

**SOAH DOCKET NO. 582-22-0585
TCEQ DOCKET NO. 2021-1001-MWD**

**IN THE MATTER OF THE
APPLICATION BY THE CITY OF
GRANBURY FOR
TPDES PERMIT NO.
WQ0015821001**

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**BEFORE THE STATE OFFICE

OF

ADMINISTRATIVE HEARINGS**

**DIRECT EXAMINATION OF JOSHUA BERRYHILL, P.E.
BY THE CITY OF GRANBURY**

FEBRUARY 18, 2022

DIRECT EXAMINATION OF
JOSHUA BERRYHILL, P.E.

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1 I. INTRODUCTION

2 **Q. Mr. Berryhill, please state your full name and professional**
3 **designation.**

4 A. Joshua Berryhill. I am a licensed professional engineer in the State of Texas.

5 **Q. How long have you practiced as a professional engineer?**

6 A. I have practiced as a professional engineer in Texas for approximately 15 years,
7 with my technical experience extending to research projects and internships
8 completed in graduate school, for a total experience in engineering of
9 approximately 18 years.

10 **Q. Where do you practice?**

11 A. I'm a Vice President and the Technical Director at Enprotec Hibbs & Todd, Inc.
12 The firm is also commonly known as eHT.

13 **Q. What are your duties as Vice President and Technical Director at**
14 **eHT?**

15 A. My duties are to identify and evaluate new technologies for use in upcoming
16 projects, to build and maintain client relationships, to mentor and train new
17 engineering personnel at eHT, to complete troubleshooting, planning, pilot
18 testing, permitting, design, commissioning, operator training, and
19 construction administration of new water and wastewater treatment projects.
20 My duties also include quality assurance and quality control review of proposed
21 project designs being completed by other eHT personnel.

1 **Q. Describe your professional history before joining eHT.**

2 A. My technical career began during graduate school at Texas Tech University in
3 2002 where I worked on a research project for the Texas Natural Resources
4 Conservation Commission regarding optimization of neighborhood cluster
5 OSSF systems, and I worked on a research project for NASA in Texas Tech's
6 Water Recovery Research Center, regarding enhanced water recovery, nutrient
7 reduction, CEC reduction and antibiotic fate to improve net water recovery on
8 the ISS and to prepare for future manned missions to Mars. Also during
9 graduate school, I was employed with CH2M Hill under an internship where I
10 worked on wastewater treatment plant, or WWTP, permit amendments, a
11 state-wide biosolids management program for the State of Utah, and treatment
12 process calculations for preliminary WWTP designs.

13 Upon graduation from Texas Tech University with Bachelor's and
14 Master's degrees in Environmental Engineering, I began work at Halff
15 Associates, Inc. in McAllen, Texas as a Graduate Engineer, where my major
16 area of focus was on preliminary design analyses of water treatment and
17 wastewater treatment plants, including a master plan development,
18 environmental assessment, permit amendment application, and preliminary
19 design of an existing conventional WWTP for the City of Donna.

20 In 2007, I left Halff Associates and joined the Brownsville Public
21 Utilities Board as a Senior Engineering Coordinator. My area of focus at
22 Brownsville PUB was to troubleshoot and master plan improvements needed
23 at Brownsville's two existing contact stabilization WWTPs, at Brownsville's two

1 existing conventional WTPs, and Brownsville's existing Southmost Regional
2 Water Authority brackish water desalination plant. In addition, I also worked
3 on the first seawater desalination pilot study in Texas, which was completed by
4 Brownsville PUB in coordination with the Brownsville Navigation District.

5 In 2008, I left the Rio Grande Valley and joined Alan Plummer
6 Associates, Inc. as an Engineer IV, which is a professional design engineer, but
7 not a project manager. My area of focus while at Alan Plummer Associates, Inc.
8 was in planning, design, troubleshooting, commissioning, construction
9 administration, and operator training for new WWTPs in the Dallas – Ft.
10 Worth area, including work on several of the first BNR facilities in Texas, at the
11 Trinity River Authority's Denton Creek Regional Wastewater System, at the
12 TRA's Ten Mile Creek Regional Wastewater System, and for the City of Azle.

13 In 2010, I joined Enprotec / Hibbs & Todd, Inc. (eHT) in 2010, initially
14 as a Project Manager, then promoted to Senior Project Manager, then Associate
15 Vice President and Technical Director, and currently as Vice President and
16 Technical Director for eHT. My area of focus while at eHT has centered on both
17 advanced water treatment and wastewater treatment projects, including the
18 planning, piloting, design, permitting, construction administration,
19 commissioning, and operator training for new membrane filtration,
20 desalination, and radionuclide removal water treatment plants, as well as the
21 majority of the largest membrane bioreactor (MBR) facilities in Texas,
22 including the Abilene Hamby Water Reclamation Facility, which is the largest
23 MBR facility in Texas, and is one of the first potable reuse facilities in the world

1 that successfully utilizes MBR, reverse osmosis, ozonation, and biologically
2 active filters.

3 **Q. What, if any, professional organizations or associations do you have**
4 **involvement with in connection with your engineering practice, or**
5 **otherwise with your work in the engineering industry?**

6 A. I am a member of the American Membrane Technology Association, the Water
7 Environment Federation, the Water Environment Association of Texas, the
8 American Water Works Association, the Texas Society of Professional
9 Engineers, the Texas Section of American Water Works Association, and I am
10 an active Board Member of the South Central Membrane Association.

11 **Q. In your professional capacity, have you written any technical papers**
12 **or peer reviewed articles?**

13 A. Yes, I have prepared technical papers and presentations for the WEAT
14 Eckenfelder Lecture Series on MBR technology, case studies on MBR treatment
15 facilities for AMTA-SCMA joint workshops, case studies on the Abilene MBR
16 potable reuse project for the WEFTEC conference, case studies on the Abilene
17 MBR potable reuse project for the WateReuse Annual Symposium, case studies
18 on the advancement of MBR technologies for multiple Texas Water
19 conferences, case studies on membrane filtration retrofits and radionuclide
20 reduction options for the Texas Water conference, and multiple advanced
21 treatment technology case studies for multiple annual Central West Texas
22 Water Utility Association regional operator training schools, and multiple case
23 studies on advanced water treatment technologies and MBR technology

1 advancements at multiple South Central Membrane Association annual
2 conferences.

3 **Q. Have you attended any seminars, conferences, classes, or courses**
4 **that relate to your work as a professional design engineer?**

5 A. Yes, I have attended numerous seminars and conferences in water, wastewater
6 and reuse engineering design, water resources, water planning, and water
7 infrastructure development throughout my career. I regularly teach special
8 topics courses, for example, on membrane filtration, desalination, radionuclide
9 reduction, sequencing batch reactors, membrane bioreactors, biological
10 nutrient removal, granular activated sludge, potable and non-potable reuse,
11 etc., at the annual Central West Texas Water Utility Association regional
12 operator training school held in May of each year in Abilene. I also regularly
13 give presentations and provide operator training lectures for South Central
14 Membrane Association operator training workshops as a subject matter expert
15 on low pressure membrane filtration, high pressure membrane desalination,
16 and membrane bioreactor technologies. For TCEQ-certified training, I am
17 currently TCEQ-certified to train membrane operators in Texas under the
18 SCMA's Membrane Operator Certification (MOC) program, for Introduction to
19 Membrane Systems (MOC I). I am also currently working with TCEQ and
20 SCMA to become a TCEQ-certified instructor to support ongoing training of
21 operators at membrane facilities in Texas under the SCMA's MOC program, for
22 Advanced Training of RO and Nanofiltration Systems (MOC II), Advanced

1 Training of Membrane Filtration Systems (MOC III), and Advanced Training
2 of Membrane Bioreactor Systems (MOC IV).

3 **Q. I'm handing you a document that has been marked as COG Exhibit**
4 **301. Can you please describe this document?**

5 A. This is my professional resume.

6 **Q. Is COG Exhibit 301 a true and correct copy of your professional**
7 **resume?**

8 A. It is.

9 **Q. Does COG Exhibit 301 fairly and accurately summarize your**
10 **professional and educational experiences that you just described in**
11 **your testimony?**

12 A. It does, yes.

13 **Q. Describe your areas of focus as an engineer, particularly with**
14 **respect to projects like the wastewater treatment plant development**
15 **project that is the subject of the application.**

16 A. My two primary areas of focus as a design engineer are with respect to the
17 design of advanced water treatment and advanced wastewater treatment
18 facilities. With regard to design of a wastewater treatment facility, I focus on
19 the planning, permitting, preliminary and final design, construction
20 administration, commissioning, and operator training for new facilities. The
21 planning and permitting efforts are completed in coordination with one
22 another, as the first major step in the design of a new WWTP facility or potential
23 expansion or modification of an existing WWTP facility is to coordinate with

1 TCEQ to determine the anticipated outfall location, the anticipated flow rate,
2 or flow rates, if more than one permit phase may be required due to anticipated
3 growth in the service area over a short period of time, and to most importantly,
4 to determine the potential permit limits evaluated from a desktop analysis. A
5 desktop analysis of the potential receiving stream is the level of analysis
6 typically completed prior to formal submittal of a permit application to TCEQ.

7 Based on the potential permit limit information provided by TCEQ and
8 coordination with the Owner on anticipated project needs (such as needs for
9 Type I or Type II non-potable reuse, needs for potable reuse, needs to minimize
10 energy, chemical and manpower costs, needs to minimize odors, noise and site
11 lighting concerns, etc.), I would then begin evaluating potential treatment
12 technologies for the secondary treatment portion of the proposed WWTP
13 improvements, which forms the core of the compliance requirements for
14 wastewater treatment in the facility. Development of pretreatment and post-
15 treatment designs are based primarily on the secondary treatment process
16 selected by the Owner (based on a multi-factor evaluation procedure reviewing
17 capital and operation and maintenance costs, treatment capability to meet a
18 specific set of proposed permit limits, level of operation and maintenance
19 requirements for operators, etc.).

20 Following development of the secondary treatment, pretreatment, and
21 post-treatment process selections, I would then begin working on preliminary
22 process design calculations for each treatment process, in compliance with
23 current TCEQ design criteria contained in Title 30 Chapter 217 which replaced

1 the previous Chapter 317 wastewater design criteria in Fall 2008. Following
2 development of preliminary process design calculations, I would then begin
3 preparing detailed design drawings and technical specifications for equipment
4 supply and treatment structure construction, to prepare for submittal of the
5 proposed design to TCEQ for plan review and approval. TCEQ currently
6 requires submittal of design drawings, specifications and a design report above
7 and beyond the past requirement of submittal of only a summary transmittal
8 letter to TCEQ on the proposed design to TCEQ for review and approval for
9 advanced treatment facilities that utilize either BNR, SBR or MBR technologies
10 (Refer to Exhibit 3). This plan submittal requirement was initiated several
11 years ago due to a failure in an SBR facility where its design was not coordinated
12 with TCEQ. For this reason, the proposed design of an advanced wastewater
13 treatment facility in Texas actually has to be proven up twice, first in the process
14 unit compliance coordination with TCEQ's permitting division during the
15 permitting process, and second with TCEQ's wastewater plan review team.

16 Following completion of design, I then coordinate with the Owner to
17 determine the necessary project delivery method, that is, traditional design-
18 bid-build, design-build, construction-manager-at-risk, or competitively sealed
19 proposals, and then prepare final bid proposal documents to support the
20 Owner's selected method of procurement.

21 Once the project is in construction, I respond to requests for information
22 from the contractor, I review equipment and construction submittals for
23 compliance with the contract construction documents, as well as reviewing any

1 proposed alternates or substitutions in the project. For example, I review of an
2 alternate equipment vendor as compared to the basis of design for a piece of
3 equipment. During construction I also coordinate with the contractor to prepare
4 for system startup and commissioning, as well as conducting initial training of
5 operators in the process theory of the proposed improvements, to prepare for
6 initial startup operation of the new facilities, followed by optimized
7 performance of the new facilities.

8 **Q. Over the course of your career, have you developed the ability to**
9 **review, interpret, and apply federal, state, and local statutes, rules,**
10 **and regulations?**

11 A. I have. I have utilized various statutes, codes, and rules throughout my career
12 that are relevant to wastewater treatment plant siting, design, construction,
13 permitting, commissioning and optimized operation. While I am familiar with
14 other states' requirements for wastewater design criteria (such as the Ten State
15 Standards), the domestic wastewater design criteria that holds primacy for
16 applicability in Texas are 30 TAC 217 for treatment criteria and 30 TAC 309 for
17 treatment plant siting.

18 **CITY OF GRANBURY OFFERS COG EXHIBIT 301 FOR ADMISSION INTO**
19 **EVIDENCE.**

20 **II. PURPOSE OF TESTIMONY**

21 **Q. Please explain your role in the project?**

22 A. In this project I was both the project manager and design manager. From a
23 project management standpoint, my efforts included coordination with the City
24 of Granbury on potential treatment alternatives, coordination with TCEQ

1 during development of the permit application for the proposed East WWTP,
2 and coordination with TCEQ during review of the proposed design. In this role
3 I also provided information about the proposed project to the general public,
4 including a landowner information workshop (Refer to Exhibit 4) and a
5 meeting with the Rists, to answer questions about the proposed MBR system,
6 lighting, noise and odor concerns.

7 Prior to initiation of permitting and design for the proposed East WWTP
8 facility, Chris Hay and I prepared a detailed wastewater system planning study
9 (refer to Exhibit 5 – WW planning study), which included the development of
10 multiple treatment alternatives for the City of Granbury’s existing wastewater
11 system. The intent of the alternatives development and evaluation was to first
12 determine what additional capacity may be needed over time for the City of
13 Granbury, then second to determine what portions of the City’s existing
14 wastewater collection were overloaded (based on wastewater system
15 modeling), and third to identify both treatment and collection system
16 improvements alternatives and costs to determine the most practicable method
17 of increasing the City’s wastewater treatment and collection system capacity in
18 a manner that would be the most environmentally protective of Lake Granbury
19 and nearby tributaries. Given the level of buildout throughout the central area
20 of the City (which would prohibit significant wastewater line replacements
21 through the heart of the City) and the ongoing concerns about potential future
22 sanitary sewer overflows (SSOs) that could be caused as a result of the failure
23 of one or more of the existing raw wastewater force mains that transfer raw

1 wastewater from the west side and the north side of Lake Granbury to the City's
2 sole WWTP (which if a force main failure occurs, would result in spilling raw
3 wastewater directly into the City's primary raw water supply, Lake Granbury),
4 and through an exhaustive, wholistic evaluation of necessary treatment and
5 collection improvements, the recommended wastewater system improvement
6 alternative selected by the City was to begin preparing to develop satellite
7 WWTPs over time. By developing satellite WWTPs over time, the City would be
8 able to begin the slow process of becoming capable of eliminating the existing
9 force main crossings at Lake Granbury, while also eliminating the City's
10 greatest source of SSOs in the City's east collection system; in other words, the
11 development of a new East WWTP in the City's eastern service area would not
12 only give relief to the City's growing wastewater needs by providing the
13 additional WWTP capacity needed at this time (which is why the City has been
14 forced to issue a city-wide moratorium on new developments until additional
15 WWTP capacity can be constructed [Refer to Exhibits 6 and 7]), but the capture
16 and treatment of wastewater within the City's eastern service area will also
17 reduce the number and severity of SSOs in this area, minimizing the number of
18 uncontrolled raw wastewater discharges into the environment, which would
19 result in a more environmentally protective solution than to maintain the
20 current system operations in trying to send all wastewater flows to the City's
21 existing sole WWTP.

22 From the design management standpoint in this project, my role was to
23 develop the original conceptual and preliminary design, to provide the process

1 calculations, process unit narratives, flow diagram and site development
2 exhibits for the new permit application and to support Luci Dunn during
3 development of the permit application and coordination with TCEQ to respond
4 to questions and requests for additional information. In addition, I prepared
5 the final technical design for the proposed East WWTP, including the
6 development of process unit calculations, mechanical drawings and technical
7 specifications, process flow diagrams and process piping and instrumentation
8 diagrams (P&IDs), the development of hydraulic flow profile calculations for
9 design and peak flow (for both the proposed Interim I and Final phase flow
10 profiles), the development of biological process modeling for the proposed BNR
11 and MBR processes, the design of the proposed ultraviolet (UV) light
12 disinfection system (including accounting for the anticipated impacts to the UV
13 transmissivity by the MBR filtrate), the design of the required pretreatment
14 systems (including coarse and fine mechanical screens, grit removal, and
15 influent pumping), the calculation of flow equalization volume necessary for
16 each proposed permit phase, the design of proposed solids storage, aeration,
17 and dewatering processes, the design of the proposed supervisory control and
18 data acquisition (SCADA) system for the proposed WWTP, and the design of
19 proposed sound attenuation, automated lighting controls, and continuous odor
20 control for the proposed treatment units.

21 I am the engineer of record for the proposed East WWTP improvements,
22 as well as for the proposed existing WWTP improvements (currently under
23 construction), which utilize the same design fundamentals (i.e., pretreatment,

1 flow equalization, BNR, MBR, UV disinfection, solids handling, SCADA, odor
2 control, etc.) as the existing WWTP improvements. The proposed East WWTP
3 improvements design has already been submitted to TCEQ for review and
4 approval, and the proposed plans and specifications for the proposed East
5 WWTP were reviewed and approved by TCEQ, the same as the plans and
6 specifications approval from TCEQ for the existing WWTP. I designed the plans
7 and specifications for each proposed WWTP improvements project in
8 compliance with 30 TAC 217 design criteria, and includes my experience in
9 working with TCEQ on multiple additional advanced wastewater treatment
10 projects, as I am also a part of the stakeholder group that is coordinating with
11 TCEQ on its upcoming 2022 revisions to advanced treatment design criteria for
12 BNR, SBR and MBR systems discussed in 30 TAC 217.

13 **Q. Please take a look at the exhibit that has already been admitted as**
14 **Admin Record Exhibit A, pages Admin Record 0113 through 0183.**
15 **Is this the draft permit you're referring to?**

16 A. Yes, it is.

17 **Q. Take a look at Tab D in Admin Record Exhibit A, which begins on the**
18 **page labeled Admin Record 0209. Is this the application you're**
19 **referring to?**

20 A. It is, yes.

21 **Q. You worked with others at eHT on the project, is that right?**

22 A. That is correct. Prior to initiation of permitting and design for the proposed
23 East WWTP facility, Chris Hay and I prepared a detailed wastewater system

1 planning study, which included the development of multiple treatment
2 alternatives for the City of Granbury's existing wastewater system, which led to
3 the recommended wastewater system improvement alternative selected by the
4 City was to begin preparing to develop satellite WWTPs over time. In the
5 alternatives planning study effort, my role in the effort was to identify multiple
6 treatment options, including location, treatment technology, and WWTP size,
7 and Chris Hay's role in the effort was to develop a hydraulic wastewater model
8 to evaluate the existing wastewater collection system performance as well as
9 identify and evaluate potential wastewater collection improvements to
10 complement my proposed WWTP alternatives. In addition, I coordinated with
11 Dave Baker on the proposed treatment technology options, to gain his
12 operational experience (both by himself as a WWTP operator and his 20+ years
13 of experience in working with the City of Granbury's operators) and feedback
14 on advantages and disadvantages of each potential treatment alternative as
15 part of my alternatives feasibility analysis.

16 Following the City's decision to proceed forward with the permitting and
17 design of the proposed East WWTP improvements, Luci Dunn began preparing
18 the new permit application, and I provided the process calculations, process
19 unit narratives, flow diagram and site development exhibits for the new permit
20 application to Luci to support her effort in development of the permit
21 application and to assist Luci in answering any technical design questions from
22 TCEQ that commonly arise during the permit application review process.

1 In parallel to the permitting effort, at the City’s request, Chris Hay, Luci
2 Dunn and I prepared a presentation for affected landowners for the proposed
3 East WWTP improvement which included a discussion of the City’s need for
4 additional WWTP capacity in conjunction with the City’s need to relieve the
5 increasing overloaded condition of the eastern collection system in the City’s
6 wastewater service area.

7 **Q. Look at the document marked COG Exhibit 302. Do you recognize**
8 **this document?**

9 A. I do. This a package of information that I put together for the presentation I
10 just mentioned to the property owners near the East Wastewater Treatment
11 Plant.

12 **Q. Was the information recorded in COG Exhibit 302 made by, or from**
13 **information provided by, a person with knowledge of the conditions**
14 **recorded in the exhibit?**

15 A. It was.

16 **Q. Was the information made at or near the time of the conditions and**
17 **events that are recorded in the exhibit?**

18 A. It was.

19 **Q. Was the information recorded in COG Exhibit 302 made in the**
20 **regular course of your business?**

21 A. Yes, it was.

1 **Q. Was the information recorded in the exhibit kept in the regular**
2 **course of your business?**

3 A. Yes.

4 **THE CITY OF GRANBURY OFFERS COG EXHIBIT 302 FOR ADMISSION INTO**
5 **THE RECORD.**

6 **Q. Can you explain more about this workshop?**

7 A. The workshop also included a discussion of the proposed treatment
8 technologies, BNR, MBR and UV disinfection, and the various treatment
9 features included in the project that go above and beyond standard wastewater
10 design criteria established in TCEQ's 30 TAC 217 wastewater design
11 requirements, such as continuous odor control, sound attenuation for all major
12 pieces of equipment, automated lighting control, etc. The workshop also
13 included discussion of the anticipated effluent water quality from the proposed
14 BNR and MBR improvements, including a quality superior to anticipated
15 standard permit limits, as well as meeting the levels of treatment requirements
16 necessary for human contact with the effluent from the proposed East WWTP
17 facility. We explained that during the detailed design effort, I completed the
18 technical treatment design of the proposed East WWTP improvements, and
19 Chris Hay prepared the offsite wastewater collection and potable water supply
20 line improvements required for the proposed East WWTP improvements.

21 **Q. You mentioned your role in designing the East Wastewater**
22 **Treatment Plant. What level of design is required at this point in the**

1 **permitting stage of a wastewater treatment plant project like this**
2 **one?**

3 A. The minimum level of design completion to complete the necessary technical
4 section of a new or major permit application is what is known in the
5 engineering industry as “30 percent”. At “30 percent” design completion,
6 process calculations have been developed to size each treatment unit, but the
7 design effort has not yet progressed to the level of developing detailed plan and
8 section views of the proposed treatment units. For example, in the sizing of an
9 MBR unit, “30percent design” would include the determination of the daily
10 average, design, maximum month, and peak hourly flux rate of the MBR unit.
11 In addition, the 30 percent design would include determination of the
12 dimensions of the MBR tanks, the number of cassettes and modules within
13 each MBR tank, the necessary air scour flow rate, etc. There are additional
14 requirements under 30 TAC 217.157.

15 **Q. You have in front of you a few documents I’d like to talk about. First,**
16 **look at the document already admitted as Admin Record A,**
17 **specifically the pages Admin Record-0675 through page 0677. It’s**
18 **titled “Attachment DTR 1.0 - 2.C Flow Diagrams”. What is this**
19 **document?**

20 A. This document is an excerpt from the permit application that was submitted to
21 TCEQ for the proposed East Wastewater Treatment Plant. This document
22 includes two process flow diagrams, one for the proposed Interim I, a 1 MGD
23 phase, and the second for the proposed Final, a 2 MGD phase. Each process

1 flow diagram provides a simple block diagram depicting the various treatment
2 units proposed in each proposed permit phase. The flow diagram for each phase
3 includes the various types of pretreatment (coarse mechanical screens, fine
4 mechanical screens, grit removal, influent pumping, flow equalization),
5 secondary treatment (BNR and MBR zones), post-treatment (UV disinfection),
6 and solids handling (aerated solids storage and dewatering) processes.

7 **Q. I'm marking Admin Record-0675 through page 0677 separately as**
8 **COG Exhibit 303. Here is another excerpt from Admin Record**
9 **Exhibit A, specifically pages Admin Record-0664-0672. It's titled**
10 **"Attachment DAR 1.1-3 Buffer Zone Map & Temporary EQ Basin**
11 **Buffer Zone Justification". Do you recognize this document?**

12 A. Yes, I do. This document includes information on the proposed concrete flow
13 equalization basins, as well as emails pertaining to the proposed treatment
14 processes at the proposed South Wastewater Treatment Plant improvements,
15 and finally an email exchange with Louis Herrin at TCEQ referring to the
16 previous City of Cisco WWTP project where TCEQ provided guidance on the
17 applicability of a 150-foot buffer zone around unaerated structures, such as a
18 flow equalization basin, as long as the water in the basin was not allowed to go
19 septic.

20 **Q. I'll label this Admin Record pages 0664 through 0672 as COG**
21 **Exhibit 304. Now look at this document titled "Attachment DTR 1.1-**
22 **4 Design Calculations." It's also an excerpt from Admin Record**

1 **Exhibit A, at pages Admin Record-0693 through 0707. Do you**
2 **recognize this?**

3 A. Yes, I do. I prepared these process unit calculations to verify compliance with
4 wastewater treatment unit design criteria, per 30 TAC 217. This document
5 includes the process design calculations for both the proposed Interim I phase
6 and the proposed Final phase.

7 **Q. I'll mark Admin Record-0693 through 0707 as COG Exhibit 305.**
8 **When you talk about designing a wastewater treatment plant for**
9 **purposes of permitting, are COG Exhibits 303, 304, and 305**
10 **reflective of that type of design work?**

11 A. Yes, that is correct. The development of process design calculations, process
12 flow diagrams and proposed site plans for the proposed phases of the permit
13 application are all required to reflect a general conformance with treatment
14 unit design criteria from 30 TAC 217. However, I note "general conformance"
15 as the final approval of the proposed technical design is completed by the
16 TCEQ's wastewater design plan review team. For this reason, it is very common
17 for the TCEQ's permitting team members to coordinate with the wastewater
18 plan review team members to complete their technical review of the proposed
19 technical design information in the permit application ahead of actual design
20 plans and specifications submittal to the wastewater plan review team,
21 especially in the case of advanced treatment facilities such as an MBR WWTP.

22 **THE DOCUMENTS MARKED COG EXHIBIT 303, COG EXHIBIT 304, AND COG**
23 **EXHIBIT 305 ARE EXCERPTS FROM EXHIBITS THAT ARE ALREADY IN**
24 **EVIDENCE. BUT FOR EASE OF DISCUSSION I'LL OFFER THEM**
25 **INDIVIDUALLY FOR ADMISSION INTO THE RECORD.**

1 **Q. Before we discuss these exhibits more, can you generally describe**
2 **the type of wastewater treatment plant you have designed, and how**
3 **it compares with other wastewater treatment technology?**

4 A. The technology I utilized for the proposed East WWTP improvements is based
5 on the use of membrane bioreactors in coordination with biological nutrient
6 removal. The City's with this plant is to produce an effluent capable of not only
7 meeting Type I reuse requirements but also preparing for the potential for
8 supporting potable reuse polishing technologies in the future. The City wanted
9 a compact treatment footprint, and it wanted the highest level of effluent
10 quality, as compared to other current wastewater treatment technologies. It
11 became clear during the development of the wastewater system study that the
12 MBR process for both the proposed East WWTP and the proposed upgrade to
13 the City's existing WWTP was the best solution.

14 The treatment capability of an MBR and BNR system far surpasses the
15 treatment capability of a conventional activated sludge WWTP. Conventional
16 activated sludge treatment is the technology commonly used at much larger
17 WWTPs such as the regional WWTP facilities around Austin, like the Walnut
18 Creek WWTP and the South Austin Regional WWTP.

19 There is virtually no comparison in treatment capability between an MBR
20 WWTP and a lagoon WWTP, as an MBR process can produce effluent quality
21 that can be further polished to potable water quality, whereas a lagoon
22 treatment process is considered a "primary treatment" process only. It can only
23 remove a small percentage of dissolved organics like 5-day biochemical oxygen

1 demand. That's why very few active lagoon WWTPs are still allowed to
2 discharge into a receiving stream due to their poor effluent quality. The
3 majority of the active lagoon WWTPs in Texas must utilize a Texas Land
4 Application Program permit for land application of effluent in order to prevent
5 the lagoon effluent from contaminating nearby receiving streams.

6 **Q. Can you describe how an MBR system works?**

7 A. The design of an MBR system utilizes the same type of membrane filters that
8 are used in submerged membrane filtration drinking water treatment plants.
9 Those filters actively separate clean effluent from the suspended solids found
10 in the activated sludge. The use of MBR is much more efficient in separating
11 clean effluent from the activated sludge than the traditional use of secondary
12 clarifiers and has the added bonus of utilize membrane filtration for that
13 filtration step. This provides orders of magnitude lower bacteria concentrations
14 in the effluent from an MBR as compared to a conventional treatment WWTP.
15 For this reason TCEQ allows in 30 TAC 217.157(d)(11) for reduced disinfection
16 of MBR effluent due to its 6-log, meaning 99.9999 percent reduction of
17 bacteria, and 3-log, or 99.9 percent reduction of viruses through the use of the
18 MBR membrane filters alone. By comparison, to achieve the same level of
19 treatment as an MBR facility, you would need to install a membrane filtration
20 water treatment plant behind the City of Austin's Walnut Creek conventional
21 WWTP.

22 Furthermore, the use of a biological nutrient removal, or BNR, biological
23 process is necessary if the proposed receiving stream will require the

1 implementation of an advanced nutrient limit, such as total phosphorus or total
2 nitrogen. In the case of the proposed East WWTP improvements, Luci Dunn
3 and I initially contacted TCEQ to determine the likely permit constituents and
4 limits and verified that a total phosphorus limit was likely for the proposed East
5 WWTP. For this reason, I designed the proposed BNR system to utilize
6 anaerobic, anoxic, and aerobic selector zones, to optimize the proposed East
7 WWTP's capability to significantly reduce BOD₅, total suspended solids (TSS),
8 ammonia, and total phosphorus.

9 The proposed anaerobic selector zone will convert phosphorus to a form
10 that supports luxury uptake in the aerobic selector zone. The proposed anoxic
11 selector zone will support simultaneous nitrification and denitrification,
12 restoring alkalinity to the effluent and reducing both ammonia and total
13 nitrogen, while providing a denitrified mixed liquor to be recycled to the
14 anaerobic selector zone to support the necessary phosphorus conversion step
15 while preventing the anaerobic selector zone from going septic. The aerobic
16 selector zone will focus on maximizing BOD₅ and ammonia reduction while
17 enhancing biological phosphorus reduction via luxury uptake (this creates an
18 environment where the bacteria absorb more phosphorus than they need to
19 produce more bacterial cells).

20 Throughout the United States MBR technology has been identified as a
21 superior treatment technology, allowing for effluent concentrations well below
22 that which can be guaranteed from conventional treatment plants. However,
23 having worked on more permanent (as opposed to package plant) MBR

1 facilities than just about anyone else in Texas, I have observed that a properly
2 designed, well operated MBR WWTP can produce effluent quality even better
3 than the anticipated performance standards noted above.

4 Furthermore, the City of Granbury maintains the highest level of
5 operator expertise at the City's existing WWTP, and regularly maintains
6 compliant operation of the facility, despite the WWTP already approaching the
7 end of its useful life, with equipment failures at the plant occurring on an ever-
8 increasing rate due to decades of "wear and tear". However, given the
9 consistent level of permit compliance achieved by the City's WWTP operators
10 with an old WWTP that is already at the end of its life, the City's operators are
11 not only capable of correctly operating the proposed new MBR facilities within
12 the permit limit requirements, but the City's operators will be able to optimize
13 the proposed new treatment processes to produce effluent quality significantly
14 better than the currently proposed draft permit limits.

15 **Q. Are you familiar with title 30, section 309.13 of the Texas**
16 **Administrative Code?**

17 A. I am.

18 **Q. How so?**

19 A. Section 309.13 refers to unsuitable site characteristics, which includes criteria
20 that are part of the required due diligence in the development of both potential
21 new WWTP locations as well as verification of compliance on existing WWTP
22 facilities. These are fundamental rules that must be taken into consideration
23 during the planning and permitting efforts for a WWTP. Some of the criteria

1 are very straightforward and do not require any interpretation, whereas certain
2 criteria may require additional coordination with TCEQ to verify efforts needed
3 to appropriately comply with the criteria. Luci and I commonly discuss these
4 items with TCEQ to ensure that we are providing the best advice to our clients
5 with regard to compliance for an existing or new WWTP site.

6 **Q. Are you familiar with section 309.13(e)(1) of that rule?**

7 A. Yes, it's the primary rule that governs spacing requirements of certain
8 treatment plant units from the facility property line as a method of abating and
9 controlling potential nuisance odors. It prohibits the construction of lagoons
10 with zones of anaerobic activity any closer than 500 feet from the nearest
11 property line, on the basis that lagoon storing wastewater indefinitely would be
12 anticipated to "go septic", which would be anticipated to increase the amount
13 of nuisance odors off gassing from the raw wastewater. The rule also requires
14 that treatment units that are not lagoons with zones of anaerobic activity be at
15 least 150 feet from the nearest property line. The purpose of the rule is to abate
16 and control nuisance odors by creating a certain distance of separation between
17 treatment plant units and adjacent properties.

18 **Q. What is a lagoon?**

19 A. A lagoon is a pond-like body of water, normally constructed by excavating a
20 hole in the ground or building a berm above ground to provide a surface
21 impoundment of wastewater. To minimize the risk of leakage, the liner of a
22 lagoon is normally either constructed of compacted clay (this is a common

1 approach if there is significant clay in the native soil in the area) or a synthetic
2 membrane liner is installed along the bottom and side of the lagoon.

3 The use of a lagoon WWTP system was very popular in rural areas dating
4 back to before World War I, with one of the earliest uses in Texas dating back
5 to the early 1900s. The popularity of a lagoon plant is that it requires little to
6 no effort for it to work, as long as you don't mind the fairly poor quality of
7 effluent. The poor quality of effluent, significant odors and significant plant
8 footprint have resulted in a significant reduction of lagoon facilities throughout
9 Texas over the past 20 years. As I noted previously, the majority of the still
10 functioning lagoon WWTPs in Texas have all but transitioned to a TLAP land
11 application permit due to their inability to consistently meet "typical"
12 conventional permit limits – to comply with a TLAP permit, a lagoon WWTP is
13 allowed to discharge up to 100 mg/L BOD₅, with no limits for TSS, ammonia,
14 or other nutrients.

15 **Q. What is a zone of anaerobic activity?**

16 A. A zone of anaerobic activity is a zone where biological activity occurs without
17 the presence of oxygen.

18 **Q. What's so significant about lagoons with zones of anaerobic activity**
19 **that they require more separation from the property line than other**
20 **treatment plant units?**

21 A. In this zone, in the absence of other actions, the bacteria growing in anaerobic
22 conditions for long periods of time, typically for periods longer than 48 hours,
23 will produce methane and hydrogen sulfide. This additional separation from a

1 property line is due to the continuous off gassing of nuisance odors that can
2 occur from a lagoon or equalization basin that stores raw wastewater for weeks
3 or months on a continuous basis.

4 **Q. In your experience, are there many new wastewater treatment**
5 **plants designed and constructed today that use lagoons with zones**
6 **of anaerobic activity?**

7 A. No.

8 **Q. Why not?**

9 A. First, because lagoon treatment technology cannot meet the same permit limits
10 as a conventional treatment plant. At eHT we currently have two WWTP
11 projects right now that are transitioning from lagoon plants to mechanical
12 treatment WWTPs because they are under agreed order from TCEQ that they
13 must eliminate the lagoon plants due to ongoing permit noncompliance. In
14 order to maintain some level of permit compliance, the majority of the
15 remaining lagoon plants in Texas have had to transition to TLAP land
16 application permits. The challenge with this is then being able to acquire
17 enough land nearby for land application, which requires upwards of 40 acres
18 per 100,000 gallons per day of WWTP capacity. For example, a 1 MGD WWTP
19 would require roughly 400 acres of additional property for land application. By
20 comparison, a potential county regional WWTP rated for 10 MGD and using
21 lagoon treatment technology would require approximately 4,000 acres for land
22 application.

1 Besides logistical challenges of trying to find enough property to build a
2 lagoon system as well as the property needed for the land application system,
3 the effluent quality from a lagoon plant is inferior to that of an MBR facility.
4 From the standpoint of treatment effectiveness, life cycle cost, capability of
5 minimizing odor production, and producing the best effluent quality possible
6 to protect the environment, MBR technology is by far superior to lagoon
7 technology.

8 **Q. Does the facility you designed for this application have any lagoons**
9 **with zones of anaerobic activity?**

10 A. There are no lagoons in the facility I have designed. There are two un-aerated
11 areas in the proposed East WWTP. The first un-aerated area is the proposed
12 temporary flow equalization (EQ) basin, which is a permanent storage tank that
13 will temporarily store wastewater in a peak flow event caused by a storm, where
14 a large portion of the volume would be expected to be mostly stormwater that
15 has diluted the influent wastewater for no more than 48 hours, before returning
16 the wastewater to the influent lift station, to be sent to the BNR and MBR
17 processes for biological treatment. However, despite the intent to maintain
18 diluted wastewater in the EQ basin during a storm event for no more than 48
19 hours before treating the stored volume, the proposed EQ basin has been
20 designed to include a cover as well as foul air piping from the EQ basin to the
21 process aeration and MBR air scour blowers, to send the foul air to the aerobic
22 selector zone and to the MBR tanks to allow for continuous biological treatment
23 of any foul air that could be produced from the EQ basin during the brief

1 periods that dilute wastewater might be stored in the EQ basin. As a note, the
2 design intent is that under normal dry weather conditions, wastewater is not
3 stored in the EQ basin, it is solely for excess flow storage during a large storm
4 event only.

5 The second un-aerated area will be the anaerobic selector zone as part
6 of the BNR process. The calculated hydraulic retention time, that is, the amount
7 of time that a drop of water remains within a specific tank volume, is
8 approximately 1.5 hours at the Interim I design flow of 1 MGD, which is
9 significantly less than the 48-hour threshold noted by TCEQ as their limit
10 where raw wastewater sitting in a tank un-aerated is anticipated to start
11 producing nuisance odors. Furthermore, I designed the proposed anaerobic
12 selector zone to utilize all submerged mixing to facilitate optimized mixing of
13 influent wastewater with denitrified mixed liquor from the anoxic zone. The use
14 of submersible mixers as required by TCEQ in 30 TAC 217.157 supports the
15 need to provide appropriate mixing within the selector zone while maintaining
16 quiescent conditions on the water surface, further minimizing the risk of any
17 off gassing of any nuisance odors. Given these reasons and the need for the
18 operators to be able to visually inspect the treatment basin for color and
19 consistency of the mixed liquor in the anaerobic selector zone, I designed the
20 anaerobic selector zone without a cover.

21 **Q. Is COG Exhibit 304 an accurate reflection of your design of the**
22 **wastewater facility?**

23 A. Yes, that is correct.

1 **Q. The protestants, particularly their key witness Mr. Esmond, says**
2 **that you have designed a plant that uses lagoons with zones of**
3 **anaerobic activity. And because of that, you need a 500-foot**
4 **separation between the treatment units and the property line. Have**
5 **you seen Mr. Esmond’s testimony?**

6 A. I have. I’ve also seen and read his deposition. There are several issues with Mr.
7 Esmond’s testimony and deposition information I would like to address if
8 possible. First, Mr. Esmond noted in his deposition that he was confused about
9 the labeling of the proposed “Temporary EQ Basin”. The intent of this labeling
10 was to maintain the understanding with TCEQ that the intended use of the
11 proposed EQ basin is to temporarily store excess influent wastewater flow
12 during a major storm event, and then drain the basin back to the influent lift
13 station at the WWTP to send that volume of wastewater on to the BNR and
14 MBR system for full treatment as soon as influent flows drop below the peak
15 throughput capacity of the proposed MBR system.

16 Second, I do not agree with Mr. Esmond’s statements on his
17 understanding of BNR selector zones. Mr. Esmond’s explanation that an anoxic
18 zone would clearly produce odors because it has no oxygen in it is incorrect.
19 “Anoxic” actually means deficiency of oxygen. Whereas anaerobic means no
20 oxygen present. The difference between an anaerobic selector zone and an
21 anoxic selector zone is that the anoxic selector zone does not have any free
22 dissolved oxygen in the tank, but it does have oxygen in the form of bound
23 oxygen. The lack of Mr. Esmond’s understanding of the differences between

1 anoxic and anaerobic selector zones reflects a lack of experience in designing,
2 troubleshooting, and optimizing BNR processes.

3 Further, Mr. Esmond’s lack of BNR process expertise is further reflected
4 in his Exhibit GF-303. Mr. Esmond used this image in his testimony to
5 demonstrate what a typical BNR facility would look like. A key issue with the
6 graphic is the use of floating, surface mixing aerators shown in the various
7 treatment zones in the picture. Surface mixing aerators should not be used with
8 BNR selector zones for several reasons, chief among them is a floating mixer in
9 an anaerobic selector zone would create significant surface turbulence that
10 would enhance the off gassing of any nuisance odors that might be produced in
11 the zone. Further, TCEQ design criteria in 30 TAC 217.157 specifically requires
12 the use of submersible mixers to prevent the issues caused by floating surface
13 mixers, which Mr. Esmond apparently does not recognize in the exhibit of a
14 “typical” BNR facility.

15 However, as a part of due diligence in design, there are practical needs
16 for odor control, where appropriate. Despite the fact the design of the proposed
17 EQ basin and the proposed BNR anaerobic selector zone have been specifically
18 designed to comply with TCEQ requirements to prevent wastewater in those
19 basins from going septic, eHT’s directive from the City of Granbury was to
20 design above and beyond minimum TCEQ criteria, which resulted in designing
21 an odor control system for the pretreatment components (e.g. coarse screening
22 structure, fine screening structure, grit removal structure, influent lift station,
23 and flow equalization basin). This included covering each of the pretreatment

1 components and designing the process aeration and MBR air scour blower
2 systems to utilize corrosion-resistant materials to allow for withdrawal of foul
3 air from each of the pretreatment process units on a 24-hour, 365 days a year
4 continuous basis. The foul air will be sent into the aerobic selector basin and
5 the MBR tanks, which will support biological treatment of the foul air, without
6 needing to utilize expensive chemical treatment systems like a caustic scrubber,
7 or potentially dangerous systems like a chlorine scrubber.

8 Further, other treatment units at the proposed East WWTP such as the
9 sludge storage tanks will utilize mechanical aeration to maintain aerobic
10 conditions within the sludge tanks.

11 **Q. Just to be clear, the facility design that you have proposed in the**
12 **application, the one you've just explained to us, is the facility design**
13 **that would be authorized by the draft permit if it is issued?**

14 A. Yes, that is correct.

15 **Q. Mr. Berryhill, based on all that you've discussed with us about your**
16 **design, and based on your personal knowledge in this field, your**
17 **skill, unique experience, extensive training, and education, do you**
18 **have an opinion regarding whether the draft permit complies with**
19 **applicable requirements to abate and control nuisance odors, as set**
20 **forth in title 30, section 309.13(e)?**

21 A. I do.

1 **Q. What is your opinion?**

2 A. As a fact, the wastewater treatment plant that is proposed in the application,
3 and that would be authorized by the draft permit, will not have any lagoons
4 with zones of anaerobic activity of any kind. The draft permit does not allow
5 for it. The facility that is authorized by the draft permit will in all respects
6 comply with section 309.13(e) of the TCEQ rules. So my opinion is that the
7 draft permit complies with applicable requirements to abate and control
8 nuisance odors, as set forth in section 309.13(e) of TCEQ rules.

9 **Q. Thank you. Let me change issues here a bit. Look at the document**
10 **titled “Attachment DTR 1.1 – 1.B.2 Justification for the Proposed**
11 **Facility”. It’s an excerpt from Admin Record Exhibit A, at pages**
12 **Admin Record-0681 through 0689. Do you recognize this?**

13 A. Yes. It’s the portion of the application that describes the need for the project.

14 **I’VE LABELED THIS DOCUMENT AS COG EXHIBIT 306. AS WITH THE**
15 **EARLIER EXHIBITS, THIS IS AN EXCERPT FROM ADMIN RECORD EXHIBIT**
16 **A, WHICH IS ALREADY IN EVIDENCE. I OFFER COG EXHIBIT 306**
17 **INDIVIDUALLY FOR ADMISSION INTO EVIDENCE.**

18 **Q. Did you draft COG Exhibit 306?**

19 A. I drafted the first part of this exhibit, that was excerpted from the Engineering
20 Feasibility Report. The second part of this exhibit that was excerpted from the
21 Environmental Information Document was drafted by Luci Dunn, with
22 technical information contributed from Chris Hay with regard to collection
23 system improvements and myself with regard to treatment improvements.

1 **Q. The front page of COG Exhibit 306 includes a statement that says,**
2 **“The following pages were excerpted from the EFR which was**
3 **submitted for the project.” What does that mean?**

4 A. That is the Engineering Feasibility Report I just mentioned, It is a document
5 describing the need for a project, proposed alternatives considered for the
6 project, and anticipated costs and timeline for the proposed project. This
7 document is required by the Texas Water Development Board as a part of the
8 planning phase tasks required to allow a project to proceed into the design
9 phase for funding.

10 The following pages that were excerpted from the EFR were specifically
11 from the section in the EFR report pertaining to anticipated growth projections
12 within the City of Granbury and projected wastewater flows within the next 20
13 years from the anticipated start of the project in 2018.

14 **Q. Further back on page 0686, there’s a statement on the page that**
15 **reads “The following pages were excerpted from the EID which was**
16 **submitted for the project.” Can you explain what that’s referring to?**

17 A. The Environmental Information Document (EID) is another planning-level
18 document describing the need for a project, proposed alternatives considered
19 for the project, potential environmental impacts of alternatives not selected,
20 and potential environmental impacts for the alternative recommended for the
21 project. This document is also required by the TWDB as a part of the planning
22 phase tasks required to allow a project to proceed into the design phase for
23 funding.

1 The following pages that were excerpted from the EID were specifically
2 from the section in the EID document pertaining to the need for the project,
3 given the anticipated increasing wastewater flows due to continuing growth in
4 the City’s service area, and the anticipated need for enhanced treatment that
5 the City’s existing WWTP cannot currently provide.

6 **Q. The statement goes on to read “The project need and purpose**
7 **section justifies the proposed facility”. Do you agree with that?**

8 A. Yes, I do.

9 **Q. Why?**

10 A. The reason that the City of Granbury is currently in a city-wide moratorium on
11 new developments is that between current wastewater flow and committed
12 connections to the wastewater system, the City is already at 100 percent of its
13 committed capacity. When we refer to committed connections, we are talking
14 about developments that have already been approved by the City and the only
15 thing keeping that flow from coming to the City’s existing WWTP is the current
16 market pricing and timing to build a house and for a family to move in. And
17 that timeline is outside of the City’s control.

18 When all of the currently approved and committed connections go
19 online, the City will not only be out of compliance with the TCEQ’s 75/90 Rule,
20 due to operating over 90 percent of capacity, potentially over 100 percent, but
21 the existing bottlenecks in the City’s wastewater collection system are likely to
22 result in significantly more uncontrolled SSOs throughout the collection
23 system, especially within the already overtaxed eastern service area. In order to

1 minimize the risk of uncontrolled discharges of untreated wastewater from the
2 already overloaded eastern collection system, it is urgent from a public health
3 and safety standpoint alone that the East WWTP get permitted and built as
4 soon as possible.

5 Furthermore, much of the equipment in the City's existing
6 WWTP is at or near the end of its useful life. Over the past several years, the
7 City has had to schedule multiple emergency City Council meetings to address
8 several equipment failures at the WWTP that could not wait for a regularly
9 scheduled council to obtain approval for large dollar expenditures to get the old
10 plant back up to normal performance. As the previously approved and
11 committed connections continue to come online, the potential for additional
12 equipment failures at the existing WWTP are only likely to increase.

13 **Q. Mr. Frossard stated multiple times in his testimony that he did not**
14 **see anything in the application regarding social or economic**
15 **development implications from denying the draft permit. Did you**
16 **see that testimony?**

17 A. I did.

18 **Q. Is he right?**

19 A. No. It's right there in the justification section of the application. In my career
20 as a process design engineer working all over the State of Texas, I fully
21 understand the challenges of limitations with a utility's capacity and how
22 rapidly and negatively that can impact business and residential growth in an
23 area. Granbury has been in that position for several years now and will

1 continue to be in that position until the proposed East WWTP can be permitted
2 and built. The justification portion of the application documents the need for
3 the additional WWTP capacity but doesn't fully capture all of the ramifications
4 if the proposed East WWTP is not permitted and built in the very near future.

5 **Q. Explain what you mean.**

6 A. If a community doesn't have adequate treatment capacity it can create
7 significant public and environmental hazards, especially given the proximity of
8 the existing wastewater collection system to the City's primary drinking water
9 source, Lake Granbury. Without the relief in the eastern collection system
10 provided by the proposed East WWTP, existing collection pipelines, manholes,
11 lift station wet wells, and lift station pumps will continue to become
12 overwhelmed during major storm events (even worse than what the City
13 currently observes). As the overloaded infrastructure begins to fail on an
14 increasing basis without collection loading relief (from the proposed East
15 WWTP), the potential for surcharges and raw wastewater backups into
16 businesses, daycares, schools and homes will get exceedingly worse. There is a
17 direct and definable connection to wastewater treatment capacity and the
18 ability of a city to grow and even function. History has shown that the two most
19 common causes of the failure of historical civilizations are the lack of safe
20 drinking water and the lack of adequate sanitary wastewater treatment. While
21 the City of Granbury has made great strides in strengthening its capability to
22 provide safe drinking water through the development of its new membrane
23 filtration and brackish desalination water plant, the increasing need for more

1 wastewater treatment capacity and its current moratorium impact on stopping
2 all new growth is creating an ever-tightening chokehold on the health and
3 wellbeing of this community, and will further jeopardize the public health and
4 safety of the City residents and the local environment as the City's collection
5 system and existing WWTP become increasingly stressed without the relief of
6 the proposed new East WWTP.

7 **Q. How does the proposed East plant address those issues?**

8 A. Installing a new WWTP in the eastern area of the City will reduce the strain on
9 the gravity interceptors, lift stations and force mains that carry the raw
10 wastewater across the City over to the City's existing WWTP. The ever-
11 increasing overloading of the City's eastern collection system continues to be
12 the biggest vulnerability of the City for accidental releases, particularly during
13 storm events, and will continue to carry the greatest risk until the proposed
14 East WWTP can be permitted and built, providing an immediate decrease in
15 SSO risk in that area.

16 Locating additional WWTP capacity where it's proposed reduces the
17 potential for uncontrolled untreated wastewater releases into the Lake
18 Granbury watershed, which makes it the better location of the other options
19 from an environmental and socio-economic standpoint. In other words, the
20 proposed East WWTP location is putting the right capacity in the right location
21 to provide the biggest benefit to the community, in terms of cost effectiveness,
22 environmental protection, and public health and safety. alternatives

1 assessments that the city undertook before settling on the East plant, but if
2 there's something to work with here, I'd like to do it.

3 **Q. Mr. Berryhill, based on your personal knowledge in this field, your**
4 **skill, experience, training, and education, do you have an opinion of**
5 **whether the TCEQ Commission should deny or alter the terms and**
6 **conditions of the draft permit based on the consideration of need?**

7 A. I do have an opinion about that.

8 **Q. Before we talk about what those opinions are, can you summarize**
9 **the basis for them?**

10 A. The basis for my opinions is the due diligence efforts completed by the City of
11 Granbury and eHT to complete a thorough evaluation of potential treatment
12 and collection system improvements options, the completion of the detailed
13 permitting and design efforts for the proposed East WWTP, and the ongoing
14 evaluation of both additional WWTP capacity needs for the City in addition ever
15 increasing needs to provide relief to portions of the City's wastewater collection
16 (specifically the eastern service area) in order to minimize the number of
17 uncontrolled discharges of untreated wastewater during major storm events
18 due to the overloaded condition of that part of the City's collection system.

19 **Q. Based on that, what is your opinion regarding whether the TCEQ**
20 **Commission should deny or alter the terms and conditions of the**
21 **draft permit based on the consideration of need?**

22 A. The City of Granbury needs the East Wastewater Treatment Plant, as soon as
23 possible. The community needs it, and the environment needs it to help minimize

1 the number of SSOs that are likely to increase over time if the East WWTP is
2 not permitted and built soon. The need for the proposed East WWTP is made
3 clear in the application.

4 Of the alternatives evaluated in the City's wastewater system planning
5 study, the selected alternative to upgrade the City's existing WWTP to BNR and
6 MBR (improving the effluent quality sent to Lake Granbury from the existing
7 WWTP) and to permit and construct the proposed East WWTP as a BNR and
8 MBR facility as a part of the Phase I project were evaluated by the City, the
9 Municipal Utility Advisory Board, the Capital Improvements Advisory
10 Committee, and eHT was determined to be the most practicable of the
11 evaluated alternatives, on the basis of utilizing the most advanced wastewater
12 treatment technology available in the industry to ensure that any potential
13 degradation of downstream water quality would be minimized through the use
14 of the proposed BNR and MBR technologies. The use of BNR and MBR
15 technologies in wastewater treatment has been proven repeatedly around the
16 world to be capable of producing high quality effluent with constituent
17 concentrations well below that of any other treatment technologies currently
18 available. To meet the original proposed permit limits stipulated by TCEQ's
19 permitting team, the City of Granbury could have elected to utilize a
20 conventional treatment process that would have most certainly resulted in
21 much higher nutrient and bacteria concentrations in the projected effluent –
22 instead, the City of Granbury chose to invest in the most advanced treatment
23 practicable for the project in order to lessen or prevent the degradation of

1 downstream water quality through the addition of the proposed new discharge
2 from the proposed East WWTP.

3 The permit limits and requirements of the draft permit would
4 provide the City with the ability to meet the needed additional WWTP
5 capacity where it is needed most, in the eastern service area. In order to be a
6 good steward to the environment, the City chose to utilize biological nutrient
7 removal and membrane bioreactor technologies for the proposed East
8 Wastewater Treatment Plant that are designed to handle the expected
9 quality of the influent wastewater at the proposed East plant to a level of
10 high effluent water quality that no other practical alternative can. The City
11 has gone to great cost and due diligence to design not just a good WWTP
12 facility, but the most practicable treatment facility to treat influent
13 wastewater to such a degree intended to prevent or lessen any potential
14 degradation of downstream waters. This need is accurately reflected in the
15 permit application and practicable treatment requirements have been
16 established in the TCEQ's draft permit.

17 **THANK YOU, MR. BERRYHILL. I HAVE NO FURTHER QUESTIONS AT THIS**
18 **TIME.**