period, Seller shall, at its sole option and as Buyer's sole and exclusive remedy, repair or replace the subject parts, re-perform the Service or refund the purchase price. Unless otherwise agreed to in writing by Seller, (i) Buyer shall be responsible for any labor required to gain access to the Work so that Seller can assess the available remedies and (ii) Buyer shall be responsible for all costs of installation of repaired or replaced Work. If Seller determines that any claimed breach is not, in fact, covered by this warranty, Buyer shall pay Seller its then customary charges for any repair or replacement made by Seller. Seller's warranty is conditioned on Buyer's (a) operating and maintaining the Work in accordance with Seller's instructions, (b) not making any unauthorized repairs or alterations, and (c) not being in default of any payment obligation to Seller. Seller's warranty does not cover (i) damage caused by chemical action or abrasive material, misuse or improper installation (unless installed by Seller) and (ii) media goods (such as, but not limited to, resin, membranes, or granular activated carbon media) once media goods are installed. THE WARRANTIES SET FORTH IN THIS SECTION 7 ARE THE SELLER'S SOLE AND EXCLUSIVE WARRANTIES AND ARE SUBJECT TO THE LIMITATION OF LIABILITY PROVISION BELOW. SELLER MAKES NO OTHER WARRANTIES OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION, ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR PURPOSE.

8. Indemnity. Seller shall indemnify, defend and hold Buyer harmless from any claim, cause of action or liability incurred by Buyer as a result of third party claims for personal injury, death or damage to tangible property, to the extent caused by Seller's negligence. Seller shall have the sole authority to direct the defense of and settle any indemnified claim. Seller's indemnification is conditioned on Buyer (a) promptly, within the Warranty Period, notifying Seller of any claim, and (b) providing reasonable cooperation in the defense of any claim.

9. Assignment. Neither party may assign this Agreement, in whole or in part, nor any rights or obligations hereunder without the prior written consent of the other party; provided, however, the Seller may assign its rights and obligations under these terms to its affiliates or in connection with the sale or transfer of the Seller's business and Seller may grant a security interest in the Agreement and/or assign proceeds of the agreement without Buyer's consent.

10. Termination. Either party may terminate this agreement, upon issuance of a written notice of breach and a thirty (30) day cure period, for a material breach (including but not limited to, filing of bankruptcy, or failure to fulfill the material obligations of this agreement). If Buyer suspends an order without a change order for ninety (90) or more days, Seller may thereafter terminate this Agreement without liability, upon fifteen (15) days written notice to Buyer, and shall be entitled to payment for work performed, whether delivered or undelivered, prior to the date of termination.

11. Dispute Resolution. Seller and Buyer shall negotiate in good faith to resolve any dispute relating hereto. If, despite good faith efforts, the parties are unable to resolve a dispute or claim arising out of or relating to this Agreement or its breach, termination, enforcement, interpretation or validity, the parties will first seek to agree on a forum for mediation to be held in a mutually agreeable site. If the parties are unable to resolve the dispute through mediation, then any dispute, claim or controversy arising out of or relating to this Agreement or the breach, termination, enforcement, interpretation or validity thereof, including the determination of the scope or applicability of this agreement to arbitrate, shall be determined by arbitration in Pittsburgh, Pennsylvania before three arbitrators who are lawyers experienced in the discipline that is the subject of the dispute and shall be jointly selected by Seller and Buyer. The arbitration shall be administered by JAMS pursuant to its Comprehensive Arbitration Rules and Procedures. The Arbitrators shall issue a reasoned decision of a majority of the arbitrators, which shall be the decision of the panel. Judgment may be entered upon the arbitrators' decision in any court of competent jurisdiction. The substantially prevailing party as determined by the arbitrators shall be reimbursed by the other party for all costs, expenses and charges, including without limitation reasonable attorneys' fees, incurred by the prevailing party in connection with the arbitration. For any order shipped outside of the United States, any dispute shall be referred to and finally determined by the International Center for Dispute Resolution in accordance with the provisions of its International Arbitration Rules, enforceable under the New York Convention (Convention on the Recognition and Enforcement of Foreign Arbitral Awards) and the governing language shall be English.

12. Export Compliance. Buyer acknowledges that Seller is required to comply with applicable export laws and regulations relating to the sale, exportation, transfer, assignment, disposal and usage of the Work provided under this Agreement, including any export license requirements. Buyer agrees that such Work shall not at any time directly or indirectly be used, exported, sold, transferred, assigned or otherwise disposed of in a manner which will result in non-compliance with such applicable export laws and regulations. It shall be a condition of the continuing performance by Seller of its obligations hereunder that compliance with such export laws and regulations be maintained at all times. BUYER AGREES TO INDEMNIFY AND HOLD SELLER HARMLESS FROM ANY AND ALL COSTS, LIABILITIES, PENALTIES, SANCTIONS AND FINES RELATED TO NON-COMPLIANCE WITH APPLICABLE EXPORT LAWS AND REGULATIONS.

13. LIMITATION OF LIABILITY. NOTWITHSTANDING ANYTHING ELSE TO THE CONTRARY, SELLER SHALL NOT BE LIABLE FOR ANY CONSEQUENTIAL, INCIDENTAL, SPECIAL, PUNITIVE OR OTHER INDIRECT DAMAGES, AND SELLER'S TOTAL LIABILITY ARISING AT ANY TIME FROM THE SALE OR USE OF THE WORK, INCLUDING WITHOUT LIMITATION ANY LIABILITY FOR MECHANICAL WARRANTY CLAIMS OR FOR ANY BREACH OR FAILURE TO PERFORM ANY OBLIGATION UNDER THE CONTRACT, SHALL NOT EXCEED THE PURCHASE PRICE PAID FOR THE WORK. THESE LIMITATIONS APPLY WHETHER THE LIABILITY IS BASED ON CONTRACT, TORT, STRICT LIABILITY OR ANY OTHER THEORY.

14. Rental Equipment / Services. Any leased or rented equipment ("Leased Equipment") provided by Seller shall at all times be the property of Seller with the exception of certain miscellaneous installation materials purchased by the Buyer, and no right or property interest is transferred to the Buyer, except the right to use any such Leased Equipment as provided herein. Buyer agrees that it shall not pledge, lend, or create a security interest in, part with possession of, or relocate the Leased Equipment. Buyer shall be responsible to maintain the Leased Equipment in good and efficient working order. At the end of the initial term specified in the order, the terms shall automatically renew for the identical period unless canceled in writing by Buyer or Seller not sooner than three (3) months nor later than one (1) month from termination of the initial order or any renewal terms. Upon any renewal, Seller shall have the right to issue notice of increased pricing which shall be effective for any renewed terms unless Buyer objects in writing within fifteen (15) days of issuance of said notice. If Buyer timely cancels service in writing prior to the end of the initial or any renewal term this shall not relieve Buyer of its obligations under the order for the monthly rental service charge which shall continue to be due and owing. Upon the expiration or termination of this Agreement, Buyer shall promptly make any Leased Equipment available to Seller for removal. Buyer hereby agrees that it shall grant Seller access to the Leased Equipment location and shall permit Seller to take possession of and remove the Leased Equipment without resort to legal process and hereby releases Seller from any claim or right of action for trespass or damages caused by reason of such entry and removal.

15. Miscellaneous. These terms, together with any Contract Documents issued or signed by the Seller, comprise the complete and exclusive statement of the agreement between the parties (the "Agreement") and supersede any terms contained in Buyer's documents, unless separately signed by Seller. No part of the Agreement may be changed or cancelled except by a written document signed by Seller and Buyer. No course of dealing or performance, usage of trade or failure to enforce any term shall be used to modify the Agreement. To the extent the Agreement is considered a subcontract under Buyer's prime contract with an agency of the United States government, in case of Federal Acquisition Regulations (FARs) flow down terms, Seller will be in compliance with Section 44.403 of the FAR relating to commercial items and those additional clauses as specifically listed in 52.244-6, Subcontracts for Commercial Items (OCT 2014). If any of these terms is unenforceable, such term shall be limited only to the extent necessary to make it enforceable, and all other terms shall remain in full force and effect. The Agreement shall be governed by the laws of the Commonwealth of Pennsylvania without regard to its conflict of laws provisions. Both Buyer and Seller reject the applicability of the United Nations Convention on Contracts for the international sales of goods to the relationship between the parties and to all transactions arising from said relationship.

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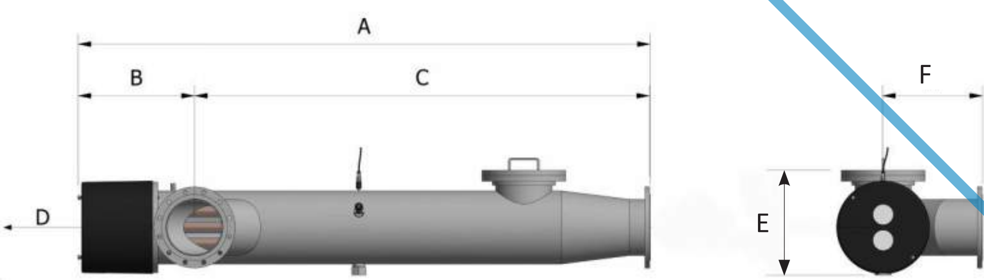
SPECIFICATION SHEET UVLW RANGE

The UVLW is a range of 800W low pressure, high output amalgam UV systems that are validated to the 2003 and 2012 NWRI Reuse Guidelines

Model	Connection (Inches)	# of Lamps (800W)	Dimensions						Panel Dimensions		
			A	B	C	D	E	F	W	H	D
~~ULVW-6800-10~~	~~8~~	~~6~~	~~105~~	~~22~~	~~83~~	~~75~~	~~25~~	~~10~~	~~32~~	~~79~~	~~24~~
~~UVLW-6800-14~~	~~10~~	~~6~~	~~110~~	~~23~~	~~87~~	~~75~~	~~31~~	~~12~~	~~32~~	~~79~~	~~24~~
~~UVLW-8800-14~~	~~10~~	~~8~~	~~110~~	~~23~~	~~87~~	~~75~~	~~31~~	~~12~~	~~62~~	~~79~~	~~24~~
~~UVLW-16800-20~~	~~16~~	~~16~~	~~121~~	~~26~~	~~95~~	~~75~~	~~40~~	~~15~~	~~62~~	~~79~~	~~24~~
~~UVLW-20800-20~~	~~16~~	~~20~~	~~121~~	~~26~~	~~95~~	~~75~~	~~40~~	~~15~~	~~94~~	~~79~~	~~24~~
~~UVLW-22800-24~~	~~20~~	~~22~~	~~121~~	~~27~~	~~94~~	~~75~~	~~47~~	~~18~~	~~94~~	~~79~~	~~24~~
UVLW-30800-24	20	30	121	27	94	75	47	18	94	79	24
~~UVLW-30800-30~~	~~20~~	~~30~~	~~122~~	~~28~~	~~94~~	~~75~~	~~55~~	~~21~~	~~94~~	~~79~~	~~24~~
~~UVLW-45800-30~~	~~20~~	~~45~~	~~122~~	~~28~~	~~94~~	~~75~~	~~55~~	~~21~~	~~125~~	~~79~~	~~24~~



CHAMBER

316L SS
ANSI 150# flanged connections
Install inline, horizontally or vertically
Features:
Acess Hatch
Twist lock lamp connections
Dry UV intensity monitor
High purity quartz thimbles
Low voltage automatic wiper
One piece wiper ring
Temperature sensor
Drain and vent ports

CONTROL SYSTEM

NEMA 12 epoxy coated mild steel enclosure
Operational 32-113°F, RH <90%
Features:
7" HMI
Spectra II control system
MODBUS
Multiple warnings and alarms
Variable power lamps
480V/3-phase

SYSTEM OPTIONS

304 or 316 NEMA 4X enclosures
Effluent flange location
Skid mounted
Containerized
Internal/external polish or electropolish

INSTALLATION NOTES

Provide necessary maintenance space
Install in a dry area
Provide floor drain or sump
Lamps submerged at all times
Minimum of two conduits required
Chamber must be grounded

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SPECIFICATION SHEET
SPECTRA TOUCH

ETS UV Technology microprocessor control system offers multiple levels of operation from basic controls to full plant system integration. Available on all UV systems. Existing systems can be upgraded to include a TOUCH control panel.

SIMPLE CONTROLS AND DISPLAY

- 7" resistive touch screen human machine interface (HMI)
- Glare free operation
- On screen trending
- STOP soft touch push buttons
- RESET soft touch push buttons
- Simple operation for any level of technical experience and expertise
- All alarm functions have a simple text message display

INTERFACE CONTROLS

- Ethernet connectivity/WiFi capability
- Selectable custom input and outputs
- Local and remote operation
- Process interrupt (valves, flow meters or pressure switches)
- Low UV alarm and shutdown
- Bleed temperature
- Flow meter input
- Automatic restart
- Variable power dosing
- Duty/Standby automatic changeover

ADVANCED DISPLAY FEATURES

- Improved noise resistance
- Distributed I/O possible
- On/Off control
- Lamp running indication/lamp current
- Power on indication
- Elapsed hours meter
- Lamp failed contact (volt free)
- UV intensity & UV dose mJ/cm2
- Flow rate (accepts a 4-20ma signal from a flow meter)
- Temperature, low UV alarm
- System spares listing
- Ground fault
- Wiper fault

ADVANCED DISPLAY FEATURES

The Touch has a built in data logging facility (retrievable by users on a standard PC or laptop). The parameters logged are:

- UV intensity required (set point)
- UV intensity measured
- Lamp current
- Temperature
- Flow (if flow meter connected)
- Time and date
- Alarms generated: restrike timer, low intensity, low dose, high temperature, PSU temperature, lamp fault and ground fault

Andrea Mendoza

From:	Derek Shires <derek.shires@ett-llc.com>
Sent:	Thursday, May 9, 2024 2:13 PM
To:	Andrea Mendoza
Cc:	Frank Phelan; Paige Reddehase
Subject:	Re: ETS UV Selection
Follow Up Flag:	Follow up
Flag Status:	Flagged

Yes ma'am. That's for three (3) units.

I'd figure about $50k in piping at the UV area.

And $100k for the six (6) valves. Three (3) of them will include actuators.

Add a small building (I'd guess CMU) for the controls and roof over the units. A common slab works nicely. Got no idea what that would cost.

Wiring between the controls and units won't be much. Maybe $25k.

Thanks,

- Derek

From: Andrea Mendoza <amendoza@gbateam.com>
Sent: Thursday, May 9, 2024 1:11 PM
To: Derek Shires <derek.shires@ett-llc.com>
Cc: Frank Phelan <fphelan@gbateam.com>; Paige Reddehase <preddehase@gbateam.com>
Subject: RE: ETS UV Selection

Derek,

Thank you for the selection and for looking into the minimum flow.

Can you verify whether the price listed in the quote includes all three units or is it for a single unit?

Additionally, would you be able to provide a high-level estimate on what the interconnecting piping, wiring, and concrete structures would cost?

Thank you,

Andrea Mendoza Staff AES | Water Environment Group
d 737.247.7539

Draft

UV Disinfection: In-Line (Using ETS-UV's UVLW)

Construction Cost Estimates

UV Units (3 units total)	$ 950,000.00	*From Quote
Piping	$ 50,000.00	*From Vendor
Yard Piping	$ 100,000.00	*From Engineer Estimate
Valves (6 valves total, 3 w/ actuators)	$ 100,000.00	*From Vendor
Electrical	$ 125,000.00	*From Vendor
Controls Building & Overhead Roof	$ 80,000.00	*From Previous Projects
Total Construction Cost	**$ 1,405,000.00**	

Yearly Cost of Operation Calculations

Design Considerations

Average flowrate	5.25	MGD
Peak flowrate	15.75	MGD
Transmittance	65%	
End of lamp life	0.85	
Fouling factor	0.9	
Dose	40	mJ/cm2
Lamps per unit	30	
Lamps	800	watts
Number of units	3	(2 duty, 1 standby)

Cost of Electricity	0.14	cent/kWh

Calculations

Power per unit	24	kW
Total power	48	kW
Power per day (assuming 24 operation)	1152	kW/d
Yearly cost of power (assuming 365 operation)	**$ 58,867.20**	

Power Calculations for a 20-year Period

Inflation Factor	5.10%
Number of Years	20
Estimated Yearly Power Requirement	$ 58,867.20

Year	Cost
1	$ 61,869.43
2	$ 65,024.77
3	$ 68,341.03
4	$ 71,826.42
5	$ 75,489.57
6	$ 79,339.54
7	$ 83,385.86
8	$ 87,638.53
9	$ 92,108.10
10	$ 96,805.61
11	$ 101,742.70
12	$ 106,931.58
13	$ 112,385.09
14	$ 118,116.73
15	$ 124,140.68
16	$ 130,471.85
17	$ 137,125.92
18	$ 144,119.34
19	$ 151,469.43
20	$ 159,194.37
Total	**$ 2,067,526.55**

UV Disinfection: Open Channel

Inputs

Current Peak Flow Rate	4688	gpm
Current Peak Flow Rate	17768	L/min
Future Peak Flow Rate	10940	gpm
Future Peak Flow Rate	41463	L/min
Minimum Transmittance	65	%
UV Dose	30	mJ/cm2
Lamps/bank	48	
Banks/channel	2	
Power Consumption	138	input watts/lamp
Power Factor	0.9	
Line to Line Voltage	480	V

Calculations

Flowrate	259	L/min-lamp
Lamps Required (Current PF)	96	lamps
	2	banks
	1	channels
Lamps Required (Future PF)	192	lamps
	4	banks
	2	channels

Power Requirements

For Current PF	13.25	kW
For Current PF	17.71	amps
For Future PF	26.50	kW
For Future PF	35.41	amps

*Assuming 24 hours of operation

For Current PF	317.95	kWh/day
For Future PF	635.90	kWh/day

Yearly Cost of Operation

Cost of Electricity	0.14	cent/kWh
For Current PF	$ 16,247.35	
For Future PF	**$ 32,494.69**	

*PF = Peak Flow
*Current PF = 2.25 MGD
*Future PF = 5.25 MGD

ENR CCI

	Date	CCI
	4/1/2024	7846.28
	2/1/2019	5925.75
	Factor	1.324099059

	Price (2019)	Price (2024)
Reference Project UV Facility =		
- UV Disinfection Equipment	$ 251,232.00	$ 332,700.00
- Electrical Circuitry and Wiring	$ 29,200.00	$ 38,700.00
- Misc. Building	$ 178,868.29	$ 236,800.00
Total	$ 459,300.29	$ 608,200.00

RM2243 UV Disinfection Facility	Price
- UV Disinfection Equipment	$ 1,996,200.00
- Electrical Circuitry and Wiring	$ 232,200.00
- Misc. Building	$ 1,420,800.00
- Yard Piping	$ 100,000.00
Total	**$ 3,749,200.00**

O&M Calculations for a 20-year Period

Inflation Factor	5.10%
Number of Years	20
Estimated Yearly Power Requirement	$ 32,494.69

Year	Cost
1	$ 34,151.92
2	$ 35,893.67
3	$ 37,724.25
4	$ 39,648.19
5	$ 41,670.24
6	$ 43,795.43
7	$ 46,028.99
8	$ 48,376.47
9	$ 50,843.67
10	$ 53,436.70
11	$ 56,161.97
12	$ 59,026.23
13	$ 62,036.57
14	$ 65,200.43
15	$ 68,525.66
16	$ 72,020.46
17	$ 75,693.51
18	$ 79,553.88
19	$ 83,611.12
20	$ 87,875.29
Total	**$ 1,141,274.65**

Overall Chlorine Disinfection System

*CCBs = Chlorine Contact Basins

Concrete at Reference Project CCBs

Wall Thickness =	1.333333333	ft
Wall Height =	16	ft
Wall Perimeter =	140	ft
No of CCBs at Reference Project =	2	
Total Volume of CCB Walls =	5973.333333	ft3
	221.2345679	yd3
Cost per CCB Walls =	$ 99,000.00	
Total cost of CCB walls =	$ 198,000.00	
Unit Cost for CCB Walls =	$ 900.00	$/CY

Reference Project Chemical Feed Building Slab Cost =	$ 30,000.00	
Chemical Feed Building Slab SA =	330	sf
Slab Thickness =	1	ft
Concrete Slab Volume =	330	ft3
	12.22222222	cy
Unit Cost for Slab =	$ 2,500.00	$/CY

Estimated concrete for RM 2243 CCBS

Slab SA =	638	sf
Thickness =	1	ft
Slab Volume =	638	cf
	23.62962963	cy
No of CCBs at RM2243 =	3	
Total Slab Volume =	70.88888889	cy

Wall Thickness =	1.33	ft
Wall Height =	12	ft
Wall Perimeter =	138	ft
Concrete Wall Volume per CCB =	2202.48	ft3
	81.57333333	cy
Total wall volume =	244.72	cy
	6607.44	ft3

ENR CCI

Date	CCI
4/1/2024	7846.28
6/1/2021	6423.67
Factor	1.221463743

Estimated Concrete Cost for RM2243 CCBS

	Cost (2024)	Units
Estimated Unit Cost for Slab	$ 3,053.66	$/CY
Estimated Unit Cost for Walls	$ 1,099.32	$/CY
Estimated Total Slab Volume Cost	$ 217,000.00	
Estimated Total Wall Volume Cost	$ 270,000.00	

Estimated Chlorine Disinfection System (Using Reference Project)

	Cost (2021)	Cost (2024)	Cost for 1 MGD
Chem Bldg and Bulk - Excavate and Place Fill	$ 55,000.00	$ 67,180.51	$ 34,000.00
Chem Feed Bldg - F/R/P Slab	$ 11,250.00	$ 13,741.47	$ 7,000.00
Chem Feed Bldg - CMU	$ 35,000.00	$ 42,751.23	$ 22,000.00
Chem Storage - F/R/P Slab	$ 27,000.00	$ 32,979.52	$ 17,000.00
Chem Storage - F/R/P Walls	$ 27,000.00	$ 32,979.52	$ 17,000.00
Chem Yard Lines/Vaults	$ 70,000.00	$ 85,502.46	$ 43,000.00
Chem Feed System	$ 182,000.00	$ 222,306.40	$ 112,000.00
DB16 - Chem Feed to EMH3	$ 25,000.00	$ 30,536.59	$ 16,000.00
Chemical Building	$ 21,000.00	$ 25,650.74	$ 13,000.00
Chemical Feed Panels	$ 37,000.00	$ 45,194.16	$ 23,000.00
3 MGD Estimated Total with Concrete Costs			$ 1,399,000.00
2 MGD Estimated Total with Concrete Costs			**$ 934,000.00**
1 MGD Estimated Total with Concrete Costs			**$ 467,000.00**

Chloride Disinfection

Current Capacity

Date	Monthly Cost of Bleach
1/22/2024	$ 12,009.91
2/12/2024	$ 8,136.48
3/14/2024	$ 9,856.88
Average	$ 10,001.09

Yearly Cost of Bleach	**$ 120,013.08**

O&M Calculations for a 20-year Period

Inflation Factor	5.10%
Number of Years	20
Estimated Yearly Cost of Bleach	$ 120,013.08

Year	Cost
1	$ 126,133.75
2	$ 132,566.57
3	$ 139,327.46
4	$ 146,433.16
5	$ 153,901.26
6	$ 161,750.22
7	$ 169,999.48
8	$ 178,669.45
9	$ 187,781.60
10	$ 197,358.46
11	$ 207,423.74
12	$ 218,002.35
13	$ 229,120.47
14	$ 240,805.61
15	$ 253,086.70
16	$ 265,994.12
17	$ 279,559.82
18	$ 293,817.37
19	$ 308,802.06
20	$ 324,550.96
Total	**$ 4,215,084.61**

Ultimate Capacity

Current Monthly Cost	$ 10,001.09
Monthly Cost per MGD	$ 4,444.93
Ultimate Monthly Cost	$ 23,335.88
Ultimate Yearly Cost	**$ 280,030.52**

O&M Calculations for a 20-year Period

Inflation Factor	5.10%
Number of Years	20
Estimated Yearly Cost of Bleach	$ 280,030.52

Year	Cost
1	$ 294,312.08
2	$ 309,321.99
3	$ 325,097.41
4	$ 341,677.38
5	$ 359,102.93
6	$ 377,417.18
7	$ 396,665.45
8	$ 416,895.39
9	$ 438,157.06
10	$ 460,503.07
11	$ 483,988.72
12	$ 508,672.15
13	$ 534,614.43
14	$ 561,879.76
15	$ 590,535.63
16	$ 620,652.95
17	$ 652,306.25
18	$ 685,573.87
19	$ 720,538.14
20	$ 757,285.58
Total	**$ 9,835,197.42**

BUDGET PROPOSAL

HUBER TECHNOLOGY
WASTE WATER Solutions

RM2243 WWTP, TX

Equipment:
HUBER Thickener S-DRUM Size 4L

Represented by:
Environmental Improvements
Brian Phenegar
(512) 295-3733
Phenegar@ei2water.com

Regional Sales Director:
Johan van Ettekoven

Project Number:	510954
Revision:	0
Date:	5/1/2024
Prepared for:	GBA

HUBER Technology, Inc.
1009 Airlie Pkwy, Denver, NC 28037
704-949-1010 | www.huber-technology.com

Design Information

Technical Data		
Upstream Screening	Rotary Wedgewire Screen with 2.54mm openings	
Sludge Type	Waste Activated Sludge	
Upstream Biological Process	Activated Sludge with Secondary Clarifier	With Bio-P Removal
Design Feed Rate (given)	230,000	gpd
Feed Sludge Concentration	0.8	%
Sludge TDS (Assumed)	800	mg/L
Sludge VSS (Assumed)	70	%
Sludge pH (Assumed)	7.1	SU
Chloride Concentration (Assumed)	50	mg/L
Phosphate Concentration (Assumed)	25	mg/L
Calculated Hydraulic Loading Rate (per unit)	358.0	gpm
Nominal Hydraulic Loading Rate (per unit)	420	gpm
Calculated Solids Loading Rate (per unit)	1432 at 0.8% feed solids	lb/hr
Operational Hours Per Day	5	hr/day
Operational Days Per Week	5	day/week
Estimated Cake Solids[1]	4-6	%
Capture Rate[1]	≥95	%
Estimated Polymer Consumption[1]	8-12 lb active polymer/dry ton of sludge	
Average Spray Wash Water Requirement[2]	809 gph at 72.5 psi	
Spray Water Connection	1.25	inch
Sludge Inlet Diameter	8	inch
Approximate Thickener Empty Weight	5500	lbs
Approximate Thickener Full Weight	9975	lbs

[1] All performance is estimated based on typical thickener performance. In order to guarantee performance Huber must run a bench test.

Equipment Details

Model	HUBER Thickener S-DRUM Size 4L
Quantity	3
Material	304L stainless steel construction; pickled and passivated in acid bath
Basket Material	Wedge Wire; 304L stainless steel
Auger Inclination	30°
Support Legs	304L stainless steel
Anchor Bolts	M12, 316L stainless steel
Motor Data	5 hp drive motor, 460 VAC, 60 Hz, 3 ph
Thickened Sludge Hopper	3, HUBER Standard 304L stainless steel
Flocculation Reactor	304L stainless steel, 30 seconds detention time, with mechanical mixer
Mixer Motor	0.25 hp, 480 VAC, 60 Hz, 3 ph, S.F. 1.15

Ancillary Equipment	
Polymer Injection Ring	3, DN150 injection rings
Polymer Mixing Device	3, DN150 mixing valves
Sludge Flow Meter	3, 6-inch sludge flow meter

Controls	Three (3) Main Control Panel
Enclosure	NEMA 4X, Stainless Steel
PLC	Allen Bradley CompactLogix
HMI	Allen Bradley PanelView 7 inch
Pre-programmed and Factory Tested	

Freight and Startup Services	
8 days and 2 trips	Startup services for installation inspection and startup supervision.
Freight to jobsite.	

Pricing

Equipment	Model	Quantity	Pricing
HUBER Rotary Screw Thickener	S-DRUM Size 4L	3	Included
Flocculation Reactor	TBD	3	Included
Thickened Sludge Hopper	HUBER Standard	1	Included
Ancillary Equipment			Included
HUBER Control Panel		3	Included
Freight and Startup Services		8 days, 2 trips	Included
TOTAL:			**$847,000.00**

Optional Adders

Equipment	Type	Quantity	Pricing
HUBER's Standard Polymer Blending System		1	**Pricing by EI2**
HUBER's Standard Sludge Feed Pump		1	**Pricing by EI2**
HUBER's Standard Thickened Sludge Pump		1	**Pricing by Ei2**

Standard delivery is 26-36 weeks from approval of submittals.

Thank you for your interest in HUBER Technology, Inc. If you have any questions, please do not hesitate to contact our Regional Sales Director or our local sales representative.

This proposal has been reviewed for accuracy and approved for issue by: NJA

Notes and Technical Clarifications

1. Equipment specification and drawings are available upon request.
2. If there are site-specific hydraulic constraints that must be applied, please consult the manufacturer's representative to ensure compatibility with the proposed system.
3. Electrical disconnects required per local NEC code are not included in this proposal.
4. All electrical interconnections, wirings, junction boxes, and terminations between the equipment and electrical components are to be provided by installing contractor.
5. Huber Technology warrants all components of the system against faulty workmanship and materials for a period of 12 months from date of start-up or 18 months after shipment, whichever occurs first.
6. Budget estimate is based on Huber Technology's standard Terms & Conditions and is quoted in US dollars unless otherwise stated.
7. Equipment recommendations are based on information provided to Huber Technology. Subsequent information which differs from what has been provided may alter the equipment recommendation.
8. Any item not specifically listed is not considered part of this scope of supply. Please contact the HUBER Technology representative listed for further clarification.
9. Sludge feed pump and flow meter shall be controlled by the Huber control panel even if provided by others.
10. Pricing shown in this proposal is valid for 30 days from the date shown on this proposal.
11. Variable frequency drive for sludge feed pump has not been included in the HUBER provided control panel. Please advise if HUBER is to modify their scope.
12. Variable frequency drive for thickened sludge transfer pump has not been included in the HUBER provided control panel. Please advise if HUBER is to modify their scope.
13. Polymer injection/mixing equipment is sized based on maintaining a specific flow velocity through these components. For the feed sludge flowrate in this application, HUBER is offering polymer injection/mixing equipment with DN150 (6 inch) flanges. Reducers, if required, to connect polymer injection/mixing equipment to upstream and downstream piping are to be supplied by others.

Special Information and Exceptions

- Price does not include any unloading or any applicable fees or taxes (Local, Federal, or Final Destination)
- Prices are in U.S. Dollars unless noted otherwise
- Freight is delivered with duty paid (D.D.P.) to Job site
- Price does not include installation or building modifications
- This Budgetary Pricing Quotation is valid for thirty (30) days from the date of this Scope or until withdrawn by HUBER Technology, Inc. (hereinafter "HUBER").

Submittals

HUBER will provide documentation to the Purchaser per the following schedule:

- Five (5) copies or the quantity stipulated in the equipment specification of submittal shop drawings 4-6 weeks after acceptance of a written purchase order.
- Three (3) copies or the quantity stipulated in the equipment specification of HUBER O&M manuals prior to equipment start-up.

Shipment

HUBER will make all reasonable efforts to maintain the following schedule:

- Submittals 4-6 weeks after acceptance of a written purchase order.
- Please consult HUBER Technology, Inc. for current fabrication lead times on the proposed equipment.
- O&M manuals prior to equipment start-up.

Accessories

This Proposal includes only those items specifically mentioned in the equipment descriptions. Any items which may be necessary for the operation of the equipment, but are not specifically mentioned, such as motors, drives, controls, or supports, are to be supplied via additional quotation separate from this offering.

Abrasion or Corrosive Materials

All of HUBER's machines and systems are manufactured from 304L or 316L grade stainless steel. The environment or materials the equipment may be exposed to may be abrasive or corrosive. This Proposal makes no representation or warranties concerning the service life of the equipment against such abrasion or corrosion. The concentration of chloride and hydrogen sulfide (H2S) in the equipment operating environment shall be kept below the following values:

• Maximum Chloride for V2A (304, 304L)*	100	mg/L
• Maximum Chloride for V4A (316L, 316Ti)*	400	mg/L
• Maximum Chloride for V4A (316L, 316Ti)**	250	mg/L
• pH Value of the Wastewater/Washwater	>6.5	
• Iron Content in Washwater	<0.50	mg/L

* no hydrogen sulphide in the area of the stainless steel

** with a maximum hydrogen sulphide content of 6 ppm

Machines made from 316 grade stainless steel are available at an additional price for extremely harsh operating environments upon request.

Alfa Laval Water & Wastewater Division

Project Name: Leander, TX

ALDRUM G3 MEGADUO for Sludge Thickening

Draft

Alfa Laval Reference No. 0810844
June 11, 2024
Quote Validity: 30 days

Prepared by:

John Moccero
Regional Sales Manager
John.moccero@alfalaval.com

Alfa Laval, Inc.
804-222-5300
5400 International Trade Drive
Richmond, VA 23231

Prepared for:

Andrea Mendoza
AES
Water Environment Group
737-247-7539

June 11, 2024

PROJECT NAME **Leander TX RM2243 WWTP**
ALFA LAVAL REFERENCE **0810844**

Dear Ms. Mendoza,

Thank you for your enquiry. On behalf of Alfa Laval and our local representative EI2, we are pleased to enclose our non-binding budget quotation for **Two (2) ALDRUM G3 MEGADUO rotary drum thickener** for the **Leander, TX RM2243** project for thickening of the plant sludge.

The Alfa Laval ALDRUM G3 rotary drum thickener sets a new standard for sludge thickening. Its enhanced design improves process performance while minimizing operating costs.

Alfa Laval ALDRUM G3 rotary drum thickeners are ideal for the mechanical thickening of sludge needed to optimize downstream processes, including digestion with higher biogas production and more cost-efficient active dewatering.

Alfa Laval offers unrivalled **24-hour service agreements**, placing your needs as close as a phone call away! Our certified field service engineers are available for installation, commissioning, maintenance, repairs, and process optimization. Additionally, Alfa Laval provides original equipment manufacturer (OEM) parts direct from our US Distribution Center in Indianapolis.

As requested, we have included the scope of supply and applicable process guarantees based on the defined influent sludge parameters. Technical details along with dimensional drawing for the proposed equipment are enclosed in the proposal.

Alfa Laval recommends the described equipment per the outlined technical specifications, and additional clarifications for greater understanding of the offer. We trust that we have interpreted your requirements correctly and shall be pleased to provide any additional information which may be required in support of our proposal.

Note: Kindly indicate our Quotation Reference in your Purchase Order/ Letter of Acceptance/ Sales Contract and all our correspondences if the order is confirmed to us.

Best Regards

John Moccero

John Moccero
Regional Sales Manager
Alfa Laval Inc.

CC: EI2

Draft

CONTENTS

1. BASIS OF DESIGN.

General Data

Sludge Origin:	RM2243 WWTP
Sludge Type:	Aerobic Digestion and a conventional activated sludge process
Duty:	Thickening

Sizing Data

Operating Times

Days per Week:	5
Hours per Day:	5

Capacity per Unit

Hydraulic (gpm):	537 gpm
Solids (lbs./hr.)	1,047-2,148 lbs/hr

Number of units

Operating:	2
Standby:	0

Feed Solids

Range (%):	0.4 - 0.8%

Polymer Consumption:

Estimated Dosage (lbs./dT):	10-14 active lbs/dT

RDT Performance

Estimated Cake Solids (%):	4%
Estimated Recovery (%)	93-95%

2. PROPOSAL

2.1. Two (2) ALDRUM G3 MEGADUO rotary drum thickeners each will come complete and include the following scope of supply:

- Two (2) 316 Stainless Steel Modular stand complete with casing
- Two (2) 316 Stainless Steel Rotating drum assemblies
- Two (2) Fiberglass Drum Covers with Inspection Ports
- Two (2) sets of High Strength Polyester Filter Media
- Two (2) Nord NEMA Gear Drive Motors: 1.0 HP
- One (1) NEMA 4X Control Panel/Starter Panel
- Two (2) Drum Variable Frequency Drives
- Spray Washing Header and Spray Valves and Solenoid Valves
- Sample points for feed sludge, thickened sludge, and filtrate
- Solid, grease drum bearings
- Factory Paint System
- One (1) set of required spares
- One (1) set of required tools for maintenance

2.2. Two (2) Mixing valves

- Complete with an injection manifold system and a four-port vortex polymer injection ring.

2.3. Two (2) Flocculation Reactors

- Open reactor without agitator

2.4. Service time as follows:

- One (1) Field Service Engineer,
- up to ten (10) days, @ 10 hr./day, with up to two (2) round trips, **per unit** for start-up, commissioning, and training.
- Any additional service time resulting from non- Alfa Laval -warranty delays, will be charged at the rate in effect at the time of service.

2.5. Also included with pricing:

- Warranty**:** Per the enclosed Alfa Laval's Standard Terms & Condition of Sale. Alfa Laval reserves the right to review operating and maintenance records to ensure compliance.

- Each unit is warranted to be free from defects in materials and workmanship for a period of twelve months after successful completion of Acceptance Testing, beneficial use, or for a period not to exceed eighteen months from shipment, whichever occurs first. Alfa Laval reserves the right to review operating and maintenance records to ensure compliance.

- Electronic Submittal and O&M Manual

2.6. The water supply available at each drum shall be as follows:

- Continuous Flushing: 28 gpm @ 72-102 psi
- Typical Flushing 9 gpm @ 72-102 psi
- Temperature: Ambient (40 - 90 F)

2.7. Notes of Clarification

- Scope of supply is per Alfa Laval standard ALDRUM configuration, and in accordance with typical specifications and drawings. Any additional items not explicitly stated in this proposal or standard to Alfa Laval's typical specifications are not included in this quotation. The specified equipment is intended for installation within a non-hazardous safe area.

- Equipment to be supplied by Alfa Laval (and /or sub-supplier), as specified in this quotation, are standard machines. Any modifications / additions other than those expressly specified in the quotation shall incur extra engineering cost, material cost and delivery time.

- Technical submittal documentation shall be per Alfa Laval's (and /or sub-supplier) standards, delivered electronically, in English language. Additional documentation requirements shall incur extra engineering cost, material cost and delivery time.

- The enclosed quotation is a non-binding budgetary quotation. Therefore, price, scope and other terms contained within this budgetary quotation are subject to considerable variations when preparing our binding quotation. All scope of supply modifications / additions requires prior agreement by both parties and written acknowledgement by Alfa Laval.

2.8. Escalation Charges:

- In the event that delivery of equipment cannot be made on the scheduled delivery date agreed upon between Alfa Laval and Purchaser and as evidenced by the terms of the contract, due to Purchaser delay, Alfa Laval reserves the right to assess reasonable escalation charges to the project at the rate of 1% per month of the contract value for material price escalation for each month that the project is delayed.

- Given the current volatility in steel prices over the past twelve months, Alfa Laval has made this offer based upon shipment of the offered products contained herein within the schedule dictated above. Should the projected shipment schedule fall outside this period for any reason, pricing shall be subject to review and revision.

2.9. Exclusions from this quotation:

- All mechanical & electrical Installation
- Equipment offloading and placement
- Field wiring, conduit, and electrical flexible connections...etc.; contractor shall remain responsible for meeting all relevant electrical codes
- Pipes, valves, and fittings...etc.
- Sludge Hopper with Level Probes/Sensors
- Feed Pump, Booster pump, strainers, etc.
- Associated equipment, i.e., sludge macerators, feed pumps, polymer preparation & dosing unit, cake conveyors, centrate tanks and pumps…etc.
- Measuring instruments between equipment and associated equipment
- Lab services for the performance test and start up
- Noise abatement enclosures
- Odor control equipment

- Inspection and access platforms or ladders
- Utilities and consumables (polymer, power, water, and other consumables required during testing, start-up and commissioning)
- Storage and handling fees
- Detailed or project specific related engineering
- Duties, taxes, bonds…etc.
- **Freight to jobsite. We are offering this FCA Europe, Incoterms 2020**

2.10. Process performance is per specified basis of design.

- The drum thickener performance (cake solids, loading, hydraulic throughput, etc.) is verified through onsite analysis of representative sampling during equipment commissioning. Variation of sludge feed may impact performance.

3. COMMERCIAL TERMS

3.1. Pricing

Item	Description	Qty.	Unit Price	Extended Price
1	ALDRUM MEGADUO	2	Included	Included
2	Set of Controls	2	Included	Included
3	Set of Ancillaries	2	Included	Included
4	Commissioning	1	Included	Included
Total Budget Price				**$678,000.00**

3.2. Payment Terms.

- 10% with PO, N10 days
- 10% upon Alfa Laval Submittal Delivery, N30 days
- 75% upon delivery or availability to deliver should owner encounter delays, N30 days
- 5% upon acceptance or beneficial use, whichever comes first, N30 days, but not later than 120 days from shipment.

3.3. Taxes

Sales tax is excluded from quoted price and remains the customer's responsibility. Per state / federal legal obligation, Alfa Laval will pay applicable taxes; said taxes are charged and invoice to customer's account as actual.

3.4. Estimated Delivery Time

- Submittals: 8 -12 weeks from fully executed PO
- ALDRUM: 34 - 38 weeks from receipt of approved submittals and/or release to manufacture.

3.5. Quotation validity

- 30 days

4. ALFA LAVAL

4.1. About us

Alfa Laval is a leading global provider of separation, heat transfer, and fluid handling technology. Founded in 1883 and for more than 130 years, we have built a global presence with service centers and partners in nearly 100 countries. This offers local expertise, supported by the global breadth and depth of Alfa Laval. With these as its base, Alfa Laval aims to help enhance the productivity and competitiveness of its customers in various industries all over the world. [Alfa Laval – Our Company.]

4.2. Wastewater Separation Technologies

We remain committed to being the technology leader in design innovations, delivering reduced power & polymer consumption, increased cake dryness, and increased capacity within the same footprint. [Alfa Laval - Municipal wastewater treatment]

- Decanter Centrifuge
- Belt Filter Press
- Gravity Belt Thickener
- Rotary Drum Thickener
- SBR / MBR / Pkg. Plants

4.3. Lab & Pilot Testing

Alfa Laval's DNA is to continuously bring value to our customers. Our state-of-the-art wastewater laboratory, located in the Houston, TX service center; allows Alfa Laval to analyze the optimal technology for your specific separation requirements. Additionally, Alfa Laval provides separation equipment available for on-site field testing and demonstration. These include decanter centrifuge, rotary drum filter, and belt press.

4.4. Always at Your Service:

- 24/7 Support
- 75+ Authorized Service Providers
- 4 - USA Service Centers -
- Indianapolis US Parts Distribution Center
- OEM Parts – 450,000+ Spare Parts in Stock
- 50+ Field Technicians

[Alfa Laval - Service and support in the USA]

4.5. Spare Parts

- **A smart choice**

Boost productivity and maximize uptime with quality genuine parts from Alfa Laval. With easy access to a broad range of long-lasting high-quality parts, you can lower your total cost of ownership and preserves the value of your equipment throughout its entire life cycle.

- **Available everywhere**

Through our global service network, you have easy access to our extensive genuine spare parts inventory through 11 major Alfa Laval distribution centers.

Alfa Laval maintains an extensive inventory of spare parts that supports our current product range as well as some legacy parts, which are up to 100 years old. Our parts inventory system contains specific information, such as technical details and availability, for more than 450,000 parts, and we have more than 50,000 unique items in stock.

The Americas are conveniently served through the American Distribution Center (AMDC), which is centrally located in Greenwood, IN, USA.
Alfa Laval AMDC
200 South Park Blvd
Greenwood, IN 46143

- **Unmatched quality**

Designed for durability, reliability and productivity, our parts deliver outstanding performance time and time again. Manufactured to precise specifications, Alfa Laval parts have proven performance in our material and test laboratories as well as in process lines around the world.

- **Traceability and certification**

Parts are continuously improved to meet the highest standards and comply with various certification requirements and regulations, such as REACH. [Alfa Laval - Spare parts]

5. ALDRUM ROTARY DRUM THICKENER: GENERAL DESCRIPTION

See how it work in less than 2 min ALDRUM animation

Alfa Laval ALDRUM G3 Sludge Thickeners are ideal for mechanical thickening of sludge to optimize subsequent processes such as digestion with higher biogas production or more cost-efficient dewatering. They handle capacities from 15-180 m3/h.

5.1. Applications

- All municipal wastewater sludge types
- A wide variety of industrial separation applications, such as paper, solid waste and food
- Fresh water production at waterworks

The ALDRUM G3 rotary drum thickener is optimized to set new standards for sludge thickening, resulting in greatly improved capacity and process performance at minimum operating cost.
The robust, straightforward design makes the ALDRUM G3 drum thickener a reliable, user-friendly product that only requires a minimum of maintenance. It is available with a range of auxiliary equipment to meet individual customer requirements.

The ALDRUM G3 reduces the sludge volume by as much as 90%, thus cutting costs for sludge handling, transportation, and storage considerably.

5.2. Benefits

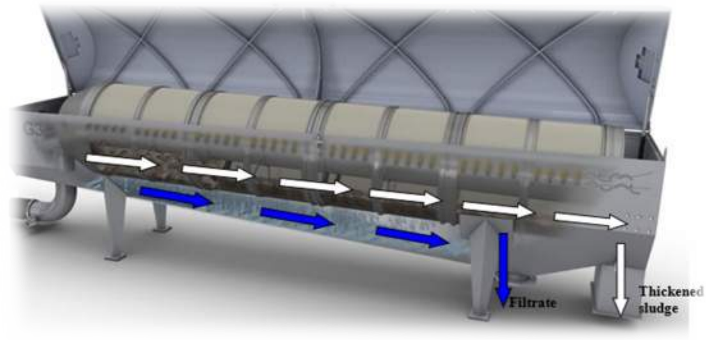
The ALDRUM G3 range features a unique design with multiple benefits:

- High capacity in small footprint
- Clean, enclosed, odor-free solution
- Compact and robust design
- Long lifetime filter cloth
- intermittent flushing saves water
- Very gentle treatment of flocculated feed saves polymer and gives high recovery
- Safe design with hinged cover and safety switch
- Selection of control panels and auxiliary equipment to meet virtually any specific processing requirement.

5.3. Working principle

The ALDRUM G3 works on the principle of conveying polyelectrolyte treated sludge (a.k.a. flocculated sludge) through a slowly rotating drum filter. The sludge remains in the drum, while the water phase passes through the filter cloth. Integrated scrolls inside the drum filter retains the liquid level between baffles, increasing capacity and separation efficiency due to higher liquid pond, and transports the sludge from one compartment to the next. Scrolling also drains the drum after operation.

Water consumption is low due to intermittent cleaning of the drum using either potable water, final effluent or treated filtrate. The ALDRUM G3 can be adjusted to suit individual sludge thickening needs. Optimal thickening is obtained by varying the feed rate, the polymer type and dosage, drum speed and the spraying interval.



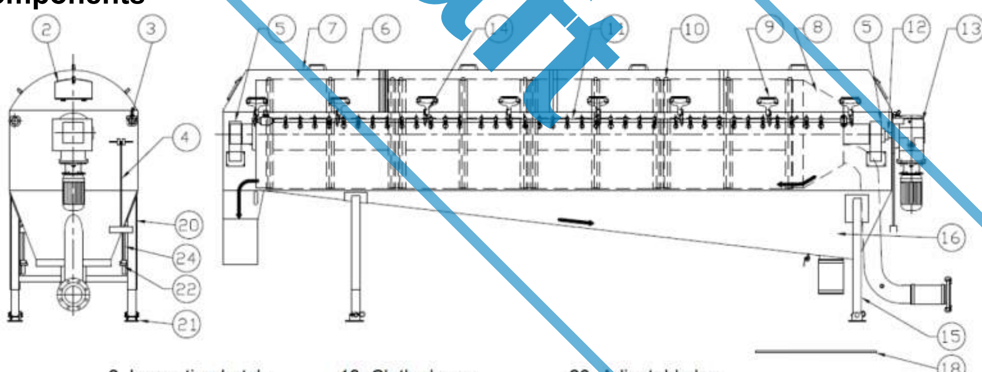
The best possible flocculation is achieved by installing the optional flocculation reactor and/or mixing valve upstream of the actual drum thickener.

5.4. Design features - Achieve more with ALDRUM G3

The feed inlet adaptor provides extraordinarily gentle treatment of the sludge being processed. This results in a lower polymer consumption at the same time as making sure of exceptionally high recovery rates for most types of sludge. Some particularly difficult sludge types, which normally require liquid polymer to flocculate and thicken them, can be treated using cheaper powder polymer, thus reducing operating costs.

The ALDRUM G3 offers a very high solids load capacity as the result of the conveyor design with integrated scrolls that also increases the separation efficiency in the drum. This, combined with the more gentle treatment of sludge, ensures superior performance as well as low polymer consumption. The one-piece cover is “slam proof “due to the integrated gas struts in each side. It comes with safety switches on both sides.

5.5. Main components



2 Inspection hatch	10 Cloth clamp	20 Adjustable leg
3 Solenoid valve	11 Spray bar	21 Foundation foot
4 Cover support	12 Shaft coupling	22 Trapezoidal nut
5 Bearing	13 Gear motor drive	24 Threaded bar
6 Filter cloth	14 Cover brackets	25 Ventilation port
7 Cover	15 Static leg	
8 Drum	16 Casing	
9 Handle	18 Crank	

5.6. Less maintenance work with ALDRUM G3

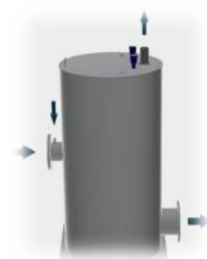
Alfa Laval ALDRUM G3 drum thickeners are renowned for their robust, straightforward design, and extremely durable filter cloth. They are also equipped with an integrated Cleaning-in-place (CIP) system. The benefits include easy operation, limited maintenance, and maximum uptime.

5.7. Optional equipment to meet your exact requirements

A selection of auxiliary equipment is available for ALDRUM G3:

- Polymer Mixing Valve:
  Ensures thorough mixing of polymer and sludge to allow flocculation with minimum amount of polymer. Can be installed directly onto the inlet of the drum thickener, or before the flocculation reactor.

- Flocculation reactor, with or without agitator
  Simple open reactor that kick-starts the creation of large and strong flocs. Can be installed directly onto the inlet of the drum thickener.



- Inlet pipe adaptor:
  A connection to the flocculation reactor with a sampling point included.

- Sludge hopper
  Leads the thickened sludge to the sludge pump in a controlled and efficient manner.

- Control panel
  - Basic Control Panel
    Straightforward, user-friendly control of the drum thickener, including level monitoring in the flocculation reactor (if fitted).
  - Advanced Control Panel
    All-in-one control solution. Control of the plant's feed pump, sludge pump and polymer pump, as well as the drum thickener, and level monitoring in the flocculation reactor and the sludge hopper.

6. ELECTRICAL ASSEMBLY AND CONTROLS

6.1. Electrical Assembly

- The drive system: gear-reduced motor, direct coupled to the shaft of the drum.
- The speed controlled by a Variable Frequency Drive (VFD)
- 460 Volt, 60 Hz, 3 phase power supply.

6.2. Controls

- The controls include logic for the control of the complete sludge thickening system.
- The system controls start-up, shutdown and alarm sequencing of all system components.
- The system is suitable for continuous unattended operation
- The panel includes
  - elapsed time meter,
  - emergency stop push-button,
  - alarm horn,
  - alarm acknowledgement/lamp rest push-button.
- The enclosure: 304 SS.
- System alarms (example)
  - RDT fail (discrete input)
  - WAS Pump Fail (discrete input via peer-to-peer communication)
  - System Emergency Stop (discrete input)
  - RDT Sludge Feed flowmeter signal loss (derived in PLC)
  - Sludge Hopper level signal loss (derived in PLC)
  - Filtrate Feed flowmeter signal loss (derived in PLC)
  - Thickened Sludge flowmeter signal loss (derived in PLC)
  - RDT Drive speed signal loss (derived in PLC)
  - Thickened Sludge pump speed signal loss (derived in PLC)
  - RSPS Polymer Dilution Water low pressure (discrete input via peer-to-peer communication)
  - SH Polymer Dilution Water low pressure (discrete input)
  - RDT Unit Spray Water low pressure (discrete input)
  - Sludge Hopper Hi-Hi level alarm (discrete input)
  - Sludge Hopper Lo-Lo level alarm (discrete input)
  - Loss of AC Power – UPS (discrete input)
  - Thickened Sludge pump fault (discrete input)
  - Thickened Sludge pump Seal Water low pressure (discrete input)
  - WAS Pump Discharge flowmeter signal loss (derived in PLC via peer-to-peer communication)
  - WAS Pump not running while Polymer Pump running (derived in PLC)
  - WAS Pump speed signal loss (derived in PLC via peer-to-peer communication)

7. SERVICE

7.1. 360º Service Portfolio

Alfa Laval partners with you for the entire life cycle of your equipment – from start-up, through operation, monitoring and maintenance, all the way to reconditioning and eventual redesign. Our goal is to ensure that our equipment continuously gives you optimized process performance.

7.2. Alfa Laval Service Centers:

You can trust Alfa Laval service technicians to maintain your equipment in peak performance and minimize the risk of unscheduled production stops. Our local service centers are equipped with the tools and expertise to improve the performance of your rotating drum thickeners. Join us on a virtual tour of our state-of-the-art facilities.

[Alfa Laval - Chesapeake service center]

[Alfa Laval - Greenwood service center]

[Alfa Laval - Houston service center]

7.3. Commissioning

Services consist of:

- installation review,
- performance checks,
- process optimization,
- operator training.

The commissioning process ends with a handover or acceptance certificate and is often the first day of warranty.
The commissioning:

- Enables trouble-free start-up and process fine-tuning.
- Advice on optimizing process conditions.
- Checks on surrounding components, systems and controls and optimization recommendations.
- Help to reduce maintenance costs with a customized proposal to optimize maintenance.

7.4. Preventive Maintenance

Highly experienced Alfa Laval specialists can formulate and implement an optimal maintenance plan for your equipment.
Service intervals are determined by various factors, including type of application as well as the usage and condition of the equipment.
The service can be performed on site or in one of the local Alfa Laval Service Centers located near you.
The preventive maintenance:

- Delivers peace of mind and operational reliability
- Secures maximum throughput
- Increases overall equipment lifetime and provides good cost control
- Maintains safe equipment operation

7.5. Repair

Alfa Laval specialists repair the equipment according to your needs, replacing unsafe or worn parts as required, and then reassemble the equipment.

- Minimizes downtime
- Maximizes production performance
- Extends the lifetime of equipment
- Prevents equipment from consequential damage and accidents

7.6. Equipment Upgrades

There is a wide range of upgrade solutions available to ensure your Alfa Laval equipment features the latest technical developments.
As operating conditions change over time, new challenges can call for a review of the current installations.
Equipment Upgrades can also include control upgrades that improve equipment automation.

8. TERMS AND CONDITIONS OF SALES

These Terms and Conditions of Sale (“Terms and Conditions”) apply to all quotations, orders, and contracts for Alfa Laval Inc. products (hereafter "Equipment") and associated services (“Services”) As used in these Terms and Conditions, the word "Equipment" includes all hardware, parts, components, software and options.

1. **ACCEPTANCE**: Our sale to you is limited to and expressly made conditional on your assent to these Terms and Conditions and, if applicable, on the attendant quotation, both of which form a part of the contract between us and which supersede and reject all prior agreements, representations, discussions or negotiations, whether written or oral, with respect to this sale and any conflicting terms and conditions of yours, whether or not signed by you. Any terms and conditions contained in your purchase order or request for quotation or other form which are different from, in addition to, or vary from these Terms and Conditions are expressly rejected, shall not be binding upon us, and are void and of no force or effect. These Terms and Conditions may not be changed except by the written agreement of both parties.

2. **PRICES**: Unless otherwise specified in writing, all quoted prices are in U.S. Dollars and are firm for thirty (30) days from the date of offer. Prices quoted are exclusive of taxes, freight and insurance, and you agree to pay any and all sales, revenue, excise or other taxes (exclusive of taxes based on our net income) applicable to the purchase of Equipment. If you claim an exemption from any such taxes you shall provide us with a tax exemption certificate acceptable to the taxing authorities.

3. **DELIVERY; FORCE MAJEURE**: Dates for the furnishing of Services and/or delivery or shipment of Equipment are approximate only and are subject to change. Quoted lead times are figured from the date of receipt of complete technical data and approved drawings as such may be necessary. We shall not be liable, directly or indirectly, for any delay in delivery or failure to deliver caused by carriers or by labor difficulties, shortages, strikes or stoppages of any sort, or difficulties in obtaining materials from ordinary sources and suppliers. In addition, we shall not be liable for any such delays or for any failure to perform our obligations under an order or contract due to any one or more of the following events, whether foreseeable or not: war, hostilities, military operations, terrorism, riots, disorder, accidents, floods, storms, natural disasters, fires, acts of God, epidemics and/or pandemics (and specifically in relation hereto and notwithstanding anything else stated herein, whether or not outbreak of such epidemic or pandemic has occurred prior to acceptance of this order or execution of a contract for the Services), governmental, judicial or administrative decisions, decrees or orders, embargoes or blockades, or any causes beyond our reasonable control. Unless otherwise specifically agreed in writing by us, in no event shall we be liable for any damages or penalties whatsoever, or however designated, resulting from our failure to perform or delay in performing due to any of the causes specified in this paragraph 3.

4. **SHIPMENT, RISK OF LOSS, TITLE**: All sales are made F.O.B. Alfa Laval shipping point, unless otherwise noted. Duty, brokerage fees, insurance, packing and handling as applicable are not included unless otherwise noted. Our liability for delivery ceases upon making delivery of Equipment to the carrier at the shipping point in good condition. The carrier shall be your agent. Risk of loss shall pass to you upon such delivery. Regardless of the delivery term specified, we shall retain title to the Equipment until final payment thereof has been made.

5. **CREDIT AND PAYMENT**: Payment terms are thirty (30) days net, unless agreed otherwise by us in writing. *Pro rata* payments shall become due with partial shipments. Any discount period which may be granted by us begins on the invoice date and all payments are due 30 days after the invoice date. All payments shall be made without deduction, deferment, set-off, lien or counterclaim of any nature. All amounts due not paid within

30 days after the date such amounts are due and payable shall bear interest at the lesser of 1.5 percent per month or the maximum rate of interest allowed by law. We reserve the right at any time to suspend credit or to change credit terms provided herein, when, in our sole opinion, your financial condition so warrants. Failure to pay invoices when such invoices are due and payable, at our election, shall make all subsequent invoices immediately due and payable irrespective of terms, and we may withhold all subsequent deliveries until the full account is settled. We shall not, in such event, be liable for delay of performance or nonperformance of contract in whole or in part subsequent to such event. We shall have the right to deduct from or set off against sums due you any sums due and owing to us from you under any other order or contract between us.

6. **SECURITY AGREEMENT:** You hereby grant us a security interest in the Equipment, including a purchase money security interest, and in such materials, proceeds and accessories thereof, to secure payment of the purchase price of the Equipment. You authorize us to file or record a purchase order or copy thereof or any UCC financing statement showing our interest in the Equipment in all jurisdictions where we may determine filing to be appropriate, and you agree to sign all such documents reasonably related thereto promptly following our request. You will not encumber the Equipment with any mortgage, lien, pledge or other attachment prior to payment in full of the price therefor.

7. **CANCELLATIONS AND CHANGES**: Orders which have been accepted by us are not subject to cancellation or changes in specification except upon prior written agreement by us and upon terms that will indemnify us against all losses resulting from or arising out of such cancellation or change in specifications. In the absence of such indemnification, we shall be entitled to recover all damages and costs of whatever nature permitted by the Uniform Commercial Code.

8. **DEFERRED SHIPMENT**: If shipment is deferred at your request, payment of the contract price shall become due when you are notified that the Equipment is ready for shipment. If you fail to make payment or furnish shipping instructions we may either extend the time for so doing or cancel the contract. In case of deferred shipment at your request, storage and other reasonable expenses attributable to such delay shall be payable by you.

9. **EQUIPMENT WARRANTY AND REMEDY**:

(a) For new Equipment only, we warrant to you that the Equipment that is the subject of this sale is free from defects in design (provided that we have design responsibility), material and workmanship. The duration of this warranty is twelve (12) months from start-up or eighteen (18) months from delivery to you, whichever occurs first (the "Warranty Period"). If you discover within the Warranty Period a defect in design, material or workmanship, you must promptly notify us in writing. Within a reasonable time after such notification, we shall repair, replace, or, at our option, refund you the price of the defective Equipment or part thereof.

(b) For repairs, parts and Services provided by us, we warrant to you that the repairs, parts and Services we provide to you will be free from defects in material and workmanship. The duration of this warranty is ninety (90) days from as applicable (i) the date the Equipment which required the repairs, parts or Services is returned to you by us, (ii) the date of your receipt of the part, or (iii) the date of completion of the repair or other Services, if performed at your facility. If during this ninety day period you discover a defect in the repairs, parts or Services you must promptly notify us in writing and we shall correct such defect with either new or used replacement parts or reperform the Services as applicable. If we are unable to correct the defect after a reasonable number of attempts, we will provide a refund of the price paid for the defective repair, parts or Services.

(c) All warranty service is subject to our prior examination and approval and will be performed by us at your facility or at service centers designated by us. All transportation to and from the designated service center will be at our expense. The remedies set forth above are your exclusive remedies for breach of warranty. Unless otherwise agreed in writing by us, our warranty extends only to you and is not assignable to or assumable by any subsequent purchaser, in whole or in part, and any such attempted transfer shall render all warranties provided hereunder null and void and of no further force or effect.

(d) The warranties set forth above are inapplicable to and exclude any product, components or parts not manufactured by us or covered by the warranty of another manufacturer. We shall have no responsibility for defects, loss or damage to the extent caused by (i) normal wear and tear, (ii) your failure to follow all installation and operation instructions or manuals or to provide normal maintenance, (iii) repairs or modifications by you or by others not under our direct supervision, or (iv) a product or component part which we did not design, manufacture, supply or repair.

(e) **DISCLAIMER OF IMPLIED WARRANTIES**. THE WARRANTIES SET FORTH ABOVE AND IN SECTION 12 BELOW ARE IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

10. **LIMITATION OF LIABILITY**: In no event shall we be liable, and you hereby waive any claims against us and release us from liability to you, for any indirect, special, punitive, incidental, or consequential damages whatsoever based upon breach of warranty, breach of contract, negligence, strict tort, or any other legal theory. In no circumstance, shall we be liable for, however such damages are characterized, loss of profits, loss of savings or revenue, loss of use of the Equipment or any associated equipment, cost of capital, cost of any substitute Equipment, facilities or services, downtime, or loss of prospective economic advantage. OUR AGGREGATE LIABILITY FOR FAILURE TO PERFORM, BREACH OF WARRANTY OR BREACH OF OTHER CONTRACTUAL OBLIGATIONS, NEGLIGENCE, STRICT TORT OR ANY OTHER LEGAL THEORY SHALL NOT EXCEED THE TOTAL PRICE PAID TO US FOR THE EQUIPMENT OR SERVICES THAT ARE THE SUBJECT OF ANY CLAIM BY YOU.

11. **OWNERSHIP:** All drawings, designs, specifications, data and other proprietary rights supplied by us (including without limitation in connection with the Equipment) have been prepared or assembled by us and are (and shall remain) exclusively our property, and upon our request you agree to execute any additional documents needed to give effect to the foregoing. Such drawings, designs and specifications have been furnished in order to provide full documentation and on the condition that they shall not be disclosed, reproduced or copied in any manner whatsoever, in whole or in part, except for your internal use as necessary, and upon the further condition that, as our sole property, they shall not be used for furnishing information and/or disclosed, in whole or in part, to others or otherwise for any purpose not specifically authorized in a writing signed by one of our corporate officers.

12. **PATENT INFRINGEMENT**

(a) We make no express or implied warranties of non-infringement with respect to the Equipment. We will, however, defend, indemnify and hold you harmless from any third party apparatus claims based upon an issued U.S. patent to the extent such claim relates to the Equipment supplied and sold to you; provided, however, that we undertake no indemnification in respect of third-party rights (i) where the alleged patent infringement is based upon or related to any method, process or design claims in third-party U.S. patents, any combination of the Equipment with other equipment not supplied by us, or any modifications of the Equipment made by you and not approved by us, or (ii) to the extent the alleged infringement is directly attributable to the negligence or intentional misconduct of you or otherwise for which you are obligated to indemnify us for under paragraph 12(c).

(b) We shall assume defense of a claim at our expense in accordance with these Terms and Conditions, provided you shall notify us within 30 days of your receipt of notice of an alleged third-party claim that you believe would entitle you to patent infringement indemnification pursuant to paragraph 12(a). You acknowledge and agree that we shall have the sole right to settle or otherwise compromise such a third-party claim, including but not limited to the right to either (i) modify the Equipment to avoid infringement if you are agreeable to the modification, (ii) repurchase the Equipment from you at a price equal to the then-current fair market value of the Equipment, or (iii) secure rights by assignment or license to permit continued use of the Equipment.

(c) If a third party charges us with patent infringement relating to Equipment sold by us to you, we shall have the right to either (i) modify the Equipment to avoid infringement if you are agreeable to the modification, (ii) repurchase the Equipment from you at a price equal to the then-current fair market value of the Equipment, or (iii) secure rights by assignment or license to permit continued use of the Equipment. If a third party charges us with patent infringement on the bases set forth in paragraph 12(a)(i) or (ii), you shall indemnify and hold us harmless for all expenses as well as any awards of damage assessed against us, and, without limiting any of our other rights and remedies available at law or in equity, we shall also have the right to modify or repurchase the Equipment or to secure rights for continued use by way of assignment or license as set forth in this paragraph.

13. **INSPECTION**: Upon prior written notice, you may make reasonable inspections of Equipment at our facility. We reserve the right to determine the reasonableness of the request and to select an appropriate time and location for such inspection. You agree to execute appropriate confidentiality provisions upon our request prior to visiting our facility. All costs of inspection shall be solely determined by us and shall be payable by you. No inspection or expediting by you at the facilities of our suppliers is authorized.

14. **SOFTWARE PROVISIONS**: If software is provided hereunder (whether such is integrated into the Equipment or otherwise operates alongside the same), you are hereby granted a non-exclusive, non-sublicensable, non-transferable, royalty free license to access and use such software as provided and as intended with our Equipment. Without limiting the foregoing, under the foregoing license you may specifically: (i) use our software in machine readable object code only and only with the Equipment provided; (ii) copy our software into any machine readable object code form solely for back up purposes in support of your use of our software on the Equipment provided in accordance with these Terms and Conditions; and (iii) create one additional copy of the software for archival purposes only. This license may only be assigned, sublicensed or otherwise transferred by you with our prior written consent. You hereby recognize and acknowledge that the software provided to you hereunder comprises valuable trade secret and/or copyright property of Alfa Laval (or its licensors) and you covenant that you will take adequate precautions against access to the software by, or disclosure of the software to, anyone not authorized hereunder to use or have access to the software as contemplated herein. The software is subject to the confidentiality obligations set forth below in paragraph 15.

15. **CONFIDENTIALITY:** Subject to any non-disclosure or confidentiality agreement already in effect between us, any drawings, data, software or other information exchanged between us is proprietary or confidential to us and shall not be used or disclosed by you without our prior written consent. Confidential information shall not be any information that (i) is known previously to you under no obligation of secrecy; (ii) becomes known to the public through no breach of an obligation of secrecy by you; or (iii) is independently developed by you without use or reference to any of the confidential information or materials provided to you by us.

16. **INAPPLICABILITY OF CISG:** The parties specifically agree that the United Nations Convention on Contracts for the International Sale of Goods shall not apply to any sale or order or the contract between us.

17. **GOVERNING LAW & VENUE**: These Terms and Conditions and any dispute or claim arising out of or related to an order or the contract between us shall be finally decided in accordance with the laws of the Commonwealth of Virginia, without giving effect to the provisions thereof relating to conflict of laws. You agree that the venue for any such dispute shall lie in the United States District Court for the Eastern District of Virginia, Richmond Division. In the event that federal jurisdiction cannot be established pursuant to 28 U.S.C. §§ 1331 or 1332, the venue for any such dispute shall lie in the Circuit Court of Henrico County, Virginia. You expressly submit and waive any objection to the sole and exclusive jurisdiction of such courts.

18. **GENERAL:** All previous agreements or understandings between us, either oral or written, with regard to the subject order, with the exception of a pre-existing non-disclosure agreement between us, are void and these Terms and Conditions constitute the entire agreement between us with respect to the matters addressed herein. Neither of us shall assign an order or contract to which these Terms and Conditions apply without the prior written consent of the other party, which consent shall not be unreasonably withheld. If any provision of these Terms and Conditions is held to be invalid or unenforceable, such holding shall not affect the validity or enforceability of any other provision herein. No waiver by either of us of any default or breach by the other party will operate as or be deemed a waiver of any subsequent default or breach.

Screw Press Thickening

Loading Calculations	*Quantity*	*Units*
Loading (Wet)	1918200	lb/day
Loading (Dry)	5.7546	tons/day

HUBER Thickener S-DRUM Size 4L	*Quantity*	*Units*
Polymer Consumption Rate	10	lbs/ton
Polymer per day	57.546	lbs/day
Polymer cost per day	$ 97.83	$/day
Monthly Polymer Cost	$ 2,934.85	$/month
Yearly Polymer Cost (all units)	**$ 35,218.15**	$/year

Parameter	*Quantity*	*Units*
Incoming Solids Concentration	6000	mg/L
Incoming Solids %	0.6%	
Future Solids Flow	230,000	gal/day
Future Solids Flow	0.23	MGD

Polymer	*Price*	*Unit*	*Quantity*	*Cost*
Clarifloc-C 6266	$ 1.70	lbs	2300	$ 3,910.00

O&M Calculations for a 20-year Period

Inflation Factor	5.10%
Number of Years	20
Estimated Yearly Cost of Polymer	$ 35,218.15

Year	Cost
1	$ 37,014.28
2	$ 38,902.01
3	$ 40,886.01
4	$ 42,971.19
5	$ 45,162.73
6	$ 47,466.02
7	$ 49,886.79
8	$ 52,431.02
9	$ 55,105.00
10	$ 57,915.36
11	$ 60,869.04
12	$ 63,973.36
13	$ 67,236.00
14	$ 70,665.04
15	$ 74,268.95
16	$ 78,056.67
17	$ 82,037.56
18	$ 86,221.48
19	$ 90,618.77
20	$ 95,240.33
Total	**$ 1,236,927.60**

Draft

Rotary Drum Thickening

Loading Calculations	*Quantity*	*Units*
Loading (Wet)	1918200	lb/day
Loading (Dry)	5.7546	tons/day

Parameter	*Quantity*	*Units*
Incoming Solids Concentration	6000	mg/L
Incoming Solids %	0.6%	
Future Solids Flow	230,000	gal/day
Future Solids Flow	0.23	MGD

ALDRUM G3 MEGADUO	*Quantity*	*Units*
Polymer Consumption Rate	12	lbs/ton
Polymer per day	69.0552	lbs/day
Polymer cost per day	$ 117.39	$/day
Monthly Polymer Cost	$ 3,521.82	$/month
Yearly Polymer Cost (all units)	**$ 42,261.78**	$/year

Polymer	*Price*	*Unit*	*Quantity*	*Cost*
Clarifloc-C 6266	$ 1.70	lbs	2300	$ 3,910.00

O&M Calculations for a 20-year Period

Inflation Factor	5.10%
Number of Years	20
Estimated Yearly Cost of Polymer	$ 42,261.78

Year	Cost
1	$ 44,417.13
2	$ 46,682.41
3	$ 49,063.21
4	$ 51,565.43
5	$ 54,195.27
6	$ 56,959.23
7	$ 59,864.15
8	$ 62,917.22
9	$ 66,126.00
10	$ 69,498.43
11	$ 73,042.85
12	$ 76,768.03
13	$ 80,683.20
14	$ 84,798.04
15	$ 89,122.74
16	$ 93,668.00
17	$ 98,445.07
18	$ 103,465.77
19	$ 108,742.53
20	$ 114,288.39
Total	**$ 1,484,313.11**

Appendix L: Emergency Power Evaluation

1500 County Road 269
Leander, TX 78641

Mailing Address:
9601 Amberglen Blvd. #109
Austin, TX 78729

PROJECT RECORD

Date: 2/15/2024

Time: 10:00 am

Project name: Leander RM2243 WWTP Facilities Plan Emergency Power Evaluation

Project Number: 15393.02

Initiated by: Walter Young

With ☐ To ☒ Name: Frank Phelan

☐ Phone call ☐ Memo ☐ Meeting ☐ Job site visit

15393.02 – LEANDER RM2243 WWTP FACILITIES PLAN EMERGENCY POWER EVALUATION

I. EXISTING SITE POWER

There are two existing, emergency stand-by generators on site. Generator #1 on the northeastern corner and Generator #2 on the west side of the plant site.

Generator #1 - The existing 250KW, 480V, 3 Phase generator located on the north-east side corner of the site serves emergency power to the on-site lift station, pumps, and blowers for sludge digestion units, non-potable water system, and filters.

Generator #2 - The existing 200KW, 480V, 3 Phase generator located west side of the site is out of commission. It once served emergency power to the office and control panel for the sludge digestion and thickening units.

II. POWER NEEDED TO MEET THE NEW POWER LOADS.

The site equipment that requires emergency power is in two areas that are approximately 400' apart. Due to the distance and the loads being located on the East and West sides of the site, we recommend two generators be provided for redundancy and a portable generator tap box for backup power in case of a generator failure.

West Loads

The list of loads requiring emergency power on the West corner are as follows:

A. Positive Displacement Blower- Blower #4	480V, 3 Phase, 75HP, 96A
B. Positive Displacement Blower – Enclosure Fan	480V, 3 Phase, 210W, 0.25A
C. Positive Displacement Blower – Heat Exchanger 4	480V, 3 Phase, 2HP, 3.4A
D. Centrifugal Blower- Blower #1	480V, 3 Phase, 100HP, 124A
E. Clarifier – Clarifer Drive 1	480V, 3 Phase, 1 HP, 2.1A
F. Clarifier – Clarifer Drive 2	480V, 3 Phase, 1 HP, 2.1A
G. Mixers – Mixer (South Anaerobic)	480V, 3 Phase, 3HP, 4.8A

H. Mixers – Mixer (Anoxic) 480V, 3 Phase, 3HP, 4.8A
I. Mixers – Mixer (North Anaerobic) 480V, 3 Phase, 3HP, 4.8A

Total required 242.25A @ 480V = 201.3KW

The total load being fed will be 201.3KW
The generator size will include starting power for the largest motors and 20% spare capacity.

The West side will require a 300KW, 480V, 3 Phase diesel generator.

**Another option is to upsize generator to supply power to future emergency loads (see next page)*

East Loads

The list of loads requiring emergency power on the East side are as follows:

A. Alum Feed (MCC-) 115V, 1 Phase, 1.5A
B. Chlorine Feed 115V, 1 Phase, 1.5A
C. Sodium Bisulfite Feed (FD1-> LPD) 115V, 1 Phase, 1.5A
D. Non-potable (Pump Panel "NP-1")
-Non-potable (Pot Pump 1: 460V, 3 Phase, 10HP, 14A
E. Master Lift Station #39 480V, 3 Phase, 421A

The load from the new Master Lift Station #39 (421A, 480V, 3 Phase, 349.6KW) will be added to the generator plus 20% spare.

Total required 3A @ 115V, 1 Phase & 435A @ 480V, 3 phase.

The East side will require a 500KW, 480V, 3 Phase diesel generator.

Copies to:

☐ Original to file

☐ Principal-in-charge Click to enter name ☐ Consultant Click to enter name

☐ Project manager Click to enter name ☐ Owner Click to enter name

☐ Field observer Click to enter name ☐ Job site

☐ Other Click to enter name

FUTURE EMERGENCY POWER REQUIREMENTS ESTIMATIONS:

Estimating Current Ratio of Emergency / Total Power Loads:

- All Existing Emergency Power Loads = 242.25 + 439.5 = 681.75A
- Existing Total Power Loads = 800 + 600 + 800 = 2,200A
- Ratio of existing emergency / total power = 681.75 / 2200 = 0.3099 ~ 31%

Existing Emergency Power Loads for Western Side of Plant:

- Existing West Emergency Power Loads = 201.3 kW
- + 20% Spare Capacity = 201.3 kW * 1.2 = 242 kW

Estimating West Future Emergency Power Loads:

- Future Estimated Total Power Loads = 2600A
- Future Estimated Emergency Power Loads = 0.3099 * 2600A = 805.7A
- Future Estimated Emergency Power Loads = (806 AMPS * 480 V * 0.9 * 1.732) / 1000 = 603 kW
- + 20% Spare Capacity = 603 kW * 1.2 = 724 kW

Alternative Option: Proposed Generator to Power Existing Emergency Loads (West) and Future Emergency Loads:

- Existing West Emergency Power Loads + Future Emergency Power Loads = 242 + 724 = 966 kW
- Proposed Generator Size for Existing (West) and Future Emergency Loads = **1000 kW**
- Proposed 1000 kW Generator Capacity Percent Utilized for Existing (West) Emergency Loads = 201.3 / 1000 = 0.20 ~ 20%