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June 30, 2020

VIA CERTIFIED MAIL NO. 7018 0360 0000 3021 1923
RETURN RECEIPT REQUESTED

Mr. Toby Baker
Executive Director (MC-109)
Texas Commission on Environmental Quality
P.O. Box 13087
Austin, Texas 78711-3087

Re: Complaint that the San Jacinto River Authority and the City of Houston Are Diverting Water from Lake Conroe in Violation of Certificate of Adjudication No. 10-4963A, the Texas Water Code, and the Rules and Policies of the Texas Commission on Environmental Quality.

Dear Mr. Baker:

This complaint is submitted on behalf of the Lake Conroe Association ("LCA") regarding the diversion of state waters from Lake Conroe in Montgomery County in violation of the applicable approved water rights and state law. Specifically, the parties that are the subject of this complaint are the San Jacinto River Authority ("SJRA") and the City of Houston ("Houston"), which have adopted a policy of diverting, or releasing, water from Lake Conroe through the dam on the south end of the lake during several months in the spring and late summer for no identified beneficial use; they are simply lowering the level of Lake Conroe. The policy, which is commonly referred to as the "Seasonal Lake Lowering Strategy" (the "Lake Lowering Strategy" or "LLS"), has the stated purpose of preventing flooding in areas downstream of Lake Conroe.

SJRA's and Houston's diversion of state water from Lake Conroe pursuant to the LLS is in violation of the requirements of amended Certificate of Adjudication No. 10-4963A ("Amended Certificate"),[1] issued by the Texas Commission on Environmental Quality ("TCEQ") to SJRA and Houston on July 20, 2010. Similarly, SJRA's and Houston's diversion of state water violates state law as set out in Chapter 11 of the Texas Water Code, violates applicable rules of TCEQ, violates the water conservation requirements set out in the Amended Certificate, is contrary to the conservation commitments identified in the Region H Water Planning Group's 2016 Regional Water Plan ("2016 Region H Plan")[2] as approved by the Texas Water Development Board

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1 TCEQ, Amendment to a Certificate of Adjudication, Certificate No. 10-4963A issued to Owners SJRA & COH (July 20, 2010) [hereinafter the "Amended Certificate"], *available at* https://www15.tceq.texas.gov/crpub/index.cfm?fuseaction=iwr.viewdocument&doc_name=Cert%2E%2010%2D4963A%2Epdf&doc_id=442317412010203&format_cd=pdf.

2 *See* Region H Water Planning Group, "2016 Regional Water Plan" (Nov. 2015) [hereinafter "2016 Region H Plan"].

("TWDB"), conflicts with state and federal water conservation policies, and undermines the very purpose of a drinking water reservoir like Lake Conroe and the responsibilities and duties of drinking water providers such as SJRA and Houston. This unauthorized diversion from Lake Conroe poses a threat to the primary water supply for Montgomery County and to the backup water supply for the greater Houston metropolitan area.

LCA is a non-profit organization made up of area residents and businesses that are concerned with issues affecting their use and enjoyment of Lake Conroe, a water supply reservoir located on the West Fork of the San Jacinto River. Originally formed in 1977 to control and eliminate a Hydrilla infestation in Lake Conroe, LCA's goals are safe water levels, water conservation, resolving vegetation problems, and improving the overall quality of life around Lake Conroe.[3] While this letter and its attachments are somewhat lengthy, LCA feels that it is necessary to provide TCEQ with detailed information to fully address the seriousness of this matter.

LCA files this complaint based on three important arguments, which are discussed in detail below. First, the LLS violates state law and the Amended Certificate, both of which prohibit the wasting of state water. Second, the LLS will not prevent or even meaningfully reduce downstream flooding in the event of a major rainfall event like Hurricane Harvey. Third, the LLS is a direct threat to the area's water supply. Lake Conroe is the primary water source for over ninety public and private entities in Montgomery County and the backup water supply for Houston—the fifth largest Metropolitan Statistical Area ("MSA") in the country.[4] During drought conditions Lake Conroe becomes critically important as a water supply for Houston. In short, the LLS is illegal, ineffective, and wasteful.

In its efforts to fully assess the LLS prior to submitting this complaint to TCEQ, LCA retained $RSAH_2O$, an environmental and water consulting firm in Austin to review the LLS and to provide LCA with its assessment. The review was conducted by Carlos Rubinstein, who has thirty-five years of water policy experience, including positions as Chairman of TWDB, Commissioner of TCEQ, and Watermaster of the Rio Grande Basin, and by Herman Settemeyer, P.E., who has forty-three years of water policy experience, including Engineer Advisor to the Canadian, Pecos, Red, Rio Grande, and Sabine River Compacts, Texas Representative to the Association of Western States Engineers, and Manager of TCEQ Water Rights Permitting program. The opinion letter prepared by Mr. Rubinstein and Mr. Settemeyer after their review and evaluation is provided as Attachment 1 to this complaint.[5]

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[3] Lake Conroe Assoc., "About LCA," at https://lcatx.com/.

[4] Wikipedia, "List of Metropolitan Statistical Areas," (last edited June 14, 2020), at https://en.wikipedia.org/wiki/List_of_metropolitan_statistical_areas (citing U.S. Census Bureau, "Metropolitan and Micropolitan Statistical Areas Population Totals and Components of Change: 2010-2019, at https://www.census.gov/data/tables/time-series/demo/popest/2010s-total-metro-and-micro-statistical-areas.html).

[5] Letter from Carlos Rubinstein, Principal, & Herman R. Settemeyer, P.E., Partner, $RSAH_2O$, to Erich Birch, Birch, Becker & Moorman, LLP, at 1 (June 29, 2020), attached hereto as Attachment 1.

LCA understands that many people in the Lake Houston area support the LLS and believe that it will protect their homes and businesses during future flood events. LCA's purpose in filing this complaint is not to minimize the harm that flooding in the Lake Houston area has caused. Instead, LCA's purpose is to identify that not only is the LLS in violation of the Amended Certificate, TCEQ rules, and state law, it also does not provide the perceived protection from future flooding. The LLS is a placebo that provides a false sense of security to individuals and businesses. Unfortunately, as SJRA's own reports show, if another Hurricane Harvey were to hit the Houston area this fall, the LLS would not reduce flooding, and it could actually increase it. LCA and those in the Lake Houston area have a common interest in responsible water management, and the LLS is not the right answer for either group.

LCA requests that TCEQ consider all of the information laid out in this complaint, identify that SJRA and Houston, through implementation of the LLS, are in violation of the Amended Certificate, TCEQ rules, and state law, and take an appropriate enforcement action against both SJRA and Houston, including requiring SJRA and Houston to immediately cease the artificial lowering of Lake Conroe through the Lake Lowering Strategy.

A. Background

Starting in 2018, SJRA and Houston adopted the LLS, a policy of diverting, or discharging, water from Lake Conroe during several months in the spring and late summer. Earlier this year, SJRA and Houston took official action to continue this policy for three additional years, and possibly longer.[6] The LLS has the stated purpose of preventing flooding in areas downstream of Lake Conroe, primarily in the Kingwood, Atascocita, and surrounding areas of Lake Houston. These areas are approximately twenty-nine linear miles, or thirty-four river miles, south of the Lake Conroe dam.[7]

The LLS grew out of the aftermath of Hurricane Harvey, which struck Texas as a Category 4 hurricane on August 25, 2017.[8] Hurricane Harvey brought torrential and historic levels of rainfall, which resulted in serious flooding over hundreds of miles of Texas, from north of Conroe to south of Corpus Christi. Houston received over fifty inches of rainfall, with up to sixty inches in some areas. Substantial rainfall also fell in the upper San Jacinto River watersheds. The associated flooding was extensive, resulting in significant property damage.

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6 *See* Letter from Dave Martin, Mayor *Pro Tem*, Council Member Dist. E., Houston, to Bd. of Dirs., San Jacinto River Auth. (Feb. 24, 2020) [hereinafter "Mayor *Pro Tem* Letter"].

7 Texas Parks & Wildlife Dept., "San Jacinto River, West Fork," in *An Analysis of Texas Waterways: A Report on the Physical Characteristics of Rivers, Streams and Bayous in Texas*, (Sept. 1974), *available at* https://tpwd.texas.gov/publications/pwdpubs/pwd_rp_t3200_1047/09_e_tx_san_jacinto_trinity_elm.phtml.

8 *See* Memorandum from Jeff Lindner, Dir. of Hydrologic Operations/Meteorologist, & Steve Fitzgerald, Chief Engineer, Harris County Flood Control Dist., to HCFCD Flood Watch/Partners, at 1 (June 4, 2018) [hereinafter "HCFCD Final Report"], *available at* https://www.hcfcd.org/Portals/62/Harvey/immediate-flood-report-final-hurricane-harvey-2017.pdf. Rainfall associated with Hurricane Harvey began on the morning of August 25, 2017, but the first heavy bands of the hurricane entered Harris County on the evening of August 26. Heavy rain bands continued to sweep across Harris County through August 29. *See id.*

Despite the widespread flooding in the Lake Houston area, some locations did not flood immediately while the hurricane was in the area. Two to three days after the hurricane made landfall, and by some reports only hours after the gates of the Lake Conroe dam were opened,[9] the water levels in some areas around Lake Houston began to rise higher. Some homes and businesses that did not flood immediately during the hurricane flooded in the days that followed—flooding reportedly beginning on Monday, August 28.[10] Some people, therefore, concluded that the post-hurricane flooding was caused by the waters released from Lake Conroe. Several lawsuits were filed against SJRA based on this belief that the post-hurricane flooding was caused by the release of waters from the dam.[11]

The belief that post-hurricane flooding was caused by the Lake Conroe dam release gained momentum, creating a growing fear that Lake Conroe presented an on-going threat of downstream flooding. Some people believed that the flood threat from Lake Conroe waters would be eliminated or substantially reduced by lowering the lake several feet below normal pool level to increase the storage capacity in the event of a future storm. Eventually this proposal was presented to SJRA for consideration as a strategy for flood mitigation.

The SJRA Board of Directors considered the LLS proposal at its April 2018 meeting.[12] It ultimately decided to lower Lake Conroe by two feet below its normal pool level from August 1 through the end of September each year to provide "extra capacity" to store storm water in Lake Conroe. For reasons that are not clear from the record of the Board meeting, SJRA also decided to add a "spring lowering," whereby Lake Conroe would be lowered by one foot in the spring as a precautionary measure to prevent flooding in the case of heavy rains. This LLS remained in place for 2018 and 2019, with SJRA lowering Lake Conroe by one foot below normal pool level from April 1 through May 31 and by two feet below normal pool level from August 1 through September 30.

At the April 2018 meeting, the discussion of the SJRA Board clearly identified that the LLS was intended to be a temporary management activity to provide some "near-term" flood mitigation benefit while needed dredging of the lower West Fork of the San Jacinto River was completed. Thus, based on representations made by SJRA in 2018, it was the understanding of LCA and many in the Lake Conroe area that the LLS would only last for the time required to dredge sand and

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9 As will be explained in more detail below, the Lake Conroe dam was releasing water throughout much of the Hurricane Harvey event, starting on August 27, just hours after the main bands of the hurricane hit Harris County. This is contrary to claims that much of the severe downstream flooding only occurred shortly after the gates of the dam were opened to release waters from Lake Conroe.

10 *See, e.g.,* Plaintiffs' Amended Petition, *John Sorrentino, et al. v. San Jacinto River Auth.*, Cause No. 1140335, Harris County – County Civil Court at Law No. 4, at 48 (Aug. 29, 2019).

11 *See, e.g., id.*

12 *See* San Jacinto River Auth., Bd. of Dir., Minutes of Regular Meeting at Item 6.a.3. at 3-5 (Apr. 26, 2018), *available at* http://www.sjra.net/wp-content/uploads/2018/05/2018-Minutes_042618.pdf.

debris caused by Hurricane Harvey from the West Fork of the San Jacinto River.[13] However, in the autumn of 2019, SJRA indicated its intention to continue the LLS, resulting in significant public interest from both the Lake Conroe area and the Lake Houston area. After large, contentious public meetings held in January and February 2020, the SJRA Board again voted to continue a modified version of the LLS until 2022.[14] Shortly after April 1, 2020, SJRA again began diverting water from Lake Conroe with no purpose other than to lower Lake Conroe. Due to the LLS and the moderate drought conditions, Lake Conroe has not been at full pool for over a year.

B. Bases for This Complaint

1. TCEQ Has the Authority to Investigate SJRA's and Houston's Implementation of the LLS and to Enforce the Requirements of the Amended Certificate, TCEQ Rules, and State Law.

TCEQ has been granted broad powers to protect the waters of the State of Texas and is the agency authorized to issue water rights permits for the use of state water.[15] TCEQ has enforcement power to issue administrative penalties and to order certain actions against a person who violates Chapter 11 of the Water Code, a rule or order adopted by TCEQ pursuant to Chapter 11, or a permit, certified filing, or certificate of adjudication issued under Chapter 11.[16] TCEQ's standard process of investigation, evaluating, and pursuing an enforcement action are applicable to water rights violations. As such, water rights violations are addressed in TCEQ's Enforcement Initiation Criteria.[17]

The Amended Certificate was issued to SJRA and Houston conditioned upon the continued oversight and authority of TCEQ. Specifically, the Amended Certificate provides: "This amendment is issued *subject to the Rules of the Texas Commission on Environmental Quality* and to the *right of continuing supervision of State water resources* exercised by the Commission."[18]

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13 "This policy shall be reviewed and renewed annually at the February Board meeting with the purpose of creating a near-term, temporary flood mitigation benefit while more permanent mitigation strategies, such as dredging of the lower West Fork, are completed . . . ." *Id.* at 5.

14 San Jacinto River Auth., Bd. of Dir., Minutes of Special Meeting at Item 2 at 1 (Feb. 20, 2020) [hereinafter "Feb. Special Mtg."], *available at* https://www.sjra.net/wp-content/uploads/2020/04/2020-Minutes_022020.pdf.

15 Martinez, Robert & Robin Smith (update by Dinniah Tadema & Ian Groetsch), "Water Rights Enforcement," ESSENTIALS OF TEXAS WATER RESOURCES ch. 13, § 13.1 at 13-1 (2020).

16 *See* TEX. WATER CODE § 11.0842(a).

17 *See* TCEQ, "Enforcement Initiation Criteria" (Rev. 13, Dec. 13, 2018), *available at* https://www.tceq.texas.gov/assets/public/compliance/enforcement/eic/eic-rev16-121318.pdf.

18 Amended Certificate, *supra* note 1, at 3 (emphasis added).

TCEQ also has a specific continuing right of supervision over districts and authorities created under Article III, Section 52 and Article XVI, Section 59 of the Texas Constitution, which includes SJRA.[19] TCEQ's right of supervision includes, but is not limited to, the authority to:

> (1) inquire into the qualifications of the officers and directors of any district or authority;
>
> (2) require, on its own motion *or on complaint by any person*, audits or other financial information, inspections, evaluations, and engineering reports;
>
> * * *
>
> (4) institute investigations and hearings using examiners appointed by the commission . . . .[20]

The Water Code authorizes TCEQ to stop the wasteful use of water. Specifically, Section 11.093 provides:

> Abatement of Waste as Public Nuisance.
>
> (a) A person who permits an unreasonable loss of water through faulty design or negligent operation of any waterworks using water for a purpose named in this chapter commits waste, and the commission may declare the works causing the waste to be a public nuisance. The commission may take the necessary action to abate the nuisance. Also, any person who may be injured by the waste may sue in the district court having jurisdiction over the works causing the waste to have the operation of the works abated as a public nuisance.
>
> (b) In case of a wasteful use of water defined by Section 11.092 of this code, the commission shall declare the use to be a public nuisance and shall act to abate the nuisance by directing the person supplying the water to close the water gates of the person wasting the water and to keep them closed until the commission determines that the unlawful use of water is corrected.[21]

TCEQ, therefore, has the authority to investigate the LLS and the wasteful diversion of water by SJRA and Houston, and it has the uncontested authority to order that the LLS be terminated.

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19 TEX. WATER CODE § 12.081.

20 *Id.* § 12.081(1), (2), & (4) (emphasis added)

21 *Id.* § 11.093.

2. The LLS as Adopted by the SJRA on February 20, 2020 Violates the Amended Certificate, TCEQ Rules, and State Law.

The current version of the LLS was adopted by SJRA during a public meeting on February 20, 2020.[22] An SJRA press release dated February 25, 2020, stated that the SJRA Board "approved a recommendation to the City of Houston (COH) to continue a temporary flood mitigation program at Lake Conroe," and identified the following provisions of the LLS:

- Spring strategy: Beginning April 1, release only an amount of water from Lake Conroe to create a one foot capacity to catch rainfall and storm runoff (from 201' mean sea level to 200' msl). Recapture of lake level beginning June 1.
- Fall strategy: Beginning on August 1, release only an amount of water from Lake Conroe to create a one foot capacity to catch rainfall and storm runoff (from 201' msl to 200' msl). After September 1, increase capacity an additional six inches (from 200' msl to 199.5' msl). If a named storm is predicted to impact our region, COH may initiate an additional release of six inches (to 199' msl) by notifying SJRA in writing of their call for release. Recapture beginning October 1.
- All releases come from COH's 2/3 share of permitted water supply in Lake Conroe at the city's request. SJRA staff to coordinate with COH staff on the details and timing of any releases.
- If the lake level of Lake Conroe has already dropped to the target elevation due to natural evaporation, no releases should be made.[23]

The normal conservation pool of Lake Conroe is 201' above mean sea level (msl), with a flood easement of up to 207' above msl.[24] Thus, in order to achieve the reduction in lake capacity below 201' above msl for additional flood control storage, water must be released from the conservation pool of Lake Conroe.[25]

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22 *See* Feb. Special Mtg., *supra* note 14, at Item 4 at 5-6. SJRA actually described the LLS as a recommendation to the COH "as it is their water being utilized for this program." *Id.* at 5.

23 *See* Press Release, San Jacinto River Auth., "SJRA Board of Directors Recommends Renewing Flood Mitigation Strategy" at 1 (Feb. 25, 2020), *available at* https://www.sjra.net/wp-content/uploads/2020/02/02-25-2020-Press-Release-Board-Recommendation-Lake-Conroe.pdf. The actual details of the LLS as discussed during the Special Meeting on February 20, 2020, were confusing, and the final decision of the Board of Directors was not clear. The February 25 Press Release appeared to summarize the intent of the Board.

24 *See* San Jacinto River Auth., *Self Evaluation Report*, submitted to the Sunset Advisory Comm'n, at 40 (Sept. 2019) [hereinafter "Self Evaluation Report"], *available at* https://www.sunset.texas.gov/public/uploads/files/reports/San%20Jacinto%20River%20Authority%20SER.pdf.

25 *See* Rubinstein & Settemeyer Letter, *supra* note 5, at 2.

a. The LLS Is a Diversion of Surface Water in Violation of State Law and the Amended Certificate.

Surface water in Texas is owned by the state and is available for use pursuant to the statutorily-defined appropriation process.[26] Texas' appropriative water rights permitting system provides for "precisely defined water rights, authorizing the use of water in a specific amount, by diversion at a definite location, for a particular purpose, and for use at a particular location."[27] When surface water is appropriated, the right to use state water "is limited not only to the amount specifically appropriated *but also to the amount which is being or can be beneficially used for the purposes specified in the appropriation*."[28] Water that is not being beneficially used for the purposes specified in the appropriation is considered to be not appropriated.[29]

Texas Water Code Section 11.023 defines the purposes for which surface water may be appropriated:

> (a) To the extent that state water has not been set aside by the commission under Section 11.1471(a)(2) to meet downstream inflow needs or freshwater inflow needs, state water may be appropriated, stored, or diverted for:
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> (1) domestic and municipal uses, including water for sustaining human life and the life of domestic animals;
>
> (2) agricultural uses and industrial uses, meaning processes designed to convert materials of a lower order of value into forms having greater usability and commercial value, including the development of power by means other than hydroelectric;
>
> (3) mining and recovery of minerals;
>
> (4) hydroelectric power;
>
> (5) navigation;
>
> (6) recreation and pleasure;
>
> (7) public parks;
>
> (8) game preserves; and
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> (9) recharge into an aquifer underlying this state other than an aquifer described under Subsection (c) through surface infiltration or an aquifer recharge project as defined by Section 27.201.
>
> (b) State water also may be appropriated, stored, or diverted for any other beneficial use.[30]

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26 *See* TEX. WATER CODE § 11.021(a); *see also* Caroom, Douglas G., & Susan M. Maxwell, "Surface Water Rights Permitting," ESSENTIALS OF TEXAS WATER RESOURCES ch. 10, § 10.1 at 10-1 (2020).

27 Caroom & Maxwell, *supra* note 26.

28 TEX. WATER CODE § 11.025 (emphasis added).

29 *Id.*

30 *Id.* § 11.023(a)&(b).

With regard to the uses of appropriated water, Section 11.023 continues:

> The amount of water appropriated for each purpose mentioned in this section shall be specifically appropriated for that purpose, subject to the preferences prescribed in Section 11.024 of this code. The commission may authorize appropriation of a single amount or volume of water for more than one purpose of use. In the event that a single amount or volume of water is appropriated for more than one purpose of use, the total amount of water actually diverted for all of the authorized purposes may not exceed the total amount of water appropriated.[31]

The term "beneficial use" is defined as "use of the amount of water which is economically necessary for a purpose authorized by this chapter, when reasonable intelligence and reasonable diligence are used in applying the water to that purpose and shall include conserved water."[32] Also, state law prioritizes uses of surface water, stating that that it is "the public policy of this state that in appropriating state water preference shall be given to the following uses in the order named:

(1) domestic and municipal uses . . .;
(2) agricultural and industrial uses . . .;
(3) mining and recovery of minerals;
(4) hydroelectric power;
(5) navigation;
(6) recreation and pleasure; and
(7) other beneficial uses."[33]

Lake Conroe was constructed as a "water supply reservoir."[34] In addressing the purpose of SJRA and Lake Conroe, SJRA has identified: "The primary objectives of the agency have remained the same, namely, to develop, conserve, and protect the water resources of the San Jacinto River basin. . . . This objective was the basis of the partnership agreement SJRA reached with Houston and the TWDB in 1968 to jointly construct a *water supply reservoir*, Lake Conroe . . . ."[35] The lake was completed in 1973 as an alternate water source for Houston.[36] Although Lake Conroe is a water supply reservoir (with a full pool level of 201' above msl),

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31 *Id.* § 11.023(e).

32 *Id.* § 11.002(4).

33 *Id.* § 11.024.

34 San Jacinto River Auth., "History of Lake Conroe," at https://www.sjra.net/lakeconroe/history/ [hereinafter "Lake Conroe History"]; *see also* Texas Water Dev. Bd., "Volumetric and Sedimentation Survey of Lake Conroe: June – August 2010 Survey" at 1 (July 2012).

35 San Jacinto River Auth., "Lake Conroe Watershed Protection Plan," § 2.2.4 at 11 (May 2015) (emphasis added), *available at* http://www.sjra.net/wp-content/uploads/2014/12/Lake-Conroe-Watershed-Protection-Plan.pdf.

36 Lake Conroe Texas, "About Lake Conroe," at https://www.lakeconroe.com/about-lake-conroe/; *see also* Self Evaluation Report, *supra* note 24, at 40.

a flowage easement around the reservoir allows storm water draining from the watershed upstream of the dam to be temporarily stored in the reservoir up to elevation 207' above msl.[37]

In addition to providing an alternate water supply source for Houston, in September 2015, Lake Conroe began to supplement groundwater sources in Montgomery County as a source of drinking water. After the Lone Star Groundwater Conservation District ("LSGCD") mandated a reduction in groundwater withdrawals, SJRA entered into voluntary agreements with over ninety public and private entities in Montgomery County to construct a water treatment system using surface water from Lake Conroe in order to create a more balanced approach to fulfilling the water supply needs of Montgomery County.[38]

Lake Conroe's use as a water supply reservoir is supported by the surface water rights allocated to SJRA and Houston pursuant to the Amended Certificate, which states:

> In lieu of the previous authorization to divert or release and use not to exceed 100,000 acre-feet of water per year for municipal purposes (66,000 acre-feet), industrial purposes (28,500 acre-feet), and mining purposes (5,500 acre-feet), Owners are now authorized to *divert or release* ***and*** *use* not to exceed 100,000 acre-feet of water per year for municipal, industrial, mining, and agricultural purposes.[39]

In addition, the Amended Certificate provides: "Owners are also authorized to use the impounded water for recreation purposes."[40]

The Amended Certificate makes clear that SJRA and Houston are bound to its terms, including the following provisions:

- "Owners *agree to be bound* by the terms, conditions and provisions contained herein and *such agreement is a condition precedent to the granting of this amendment*."[41]
- "This amendment is issued *subject to the Rules of the Texas Commission on Environmental Quality* and to the *right of continuing supervision of State water resources* exercised by the Commission."[42]

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37 Self Evaluation Report, *supra* note 24, at 40.

38 *Id.*

39 Amended Certificate, *supra* note 1, ¶ 1.A. at 2 (emphasis added).

40 *Id.* ¶ 1.C. at 2.

41 *Id.* at 3 (emphasis added).

42 *Id.* (emphasis added).

In summary, SJRA and Houston are only authorized to divert or release *and use* water from Lake Conroe for municipal, industrial, mining, and agricultural purposes. Any other use of surface water from Lake Conroe is not authorized by the Amended Certificate, and thus, is a violation of the Amended Certificate and state law.

The LLS policy does not result in the diversion of water from Lake Conroe for municipal, industrial, mining, or agricultural purposes. Instead, water is simply discharged from Lake Conroe and sent downstream through Lake Houston and to the Gulf of Mexico. As identified by Mr. Rubinstein and Mr. Settemeyer: "Release of water from the conservation pool strictly for flood control purposes, with no documented beneficial use downstream constitutes an unauthorized use of water as per the terms and conditions of the water right."[43]

Houston attempts to identify that the water is being diverted pursuant to the LLS for "municipal use," but this is a mischaracterization of the use of the water diverted from Lake Conroe. Specifically, TCEQ rules define "municipal use" as:

> (A) The use of potable water within a community or municipality and its environs for domestic, recreational, commercial, or industrial purposes or for the watering of golf courses, parks and parkways, or other public or recreational spaces; or
>
> (B) the use of reclaimed water in lieu of potable water for the preceding purposes; or
>
> (C) the use of return flows authorized pursuant to Texas Water Code, §11.042, in lieu of potable water for the preceding purposes. Return flows used for human consumption as defined in §290.38(34) of this title (relating to Definitions) must be of a quality suitable for the authorized beneficial use as may be required by applicable commission rules; or
>
> (D) the application of municipal sewage effluent on land, under a Texas Water Code, Chapter 26, permit where:
>
> > (i) the application site is land owned or leased by the Chapter 26 permit holder; or
> >
> > (ii) the application site is within an area for which the commission has adopted a no-discharge rule.[44]

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[43] Rubinstein & Settemeyer, *supra* note 5, at 2. Mr. Rubinstein and Mr. Settemeyer also note that the process of lowering and refilling Lake Conroe seasonally is a process "that could subject the lake and potentially the bays to potential environmental impacts." *Id.* at 3. They continue: "This change in operation has not been subject to a TCEQ environmental review approval process as would be required by any permit amendment." *Id.*

[44] 30 TEX. ADMIN. CODE § 297.1(34).

Water Use Reports ("WURs") prepared by Houston for the years 2018 and 2019 indicate seasonal releases from Lake Conroe (*i.e.*, releases pursuant to the LLS) of 18,265 acre-feet and 66,167 acre-feet, respectively.[45] Houston has categorized the use for these releases as "municipal/domestic."[46] Similarly, Houston categorized pre-storm releases from Lake Houston for flood control purposes as a "municipal/domestic" use.[47] Clearly, based on the definition of "municipal use" set out above, neither a "seasonal release" nor a "pre-storm release" for flood control purposes would qualify as a municipal use pursuant to TCEQ rules and state law. The WURs do not contain any information identifying that the seasonal releases were subsequently used for a permitted beneficial use. The only intended use was the policy of lowering the level of Lake Conroe for flood control purposes. This use of the state water in Lake Conroe is not authorized by the Amended Certificate. Simply put, this is a waste of valuable state waters in violation of the Amended Certificate and state law.

b. The LLS Fails to Conserve Water in Violation of the Amended Certificate and State Law.

The Amended Certificate issued to SJRA and Houston not only includes specific use provisions for the allocated surface water, it also contains conservation requirements intended to preserve water and minimize the waste of water. Due to the importance of preserving water in the state, the Legislature has specifically required conservation by water rights permit holders:

> Additional Requirements: Water Conservation Plans.
>
> (a) The commission shall require from an applicant for a new or amended water right the formulation and submission of a water conservation plan and the adoption of reasonable water conservation measures, as defined by Subdivision (8)(B), Section 11.002, of this code.
>
> (b) The commission shall require the holder of an existing permit, certified filing, or certificate of adjudication for the appropriation of surface water in the amount of 1,000 acre-feet a year or more for municipal, industrial, and other uses, and 10,000 acre-feet a year or more for irrigation uses, to develop, submit, and implement a water conservation plan, consistent with the appropriate approved regional water plan, that adopts reasonable water conservation measures as defined by Subdivision (8)(B), Section 11.002, of this code. The requirement for a water

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45 Texas Comm'n on Envt'l Quality, Report of Surface Used for the Year Ending 2018, City of Houston, Water Right No. 4963, WUR USE: Municipal/Domestic (Mar. 12, 2019) [hereinafter "Houston 4963 2018 WUR"]; Texas Comm'n on Envt'l Quality, Report of Surface Used for the Year Ending 2019, City of Houston, Water Right No. 4963, WUR USE: Municipal/Domestic (Feb. 28, 2020) [hereinafter "Houston 4963 2019 WUR"]; *see also* Letter from Veronica R. Osegueda, Div., Mgr., Water Resources, Houston Water Planning to Kathy Alexander, Water Availability Div., Texas Comm'n on Envt'l Quality (Mar. 13, 2019) [hereinafter "Osegueda Letter"].

46 Houston 4963 2018 WUR, *supra* note 45; Houston 4963 2019 WUR, *supra* note 45.

47 *See* Osegueda Letter, *supra* note 45. For example, in 2018, pre-storm releases from Lake Houston totaled 117,644 acre-feet. *Id.*

> conservation plan under this section shall not result in the need for an amendment to an existing permit, certified filing, or certificate of adjudication.
>
> (c) Beginning May 1, 2005, all water conservation plans required under this section must include specific, quantified 5-year and 10-year targets for water savings. The entity preparing the plan shall establish the targets. Targets must include goals for water loss programs and goals for municipal use in gallons per capita per day.[48]

"Conservation" is defined in Chapter 11 of the Water Code as:

> (A) the development of water resources; and
>
> (B) those practices, techniques, and technologies that will reduce the consumption of water, reduce loss or waste of water, improve the efficiency in the use of water, or increase the recycling and reuse of water so that a water supply is made available for future or alternative uses.[49]

In accordance with this state law, when TCEQ issued the Amended Certificate, the following provision was added:

> 2. CONSERVATION
>
> *Owners shall implement water conservation plans* that provide for the utilization of those practices, techniques, and technologies *that reduce or maintain the consumption of water, prevent or reduce the loss or waste of water*, maintain or improve the efficiency in the use of water, increase the recycling and reuse of water, or prevent the pollution of water, *so that a water supply is made available for future or alternative uses*. Such plans shall include a requirement that in every wholesale water contract entered into, on or after the effective date of this amendment, including any contract extension or renewal, that each successive wholesale customer develop and implement conservation measures. If the customer intends to resell the water, then the contract for resale of the water must have water conservation requirements so that each successive wholesale customer in the resale of the water be required to implement water conservation measures.[50]

Although these duties related to the conservation of water were added to the Amended Certificate in 2010, SJRA should have been following this directive all along. According to its website:

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48 TEX. WATER CODE § 11.1271.

49 *Id.* § 11.002(8).

50 Amended Certificate, *supra* note 1, at ¶ 2 at 2 (emphasis added).

> The San Jacinto River Authority (SJRA) is a public entity created by the Texas Legislature whose mission is to develop, conserve, and protect the water resources of the San Jacinto River basin. . . . [I]t's primary purpose is to implement long-term, regional projects related to water supply and wastewater treatment. [51]

SJRA's 2019 Water Conservation Plan ("2019 Conservation Plan") recognizes the purpose of the plan and the risks of wasting water:

> In 1996, severe drought conditions affected every region of the State. Water systems throughout the State were forced to cope with water shortages or system capacity problems. In response to the 1996 drought, the 75th Texas Legislature enacted Senate Bill 1, which directed the State to take a regional approach to water planning. One of the provisions of the legislation required the Texas Commission on Environmental Quality (TCEQ) to adopt rules requiring wholesale and retail public water suppliers to develop water conservation and drought contingency plans.[52]

As required by state law, the 2019 Conservation Plan identifies the contract provisions imposed on SJRA's water customers to conserve water. SJRA identifies that it:

> will enforce the terms of contracts with wholesale water supply customers related to water conservation measures and Water Conservation Plan requirements. Additionally, SJRA will include in all water supply contracts entered into, renewed, or amended after the adoption of the Division's Water Conservation Plan a requirement that customers develop and implement water conservation a [*sic*] plans as required by Title 30, Texas Administrative Code, Chapter 288 30 TAC §288).[53]

Further, SJRA identifies that it prohibits the wasting of water, and the language in its most recent contract with its water supply customers specifically requires water conservation:

> Buyer shall develop and implement water conservation and drought contingency plans to conserve water resources and to *promote practices that will reduce loss or waste of water*, improve efficiency in the use of water, or increase the recycling and reuse of water. Buyer's water conservation plan and drought contingency plan shall be at least equal to or more stringent than that adopted by the Authority, and Buyer shall comply with all requirements of the TCEQ, Texas Water Development Board, and any other federal, state or local regulatory agency with jurisdiction.[54]

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51 San Jacinto River Auth., Homepage, at https://www.sjra.net/.

52 San Jacinto River Auth., "Water Conservation Plan for San Jacinto River Authority Lake Conroe Division," § 1 at 1-1 (Feb. 28, 2019) (citing S.B. 1, 75th Leg., TEX. WATER CODE § 12.1272), *available at* http://www.sjra.net/wp-content/uploads/2019/03/WCP-Lake-Conroe-02-28-2019.pdf.

53 *Id.* § 3.2.5 at 3-4.

54 *Id.* at 3-5.

Ironically, SJRA prohibits its water supply customers from wasting water while Houston and SJRA itself are draining thousands of acre-feet of water from Lake Conroe for no beneficial purpose. The fact that the Lake Conroe water is simply being wasted pursuant to the LLS is evident from recent correspondence where Houston instructs SJRA to release a significant volume of water prior to the LLS spring deadline of May 31. Rainfall in late May 2020 resulted in Lake Conroe recovering some of the water that SJRA and Houston had diverted as part of the LLS in April.

As reflected in e-mail discussions, Houston did not request SJRA to divert Lake Conroe water for any authorized or beneficial use. Instead, Houston instructed SJRA to lower Lake Conroe to a *specific level*, as opposed to calling for the water for a specific beneficial use.[55] In an e-mail from May 29, Houston even violated the LLS itself by instructing SJRA to lower Lake Conroe to 200' above msl by June 2, *i.e.*, two days after the spring LLS discharges were to cease under the LLS.[56] As shown in Attachment 2, water levels in Lake Conroe dropped quickly over the next three days and have continued to drop since that time until recent rainfall on June 24.[57]

3. The LLS Will Not Prevent or Meaningfully Reduce Downstream Flooding in the Event of a Major Rainfall Event.

Lowering Lake Conroe does not accomplish the stated purpose of the LLS—to prevent or mitigate downstream flooding in the event of a future, major rainfall event. There are at least three reasons why the LLS will not prevent flooding in the Lake Houston area, nor will it meaningfully reduce future flooding.

a. Engineering Studies Have Demonstrated that the LLS Will Not Meaningfully Mitigate Downstream Flooding.

First, the SJRA Board adopted the LLS in both 2018 and again in 2020 without technical data demonstrating that the policy would actually mitigate downstream flooding. Two engineering studies of the potential flood benefits have been conducted, and both concluded that any possible benefits would be marginal at best, and one notes that under a major storm event such as Hurricane Harvey, the LLS could actually *increase* downstream flooding.

Prior to adopting the LLS, SJRA commissioned its long-term technical consultant, Freese & Nichols, Inc. ("F&N"), to evaluate the potential water supply and flood reduction impacts and benefits of lowering Lake Conroe for flood control purposes. F&N prepared two reports: (1) a Technical Memorandum dated April 10, 2018, referencing "Lake Conroe Dam Gate

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55 E-mail from Sharon Citino, Planning Dir., Houston Water, City of Houston, to Jace Houston, Gen. Mgr., San Jacinto River Auth. (Apr. 1, 2020, 4:00 p.m.).

56 E-mail from Yvonne Forrest, Director, Houston Water, City of Houston, to Chuck Gilman & Greg Olinger (May 29, 2020, 8:59 a.m.).

57 "Lake Conroe – Lake Levels, May 27 through June 27, 2020," attached hereto as Attachment 2, from San Jacinto River Authority Contrail® System, Lake Conroe Dashboard, Lake Level, *available at* https://sanjacinto.onerain.com/sensor/?site_id=13189&site=b6f6df4e-f5a5-4398-a2e9-1a3508c4e9b5&device_id=15&device=28823576-054f-43ef-bff3-c1acb76595f2.

Operations Modification Analysis" ("F&N Flooding Report"),[58] which evaluated the flood control impacts; and (2) a Technical Memorandum dated April 9, 2018, referencing "Proposed Lowering of Lake Conroe Conservation Pool: Potential Impacts on San Jacinto Basin Water Supplies."[59]

The F&N Flooding Report summarized its findings: "The benefits to those downstream, though the water surfaces are reduced by a foot or more in places, are generally not enough to be considered wholesale improvements to the flood hazard and show minimal differences in spatial extent."[60] There are several important qualifications concerning this report. First, flood reduction impacts were evaluated at a location where the West Fork of the San Jacinto River intersects Interstate Highway 45 ("IH-45"). This location is about ten miles downstream of Lake Conroe, but is still approximately twenty linear miles from the Lake Houston area. The flood reduction benefits in the Lake Houston area were not evaluated in the F&N Flooding Report.[61]

Second, the "foot or more in places" reduction in flood levels was measured against flood waters that were already eight feet above the river channel banks for a 100-year flood and twelve feet above the banks for a 500-year flood.[62] So, for example, in a flood less severe than Hurricane Harvey, the flood waters might be reduced from twelve-feet high to eleven-feet high in a house or other structure. However, a much overlooked third qualification in the F&N Flooding Report disturbingly concludes that for a rainfall event greater than the 500-year event—Hurricane Harvey or future similar storms—the artificially lowered level of Lake Conroe "could potentially increase the flood hazard downstream."[63] Therefore, according to the study prepared for SJRA by its long-time consulting experts, the LLS could result in *increased* flooding in the Lake Houston area if the peak release from the dam is delayed and the release coincides with draining from other tributaries to the West Fork of the San Jacinto River.

As noted, the F&N Flooding Report did not measure the potential flood reduction benefits of the LLS in the Lake Houston area. LCA attempted to provide SJRA with this important missing information and retained an engineering firm to continue F&N's study further downstream to Lake

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58 Freese & Nichols, Inc., Technical Memorandum from Jeremy D. Dixon, P.E., CFM, to Michael V. Reedy, P.E. (Apr. 10, 2018) [hereinafter "F&N Flooding Report"], attached hereto as Attachment 3.

59 Freese & Nichols, Inc., Technical Memorandum from Philip I. Taucer, P.E., to Michael V. Reedy, P.E. (Apr. 9, 2018) [hereinafter "F&N Water Supply Report"].

60 F&N Flooding Report, *supra* note 58, § 6.00 at 11.

61 *See id.* § 2.00 at 4.

62 *See id.* § 6.00 at 11; *see also* Letter from Jace A. Houston, Gen. Mgr., San Jacinto River Auth., to the Honorable Lyle Larson, Chairman, House Comm. on Natural Res., Texas House of Reps., at 3 (Apr. 16, 2018) (indicating that SJRA was clearly aware of the limited potential benefit of the LLS) [hereinafter "SJRA Letter to Larson"], attached hereto as Attachment 4.

63 F&N Flooding Report, *supra* note 58, § 6.00 at 11; *see also* SJRA Letter to Larson, supra note 62, at 3 ("For storm events larger than a 500-year event, it is anticipated that the addition of extra flood capacity will likely yield no additional benefit upstream and could potentially increase the flood hazard downstream of the dam . . . .").

Houston. LCA retained Bleyl Engineering, which obtained the underlying study information from F&N in order to perform this analysis (the "Bleyl Study").[64]

The Bleyl Study determined that lowering Lake Conroe by two feet could result in a maximum reduction in flood waters in the Lake Houston area of three inches. This three-inch reduction was determined to be at a point where the flood waters were already seventeen feet high (a less than 1.5% reduction in the height of the flood waters). Like the F&N Flooding Report, the Bleyl Study concluded that the reductions in flood elevations due to the LLS "are generally not enough to be considered wholesale improvements to the flood hazards along the West Fork."[65] Attachment 6 is a sketch prepared by Bleyl graphically depicting the difference in flood levels due to the LLS.[66]

Although the Bleyl Study was completed and provided to SJRA prior to the February 2020 Board of Directors meeting, LCA later learned that the Board did not actually see the study prior to the meeting, and so the Bleyl Study did not factor into the Board's decision to re-adopt and extend the LLS. The LLS was adopted in 2018 and then again in 2020 based only on the F&N Flooding Report, which did not provide any data identifying what benefits there might be to reduced flooding in the Lake Houston area. In short, the Board has twice adopted the LLS with no documented technical support for its claim that it will meaningfully reduce downstream flooding.

It is also important to note that even the minimal benefit was overstated in both the F&N Flooding Report and the Bleyl Study due to an important observation about the level of Lake Conroe in August 2017, *i.e.*, that Lake Conroe was already six inches below normal pool level when Hurricane Harvey struck. The engineering studies evaluated the benefits of lowering Lake Conroe by two feet, *i.e.*, from the full pool of 201' above msl down to 199' above msl to create an extra two feet of storage capacity. However, on August 25, 2017, Lake Conroe was at an elevation of 200.37' above msl.[67] As such, whatever minimal benefits to downstream flooding might be associated with lowering Lake Conroe, those benefits were partially in place on August 25, 2017, prior to Hurricane Harvey.

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64 *See* Letter from Ryan Londeen, PE, Bleyl Eng., to Kevin Lacy, Lake Conroe Assoc. (Feb. 14, 2020), attached hereto as Attachment 5.

65 *Id.* at 5.

66 Bleyl Eng., "Flood levels during Hurricane Harvey and impact of lowering Lake Conroe by 2 feet," attached hereto as Attachment 6.

67 "Lake Conroe – Lake Levels, August 24-26, 2017," attached hereto as Attachment 7, from San Jacinto River Authority Contrail® System, Lake Conroe Dashboard, Lake Level, *available at* https://sanjacinto.onerain.com/sensor/?time_zone=US%2FCentral&site_id=13189&site=b6f6df4e-f5a5-4398-a2e9-1a3508c4e9b5&device_id=15&device=28823576-054f-43ef-bff3-c1acb76595f2&bin=86400&range=Custom%20Range&markers=false&legend=true&thresholds=true&refresh=off&show_raw=true&show_quality=true&data_start=2017-08-24%2000%3A00%3A00&data_end=2017-08-26%2023%3A59%3A59.

Adopting a policy such as the LLS, in an attempt to prevent flooding can only be done if all of the associated risks and costs are tallied and if the policy will actually prevent the flooding. No evaluation of the adverse impacts of the LLS has been provided by SJRA, and it is unclear whether any has been conducted. More importantly, the engineering evaluations of the benefits show the policy will not prevent downstream flooding.

b. Discharges from Lake Conroe Were Only a Small Part of the Overall Flood Waters that Reached the Lake Houston Area.

The second reason that the LLS will not prevent flooding in the Lake Houston area is because the Lake Conroe releases were only a fraction of the water rushing into the Lake Houston area during Hurricane Harvey. Even if there were no releases from Lake Conroe, the Houston area would have flooded, including the flooding that is mistakenly believed to have occurred only after the Lake Conroe dam gates were open after Hurricane Harvey had passed through Houston. In fact, Lake Conroe served its design purpose of flood mitigation during the hurricane,[68] including the discharges from the dam.

After Hurricane Harvey moved out of the Houston area, significant amounts of water continued to drain into the Lake Houston area from Lake Conroe and all of the other watersheds that drain into Lake Houston. Importantly, due to the existence of Lake Conroe, waters from the Lake Conroe watershed were only sixty percent of the volume that would have otherwise flowed into Lake Houston.[69]

Lake Houston collects water from thirteen major watersheds covering a 2,828-square mile area.[70] The Lake Conroe watershed is 445 square miles in area and comprises approximately seventeen percent of the water draining to Lake Houston.[71] While the water from at least eleven key rivers, streams, and creeks, and many smaller tributaries released their entire rainfall amounts into Lake Houston unabated, the Lake Conroe waters were held back with only a portion of the waters being released in order to protect the dam. Even then, the maximum discharge rates were forty percent less than they would have been otherwise. As previously noted, Lake Conroe is not a flood control

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68 As noted above, a flowage easement around Lake Conroe allows storm water draining from the watershed upstream of the dam to be temporarily stored in the reservoir up to elevation 207' above msl. *See* SJRA, Self Evaluation Report, *supra* note 24, at 40.

69 *See* San Jacinto River Auth., "Frequently Asked Questions Related to Hurricane Harvey and Lake Conroe Dam" at 2, *available at* http://www.sjra.net/wp-content/uploads/2017/08/FAQs-Related-to-Harvey-and-Lake-Conroe-Dam.pdf. It was estimated that storm water flows were entering Lake Conroe at a rate of approximately 130,000 cubic feet per second (cfs), but the water discharging from the dam reached a peak rate of only 79,100 cfs.

70 *See* Texas Water Dev. Bd., "Lake Houston (San Jacinto River Basin)" [hereinafter "TWDB Lake Houston"], at https://www.twdb.texas.gov/surfacewater/rivers/reservoirs/houston/index.asp. The major contributing watersheds are shown on Attachment 8. *See* San Jacinto River Auth., "What Is a Watershed?," at fig. "Watersheds of the San Jacinto River Basin," at https://www.sjra.net/education/what-is-a-watershed/.

71 *See* TWDB Lake Houston, *supra* note 70.

reservoir, but it is designed to mitigate downstream flooding, *i.e.*, as a wide spot in the West Fork of the San Jacinto River, significantly reducing the unimpeded flow of flood waters down the river.[72]

The actual flood control role of Lake Conroe has also been identified by the Harris County Flood Control District ("HCFCD"). In its report on the Hurricane Harvey flooding, HCFCD stated:

> The lake can rise a maximum of six feet within a flowage easement purchased for all property around the reservoir, thus *reducing the dam flood releases to a flow level that is below the amount of inflow into the reservoir*. Again, *this lake is intended to be a water supply reservoir – not flood control infrastructure* – and SJRA operators were charged with maintaining the integrity of the structures as Harvey caused rapidly increasing water levels on Lake Conroe.[73]

SJRA has provided a similar explanation of the role of Lake Conroe:

> The difference between the normal lake level (201 feet above mean sea level (msl)) and the Lake's maximum level (207 feet above msl) is small compared to that of a flood-control reservoir. But while Lake Conroe was not designed or constructed to function as a flood-control reservoir, SJRA's ability to temporarily store water up to 207 feet above msl allows the reservoir and Dam to act as a buffer to reduce the maximum flows in the West Fork San Jacinto River during flood events.[74]

Shortly after the Hurricane Harvey floods, SJRA provided detailed responses to allegations that releases from Lake Conroe caused or contributed to the flooding. SJRA explained how only a maximum of ten to twenty percent of the waters in the watershed that reach Lake Houston actually come through Lake Conroe. The other eighty to ninety percent of the waters came from other parts of the watershed where the waters cannot be controlled. SJRA also explained that SJRA's operation of Lake Conroe actually reduced the flooding during the storm, stating:

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72 *See* San Jacinto River Auth., "Lake Conroe – A Water Supply Reservoir," at https://www.sjra.net/education/water-supply-reservoir/.

73 Harris County Flood Control Dist., "Hurricane Harvey: Impact and Response in Harris County," at 32 (May 2018).

74 Defendant SJRA's Plea to the Jurisdiction, *Nancy Daniels, et al. v. San Jacinto River Auth.*, Cause No. 1140382, Harris County, County Civ Ct. at Law No. 3 at 5-6 (Mar. 11, 2020) (internal citations omitted).

> Lake Conroe reduced the flooding around Lake Houston by reducing the peak flow going through Lake Conroe and into the West Fork of the San Jacinto River from 130,000 [cubic feet per second (cfs)] to 79,000 cfs. That is approximately a 50,000 cfs reduction in the peak flows going down the river to Lake Houston.[75]

SJRA concluded: "To claim that Lake Conroe is the cause of flooding around Lake Houston is a gross misstatement of the facts."[76]

As identified above, many people believe that large numbers of homes in the Lake Houston area only flooded after the gates of the Lake Conroe dam were opened after the main bands of Hurricane Harvey passed through the area, and thus, the Lake Conroe release was the cause of the post-hurricane flooding. This belief that post-hurricane flooding was caused by the Lake Conroe dam release is a principal reason why so many people support the LLS. But this version of events is not factual. Instead, while the most intense parts of Hurricane Harvey began to affect the Houston area on the evening of August 26, with rainfall continuing through August 30, the dam already had one gate open at 12:25 a.m. on August 27, and by 7:20 a.m. on August 27, all five gates were open discharging at a total rate of 2,667 cfs. The gates continued to be opened wider until the total peak discharge rate of 79,141 cfs was reached at 12:00 p.m. on August 28. On August 31 all five gates were still open, but the total rate of release was back down to 2,705 cfs.[77]

Whereas the rumors were that the Lake Conroe dam opened and then caused downstream flooding, the SJRA dam release records show instead that all five gates of the dam were open during the hurricane. Had the floodgates not been open, allowing the torrential rainfall waters accumulating upstream in the West Fork to pass through, Lake Conroe would have filled with water incurring the possibility of a dam breach in a matter of hours. If the dam had breached, it is possible that all of the impounded water would have washed downstream. As identified above, the water draining *into* Lake Conroe reached an estimated maximum rate of 130,000 cfs. Serving its true, designed flood control function, during the peak of the Hurricane Harvey rainfall Lake Conroe was holding back approximately 50,000 cfs of waters from rushing downstream, which no doubt prevented significant additional flooding.

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75 San Jacinto River Auth., "Responses to Statements Made by Kingwood Officials," at 1 [hereinafter "SJRA Response"], *available at* http://www.sjra.net/wp-content/uploads/2017/09/Responses-to-Statements-by-Kingwood-Officials.pdf; *see also* San Jacinto River Auth., "San Jacinto River Basin Estimated Peak Flows, Hurricane Harvey August 25-29, 2017" [hereinafter "Peak Flow Map"], attached hereto as Attachment 9 (showing the vast volumes of stormwater that flowed into Lake Houston from all sources during Hurricane Harvey).

76 SJRA Response, *supra* note 75, at 3.

77 *See* San Jacinto River Auth., Water Releases Report, Aug. 2017, attached hereto as Attachment 10.

c. Flooding from Hurricane Harvey Was Inevitable, and the LLS Will Not Mitigate Flooding from a Similar Future Storm Event.

Finally, the third reason that the LLS is flawed is that it was adopted based on the hopes of preventing flooding that had resulted from a one-in-one-thousand-year rainfall event. Hurricane Harvey was unprecedented, as was the resultant flooding. As reported by the HCFCD:

> It should be noted that a total of 1 trillion gallons of water fell across Harris County over a four-day period. This amount of water would cover Harris County's 1,800 square miles with an average of 33 inches of water. More than two dozen rainfall gages registered seven-day readings topping 40 inches, with a maximum rainfall of 47.4 inches near Clear Creek at Interstate 45. Harris County generally receives an annual rainfall of about 50 inches per year; our county received this much rainfall in just a few days. This unprecedented storm event impacted the residents of each of Harris County's 22 watersheds, and it is estimated that more than 120,000 structures were flooded in Harris County, alone.[78]

HCFCD generated a final report regarding Hurricane Harvey, *i.e.*, the HCFCD Final Report, which summarized the catastrophic flooding and specifically addressed flooding in many of the watersheds.[79] Regarding the San Jacinto River, Lake Houston, and Lake Conroe, *i.e.*, the three waterbodies that are most closely associated with the LLS, the HCFCD Final Report stated:

> **San Jacinto River**
> *Catastrophic record flooding occurred along the entire San Jacinto River system including the West Fork, East Fork, main stem below Lake Houston, and major tributaries along the river including Jackson Bayou. Massive flooding occurred throughout Humble, Kingwood, Huffman, Crosby, Highlands, and portions of Sheldon*. Extreme flows on the lower portion of the San Jacinto River around Banana Bend completely lifted houses off their elevated pilings and resulted in severe damage to roadway access into that subdivision. *The previous record flood levels of October 1994 were exceeded at all locations along each section of the river*. Along the West Fork of the San Jacinto River water levels surpassed October 1994 by 3.0-4.0 ft, and as much as 5.0 ft along the East Fork of the San Jacinto River. Main stem river flooding below Lake Houston exceeded the previous record in October 1994 by 1.0-3.0 ft and at the I-10 crossing water levels exceeded Hurricane Ike's storm surge by 4.0 ft. Water levels along the West Fork of the San Jacinto River averaged above the .2% (500-yr), along the East Fork of the San Jacinto River were 5.0 ft above the .2% (500-yr) level and along the main stem of the river below Lake Houston averaged between the 1% (100-yr) and .2% (500-yr) annual exceedance probabilities. Several locations along the river system experienced water levels into the second floor of homes or the first floor of

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78 *See* Harris County Flood Control Dist., "Harris County Has Never Seen a Storm Like Harvey," at https://www.hcfcd.org/Hurricane-Harvey.

79 HCFCD Final Report, *supra* note 8.

elevated structures requiring extensive water rescue efforts. Additionally, large amounts of debris and heavy sedimentation upwards of 4.0-8.0 ft in some locations have been noted especially along the West Fork of the San Jacinto River.

Lake Houston

A record pool elevation of 53.1 ft was recorded at the Lake Houston Spillway surpassing the previous record of 52.3 ft in October 1994. *An estimated discharge of 425,000 cfs or 5.0 times the average flow of Niagara Falls occurred at the peak flow over the Lake Houston spillway*. This amount of flow would fill NRG Stadium in 3.5 minutes.

* * *

Lake Conroe

A new record pool elevation of 206.20 ft was recorded for Lake Conroe surpassing the previous record pool of 205.60 ft in October 1994. A peak release rate of 79,140 cfs was passed through the Lake Conroe flood gates into the West Fork of the San Jacinto River in accordance with emergency procedures for an extreme event to protect the integrity of the dam structure. A peak inflow of 130,000 cfs was recorded into Lake Conroe. While Lake Conroe released 79,140 cfs, three other uncontrolled watersheds: Spring Creek, Cypress Creek, and Lake Creek contributed a total of 165,200 cfs into the West Fork of the San Jacinto River. It is estimated that 240,900 cfs flowed through the West Fork of the San Jacinto River at Humble (US 59) of which 32% was water from Lake Conroe. Of the total estimated inflow of 491,800 cfs into Lake Houston 16% was from Lake Conroe. The table below shows the peak discharge rates into Lake Houston from the major watersheds that drain into the lake.

Watershed	Peak Discharge (cfs)
East Fork of San Jacinto River	120,000
Peach Creek	77,000
Caney Creek	21,100
Cypress Creek	31,500
Spring Creek	78,400
West Fork of San Jacinto River (Porter)	131,000
Luce Bayou	32,800
Total	**491,800**[80]

[80] *Id.* at 7 & 11-12. The peak discharge rate of 131,000 cfs for the "West Fork of the San Jacinto River (Porter)" includes flow from both Lake Conroe and Lake Creek as well as from other smaller tributaries. *See* Peak Flow Map, *supra* note 75 (Attachment 9).

A noteworthy comment from HCFCD concerned the flooding along Spring Creek. Discharges from Lake Conroe in the West Fork of the San Jacinto River merge with Spring Creek at a point prior to where the West Fork intersects IH-45. HCFCD refuted reports that the Lake Conroe discharges had caused flooding along Spring Creek, stating:

> One of many persistent rumors during and after Hurricane Harvey is that flooding along Spring Creek resulted from water releases from Lake Conroe. Flooding along Spring Creek was a direct result of the 20.0-28.0 inches of rainfall cross the watershed and not a result of releases from Lake Conroe. Releases from Lake Conroe do not affect water surface elevations along Spring Creek.[81]

The flooding from what has been reported as a one-in-one-thousand-year rainfall event, including the flooding that occurred after Hurricane Harvey passed through the area, was unavoidable. HCFCD summarized the massive amount of water that fell from Hurricane Harvey in the HCFCD Final Report, stating: "Over a 50,000 square mile area, Harvey dropped upwards of 16.6 trillion gallons of water which could supply the entire US water needs for 280 days and fill Lake Conroe 116 times."[82] Widespread, severe flooding would have occurred regardless of the releases from Lake Conroe and regardless of the starting water elevation in Lake Conroe. The area around Lake Houston has significant flooding issues, but fortunately there are plans to address many of these issues, with over fifty projects with an estimated cost of nearly two billion dollars already committed.[83] Unlike the LLS, these projects will result in real improvements to flooding in the area of Lake Houston.

It is a rare event for Lake Conroe to discharge during a rainfall event. As recognized by SJRA's own in-house expert, Chuck Gilman, SJRA's Director of Flood Management and Water Resources, large-volume discharges through the Lake Conroe dam have only been necessary on two occasions, both during major tropical storm events.[84] In addition, since 1999, only two rainfall events during the peak hurricane months of August and September have resulted in more than a one-foot increase in the level of Lake Conroe.[85] Ninety percent of the rain events have resulted in less than a three-inch increase in lake levels.[86] On the other hand, areas around Lake Houston have routinely flooded when there has been no release of water at all from Lake Conroe. The LLS will not mitigate flooding in the Lake Houston area. The LLS is simply a waste of water that acts only as a placebo, providing a false sense of security to individuals and businesses downstream that believe the LLS will protect them in the event of future floods.

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81 HCFCD Final Report, *supra* note 8, at 8.

82 *Id.* at 5.

83 *See* Harris County Flood Control Dist., "2018 Bond Projects," *available at* https://www.hcfcd.org/Portals/62/Resilience/Bond-Program/Project-List/2018bondprojectlist2018-08-06-1130.pdf?fbclid=IwAR0M68idFrijqxiHdOFhh8CTGaziaXrzh0W8SLv0sHtOdduaAjdSqebAm0A.

84 *See* San Jacinto River Auth., Bd. of Dir., Minutes of Special Meeting at Item 2 at 1 (Jan. 21, 2020), *available at* https://www.sjra.net/wp-content/uploads/2020/04/2020-Minutes_012120.pdf [hereinafter "Jan. Special Mtg."]; Feb. Special Mtg., *supra* note 14.

85 *See* Jan. Special Mtg., *supra* note 84; Feb. Special Mtg., *supra* note 14.

86 *See* Jan. Special Mtg., *supra* note 84; Feb. Special Mtg., *supra* note 14.

4. The LLS Undermines the Water Supply of the Region Both Now and in the Future.

a. The LLS Poses a Present and Future Threat to the Montgomery County Water Supply and an Imminent Threat to the Houston Water Supply.

As discussed above, Lake Conroe is the primary water source for Montgomery County and a backup water supply for Houston. SJRA provides treated drinking water from the surface water supplies in Lake Conroe to over ninety public and private water entities.[87] In addition, Lake Conroe water is the backup water supply for Houston. This backup supply becomes critically important to Houston during drought conditions. In fact, Houston identifies the water in Lake Conroe as one of its most reliable surface water supplies in the event of a drought.[88] SJRA has repeatedly acknowledged that Lake Conroe "is designed to be a water-supply reservoir, not a flood-control reservoir."[89]

The amount of water available in Lake Conroe is obviously based on rainfall, the amount of water diverted by water rights holders, and evaporative losses (up to 180 million gallons per day (MGD)) during the summer.[90] In 2018, Lake Conroe was lowered in August, but then quickly rebounded in October due to heavy rains.[91] In the autumn of 2019, though, Lake Conroe was lowered notwithstanding the fact that the area was beginning to enter a period of moderate drought.

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87 Lake Conroe History, *supra* note 34.

88 *See* Molly, Drew, P.E., Houston, "Drinking Water Operations," at https://www.publicworks.houstontx.gov/pud/drinkingwater.html.

89 *See, e.g.*, Plea to the Jurisdiction, *supra* note 74, at 5.

90 *See* San Jacinto River Auth., "What Is the Water Cycle?," at https://www.sjra.net/education/what-is-the-water-cycle/.

91 *See* "Lake Conroe – Lake Levels, August 1 through November 30, 2018," attached hereto as Attachment 11, from San Jacinto River Authority Contrail® System, Lake Conroe Dashboard, Lake Level, *available at* https://sanjacinto.onerain.com/sensor/?time_zone=US%2FCentral&site_id=13189&site=b6f6df4e-f5a5-4398-a2e9-1a3508c4e9b5&device_id=15&device=28823576-054f-43ef-bff3-c1acb76595f2&data_start=2018-08-01%2000%3A00%3A00&data_end=2018-11-30%2023%3A59%3A59&bin=86400&range=Custom%20Range&markers=false&legend=true&thresholds=true&refresh=off&show_raw=true&show_quality=true.

The last time that Lake Conroe was at full pool was in May 2019.[92] Lake levels fell throughout the summer and early autumn. Then, even though Lake Conroe was down to 200.44' above msl on August 1, 2019, pursuant to the LLS, the lake was further drained down to 199' above msl by September 1, 2019.[93] Since the upper San Jacinto River Basin was in a moderate drought,[94] Lake Conroe continued to drop, and by December 31, 2019, the lake was at 198.69' above msl.[95] Water levels in Lake Conroe continued to drop and did not begin to recover until late winter 2020 when the area began to experience rainfall again. What is sobering about 2019 is that if the moderate drought had turned into something more serious and continued for a longer period of time, Lake Conroe would have been in a compromised position with regard to fulfilling the water needs of Montgomery County and Houston in time of drought.

Again, SJRA's own expert has presented factual information contradicting the LLS. In a presentation to the Board, Mr. Gilman identified:

- Minimizing the amount of stored water released from Lake Conroe will benefit regional water supplies.

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92 See "Lake Conroe – Lake Levels, May 1, 2019 through June 28, 2020," at 1, attached hereto as Attachment 12, from San Jacinto River Authority Contrail® System, Lake Conroe Dashboard, Lake Level, *available at* https://sanjacinto.onerain.com/sensor/?time_zone=US%2FCentral&site_id=13189&site=b6f6df4e-f5a5-4398-a2e9-1a3508c4e9b5&device_id=15&device=28823576-054f-43ef-bff3-c1acb76595f2&data_start=2019-05-01%2000%3A00%3A00&data_end=2019-12-31%2023%3A59%3A59&bin=86400&range=Custom%20Range&markers=false&legend=true&thresholds=true&refresh=off&show_raw=true&show_quality=true & https://sanjacinto.onerain.com/sensor/?time_zone=US%2FCentral&site_id=13189&site=b6f6df4e-f5a5-4398-a2e9-1a3508c4e9b5&device_id=15&device=28823576-054f-43ef-bff3-c1acb76595f2&data_start=2020-01-01%2000%3A00%3A00&data_end=2020-06-28%2023%3A59%3A59&bin=86400&range=Custom%20Range&markers=false&legend=true&thresholds=true&refresh=off&show_raw=true&show_quality=true. The level of Lake Conroe briefly reached 201.05' above msl on April 9, 2020, but this level appears to have lasted only about fifteen minutes before dropping precipitously over the next several hours. *See id.* at 3, *available at* https://sanjacinto.onerain.com/sensor/?time_zone=US%2FCentral&site_id=13189&site=b6f6df4e-f5a5-4398-a2e9-1a3508c4e9b5&device_id=15&device=28823576-054f-43ef-bff3-c1acb76595f2&data_start=2020-04-08%2000%3A00%3A00&data_end=2020-04-10%2023%3A59%3A59&bin=86400&range=Custom%20Range&markers=false&legend=true&thresholds=true&refresh=off&show_raw=true&show_quality=true.

93 *See* "Lake Conroe – Lake Levels, August 1 through December 31, 2019," attached hereto as Attachment 13, from San Jacinto River Authority Contrail® System, Lake Conroe Dashboard, Lake Level [hereinafter "Lake Levels, Aug.-Dec. 2019 (Attachment 13)"], *available at* https://sanjacinto.onerain.com/sensor/?time_zone=US%2FCentral&site_id=13189&site=b6f6df4e-f5a5-4398-a2e9-1a3508c4e9b5&device_id=15&device=28823576-054f-43ef-bff3-c1acb76595f2&bin=86400&range=Custom%20Range&markers=false&legend=true&thresholds=true&refresh=off&show_raw=true&show_quality=true&data_start=2019-08-01%2000%3A00%3A00&data_end=2019-12-31%2023%3A59%3A59.

94 *See* Jan. Special Mtg., *supra* note 84; Feb. Special Mtg., *supra* note 14.

95 *See* Lake Levels, Aug.-Dec. 2019 (Attachment 13), *supra* note 93.

- The best practice is to store water supplies as high as possible in the basin.[96]

Mr. Gilman emphasized the importance of preserving water in the Lake Conroe water reservoir. The Board, in approving the LLS, ignored the best information available from both its own employee and its paid experts.

As identified by Mr. Rubinstein and Mr. Settemeyer, TCEQ's approval of the water right granted to SJRA and Houston was based on an evaluation of Lake Conroe's full firm yield. They determined, though, that the releases associated with the LLS have a "detrimental impact on the firm-yield water supply of the reservoir and subsequently the reservoirs [*sic*] water supply contracts and obligations."[97] SJRA has concurred with this opinion. In an April 2018 letter from Jace A. Houston, the General Manager of SJRA, to the Honorable Lyle Larson, Chairman of the House Committee on Natural Resources, Mr. Houston identified that the "yield of Lake Conroe was reduced for all scenarios where the conservation pool was lowered by more than one foot, whether temporary or permanent."[98] Mr. Houston continued:

> Existing water supplies in the San Jacinto River Basin are either currently being used or will be used in the near term to meet existing and projected demands for the region. Therefore, any reduction in water supply capacity – whether resulting from lowering the conservation pool of Lake Conroe, or from a regulatory requirement to charge the release of water to create flood capacity in Lake Conroe against SJRA and COH annual water rights – will need to be replaced through the development of major project infrastructure with associated costs dependent on project-specific infrastructure, source, yield, and timing.[99]

If TCEQ allows the LLS to continue, it will establish bad precedent for water reservoir management across the state. Flooding downstream of reservoirs during or after significant storm events occurs often, and managers of these critical water supply infrastructure storage reservoirs cannot choose the narrow goal of infrequent and potentially insignificant flood control over the long-term risks of failure to conserve water against current and future droughts.

b. The Effects of the LLS Are Not Addressed in the State Water Plan, and thus, Potentially Harming Water Supply Planning for the Entire Region.

The Texas Water Development Board develops the State Water Plan based on sixteen regional water plans. The State Water Plan "addresses the needs of all water user groups in the state – municipal, irrigation, manufacturing, livestock, mining, and steam-electric power – during a repeat

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96 *See* Jan. Special Mtg., *supra* note 84; Feb. Special Mtg., *supra* note 14.

97 Rubinstein & Settemeyer, *supra* note 5, at 2.

98 SJRA Letter to Larson, *supra* note 62, at 4. Earlier in the letter, Mr. Houston had defined "yield" as a "modeled firm water availability." *Id. See also* F&N Water Supply Report, *supra* note 59.

99 *Id.*

of the drought of record that the state suffered in the 1950s."[100] The State Water Plan is developed by TWDB staff on a five-year cycle based on information compiled from the sixteen approved regional water plans and is then presented to the TWDB governing Board for adoption.[101]

SJRA and Lake Conroe are located in Planning Region H, which is comprised of all or parts of fifteen counties and includes portions of the Trinity, San Jacinto, Brazos, Neches, and Colorado river basins.[102] The 2016 Region H Plan recognizes Lake Conroe as one of three reservoirs that are the predominant sources of surface water supply in the region.[103]

In general, the 2016 Region H Plan considers existing water supplies and then makes recommendations on how to address future water needs. While the 2016 Region H Plan does not specifically address how water providers, such as SJRA, may be using their water rights outside of identified uses, such as municipal, industrial, and irrigation both currently and in the future, the water planning process itself uses the existing firm-yield water supply to determine the region's future water supplies, availability, reliability, and needs.[104] Because of this, the 2016 Region H Plan does not contemplate a situation where SJRA and Houston institute a "lake-lowering strategy." Therefore, the firm water yield forecast for Lake Conroe, the figures upon which state planners are relying, would not reflect the actual reduced amount of water available from Lake Conroe due to the LLS.

c. The LLS Is Contrary to the Purpose and Mission of SJRA.

In its Vision Mission and Principles statement, SJRA identifies that the very purpose of Lake Conroe is to assure long-term water supplies and to supply water in drought conditions.[105] Nowhere in its Mission Statement does SJRA mention the practice of lowering Lake Conroe. In May 2019, SJRA issued a Strategic Plan for its operations.[106] The detailed plan identifies the many programs and policies intended to ensure that SJRA can provide a reliable water supply, but again, it fails to mention that for the next two to three years (or indefinitely) SJRA will be wasting water from Lake Conroe. Notably, in its discussions with stakeholders, the Groundwater

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100 Texas Water Dev. Bd, "State Water Planning," at https://www.twdb.texas.gov/waterplanning/swp/index.asp.

101 *See id.*

102 Texas Water Dev. Bd., "2017 Texas State Water Plan, Planning Region H" (interactive website), at https://2017.texasstatewaterplan.org/region/H.

103 *See* 2016 Region H Plan, *supra* note 2, § ES.3 at ES-4. The three reservoirs are Lake Conroe and Lake Houston in the San Jacinto River Basin and Lake Livingston in the lower Trinity River Basin. *See id.*

104 *See* Rubinstein & Settemeyer, *supra* note 5, at 2.

105 *See* San Jacinto River Auth., "Vision Mission and Principles," at https://www.sjra.net/about/vision_mission_principles/.

106 San Jacinto River Auth., "2019 Strategic Plan," (May 23, 2019), *available at* https://www.sjra.net/wp-content/uploads/2019/07/SJRA-Strategic-Plan-landscape-final-web.pdf.

Reduction Planning ("GRP") Review Committee affirmatively stated: "Lake Conroe should not be lowered – it is not a flood control reservoir."[107]

SJRA is currently undergoing Sunset review—a significant review of all its policies and operations and a method by which the Legislature can evaluate how SJRA is implementing its statutory purpose and mission. However, SJRA fails to make any mention of the LLS in its Self Evaluation Report submitted to the Sunset Advisory Commission.[108] As part of Section VII. "Guide to Agency Programs – Flood Management Division" of the Self Evaluation Report, SJRA discusses the major activities performed under the program, yet the LLS is not discussed here or elsewhere in the 131-page report. Considering SJRA's recent recommitment to and conviction regarding the benefits and effectiveness of the LLS, not to mention the controversy and public interest in the LLS, it would seem that the LLS should have been discussed in SJRA's report to the Legislature.

C. <u>While TCEQ Has Previously Exercised Enforcement Discretion Regarding the LLS, the Reasons for Doing So Are No Longer Present.</u>

Apparently in response to a request from SJRA and Houston, TCEQ temporarily acquiesced to the LLS in a letter dated June 15, 2018, stating:

> *The issue of lowering the levels of Lakes Conroe and Houston while the dredging takes place over the next one to three years* has been identified by the San Jacinto River Authority (SJRA), City of Houston (COH), and the Texas Department of Emergency Management as being critical to the effort of mitigating flood risk. . . .
>
> As TCEQ understands, SJRA, in coordination with the COH, have developed an emergency driven seasonal strategy for managing the water reservoirs during periods of heavy rainfall. TCEQ further understands that *these measures would be utilized only on a temporary basis to mitigate flooding while dredging activities are completed*. . . .
>
> The TCEQ appreciates the *challenges with mitigating flood risks during the time in which the San Jacinto River will be dredged* while managing the region's water supply.[109]

TCEQ's Office of the Executive Director stated it would exercise "enforcement discretion" with regard to any exceedance of the annual permitted amounts authorized for diversion or release that resulted from the LLS based on its understanding that the lake lowering measures would be used seasonally and would only be utilized on a temporary basis while dredging activities were

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107 *Id.* at 5.

108 Self Evaluation Report, *supra* note 24.

109 Letter from Stephanie Bergeron Perdue, Interim Exec. Dir., Texas Comm'n on Envt'l Quality, to Jace A. Houston, Gen. Mgr., San Jacinto River Auth., & Carol Haddock, Dir., Houston Pub. Works, Houston, at 1-2 (June 15, 2018) (emphasis added).

completed.[110] That dredging was completed in September 2019,[111] but SJRA, at its public meeting in February 2020, and as endorsed in a subsequent letter from the Mayor *Pro Tem* of Houston, reaffirmed and extended the LLS, which is now expected to continue until 2023 or later.[112]

All parties understand that there was a need to take some sort of emergency steps after the Hurricane Harvey devastation, and due to the uncertainties at the time, LCA understands TCEQ's decision to exercise short-term enforcement discretion under those circumstances. Both Houston and SJRA were aware that TCEQ's determination to exercise enforcement discretion was temporary because of an immediate condition. In an e-mail from Jace A. Houston, General Manager of SJRA, to Carol Ellinger Haddock, P.E., Director of Houston Public Works, discussing the preparation of a joint Houston/SJRA press release to announce TCEQ's decision, Mr. Houston noted: "I intentionally mentioned the emergency and temporary nature of this action. TCEQ and [the Texas Division of Emergency Management] were very specific that this is a temporary solution due to an immediate, emergency condition."[113] The Joint Press Release also acknowledged the short-term nature of the LLS:

> The silt [from Hurricane Harvey] physically changed the river's ability to safely pass flows during storms and created the need for a significant dredging project to restore the river's capacity. As a *temporary* flood mitigation solution, the City of Houston and the San Jacinto River Authority (SJRA) proposed a *temporary*, joint reservoir operations strategy for Lake Houston and Lake Conroe. The *temporary* flood mitigation would be in place *for up to two years or until the dredging project is completed.*
>
> * * *

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110 *See id.* In making its enforcement decision, TCEQ appears to have relied, at least in part, on a request by the Texas Department of Public Safety. Through a June 12, 2018 letter to Governor Greg Abbott, W. Nim Kidd, Chief of the Texas Division of Emergency Management, requested that the Governor urge TCEQ to provide regulatory flexibility to allow for flood mitigation measures—specifically the LLS—"only on a temporary and seasonal basis." Letter from W. Nim Kidd, CEM, Chief, Texas Div. of Emer. Mgmt., Div. Dir., Texas Dep't of Pub. Safety, to the Honorable Greg Abbott, Governor, State of Texas, at 2 (June 12, 2018). Mr. Kidd referenced the "acute need to dredge portions of the west fork of the San Jacinto River," and identified that the "temporary, seasonal, systematic lowering" of Lake Conroe was "not a long-term solution, but an emergency driven measure that is needed temporarily." Id. at 1.

111 Galveston Dist., U.S. Army Corps of Engineers, "West Fork San Jacinto Emergency Dredging Placemat, at https://www.swg.usace.army.mil/Business-With-Us/Emergency-Management-Office/West-Fork-San-Jacinto-Emergency-Dredging/. Although not included in the original scope of work, in April 2019, the contract was modified to include additional dredging in the San Jacinto River, which was expected to be completed in September 2019.

112 *See* Feb. Special Mtg., *supra* note 14; Mayor *Pro Tem* Letter, *supra* note 6.

113 E-mail from Jace A. Houston, Gen. Mgr., San Jacinto River Auth., to Carol Ellinger Haddock, P.E., Dir., Houston Pub. Wks. (June 15, 2018, 9:39 p.m.).

> In a letter to the City of Houston and SJRA on Friday, June 15, 2018, the TCEQ expressed its intent to use enforcement discretion to allow the two agencies to move forward with finalizing their *temporary* flood mitigation strategy.[114]

As noted above, the dredging project that was the basis for this request has been completed. However, the SJRA Board has chosen to continue the LLS, which as identified above, is in direct violation of the Amended Certificate and state law and will not meaningfully mitigate downstream flooding.

The time for enforcement discretion has ended. SJRA and Houston are wasting tens of thousands of acre-feet seasonally from Lake Conroe, and they cannot point to any actual benefit to potential downstream flooding. The very purposes of Lake Conroe are being undermined every spring and fall by the LLS, and in fact throughout the year when there is insufficient rainfall to return the lake to its conservation pool level.

D. Other Impacts, Penalties, and Punitive Provisions

The very purpose of LCA is to protect the interests of Lake Conroe, and even the lengthy discussion above does not address all concerns with the LLS. Environmental concerns are of particular note, and there appears to have been no study by SJRA or Houston regarding not only impacts on Lake Conroe, but the downstream impacts of the huge volumes of fresh water that are being released into the Galveston Bay estuary. As noted, LCA was originally formed to control and eliminate the Hydrilla infestation in Lake Conroe, and the artificially lowered lake level raises concerns with the reemergence of invasive species. The lowered lake impacts fish breeding areas and affects fish size and population. Many varieties of permanent and migratory bird species feed on Lake Conroe fish, and the lake serves as habitat for many species, including egrets, herons, and eagles. The possible adverse impacts on plant and animal wildlife due to the lowering of Lake Conroe for no demonstratable useful purpose have not been evaluated or even considered by SJRA and Houston.

State law and TCEQ's rules establish significant penalty provisions for SJRA's and Houston's wasting of state water. The Texas Water Code provides for enforcement and penalties for violation of a water right: "No person may willfully take, divert, or appropriate any state water for any purpose without first complying with all applicable requirements of this chapter."[115] It also provides for civil penalties: "A person who willfully takes, diverts, or appropriates state water without complying with the applicable requirements of this chapter is also liable to a civil penalty

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[114] Press Release, City of Houston & San Jacinto River Auth., "City and SJRA Receive Approval to Move Forward with Temporary Flood Mitigation Proposal for Lake Houston and Lake Conroe," at 1 (June 16, 2018) (emphasis added), *available at* http://www.sjra.net/wp-content/uploads/2018/06/06-17-2018-Joint-Press-Release-TCEQ-allows-temporary-mitigation-strate....pdf.

[115] TEX. WATER CODE § 11.081.

of not more than $5,000 for each day he continues the taking, diversion, or appropriation."[116] TCEQ likely has its own directives and policies regarding enforcement of its rules and state law.

LCA is only interested in the cessation of this illegal and harmful practice of wasting water.

E. Conclusion

Lake Conroe was designed and intended to be a water supply reservoir, and the Amended Certificate issued by TCEQ sets limits on how waters from the lake can be used. To determine compliance with the Amended Certificate, TCEQ must ensure that the water diverted from Lake Conroe is for a documented need for an authorized beneficial use. The LLS does not utilize Lake Conroe's water for any of the approved uses. Instead, it simply discharges water downstream for no use whatsoever. Allowing a water reservoir like Lake Conroe to be artificially lowered for flood control establishes a bad precedent for the management of other water reservoirs in Texas. For example, downstream flooding has occurred due to storm release from Lake Livingston, which is one of the primary water supplies for Houston. Reduction of the full pool levels of Lake Livingston and other lakes in Texas would result in a significantly reduced water supply for the state.

LCA files this complaint, as supported by the information set out above, and respectfully requests that TCEQ investigate SJRA, Houston, and the LLS in light of the Amended Certificate and state law, and upon completion of the investigation, require SJRA and Houston to cease this illegal, misguided, ineffective, wasteful, and destructive policy. Thank you for your attention to this matter, and please let me know if you have any questions or if you need additional information from LCA.

Sincerely,

Erich M. Birch
Attorney for the Lake Conroe Association

ATTACHMENTS
cc: Mr. Kevin Lacy, President, Lake Conroe Association, *via U.S. Mail*
Mr. Jace A. Houston, General Manager, San Jacinto River Authority, *via U.S. Mail*
Ms. Carol Haddock, P.E., Director, Houston Public Works, City of Houston, *via U.S. Mail*
The Honorable Kevin Brady, U.S. House of Representatives, *via U.S. Mail*
The Honorable Dan Crenshaw, U.S. House of Representatives, *via U.S. Mail*
The Honorable Robert Nichols, Texas Senate, *via U.S. Mail*
The Honorable Brandon Creighton, Texas Senate, *via U.S. Mail*
The Honorable Will Metcalf, Texas House of Representatives, via U.S. Mail
The Honorable Dan Huberty, Texas House of Representatives, *via U.S. Mail*

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116 *Id.* § 11.082(a).

List of Attachments

Attachment 13 – "Lake Conroe – Lake Levels, August 1 through December 31, 2019," from San Jacinto River Authority Contrail® System, Lake Conroe Dashboard, Lake Level.

Attachment 1

June 29, 2020

Erich Birch
Birch, Becker & Moorman, LLP
4705 Spicewood Springs Rd., Suite 200
Austin, Texas 78759-7814

Dear Mr. Birch:

Re: Release of Water from Lake Conroe by the San Jacinto River Authority and City of Houston

RSAH2O, LLC (RSAH2O) was requested to provide consulting assistance with respect to a practice by the San Jacinto River Authority (SJRA) and the City of Houston (CoH) of lowering Lake Conroe for flood control purposes. We have been asked whether this practice is authorized under the water rights permit issued by the Texas Commission on Environmental Quality ("TCEQ") or whether there might be other authority that would allow this practice. We have also been asked for our views on whether lowering of Lake Conroe could provide flood control benefits based on our experience with rivers, reservoirs and flood control structures. Finally, we were asked to identify whether there would be impacts to water supply and whether this practice is consistent with the state of Texas' water policy. RSAH2O has reviewed available documentation, including documents that you provided in response to public information requests, and offers the following opinions.

Certificate of Adjudication No. 10-4963, as amended, authorizes the SJRA and CoH to maintain an existing dam and reservoir (Lake Conroe) on the West Fork San Jacinto River and impound therein not to exceed 430,260 acre-feet of water. Owners are authorized to divert or release and use not to exceed 100,000 acre-feet per year for municipal, industrial, mining, and agricultural purposes. Owners are required to implement water conservation plans as specified by the water right and state requirements.

Owners of this certificate are subject to the Rules of the Texas Commission on Environmental Quality and its continuing right of supervision of the State water resources consistent with the Texas Water Code.

RSAH2O, LLC, 16238 Ranch Road 620 N, STE F364, Austin Texas 78717
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Curtis Seaton, Associate curtis@rsah2o.com

The SJRA and CoH, since Hurricane Harvey, have implemented a strategy to lower Lake Conroe by one foot below its normal pool level for the period April 1 through May 31, and again from August 1 through August 31 to lower the lake below its normal poll level by one foot, and then lower it an additional six inches from September 1 through September 30 – irrespective of whether an imminent threat of property damaging flooding or storm events exist at those times. The normal conservation level of Lake Conroe is 201msl, with a flood easement up to 207 msl. Thus, to achieve a reduction for flood control in storage below 201 msl, water must be released from the conservation pool of Lake Conroe.

Any release of water from the conservation pool must be in accordance with the authorized water right. Release of water from the conservation pool strictly for flood control purposes, with no documented beneficial use downstream constitutes an unauthorized use of water as per the terms and conditions of the water right. Additionally, it is contrary to the water supply conservation requirements of the water right. Studies provided to and reviewed by RSAH2O have shown that such a release has a detrimental impact on the firm-yield water supply of the reservoir and subsequently the reservoirs water supply contracts and obligations. The TCEQ used the reservoir's full firm yield when evaluating whether to grant the water right. Furthermore, the State's water planning process uses the existing firm-yield water supply to determine the region's further water supplies, availability, reliability and needs.

Perhaps there was a need to take proactive measures to mitigate flooding during a significant or imminent storm event. Although studies reviewed demonstrate that during Hurricane Harvey type events, the benefits of such lake level lowering are minimal at best. When there is no such threat, any release of water not subsequently used per the terms of the water right is an inappropriate and unauthorized use of the permitted water supply of Lake Conroe.

The lake lowering strategy was initially supported by a letter dated June 15, 2018 from the TCEQ. This letter specifically notes lake lowering to facilitate downstream dredging operations. The letter states that *"if flood mitigation releases made under these conditions result in an exceedance of the annual permitted amounts authorized for diversion or release by SJRA or the COH, the TCEQ Executive Director will exercise enforcement discretion with respect to such exceedance."* We interpret this enforcement discretion letter as being limited in time *"while the San Jacinto River will be dredged…"*, and not an authorization to use water outside of the four corners stipulations and conditions included in the permit, or to cause a waste of water.

RSAH2O has reviewed the Water Use Reports, including associated documents, relative to the water releases from Lake Conroe. The documents indicate there was a pre-release in 2018 of 18,265 acre-feet from Lake Conroe. All of this water was accounted for as municipal use. For 2019, there was a pre-release from Lake Conroe of 66,167 acre-feet. All of this water was accounted for as municipal use as well. The documents describe the releases as pre-storm releases. A pre-storm release of water is not a municipal use of water.

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The Texas Administrative Code 30 TAC 297.1 provides the following:

> (34) Municipal use--
> (A) The use of potable water within a community or municipality and its environs for domestic, recreational, commercial, or industrial purposes or for the watering of golf courses, parks and parkways, other public or recreational spaces; or
> (B) the use of reclaimed water in lieu of potable water for the preceding purposes; or
> (C) the use of return flows authorized pursuant to Texas Water Code, §11.042, in lieu of potable water for the preceding purposes. Return flows used for human consumption as defined in §290.38(34) of this title (relating to Definitions) must be of a quality suitable for the authorized beneficial use as may be required by applicable commission rules; or
> (D) the application of municipal sewage effluent on land, under a Texas Water Code, Chapter 26, permit where:
> (i) the application site is land owned or leased by the Chapter 26 permit holder; or
> (ii) the application site is within an area for which the commission has adopted a no-discharge rule.

The review of documents reveals that water from Lake Conroe was released as a pre-storm event and wrongfully classified as used for municipal purposes. There is no documentation to indicate that the water was subsequently used for a permitted beneficial use. The only intended use was the desire to lower the lake level at Lake Conroe for flood control purposes. Such use of this water is not authorized by the water right and constitutes a waste of a valuable resource.

The TCEQ, to determine compliance with the water right, must ensure that water released from Lake Conroe is for a documented need of one of the specific authorized uses; is made by the rightful owners of the water under the water right; and that the actual downstream diversion and use must corresponded with the amount of water released minus accepted conveyance losses. The TCEQ must identify the volume of water released from Lake Conroe that went unused or used outside the terms of the water right (flood control designations).

Additionally, the continuation of the recent and arbitrary process of lowering Lake Conroe seasonally is something that could subject the lake and potentially the bays to potential environmental impacts. This change in operation has not been subject to a TCEQ environmental review approval process as would be required by any permit amendment.

In summary, the seasonal fluctuations of the conservation pool at Lake Conroe by the SJRA and CoH does not appear to be authorized under the water rights permit. Further, any use of water outside the current permit would require an amendment authorization to the Lake Conroe water right. Instead, the current practice will impact the region's future water supply, appears to constitute a waste of water, and is a violation of the water right when no authorized use is made

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of the releases. Additionally, any environmental impacts remain unaccounted for as no analysis with public review has been completed by the TCEQ.

RSAH2O stands ready to answer any questions you may have.

Sincerely,

Carlos Rubinstein
Principal, RSAH2O

Herman R. Settemeyer, P. E.
Partner, RSAH2O

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Attachment 2

Lake Conroe – Lake Levels, May 27 through June 27, 2020

From San Jacinto River Authority Contrail® System, Lake Conroe Dashboard, Lake Level, *available at* https://sanjacinto.onerain.com/sensor/?site_id=13189&site=b6f6df4e-f5a5-4398-a2e9-1a3508c4e9b5&device_id=15&device=28823576-054f-43ef-bff3-c1acb76595f2.

Attachment 3

TECHNICAL MEMORANDUM

FREESE AND NICHOLS

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TO:	Michael V. Reedy, P.E.
FROM	Jeremy D. Dixon, P.E., CFM
SUBJECT:	Lake Conroe Dam Gate Operations Modification Analysis
PROJECT:	SPH18133
DATE:	April 10, 2018
CC:	

STATE OF TEXAS
JEREMY D. DIXON
121614
LICENSED
PROFESSIONAL ENGINEER
04/10/18
FREESE AND NICHOLS, INC.
TEXAS REGISTERED
ENGINEERING FIRM
F-2144

1.00 BACKGROUND AND PURPOSE

The San Jacinto River Authority (SJRA) received a letter from Lyle Larson, Chair of the Texas House of Representatives Committee on Natural Resources, dated December 18, 2017 regarding actions that may be undertaken to prevent future flooding, similar to that which occurred as a result of Hurricane Harvey. In particular, Representative Larson requested a response to the following question:

> *"If the SJRA were to drop the elevation of Lake Conroe by one to three feet, what would the impact be on permits that are already issued for water in the basin based on historic use during hurricane season (August and September) over the last two decades? What would be the flood control capacity gained by lowering the lake level annually during hurricane season (August and September) by one, two, or three feet?"*

The purpose of this memorandum is to document the potential impact on lake levels and downstream maximum water surface elevation of a two-foot and a three-foot reduction in the normal pool level of Lake Conroe. Two hypothetical storms, the 1-percent annual exceedance probability (100-year) storm event and the 0.2-percent annual exceedance probability (500-year) storm event, are used as test cases to demonstrate the impacts of the proposed changes.

Freese and Nichols, Inc. (FNI) updated and amended the existing gate operations policy for the San Jacinto River Authority (SJRA) in April 2017 based on historical operations data. This memorandum uses the spreadsheet tools from the April 2017 gate operations policy.

2.00 METHODOLOGY

To answer the question of the amount of flood control capacity gained by lowering the normal pool elevation of the reservoir to elevation by one, two, or three feet, a relatively simple calculation can provide the answer. Table 1 shows this calculation, based on the bathymetric survey by Texas Water Development Board in 2010[1]. The Runoff Storage column indicates the amount of basin-averaged runoff that can be stored within the volume in flood pool.

Table 1: Lake Conroe Conceptual Flood Pool Volume Calculation

	Normal Pool Elevation, feet-MSL	Normal Pool Volume, ac-ft	Flood Pool Storage, ac-ft	Runoff Storage, inches
Lowered 3 feet	198.00	355,653	55,369	2.30
Lowered 2 feet	199.00	373,635	37,387	1.55
Lowered 1 foot	200.00	392,078	18,944	0.79
Current	201.00	411,022	0	0.00

The operators of Lake Conroe Dam use a spreadsheet tool that records time-series data of lake level and gate opening, computes an estimated inflow over the time step, and recommends a minimum, target, and maximum gate opening for each time step. FNI has developed a version of the spreadsheet tool to compute the resulting lake level and discharge based on a known inflow hydrograph.

FNI used the HEC-HMS version 4.2.1 PMF hydrologic model developed for the Emergency Action Plan (EAP) to apply the 100-year (24-hour) and 500-year (24-hour) storm events to the Lake Conroe basin. These storm events were modeled as nested intensity Frequency Storms, with the peak centered at 50% of the duration of the storm. The resulting hydrographs from the HEC-HMS model

[1] TWDB, 2010. "Volumetric and Sedimentation Survey of Lake Conroe". http://www.twdb.texas.gov/hydro_survey/conroe/2010-08/

were input into the spreadsheet tool to compute the lake level and discharge for each hypothetical storm event. Table 2 shows the precipitation depths used to determine the inflow hydrographs.

Table 2: Precipitation Depths

Duration	100-year Precipitation Depth, inches	500-year Precipitation Depth, inches
15 Minutes	2.3	2.8
1 Hour	4.4	5.8
2 Hours	6.2	8.5
3 Hours	6.75	9.4
6 Hours	9	13
12 Hours	11	16
1 Day	11.5	17.5

The hypothetical storm inflow hydrographs for the 100-year and 500-year events are shown in **Figure 1**.

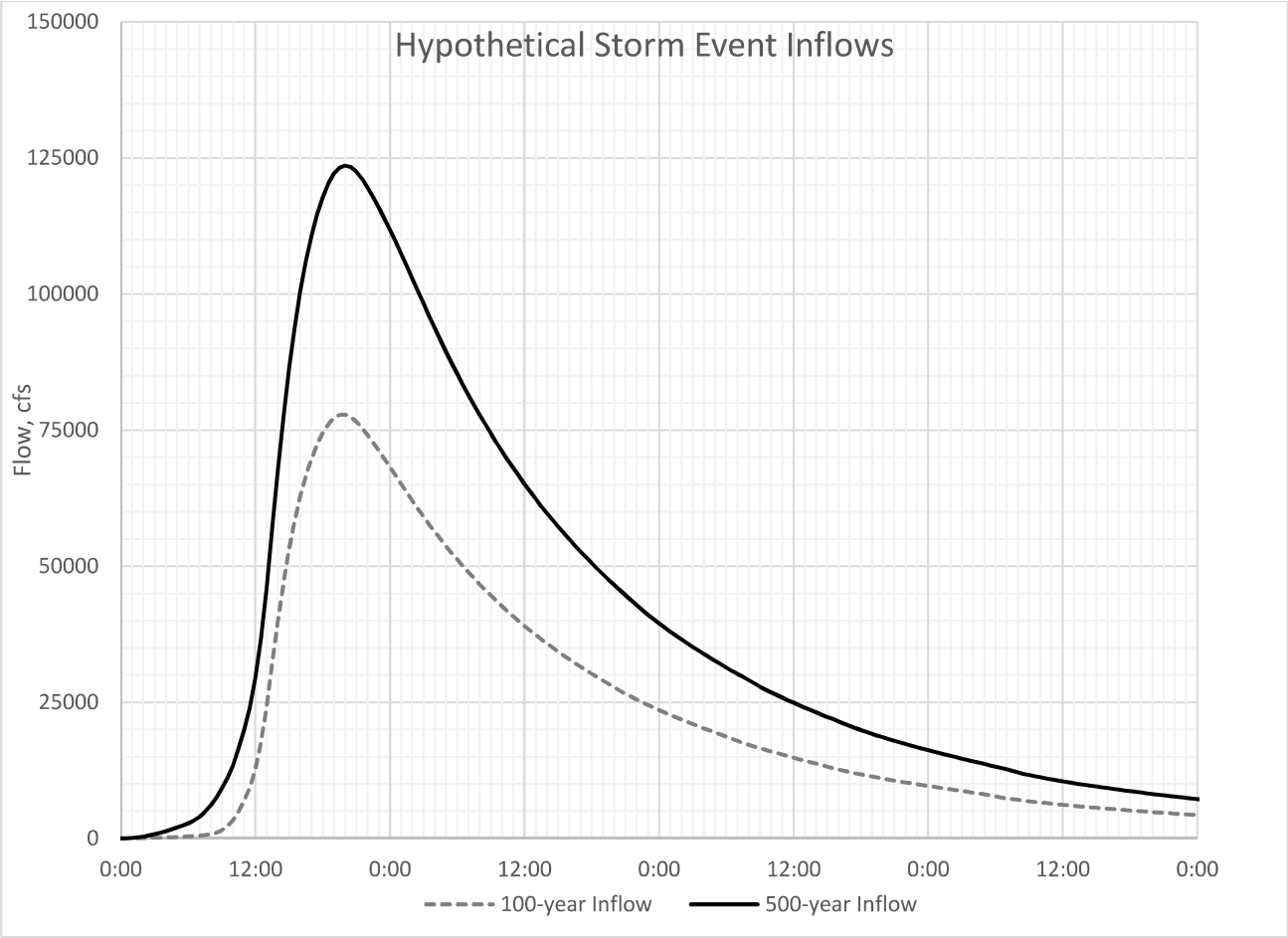


Figure 1: Hypothetical Storm Event Inflows

The impact of lowering the normal pool is determined by using these same hypothetical storm event inflows at different starting lake levels, with gate operations run at the target release rate, as determined by the gate operations spreadsheet.

The three scenarios to be evaluated include:

- Base condition, which is representative of the current gate operations plan
- 199 ft-msl normal pool (lowered 2 feet)
- 198 ft-msl normal pool (lowered 3 feet)

Comparisons will be made with the Base condition, as it represents the current gate operations plan. The impacts to those downstream of Lake Conroe Dam will be evaluated using the EAP HEC-RAS model truncated at IH-45.

3.00 100-YEAR EVENT COMPARISONS

FNI used the spreadsheet tool to evaluate the impact of lowering the normal pool elevation by 2 feet (199 ft-msl starting elevation) and 3 feet (198 ft-msl starting elevation). The same 100-year inflow hydrograph was used as input for all scenarios, with the starting lake level being the only difference. The recommended target release was used for each gate operation in all three scenarios. The resulting lake level and discharge is shown tabularly in Table 3 and graphically in Figure 2.

Lowering the normal pool by two or three feet allows the full rising limb of the inflow hydrograph to be stored prior to releasing any water. This alters the timing of the event and causes the releases to begin only on the descending limb of the inflow hydrograph, for which the spreadsheet tool recommends different gate openings than the ascending limb. Because the lake level did not exceed the flowage easement, and in order to make direct comparisons, no overrides of the gate openings were incorporated.

Table 3: 100-year, 24-hour Event Results

	Base	199 ft-msl Normal Pool	198 ft-msl Normal Pool
Peak Lake Level, ft-msl	205.14	204.64	204.26
Time of Peak Lake Level, hours	49.00	56.50	56.50
Peak Outflow, cfs	22,664	16,837	16,733

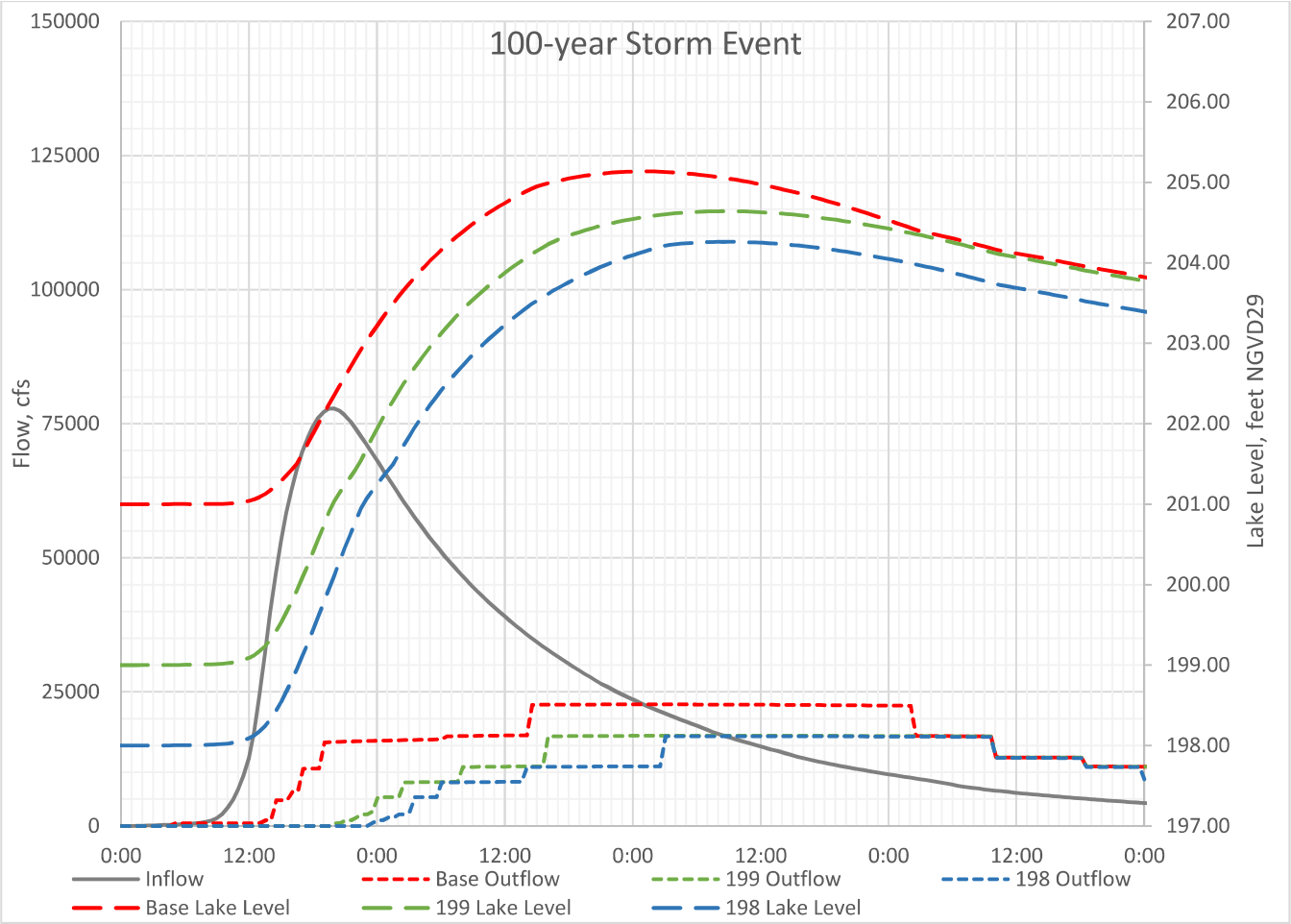


Figure 2: 100-year Event Inflow, Outflow, and Lake Level

4.00 500-YEAR EVENT COMPARISONS

FNI used the spreadsheet tool to evaluate the impact of lowering the normal pool elevation by 2 feet (199 ft-msl starting elevation) and 3 feet (198 ft-msl starting elevation). The same 500-year inflow hydrograph was used as input for all scenarios, with the starting lake level being the only difference. The recommended target release was used for each gate operation in all three scenarios. The resulting lake level and discharge is shown tabularly in Table 4 and graphically in Figure 3.

Lowering the normal pool by two or three feet allows the full rising limb of the inflow hydrograph to be stored prior to releasing any water. This alters the timing of the event and causes the releases to begin only on the descending limb of the inflow hydrograph, for which the spreadsheet tool recommends different gate openings than the ascending limb. It is for this reason that there were several manual overrides of the discharges, which are represented in Figure 3 as dots labeled "Override". These overrides were selected to be consistent between the two alternative runs, so that the results would be comparable, and also consistent with historic gate operations.

Table 4: 500-year, 24-hour Event Results

	Base	199 ft-msl Normal Pool	198 ft-msl Normal Pool
Peak Lake Level, ft-msl	205.73	205.72	205.67
Time of Peak Lake Level, hours	40.00	45.50	47.50
Peak Outflow, cfs	54,532	43,349	39,918

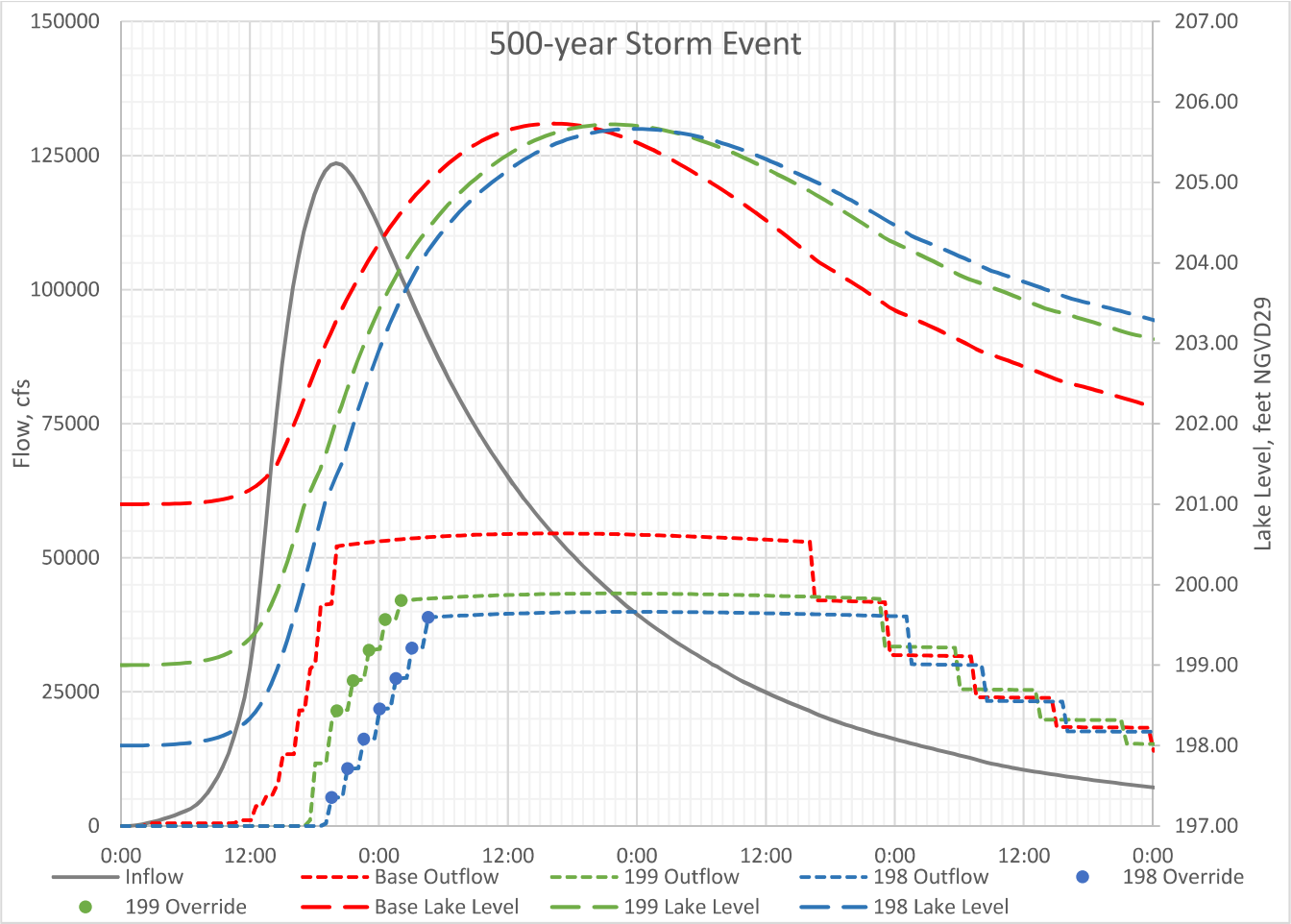


Figure 3: 500-year Event Inflow, Outflow, and Lake Level

5.00 DOWNSTREAM IMPACTS

Water surface elevations downstream of Lake Conroe Dam are computed based on the same HEC-RAS v 5.0.3 model as used in the EAP. This model is calibrated for the PMF storm event, but the hydraulic parameters seem to be sufficient for analyzing peak discharges from the Lake Conroe Dam in this situation.

The hydraulic model was truncated upstream of the IH-45 bridge, with a downstream boundary condition of a rating curve based on the unsteady flow 72-hour PMF run results at that cross section. The steady state flows applied to the hydraulic model include both the peak discharge from Lake Conroe, as well as the coincident flow from Lake Creek at the same time of the peak. No attenuation or lag was assumed between Lake Conroe Dam and the Lake Creek confluence. A summary of the simulated discharges is shown in Table 5.

Table 5: Hydraulic Model Flows

	Base	199 ft-msl Normal Pool	198 ft-msl Normal Pool
100-year Lake Conroe Discharge, cfs	22,664	16,837	16,733
100-year Lake Creek Confluence, cfs	77,768	70,965	66,374
500-year Lake Conroe Discharge, cfs	54,532	43,349	39,918
500-year Lake Creek Confluence, cfs	142,577	131,208	127,708

The computed floodplain within and downstream of Lake Conroe are plotted in Exhibit 1 for the 100-year storm event and Exhibit 2 for the 500-year storm event.

The computed water surface elevations downstream of Lake Conroe Dam are plotted on a profile, including the Base condition (201 NP), the 199 ft-msl Normal Pool (199 NP), and the 198 ft-msl Normal Pool (198 NP) for the 100-year (100yr) and 500-year (500yr) storm events in Exhibit 3. These values are also shown in Table 6, and the difference relative to the Base condition is shown in Table 7.

Table 6: Computed Downstream Water Surface Elevation

	Base	199 ft-msl Normal Pool	198 ft-msl Normal Pool
100-year Water Surface Elevation at Cross Section, ft-msl			
261977 DS Lake Conroe	153.94	152.47	152.44
245816 US SH 105	149.57	148.10	148.07
209465 Lake Creek	136.88	136.36	136.01
182231 IH-45	124.44	123.70	123.19
500-year Water Surface Elevation at Cross Section, ft-msl			
261977 DS Lake Conroe	159.31	157.74	157.20
245816 US SH 105	154.33	153.00	152.55
209465 Lake Creek	141.02	140.37	140.17
182231 IH-45	129.69	128.89	128.63

Table 7: Computed Downstream Water Surface Elevation Difference

	199 ft-msl Normal Pool	198 ft-msl Normal Pool
100-year Water Surface Elevation Difference, ft		
261977 DS Lake Conroe	-1.47	-1.50
245816 US SH 105	-1.47	-1.50
209465 Lake Creek	-0.52	-0.87
182231 IH-45	-0.74	-1.25
500-year Water Surface Elevation Difference, ft		
261977 DS Lake Conroe	-1.57	-2.11
245816 US SH 105	-1.33	-1.78
209465 Lake Creek	-0.65	-0.85
182231 IH-45	-0.80	-1.06

6.00 DISCUSSION AND CONCLUSIONS

This analysis shows the reduction in normal pool elevation does provide some benefit to areas upstream of Lake Conroe for flood events, and there is also a limited benefit for those downstream as the peak outflow is slightly reduced relative to the base condition. The average change in downstream water surface elevation for a normal pool elevation of 199 ft-msl is a reduction of approximately 1.0 feet for both the 100-year and 500-year storm events. The average change in downstream water surface elevation for a normal pool elevation of 198 ft-msl is a reduction of approximately 1.25 and 1.50 feet for the 100-year and the 500-year storm events, respectively. These reductions are relative to flows that are on average 8 feet above the channel banks in the 100-year event, and more than 12 feet above the channel banks in the 500-year event.

As mentioned above, the approximate extents of flooding for the compared scenarios are shown in Exhibit 1 and Exhibit 2, and Water Surface Elevation profiles of the West Fork San Jacinto River between Lake Conroe Dam and Interstate Highway 45 are shown in Exhibit 3. The benefits to those downstream, though the water surfaces are reduced by a foot or more in places, are generally not enough to be considered wholesale improvements to the flood hazard and show minimal differences in spatial extent.

For storm events larger than a 500-year event, it is anticipated that the addition of the flood pool will likely yield no additional benefit to the upstream and could potentially increase the flood hazard downstream of the dam if the peak release is delayed such that it occurs at the same time as other tributaries to the West Fork San Jacinto River. For lake levels above elevation 205.00 ft-msl, the gate operations policy is generally dictated by the requirements of the PMF storm, and the peak releases begin to converge to the same discharge rate.

The addition of a flood pool below the current normal pool elevation of 201 ft-msl will likely require a change to the gate operations policy, especially as lake levels exceed elevation 201 ft-msl. With the high rate of rise shown in the 100-year and 500-year scenarios, the amount of time prior to when the gates would be overtopped is reduced by approximately 13 hours. An update to the gate operations policy would be needed to ensure appropriate management and technical staff are present whenever the lake level was sufficiently high into the flood pool, but not yet above the 201 ft-msl level for releases, because the lake level will be rising rapidly as the level exceeds 201 ft-msl and rapid gate operations will be required.

The amount of data currently available to operators in real-time is not conducive to the fine-tuning of gate operations in this way. Gate Operators must have flexibility to operate the gates in accordance with their mission to ensure safe, dependable reservoir operations, so that when dam safety issues arise, the lake level can be controlled safely without additional deleterious effects.

FNI recommends that the analyzed modifications to the gate operations policy for Lake Conroe Dam not be undertaken without:

- A thorough study of the impact of the revised policy on lake levels and flows for multiple storm events, up to and including the PMF.
- A detailed design storm review to make sure that the dam can safely pass the appropriate design storm with the revised policy.
- A significant initial and ongoing investment to develop additional streamflow gauging stations upstream of Lake Conroe Dam to more accurately quantify inflow into the lake.

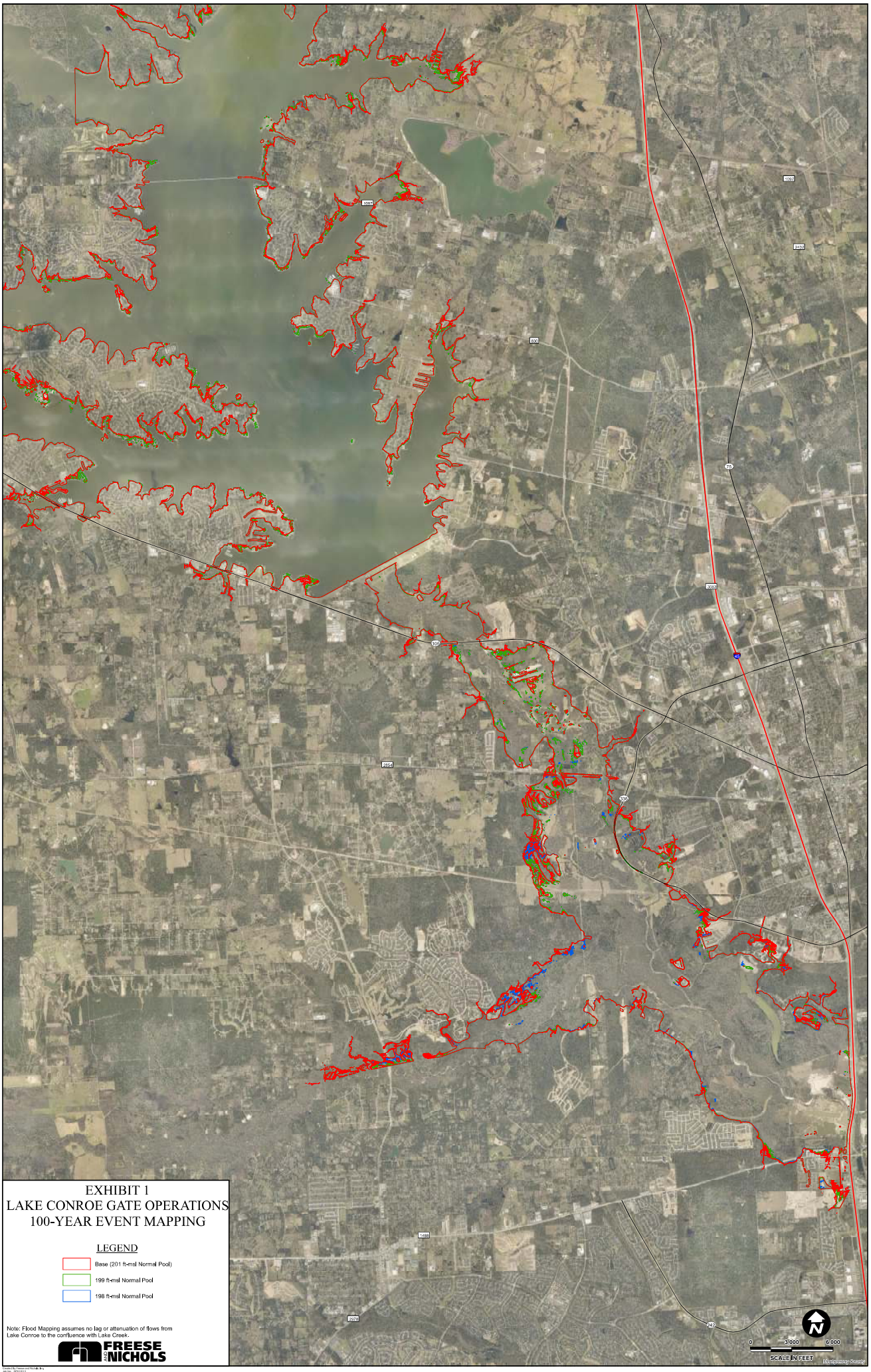


EXHIBIT 1
LAKE CONROE GATE OPERATIONS
100-YEAR EVENT MAPPING
LEGEND
Base (201 ft-msl Normal Pool)
199 ft-msl Normal Pool
198 ft-msl Normal Pool
Note: Flood Mapping assumes no lag or attenuation of flows from Lake Conroe to the confluence with Lake Creek.
FREESE AND NICHOLS
0
3,000
6,000
SCALE IN FEET
Montgomery County

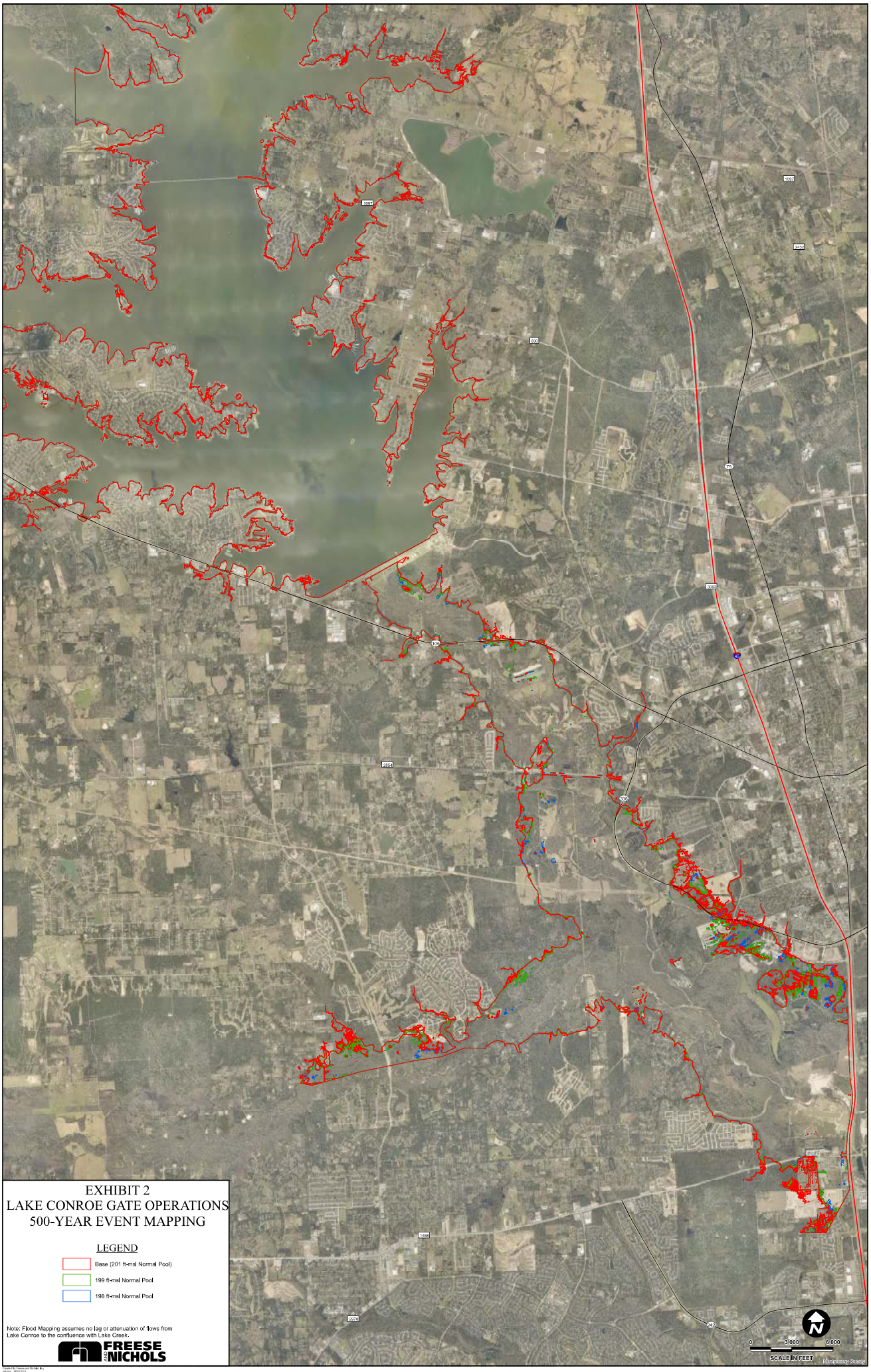
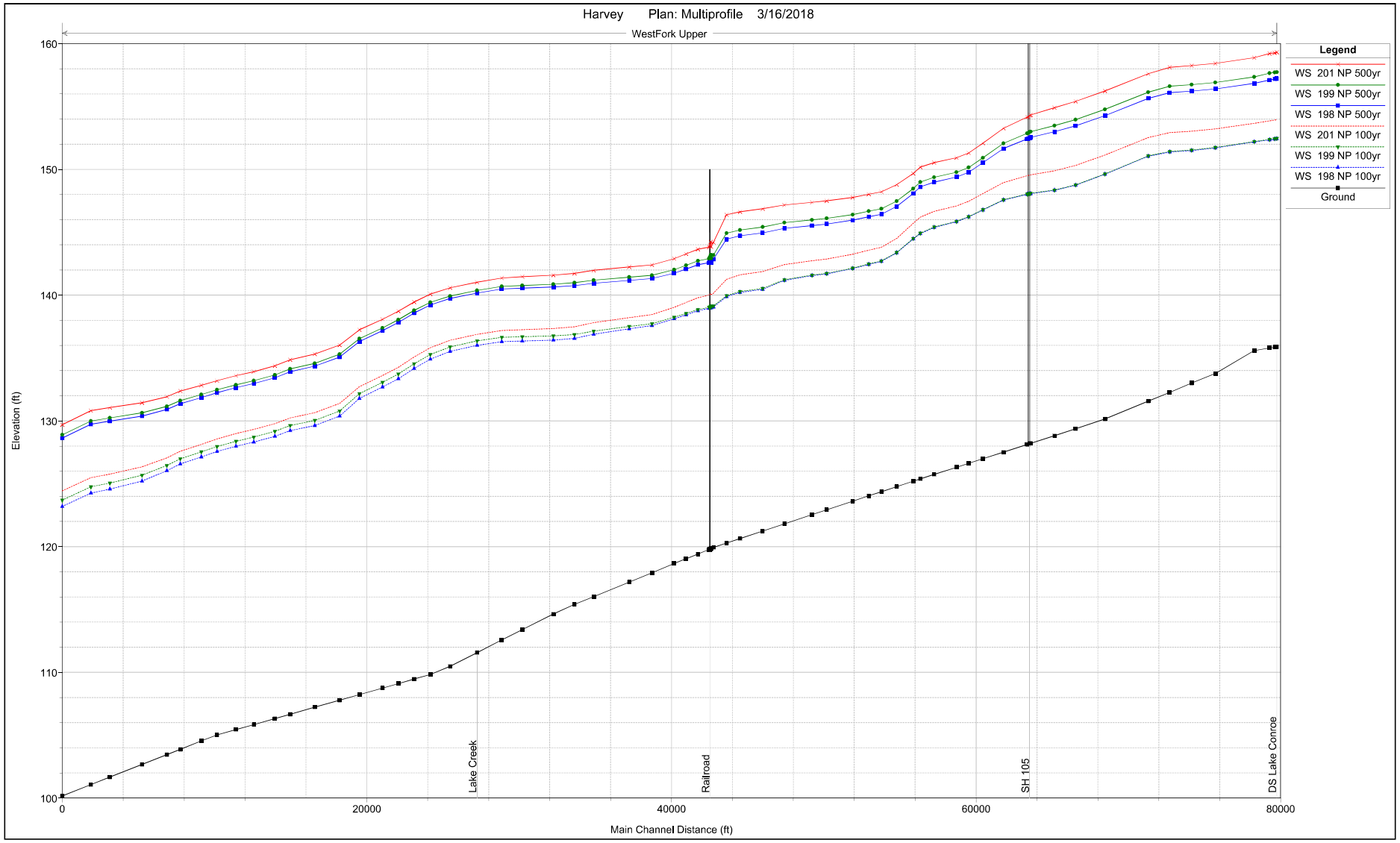


EXHIBIT 2
LAKE CONROE GATE OPERATIONS
500-YEAR EVENT MAPPING
LEGEND
Base (201 ft-msl Normal Pool)
199 ft-msl Normal Pool
198 ft-msl Normal Pool
Note: Flood Mapping assumes no lag or attenuation of flows from Lake Conroe to the confluence with Lake Creek.
FREESE AND NICHOLS
0
3,000
6,000
SCALE IN FEET
Montgomery County

Exhibit 3
HEC-RAS Profiles



Attachment 4

San Jacinto River Authority

ADMINISTRATIVE OFFICE
P.O. Box 329 • Conroe, Texas 77305
(T) 936.588.3111 • (F) 936.588.3043

April 16, 2018

The Honorable Lyle Larson
Chairman, House Committee on Natural Resources
PO Box 2910
Austin, TX 78768

Dear Chairman Larson,

In a letter dated December 18, 2017, you asked the San Jacinto River Authority (SJRA) to provide the Texas House of Representatives Committee on Natural Resources with an analysis of how dredging may be accomplished in a flood control context. I understand that, at the moment, the U.S. Army Corps of Engineers is considering a significant dredging effort to remove sand deposits and restore channel capacity in the West Fork of the San Jacinto River immediately upstream of Lake Houston. This is a project that is supported by the SJRA because, in areas such as this where the natural channel is shallow (relative to adjoining development) or has been choked with deposits, dredging the channel may allow it carry a given amount of flow at a lower water surface elevation. For its part, the SJRA is in the process of working with other governmental entities to conduct a regional flood study with grant funds from the Texas Division of Emergency Management and/or the Texas Water Development Board. The SJRA is advocating that the study consider whether additional dredging of the West Fork of the San Jacinto River (beyond the dredging expected to be performed immediately upstream of Lake Houston) would provide flood control benefits and what additional dredging may cost the participating governmental entities compared to other possible strategies. We will, of course, keep the Committee apprised of the status of the study and its results.

In the above-referenced letter you also asked me to provide the Texas House of Representatives Committee on Natural Resources with information regarding the potential positive and negative impacts of creating temporary or permanent flood capacity in Lake Conroe. In response to your request, SJRA commissioned two technical memoranda addressing the specific questions you asked in your letter. The results are summarized in this letter below. The technical memoranda are enclosed for the Committee's further review and reference.

Question 1: What would be the flood control capacity gained by lowering the lake level annually during hurricane season (August and September) by one, two, or three feet?

Under normal operating conditions, the conservation pool elevation of Lake Conroe is 201 feet above mean sea level (ft-msl). The table below shows the volume in acre-feet (ac-ft) of flood control capacity gained by lowering the normal pool elevation of the reservoir by one, two, or three feet.

	Lake Elevation, ft-msl	Supply Pool Volume, ac-ft	Flood Capacity Volume, ac-ft
Current	201.00	411,022	0
Lowered 1 foot	200.00	392,078	18,944
Lowered 2 feet	199.00	373,635	37,387
Lowered 3 feet	198.00	355,653	55,369

Knowing the volume of flood capacity created in Lake Conroe is of limited value in understanding the overall flood control benefit created by this capacity, as well as the limitations on using Lake Conroe to control flood flows. To better evaluate the flood control benefits and limitations that may result from lowering Lake Conroe's conservation pool, analyses were performed to estimate the peak discharge from Lake Conroe and the flood stage elevations downstream of Lake Conroe during 100-year and 500-year storm events.

- 100-Year Event -

Under normal operating conditions and at the current conservation pool elevation of 201 ft-msl, the maximum discharge from Lake Conroe during a 100-year storm event would be 22,664 cubic feet per second (cfs). Lowering the conservation pool elevation by two feet (199 ft-msl) and three feet (198 ft-msl) would reduce the peak discharges from Lake Conroe to 16,837 cfs and 16,733 cfs, respectively. This reflects a reduction of approximately 26% from the normal condition at conservation pool elevation of 201 ft-msl.

For the 100-year storm event, the reduction in downstream flooding on the West Fork San Jacinto River is less than one foot (0.74 feet) at the IH-45 bridge assuming a two-foot lowering of the water level in Lake Conroe. By comparison, a three-foot lowering of the water level during a 100-year event results in a 1.25-foot reduction in flood elevations downstream at the same IH-45 bridge location. It is important to note, however, that these reductions are relative to flows that are on average eight feet above the channel banks in a 100-year event. The analysis of elevation reductions did not extend beyond the IH-45 bridge location because of time constraints and the complexity of taking into account (i) uncontrolled flows from other tributaries entering the West Fork, such as Spring Creek and Cypress Creek, and (ii) the need for updated channel models due to significant sedimentation that has changed the channel profile along the lower West Fork.

- 500-Year Event -

Under normal operating conditions and at the current conservation pool elevation of 201 ft-msl, the maximum discharge from Lake Conroe during a 500-year storm event would be 54,532 cfs. Lowering the conservation pool elevation by two feet (199 ft-msl) and three feet (198 ft-msl) would reduce the peak discharges from Lake Conroe to 43,349 cfs and 39,918 cfs, respectively. This reflects a reduction of approximately 21% to 27% from the normal condition at conservation pool elevation of 201 ft-msl.

For the 500-year storm event, the reduction in downstream flooding on the West Fork San Jacinto River is also less than one foot (0.80 feet) at the IH-45 bridge assuming a two-foot lowering of the water level in Lake Conroe. By comparison, a three-foot lowering of the water level during a 500-year event results in a 1.06 foot reduction in flood elevations downstream at the same IH-45 location. It is important to note, however, that these elevation reductions are relative to flows that are on average 12 feet above the channel banks in a 500-year event. The analysis of elevation reductions did not extend beyond the IH-45 bridge location because of time constraints and the complexity of taking into account (i) uncontrolled flows from other tributaries entering the West Fork, such as Spring Creek and Cypress Creek, and (ii) the need for updated channel models due to significant sedimentation that has changed the channel profile along the lower West Fork.

- Summary -

The analysis shows reductions in normal pool elevation do provide some benefit to areas immediately downstream as the peak outflow is slightly reduced relative to existing conditions, and there is also some benefit for those upstream of Lake Conroe during flood events. The benefit for those downstream is offset, however, by the fact that in a 100-year or 500-year event, the average flows will already be above channel banks by 8 to 12 feet, respectively.

For storm events larger than a 500-year event, it is anticipated that the addition of extra flood capacity will likely yield no additional benefit upstream and could potentially increase the flood hazard downstream of the dam if the peak release is delayed such that it occurs at the same time as other tributaries contribute their own flows to the West Fork San Jacinto River.

In closing, we would stress that gate operators must have flexibility to operate the gates in accordance with their mission to ensure safe, dependable reservoir operations, so that when dam safety issues arise, the lake level can be controlled safely without additional deleterious effects. The addition of flood capacity below the current normal pool elevation of 201 ft-msl will likely require a change to the current gate operations policy. Prior to undertaking a change in gate operations for the Lake Conroe Dam, a thorough study of the impact of the revised policy on lake levels and flows for multiple storm events would be required as well as significant initial and ongoing investments to develop additional gauging stations upstream of Lake Conroe to more accurately quantify inflow into the lake.

Question 2: If the SJRA were to drop the level of Lake Conroe by one to three feet, what would the impact be on permits that are already issued for water in the basin based on historic use during hurricane season (August and September) over the last two decades?

Texas Commission on Environmental Quality (TCEQ) Certificate of Adjudication (CoA) 10-4963 authorizes the impoundment of up to 430,260 acre-feet of water in Lake Conroe, with a priority date of January 12, 1959, for the impoundment of 380,430 ac-ft of water and a priority date of June 28, 1965, for the impoundment of the remaining 49,830 ac-ft of water. The diversion and use of 100,000 ac-ft of water per year from Lake Conroe is also authorized under CoA 10-4963 with a priority date of January 12, 1959. This water right is held jointly by the City of Houston (COH) and SJRA.

- Analysis -

A modeling analysis[1] was performed to evaluate the potential impacts of lowering the Lake Conroe conservation pool elevation on lake storage and elevation, available diversions from the lake (average and firm), and downstream junior water rights.[2] The results may be summarized as follows:

---

[1] The analysis was performed using the TCEQ-approved Water Availability Model (WAM) for the San Jacinto River Basin simulating water rights in a prior appropriation framework for a period of historical hydrology for 1940 through 1996. The analysis also included a spreadsheet model of Lake Conroe simulating 1940 through 2016 hydrology on a monthly timestep based on data from the TCEQ WAM for the San Jacinto River Basin, records for the post-1996 period, and estimates of year 2010 sediment and storage conditions. The spreadsheet model was developed to incorporate extended hydrology beyond 1996 (end of period for TCEQ WAM) to 2016 and to include the more recent 2011 drought period.

[2] There are also two non-saline perpetual water rights junior to CoA 10-4963 located downstream of Lake Conroe. CoA 10-5807, held by the COH and SJRA, is located at Lake Houston and authorizes the use of 28,200 ac-ft/yr of the unappropriated firm yield of Lake Houston for municipal and industrial uses at a priority date of June 19, 2003. The right is subject to special conditions, including conditions related to instream use. CoA 10-5808, held by the COH and SJRA, authorizes the diversion and use of up to

- Under normal conditions, Lake Conroe has a modeled firm water availability (yield) of 80,200 ac-ft/yr.
- The yield of Lake Conroe was not impacted by a temporary lowering of the conservation pool by one foot during the fall.
- The yield of Lake Conroe was reduced for all scenarios where the conservation pool was lowered by more than one foot, whether temporary or permanent.
    - The yield of Lake Conroe was reduced by 2,300 ac-ft (2.9 percent of baseline firm diversion) for permanent lowering of one foot (200 ft-msl).
    - The permanent lowering of Lake Conroe by one foot (200 ft-msl) results in lake levels below elevation 197 ft-msl for 60 more months (approximately 1.2 times more often) than under normal conditions. 197 ft-msl is the level at which mandatory drought response measures are initiated.
    - The yield of Lake Conroe was reduced by 6,600 ac-ft (8.2 percent of baseline firm diversion) for permanent lowering of three feet (198 ft-msl).
    - The permanent lowering of Lake Conroe by three feet (198 ft-msl) results in lake levels below elevation 197 ft-msl for 231 more months (approximately 1.6 times more often) than under normal conditions. 197 ft-msl is the level at which mandatory drought response measures are initiated.
- Lowering the Lake Conroe conservation pool does not result in impacts to the diversion reliability of downstream junior water rights.

The above analysis assumes that the release of water to lower Lake Conroe is not charged against SJRA and COH annual water rights under CoA 10-4963. This is a significant issue for consideration by the Committee and by the TCEQ, as CoA 10-4963 currently provides that all releases from Lake Conroe are charged against SJRA and COH annual water rights under that permit. If the TCEQ takes the position that the release of water to lower Lake Conroe must be charged against SJRA and COH annual water rights under CoA 10-4963, then every gallon of water that is released from Lake Conroe to create flood capacity is a gallon of water that cannot be diverted for municipal, industrial, or other beneficial uses.

It should also be noted that the above impacts on the yield of Lake Conroe do not include the potential additional impacts to both SJRA and City of Houston permits if the conservation pool of Lake Houston were lowered. Lowering the conservation pool of Lake Houston will result in additional annual reductions to water supply in the San Jacinto Basin beyond those stated here.

- Other Considerations -

Existing water supplies in the San Jacinto River Basin are either currently being used or will be used in the near term to meet existing and projected demands for the region.[3] Therefore, any reduction in water supply capacity -- whether resulting from lowering the conservation pool of Lake Conroe, or from a regulatory requirement to charge the release of water to create flood capacity in Lake Conroe against SJRA and COH annual water rights -- will need to be replaced through the development of major project infrastructure with associated costs dependent on project-specific infrastructure, source, yield, and timing. A preliminary, conceptual-level unit cost analysis was performed to estimate the cost of replacing this raw water availability. Costs were based on potential future water management strategies associated with SJRA

80,000 ac-ft/yr of run-of-river water from Lake Houston for municipal and industrial uses at a priority date of June 19, 2003. The right is subject to special conditions, including conditions related to instream use.

[3] See the 2016 Regional Water Plan (RWP) for the Region H Water Planning Area (Region H).

in the 2016 RWP for Region H. Based on this analysis, the costs to replace SJRA's lost yield could exceed $21 million, assuming a permanent three-foot lowering of the conservation pool of Lake Conroe.

* * *

I hope this information is helpful to you and to the Committee in analyzing potential flood mitigation strategies and the impacts they may have on the State's water supplies. Please do not hesitate to call on me if you have any questions regarding this letter or the enclosed memoranda.

Respectfully,

Jace A. Houston
General Manager

cc: House Natural Resources Committee Members
San Jacinto River Authority Board of Directors
The Honorable Dan Huberty, State Representative, District 127
Russ Poppe, Executive Director, Harris County Flood Control District
Stephen Costello, Chief Resiliency Officer, City of Houston
Carol Haddock, Director of Public Works and Engineering, City of Houston
Jeff Walker, Executive Administrator, Texas Water Development Board
Dr. Michael Sterling, U.S. Army Corps of Engineers, Southwestern Division

Attachment 5

BLEYL ENGINEERING
PLANNING • DESIGN • MANAGEMENT

(936) 441-7833
Bleyl Engineering
100 Nugent Street
Conroe, TX 77301

2/14/20

Mr. Kevin Lacy
Lake Conroe Association
P.O. Box 376
Willis, TX 77378

Re: Lake Conroe Lowering Analysis

Mr. Lacy:

Background

The City of Houston and the surrounding region has, within the last few years, seen numerous storm events that have caused widespread flooding. The frequency and severity of the flooding has caused an increase in public awareness of the region's proneness to flooding and of potential causes of negative impacts to flood levels. One event in particular, Hurricane Harvey, has caused a focused awareness of the relationship between upstream drainage infrastructure and their impact to downstream flood levels. Specifically, the Lake Conroe Dam and its relationship to flood levels along the West Fork of the San Jacinto River ("West Fork") has been put under public scrutiny.

In response to the widespread flood damage caused by Hurricane Harvey, Lyle Larson, Chair of the Texas House of Representatives Committee on Natural Resources, requested that the San Jacinto River Authority ("SJRA") investigate the flood benefits obtained from lowering the normal pool level of Lake Conroe (201 ft-msl) by two to three feet. SJRA, in turn, hired Freese and Nichols, Inc ("FNI") to perform this analysis. Based on this scientific study, and other non-scientific factors, the SJRA and City of Houston agreed to seasonally lower the normal pool level of Lake Conroe by two feet in the summer in order to gain additional flood storage in the lake prior to the commencement of hurricane season. This is intended to potentially reduce downstream flows and downstream flood levels during heavy rain events associated with hurricanes for the purpose of mitigating flood damage along the West Fork and to provide downstream relief to the dredging efforts along the West Fork. However, disagreements among upstream and downstream home owners, as well as those in regional political leadership, have arisen as to the effectiveness of this strategy and the benefits compared to the costs.

The purpose of this study is to provide a second, objective professional engineering opinion to the effectiveness of the lake lowering flood mitigation strategy by checking the validity of the FNI analysis and its conclusions and by evaluating any immediately available hydrologic and hydraulic data for the West Fork watershed. A secondary objective of this study is to spread additional light on the situation that may not have been previously discussed in the FNI report.

Freese and Nichols, Inc Analysis

The report, *Lake Conroe Dam Gate Operations Modification Analysis*, was completed in April of 2018 by FNI. The report specifically analyzed the reduction in downstream flood elevations in the West Fork due to the lowering of the normal pool elevation of Lake Conroe by two and three feet (mean sea level).

The study utilized the existing SJRA gate operation procedures to develop lake outflow hydrographs (flow rate of water as a function of time) for three different scenarios: a starting normal pool elevation for Lake Conroe at (1) 201 ft-msl, (2) 199 ft-msl, and (3) 198 ft-msl. For the 199 ft-msl normal pool scenario (the scenario currently being implemented by SJRA), the reduction to the peak outflow rates are 5,827 cubic feet per second ("cfs") and 11,183 cfs for the 1-percent annual chance ("100-year") and the 0.2-percent annual chance ("500-year") storm events respectively. Additionally, the time to peak for the outflow hydrographs were increased by 7.5 and 5.5 hours for the 100-year and 500-year storm events respectively.

The analysis then took the peak flow rate for each resulting outflow hydrograph and modeled them in a 1-dimensional steady-state hydraulic model. The hydraulic model determined the 100-year and 500-year water surface elevations along the West Fork for the three scenarios from a location just downstream of the Lake Conroe Dam to a point just upstream of the IH-45 bridge (see **Appendix A – West Fork Overall**). The results from the hydraulic model for the 199-ft-msl scenario show an average reduction of 1-ft to the water surface elevation of the West Fork between the Lake Conroe Dam and IH-45 for both the 100-year and 500-year storm events. Due to the moderately steep topography along this stretch of the West Fork, the mapped floodplain comparison for the 201 ft-msl and 199 ft-msl storm events, provided in the FNI study, show minimal reduction to the floodplain extents between Lake Conroe and IH-45.

We generally agree with the methodology of the study. However, some limitations of the study should be noted.

First, the 24-hour precipitation estimates used in the study are generally consistent with the statistical rainfall data produced in the USGS Atlas of Depth-Duration Frequency of Precipitation Annual Maxima for Texas, 2004. Rainfall statistics for Texas have since been updated with the release of Atlas 14, Volume 11 in 2018. The estimated 100-year and 500-year 24-hour rainfall depths have increased by 37% and 34% respectively at Lake Conroe when compared to the estimates used in the FNI study. For general comparison, the 500-year event of 17.5 inches over 24-hours is used in the FNI report while the 100-year Atlas 14 storm event is 15.8 inches over 24-hours. In other words, the "new" Atlas 14 100-year storm event flows and water surface elevations can be estimated by using the "old" 500-year storm event flows and water surface elevations.

Secondly, the FNI study was limited to the section of the West Fork between the Lake Conroe Dam and IH-45. Therefore, flood reduction benefits for the region south of IH-45 cannot be determined based solely on the FNI study. While inferences on the impact to the West Fork flood levels downstream of IH-45 can be drawn from this data, the study does not make any such inferences. So, the conclusions found in the FNI study are only applicable to the region between the Lake Conroe Dam and IH-45.

Thirdly, the steady state hydraulic model used peak flows produced at the Lake Conroe Dam for each normal pool lowering scenario. Therefore, it does not appear that reduction in storage in the floodplain resulting from a lower water surface elevation was considered. As the water surface elevation in the West Fork is reduced, so is the available floodplain storage. The steady state model does not account for this reduction in floodplain storage. So, the reduction in the water surface elevations in the West Fork are slightly overestimated.

Considering that the Atlas 14, Volume 11 100-year rainfall is close to the 500-year rainfall used in the FNI study, that the 500-year event in the FNI study resulted in a 1-ft rise, and that the resulting 500-year floodplain delineations showed minimal reduction to the floodplain extents, we agree with the conclusion of the FNI study that the lowering of the Lake Conroe normal pool elevation to 199 ft-msl is "generally not enough to be considered wholesale improvements to the flood hazard" in the region of the West Fork between Lake Conroe and IH-45.

Based solely on the FNI study, there is no information provided to fully understand the effects that the seasonal lake lowering will have on flood levels downstream of IH-45.

Additional Analysis

Bleyl Engineering ("Bleyl") reached out to SJRA, City of Conroe, and Harris County Flood Control District ("HCFCD") to obtain any immediately available data for the entire West Fork. Bleyl performed additional limited analysis based on the FNI report and the other publicly available data provided by City of Conroe and HCFCD such as:

1. FEMA Flood Insurance Rate Maps ("FIRM")
2. FEMA Flood Insurance Rate Studies ("FIS")
3. Harris County Flood Control District hydraulic models
4. Hydrologic and hydraulic models associated with the Flood Protection Study and Early Warning System Project for the West Fork completed by Halff and Associates for the City of Conroe and SJRA.

Our analysis first included the flow rate reduction of 5,827 cfs for the 100-year storm event and 11,833 cfs for the 500-year storm event, as determined in the FNI study, at the Lake Conroe Dam and applied these reductions to the HCFCD steady state hydraulic model for the West Fork between US-59 and Lake Houston (see **Attachment A – West Fork Overall**). **Table 1** below shows the reduction in the flow rate, water surface elevation, and resulting flood plain extent top widths for the 100-year and 500-year storm events as compared to the values provided in the HCFCD hydraulic model.

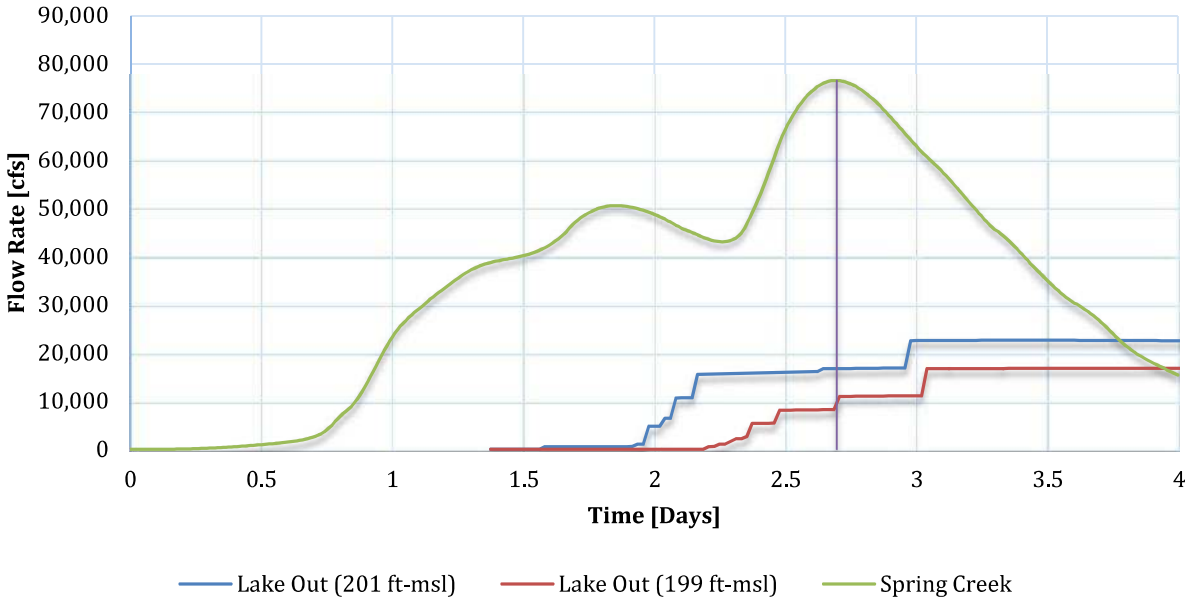
Table 1 – Water Surface Elevation and Flood Extent Reductions

	Flow Rate cfs / (% total)	Max WSEL ft. / (% total)	Avg WSEL ft. / (% total)	Min WSEL Ft. / (% total)	Avg Top Width ft. / (% total)
100-Year Reduction	5,827 (3.4)	0.37 (0.54)	0.23 (0.39)	0 (0)	145 (0.15)
500-Year Reduction	11,833 (1.8)	0.35 (0.47)	0.25 (0.39)	0 (0)	33 (0.03)

One variable that is not accounted for when transposing the flow reduction downstream is that the loss of floodplain storage resulting from the lower water surface elevation along the West Fork will result in a lower flow reduction. The lower flood storage means the West Fork floodplain does not provide as much flow attenuation as the base scenario. Therefore, the flow reduction values of 5,827 cfs and 11,833 at US-59 are slightly higher than expected. To put it conversely, the higher outlet flows caused by raising the lake normal pool from 199 ft-msl to 201 ft-msl will cause the water surface elevation to rise along the West Fork thereby allowing some of that additional flow to be stored within the floodplain of the West Fork (mostly around the time of the crest of the West Fork). While this will reduce the flow reduction as flow travels downstream, the attenuation is likely negligible.

Another variable that is not considered is the lag in the Lake Conroe hydrograph that was caused by the additional storage provided in the lake during the rising limb of the Lake Conroe inflow hydrograph (7.5 hours for the 100-year and 5.5 hours for the 500-year). The impacts of this lag cannot be known without performing a full hydrologic study of the entire West Fork watershed and its tributaries (existing hydrologic models for the entire West Fork watershed were not made available for this analysis). By way of example, when comparing the Lake Conroe dam outflow hydrographs (translated downstream to the Spring Creek confluence) to the HCFCD Spring Creek confluence hydrograph, the peak of Spring Creek occurs later in the rising limb of the 201 ft-msl hydrograph than the 199 ft-msl hydrograph. While there is a lot of variability due to numerous watersheds contributing to the flows at US-59, the West Fork is the largest contributing watershed and, therefore, likely drives the hydrograph crest timing of the West Fork at US-59.

Figure 1 – Spring Creek and Lake Conroe Outlet Flow Rates



1. Lake Conroe outlet hydrographs are translated by 33 hours per FEMA FIS floodway tables

Regardless of the limitations mentioned above, the transposition of peak flow rates from the Lake Conroe Dam to US-59 is still a reasonable estimate for flood impacts caused by the seasonal lowering of Lake Conroe, given the available data. While there is a positive impact to the water surface elevations of West Fork from US-59 to Lake Houston, it is our professional opinion that these reductions, under the given storm characteristics, are still generally not enough to be considered wholesale improvements to the flood hazards along the West Fork.

Additional Considerations

It should be noted that the FEMA FIS has a peak 100-year flow rate at the Lake Conroe Dam of 83,249 cfs, and that the FEMA floodplain extents within Montgomery County are mapped based on this flow. This peak flow rate is 60,585 cfs more than the peak 100-year outflow rate in the FNI report. Additionally, according to the FEMA FIRMs, the 100-year water surface elevation for Lake Conroe is 203 ft-msl compared to the FNI 100-year water surface elevation of 205.73 ft-msl. In other words, Lake Conroe is currently providing additional storage as compared to the FIS and, in turn, is already providing reduction to the outlet flow rate by 73% as compared to the FEMA FIS. Based on a comparison of the Harris County FIS and the Montgomery County FIS summary of discharges for the West Fork, we believe this is also true of the Harris County FIS and the delineated floodplains along the West Fork in Harris County.

It should also be noted that the FEMA FIS studies, the HCFCD models (used to map the FEMA special flood hazard areas in Harris County), and the hydrologic model used to compute the inflow and outflow hydrographs in the FNI study are all based on synthetic (i.e. manmade) 24-hour storm events. They do not, and cannot, consider every hypothetical storm event. There are likely hypothetical storm events that cause greater or lower impacts than what is shown in this study. Additional storm events (e.g. squall

line, Tropical Storm Imelda, Hurricane Harvey, etc.) could be modeled to provide a conglomerate idea of flood reductions.

Finally, as shown on the FEMA FIRMs, the Kingwood area is located just upstream of Lake Houston and also near the confluence of several creeks and rivers including Spring Creek, the West Fork of the San Jacinto River, and the East Fork of the San Jacinto River. Due to its location, this area is sensitive to extreme storm events, and flooding levels can be impacted by various factors such as:

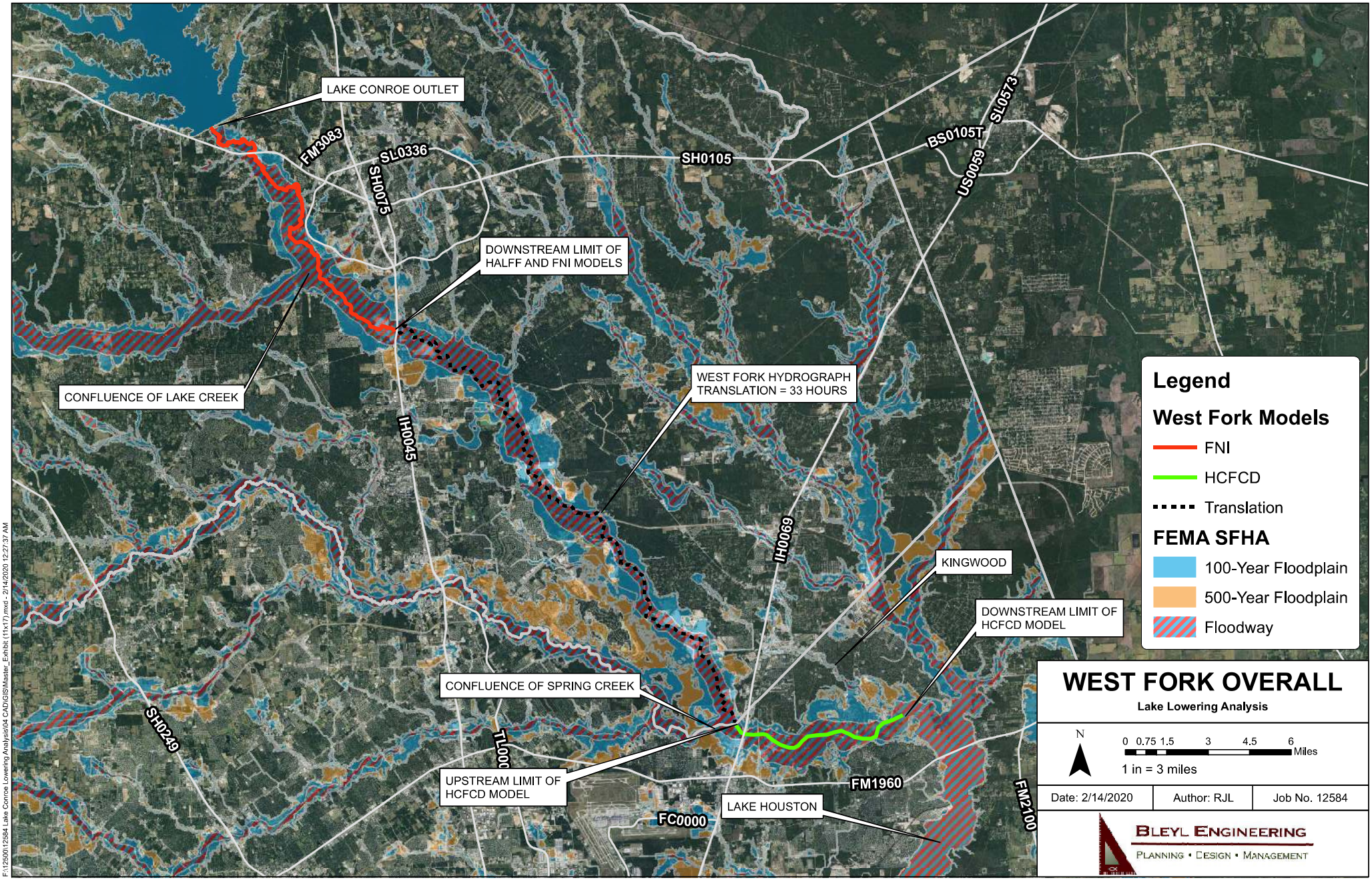
1. Duration, intensity, and direction of storm events in the upstream watersheds (an intense frontal system moving southeast versus a long duration hurricane moving northwest),
2. Differences in watershed responses to regional storms (e.g. creeks with smaller watersheds cresting before creeks with larger watersheds),
3. Cumulative increases in impervious cover due to development in upstream watersheds increasing both volume and timing of runoff,
4. Detention mitigation regulations and policies in upstream watersheds,
5. Floodplain development regulations and policies both downstream and upstream of the region,
6. The construction of upstream drainage infrastructure such as bridges, culverts, fixed outlet lakes, etc. (attenuating runoff),
7. Lake Conroe outlet flows controlled by gate operation procedures (change in flow rate of the West Fork),
8. Lake Houston water level controlled by gate operation procedures (change in tailwater conditions for all inlet creeks).

Due to the large number of variables, a holistic understanding of the entire watershed for the West Fork needs to be achieved in order to accurately determine the effectiveness of flood mitigation strategies, especially the seasonal lowering of the normal pool of Lake Conroe. Currently, HCFCD is leading a study of the entire West Fork watershed that will likely be able to provide a holistic understanding of the watershed and may possibly be used as a base for analyzing the effectiveness of various flood mitigation efforts. This study is expected to be complete in the Fall of 2020.

Sincerely,

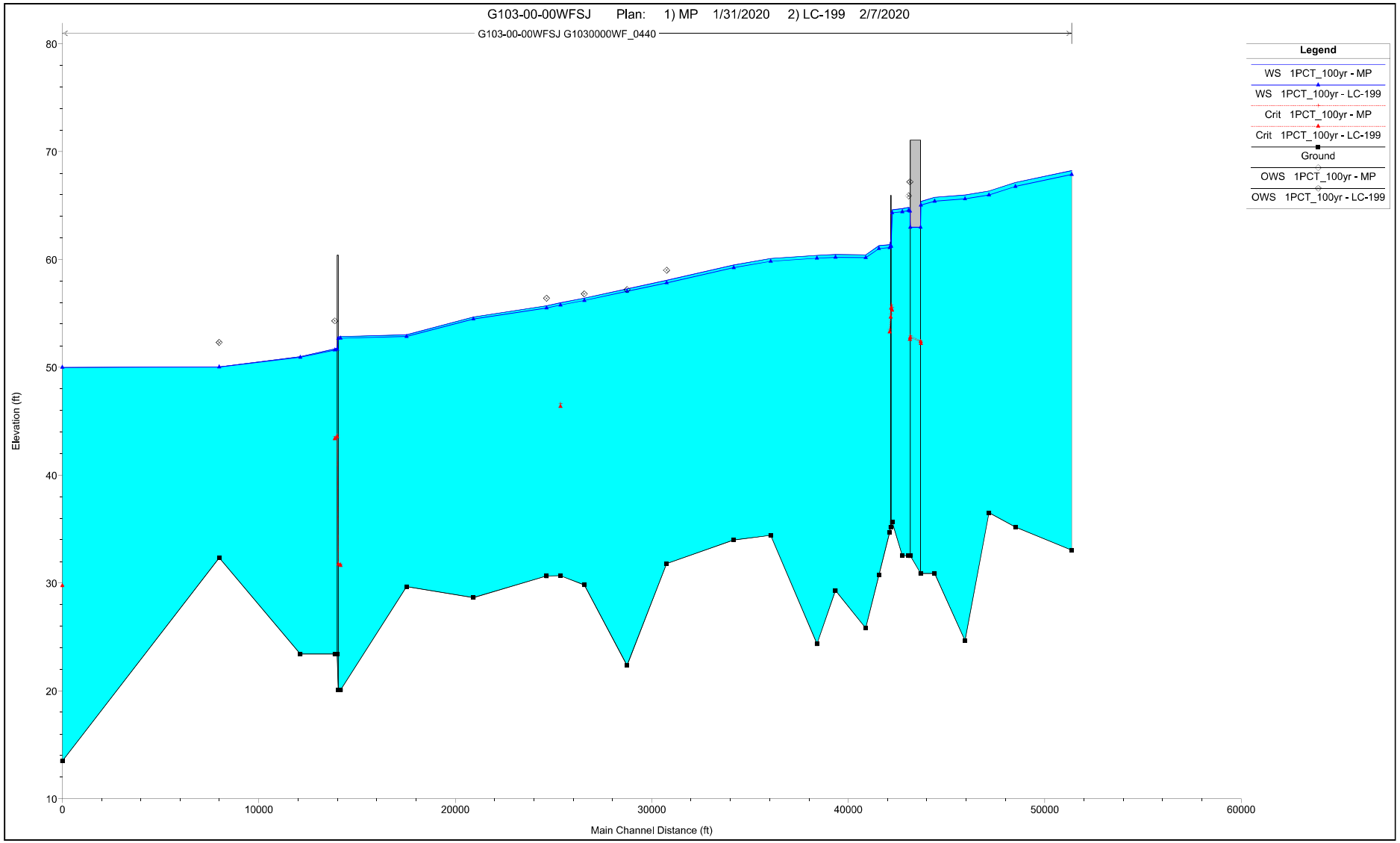
Ryan Londeen, PE
Hydrology & Hydraulics Design Engineer
Bleyl Engineering

Attachment A
West Fork Overall



F:\12500\12584 Lake Conroe Lowering Analysis\04 CAD\GIS\Master_Exhibit (11x17).mxd - 2/14/2020 12:27:37 AM

Attachment B
Supporting Calculations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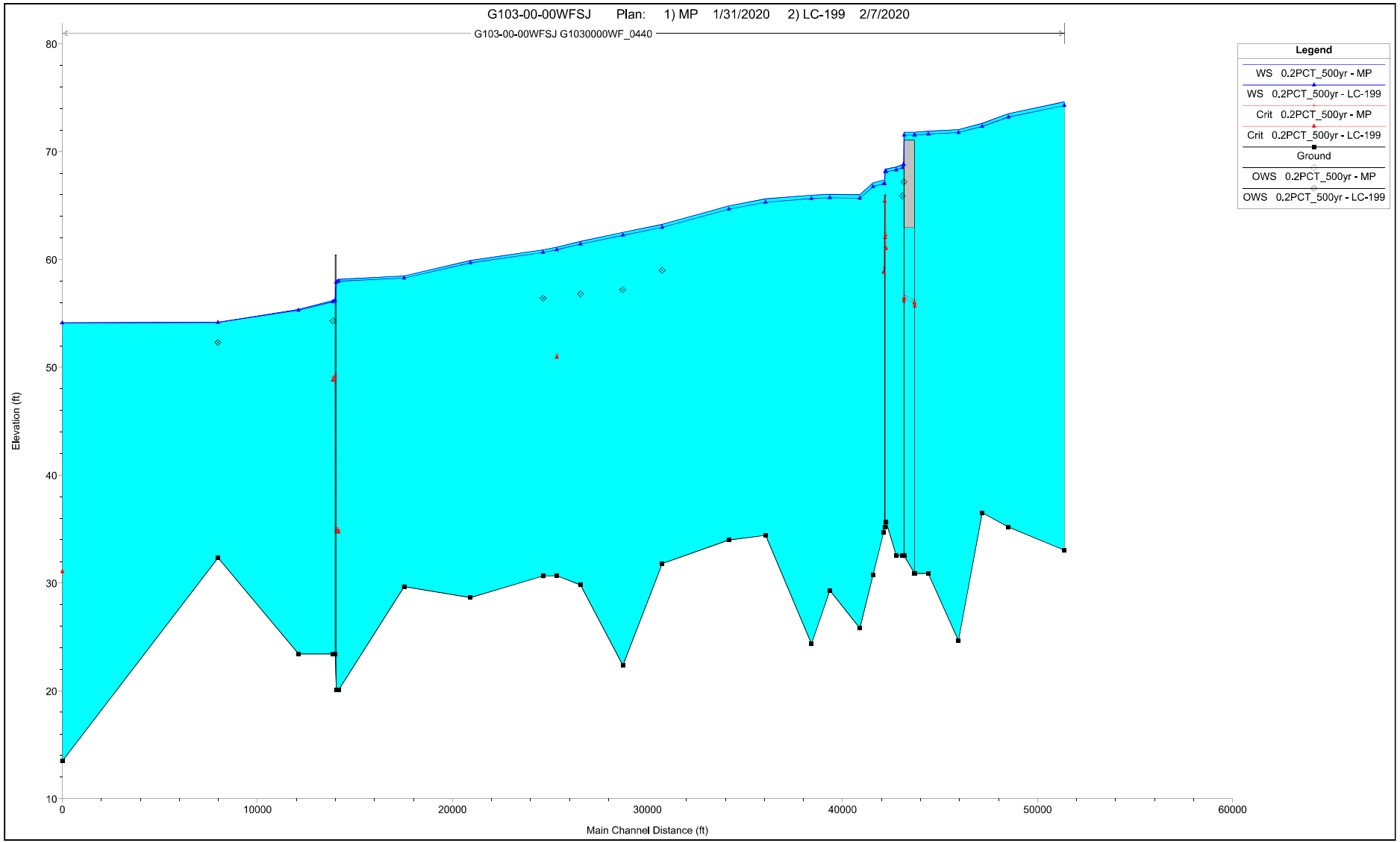
G103-00-00WFSJ G1030000WF_0440
Legend
WS 1PCT_100yr - MP
WS 1PCT_100yr - LC-199
Crit 1PCT_100yr - MP
Crit 1PCT_100yr - LC-199
Ground
OWS 1PCT_100yr - MP
OWS 1PCT_100yr - LC-199
Elevation (ft)
Main Channel Distance (ft)
80
70
60
50
40
30
20
10
0
10000
20000
30000
40000
50000
60000


G103-00-00WFSJ Plan: 1) MP 1/31/2020 2) LC-199 2/7/2020
G103-00-00WFSJ G1030000WF_0440
Legend
WS 0.2PCT_500yr - MP
WS 0.2PCT_500yr - LC-199
Crit 0.2PCT_500yr - MP
Crit 0.2PCT_500yr - LC-199
Ground
OWS 0.2PCT_500yr - MP
OWS 0.2PCT_500yr - LC-199
Elevation (ft)
Main Channel Distance (ft)
10
20
30
40
50
60
70
80
0
10000
20000
30000
40000
50000
60000

HEC-RAS River: G103-00-00WFSJ Reach: G1030000WF_0440 Profile: 1PCT_100yr

Reach	River Sta	Profile	Plan	Q Total	W.S. Elev	Top Width
				(cfs)	(ft)	(ft)
G1030000WF_0440	95419.06	1PCT_100yr	MP	165730.00	68.24	6280.01
G1030000WF_0440	95419.06	1PCT_100yr	LC-199	159903.00	67.88	6127.64
G1030000WF_0440	92550.84	1PCT_100yr	MP	165730.00	67.13	6980.07
G1030000WF_0440	92550.84	1PCT_100yr	LC-199	159903.00	66.77	6931.68
G1030000WF_0440	91206.56	1PCT_100yr	MP	165730.00	66.35	6409.01
G1030000WF_0440	91206.56	1PCT_100yr	LC-199	159903.00	65.98	6384.78
G1030000WF_0440	89987.87	1PCT_100yr	MP	165730.00	65.97	6861.80
G1030000WF_0440	89987.87	1PCT_100yr	LC-199	159903.00	65.62	6500.47
G1030000WF_0440	88441.26	1PCT_100yr	MP	167500.00	65.76	7689.79
G1030000WF_0440	88441.26	1PCT_100yr	LC-199	161673.00	65.40	7660.56
G1030000WF_0440	87742.76	1PCT_100yr	MP	167500.00	65.38	7995.03
G1030000WF_0440	87742.76	1PCT_100yr	LC-199	161673.00	65.04	7912.98
G1030000WF_0440	87463.61			Bridge		
G1030000WF_0440	87184.46	1PCT_100yr	MP	167500.00	64.77	7358.02
G1030000WF_0440	87184.46	1PCT_100yr	LC-199	161673.00	64.49	6771.39
G1030000WF_0440	87112.78	1PCT_100yr	MP	167560.00	64.83	7890.56
G1030000WF_0440	87112.78	1PCT_100yr	LC-199	161733.00	64.54	7717.50
G1030000WF_0440	86799.31	1PCT_100yr	MP	167670.00	64.71	8107.54
G1030000WF_0440	86799.31	1PCT_100yr	LC-199	161843.00	64.42	7931.03
G1030000WF_0440	86280.02	1PCT_100yr	MP	167670.00	64.60	8952.25
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G1030000WF_0440	86216.96			Bridge		
G1030000WF_0440	86153.91	1PCT_100yr	MP	167670.00	61.37	7131.44
G1030000WF_0440	86153.91	1PCT_100yr	LC-199	161843.00	61.10	7071.86
G1030000WF_0440	85606.07	1PCT_100yr	MP	167890.00	61.28	6805.81
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G1030000WF_0440	84932.06	1PCT_100yr	MP	168090.00	60.43	6280.85
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G1030000WF_0440	83393.67	1PCT_100yr	MP	168330.00	60.46	7556.28
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G1030000WF_0440	80095.81	1PCT_100yr	MP	169330.00	60.09	9942.01
G1030000WF_0440	80095.81	1PCT_100yr	LC-199	163503.00	59.83	9936.89

HEC-RAS River: G103-00-00WFSJ Reach: G1030000WF_0440 Profile: 1PCT_100yr (Continued)

Reach	River Sta	Profile	Plan	Q Total	W.S. Elev	Top Width
				(cfs)	(ft)	(ft)
G1030000WF_0440	78212.09	1PCT_100yr	MP	169330.00	59.49	8637.69
G1030000WF_0440	78212.09	1PCT_100yr	LC-199	163503.00	59.24	8590.91
G1030000WF_0440	74800.67	1PCT_100yr	MP	169770.00	58.06	6366.98
G1030000WF_0440	74800.67	1PCT_100yr	LC-199	163943.00	57.83	6355.38
G1030000WF_0440	72784.57	1PCT_100yr	MP	169770.00	57.27	10728.80
G1030000WF_0440	72784.57	1PCT_100yr	LC-199	163943.00	57.05	10532.76
G1030000WF_0440	70613.72	1PCT_100yr	MP	171000.00	56.41	10976.22
G1030000WF_0440	70613.72	1PCT_100yr	LC-199	165173.00	56.19	10776.65
G1030000WF_0440	69395.08	1PCT_100yr	MP	171000.00	55.98	13817.40
G1030000WF_0440	69395.08	1PCT_100yr	LC-199	165173.00	55.78	13531.57
G1030000WF_0440	68690.36	1PCT_100yr	MP	171000.00	55.71	12258.87
G1030000WF_0440	68690.36	1PCT_100yr	LC-199	165173.00	55.50	11671.12
G1030000WF_0440	64969.45	1PCT_100yr	MP	171320.00	54.66	8163.83
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G1030000WF_0440	61563.42	1PCT_100yr	MP	172610.00	53.01	8613.42
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G1030000WF_0440	58206.30	1PCT_100yr	MP	172610.00	52.84	7591.46
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G1030000WF_0440	44044.71	1PCT_100yr	MP	214619.00	49.99	8768.77
G1030000WF_0440	44044.71	1PCT_100yr	LC-199	208792.00	49.99	8768.77

HEC-RAS River: G103-00-00WFSJ Reach: G1030000WF_0440 Profile: 0.2PCT_500yr

Reach	River Sta	Profile	Plan	Q Total	W.S. Elev	Top Width
				(cfs)	(ft)	(ft)
G1030000WF_0440	95419.06	0.2PCT_500yr	MP	299930.00	74.61	7487.62
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G1030000WF_0440	92550.84	0.2PCT_500yr	MP	299930.00	73.52	7961.72
G1030000WF_0440	92550.84	0.2PCT_500yr	LC-199	288747.00	73.20	7947.88
G1030000WF_0440	91206.56	0.2PCT_500yr	MP	299930.00	72.62	8214.36
G1030000WF_0440	91206.56	0.2PCT_500yr	LC-199	288747.00	72.33	8202.50
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G1030000WF_0440	87742.76	0.2PCT_500yr	MP	306000.00	71.79	10098.84
G1030000WF_0440	87742.76	0.2PCT_500yr	LC-199	294817.00	71.53	10073.83
G1030000WF_0440	87463.61			Bridge		
G1030000WF_0440	87184.46	0.2PCT_500yr	MP	306000.00	69.09	9292.35
G1030000WF_0440	87184.46	0.2PCT_500yr	LC-199	294817.00	68.80	9217.65
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G1030000WF_0440	86799.31	0.2PCT_500yr	MP	307570.00	68.57	9839.33
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G1030000WF_0440	86280.02	0.2PCT_500yr	MP	307570.00	68.39	10058.31
G1030000WF_0440	86280.02	0.2PCT_500yr	LC-199	296387.00	68.13	10048.89
G1030000WF_0440	86216.96			Bridge		
G1030000WF_0440	86153.91	0.2PCT_500yr	MP	307570.00	67.36	10031.06
G1030000WF_0440	86153.91	0.2PCT_500yr	LC-199	296387.00	67.01	10027.20
G1030000WF_0440	85606.07	0.2PCT_500yr	MP	308450.00	67.10	11117.28
G1030000WF_0440	85606.07	0.2PCT_500yr	LC-199	297267.00	66.75	11100.34
G1030000WF_0440	84932.06	0.2PCT_500yr	MP	310160.00	66.00	10476.97
G1030000WF_0440	84932.06	0.2PCT_500yr	LC-199	298977.00	65.68	10332.45
G1030000WF_0440	83393.67	0.2PCT_500yr	MP	309220.00	66.04	10269.39
G1030000WF_0440	83393.67	0.2PCT_500yr	LC-199	298037.00	65.72	10235.07
G1030000WF_0440	82452.94	0.2PCT_500yr	MP	314100.00	65.96	10502.30
G1030000WF_0440	82452.94	0.2PCT_500yr	LC-199	302917.00	65.64	10495.65
G1030000WF_0440	80095.81	0.2PCT_500yr	MP	314100.00	65.62	10727.99
G1030000WF_0440	80095.81	0.2PCT_500yr	LC-199	302917.00	65.30	10714.34

HEC-RAS River: G103-00-00WFSJ Reach: G1030000WF_0440 Profile: 0.2PCT_500yr (Continued)

Reach	River Sta	Profile	Plan	Q Total	W.S. Elev	Top Width
				(cfs)	(ft)	(ft)
G1030000WF_0440	78212.09	0.2PCT_500yr	MP	314100.00	64.96	9233.12
G1030000WF_0440	78212.09	0.2PCT_500yr	LC-199	302917.00	64.66	9223.71
G1030000WF_0440	74800.67	0.2PCT_500yr	MP	315820.00	63.25	7345.74
G1030000WF_0440	74800.67	0.2PCT_500yr	LC-199	304637.00	62.98	7338.58
G1030000WF_0440	72784.57	0.2PCT_500yr	MP	315820.00	62.51	12191.19
G1030000WF_0440	72784.57	0.2PCT_500yr	LC-199	304637.00	62.24	12159.66
G1030000WF_0440	70613.72	0.2PCT_500yr	MP	320030.00	61.68	14223.19
G1030000WF_0440	70613.72	0.2PCT_500yr	LC-199	308847.00	61.42	14116.60
G1030000WF_0440	69395.08	0.2PCT_500yr	MP	320030.00	61.14	17745.11
G1030000WF_0440	69395.08	0.2PCT_500yr	LC-199	308847.00	60.90	17736.10
G1030000WF_0440	68690.36	0.2PCT_500yr	MP	320030.00	60.89	17708.62
G1030000WF_0440	68690.36	0.2PCT_500yr	LC-199	308847.00	60.65	17679.12
G1030000WF_0440	64969.45	0.2PCT_500yr	MP	321900.00	59.91	11168.15
G1030000WF_0440	64969.45	0.2PCT_500yr	LC-199	310717.00	59.68	11090.35
G1030000WF_0440	61563.42	0.2PCT_500yr	MP	326970.00	58.47	10337.61
G1030000WF_0440	61563.42	0.2PCT_500yr	LC-199	315787.00	58.28	10306.40
G1030000WF_0440	58206.30	0.2PCT_500yr	MP	326970.00	58.15	13590.69
G1030000WF_0440	58206.30	0.2PCT_500yr	LC-199	315787.00	57.98	13565.07
G1030000WF_0440	58060.89			Bridge		
G1030000WF_0440	57915.48	0.2PCT_500yr	MP	326970.00	56.20	13741.19
G1030000WF_0440	57915.48	0.2PCT_500yr	LC-199	315787.00	56.08	13734.60
G1030000WF_0440	56153.38	0.2PCT_500yr	MP	329800.00	55.37	13374.56
G1030000WF_0440	56153.38	0.2PCT_500yr	LC-199	318617.00	55.29	13346.40
G1030000WF_0440	52026.90	0.2PCT_500yr	MP	333600.00	54.17	11145.26
G1030000WF_0440	52026.90	0.2PCT_500yr	LC-199	322417.00	54.17	11143.92
G1030000WF_0440	44044.71	0.2PCT_500yr	MP	369116.00	54.12	8926.61
G1030000WF_0440	44044.71	0.2PCT_500yr	LC-199	357933.00	54.12	8926.61

Peak Flow Rates for West Fork Between US-59 and Lake Conroe

1% Chance Return Event		
201 ft-msl	199 ft-msl	Reduction (%)
165,730	159,903	3.52%
167,500	161,673	3.48%
167,560	161,733	3.48%
167,670	161,843	3.48%
167,890	162,063	3.47%
168,090	162,263	3.47%
168,330	162,503	3.46%
169,330	163,503	3.44%
169,770	163,943	3.43%
171,000	165,173	3.41%
171,320	165,493	3.40%
172,610	166,783	3.38%
173,330	167,503	3.36%
174,300	168,473	3.34%
214,619	208,792	2.72%

0.2% Chance Return Event		
201 ft-msl	199 ft-msl	Reduction (%)
299,930	288,747	1.94%
306,000	294,817	1.90%
307,140	295,957	1.90%
307,570	296,387	1.89%
308,450	297,267	1.89%
310,160	298,977	1.88%
309,220	298,037	1.88%
314,100	302,917	1.86%
315,820	304,637	1.85%
320,030	308,847	1.82%
321,900	310,717	1.81%
326,970	315,787	1.78%
329,800	318,617	1.77%
333,600	322,417	1.75%
369,116	357,933	1.58%

*Base flows from HCFCD hydraulic model

Water Surface Elevations for West Fork Between US-59 and Lake Conroe

1% Chance Return Event				0.2% Chance Return Event			
Base Model (ft)	199 ft-msl (ft)	Reduction (in)		Base Model (ft)	199 ft-msl (ft)	Reduction (in)	
68.24	67.88	4.32		74.61	74.27	4.08	
67.13	66.77	4.32		73.52	73.2	3.84	
66.35	65.98	4.44		72.62	72.33	3.48	
65.97	65.62	4.2		72.03	71.77	3.12	
65.76	65.4	4.32		71.89	71.63	3.12	
65.38	65.04	4.08		71.79	71.53	3.12	
64.77	64.49	3.36		69.09	68.8	3.48	
64.83	64.54	3.48		68.79	68.52	3.24	
64.71	64.42	3.48		68.57	68.3	3.24	
64.6	64.32	3.36		68.39	68.13	3.12	
61.37	61.1	3.24		67.36	67.01	4.2	
61.28	61	3.36		67.1	66.75	4.2	
60.43	60.17	3.12		66	65.68	3.84	
60.46	60.2	3.12		66.04	65.72	3.84	
60.38	60.12	3.12		65.96	65.64	3.84	
60.09	59.83	3.12		65.62	65.3	3.84	
59.49	59.24	3		64.96	64.66	3.6	
58.06	57.83	2.76		63.25	62.98	3.24	
57.27	57.05	2.64		62.51	62.24	3.24	
56.41	56.19	2.64		61.68	61.42	3.12	
55.98	55.78	2.4		61.14	60.9	2.88	
55.71	55.5	2.52		60.89	60.65	2.88	
54.66	54.47	2.28		59.91	59.68	2.76	
53.01	52.86	1.8		58.47	58.28	2.28	
52.84	52.7	1.68		58.15	57.98	2.04	
51.7	51.6	1.2		56.2	56.08	1.44	
50.99	50.93	0.72		55.37	55.29	0.96	
50.03	50.03	0		54.17	54.17	0	
49.99	49.99	0		54.12	54.12	0	

Max	68.24	67.88	4.44	0.54%	74.61	74.27	4.2	0.47%
Min	49.99	49.99	0	0.00%	54.12	54.12	0	0.00%
Avg	59.6	59.3	2.8	0.39%	64.8	64.6	3	0.39%

*Base water surface elevations from HCFCD hydraulic model

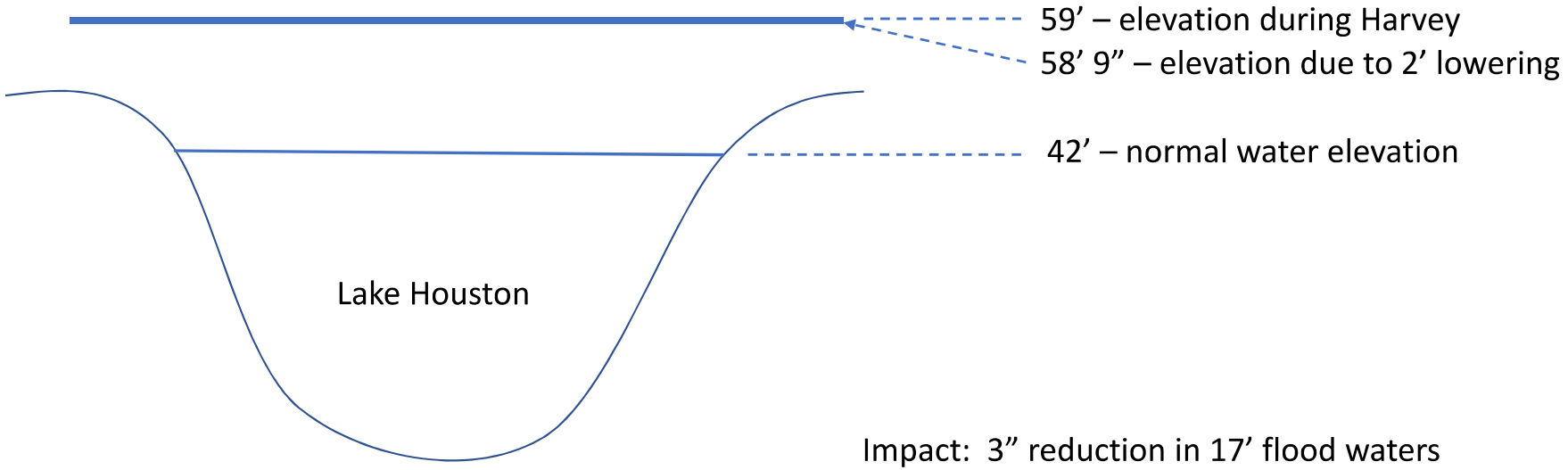
Flood Extents for West Fork Between US-59 and Lake Conroe

1% Chance Return Event				0.2% Chance Return Event			
Base Model (ft)	199 ft-msl (ft)	Reduction (in)		Base Model (ft)	199 ft-msl (ft)	Reduction (in)	
6280.01	6127.64	152.37		7487.62	7476.49	11.13	
6980.07	6931.68	48.39		7961.72	7947.88	13.84	
6409.01	6384.78	24.23		8214.36	8202.5	11.86	
6861.8	6500.47	361.33		9087.36	8997.35	90.01	
7689.79	7660.56	29.23		9651.81	9640.84	10.97	
7995.03	7912.98	82.05		10098.84	10073.83	25.01	
7358.02	6771.39	586.63		9292.35	9217.65	74.7	
7890.56	7717.5	173.06		9114.77	9085.02	29.75	
8107.54	7931.03	176.51		9839.33	9734.31	105.02	
8952.25	8645.36	306.89		10058.31	10048.89	9.42	
7131.44	7071.86	59.58		10031.06	10027.2	3.86	
6805.81	6770.66	35.15		11117.28	11100.34	16.94	
6280.85	6202.56	78.29		10476.97	10332.45	144.52	
7556.28	7438.29	117.99		10269.39	10235.07	34.32	
8254.64	8180.77	73.87		10502.3	10495.65	6.65	
9942.01	9936.89	5.12		10727.99	10714.34	13.65	
8637.69	8590.91	46.78		9233.12	9223.71	9.41	
6366.98	6355.38	11.6		7345.74	7338.58	7.16	
10728.8	10532.76	196.04		12191.19	12159.66	31.53	
10976.22	10776.65	199.57		14223.19	14116.6	106.59	
13817.4	13531.57	285.83		17745.11	17736.1	9.01	
12258.87	11671.12	587.75		17708.62	17679.12	29.5	
8163.83	8049.3	114.53		11168.15	11090.35	77.8	
8613.42	8603.51	9.91		10337.61	10306.4	31.21	
7591.46	7230.43	361.03		13590.69	13565.07	25.62	
6584.26	6543.01	41.25		13741.19	13734.6	6.59	
5669.12	5626.14	42.98		13374.56	13346.4	28.16	
8229.66	8225.65	4.01		11145.26	11143.92	1.34	
8768.77	8768.77	0		8926.61	8926.61	0	
Max 13817.4	13531.57	587.75	0.35%	17745.11	17736.1	144.52	0.07%
Min 5669.12	5626.14	0	0.00%	7345.74	7338.58	0	0.00%
Avg 8169	8023.8	145.2	0.15%	10850.4	10817.1	33.3	0.03%

*Base flood extents from HCFCD hydraulic model

Attachment 6

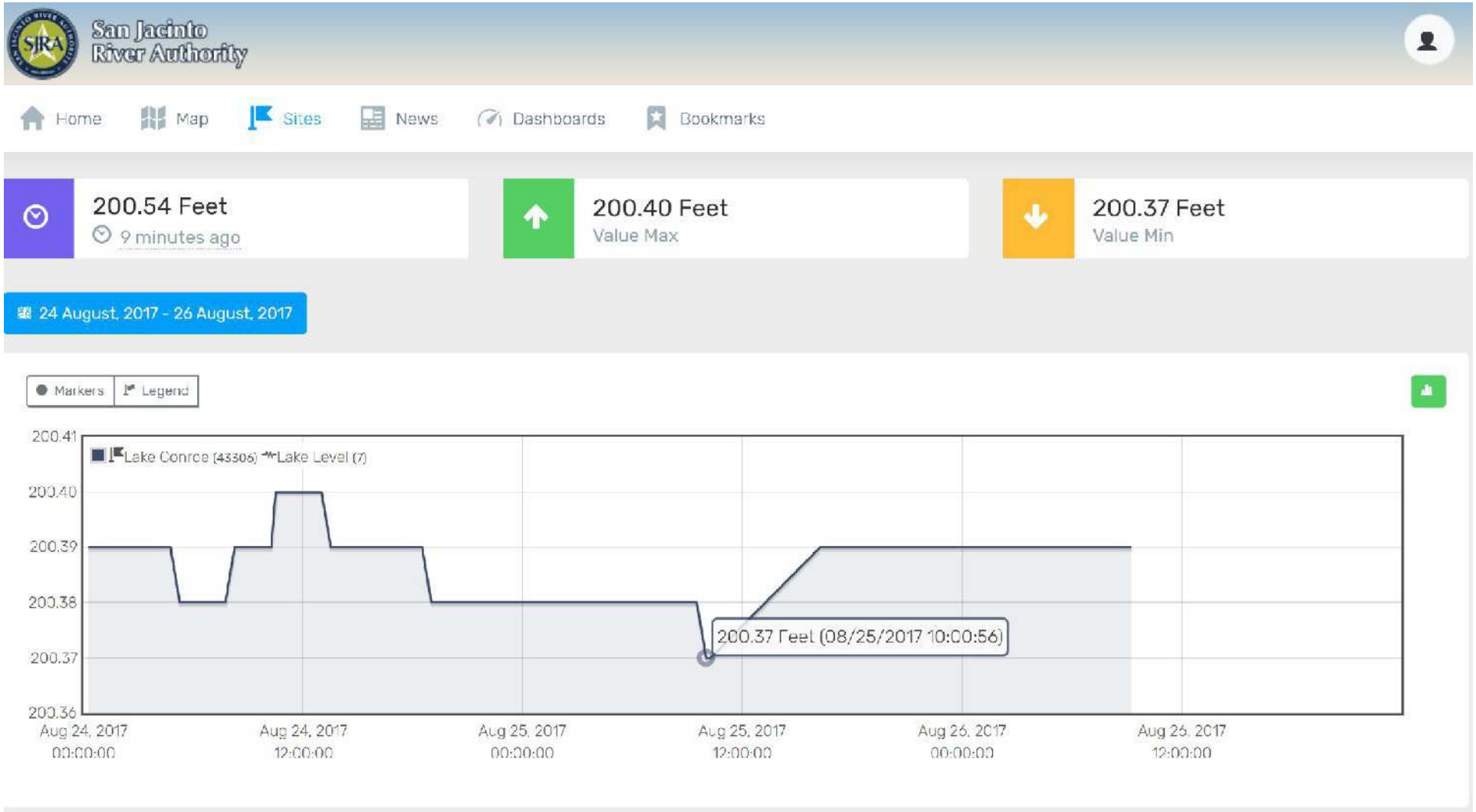
Flood levels during Hurricane Harvey and impact of lowering Lake Conroe by 2 feet



Impact: 3” reduction in 17’ flood waters
(= 1.5% reduction)

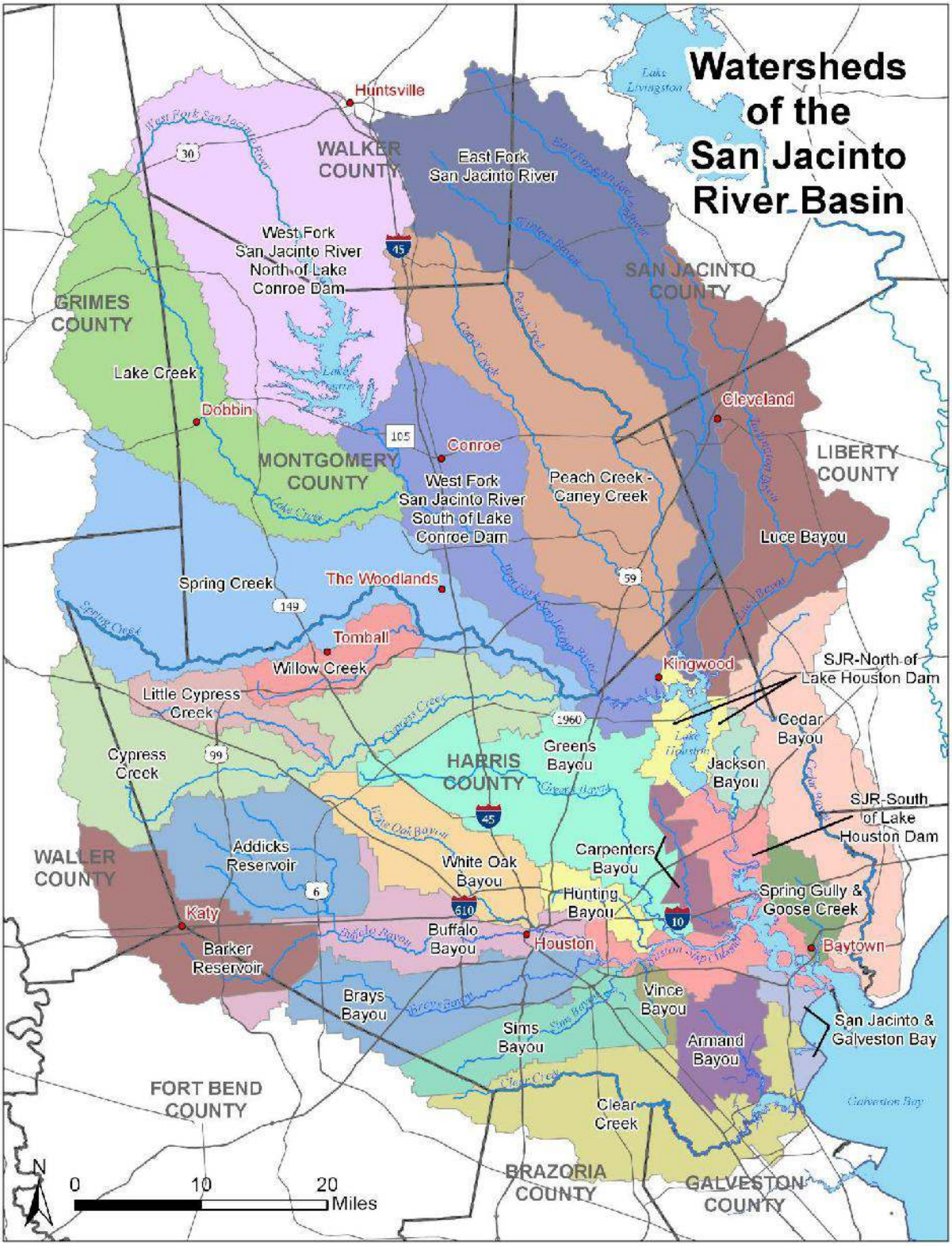
Attachment 7

Lake Conroe – Lake Levels, August 24-26, 2017



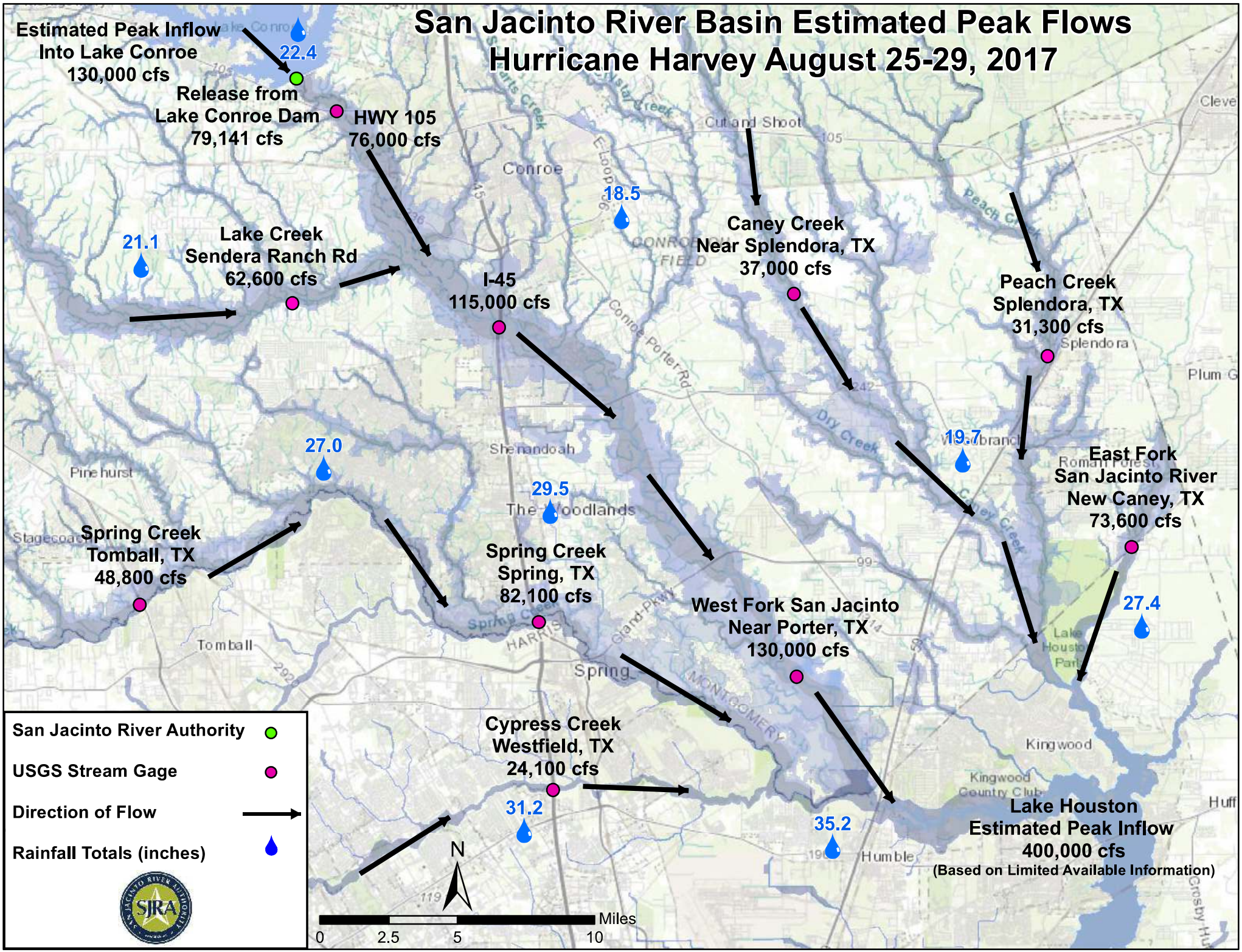
From San Jacinto River Authority Contrail® System, Lake Conroe Dashboard, Lake Level, *available at* https://sanjacinto.onerain.com/sensor/?time_zone=US%2FCentral&site_id=13189&site=b6f6df4e-f5a5-4398-a2e9-1a3508c4e9b5&device_id=15&device=28823576-054f-43ef-bff3-c1acb76595f2&bin=86400&range=Custom%20Range&markers=false&legend=true&thresholds=true&refresh=off&show_raw=true&show_quality=true&data_start=2017-08-24%2000%3A00%3A00&data_end=2017-08-26%2023%3A59%3A59

Attachment 8



From San Jacinto River Auth., "What Is a Watershed?," at https://www.sjra.net/education/what-is-a-watershed/.

Attachment 9


San Jacinto River Basin Estimated Peak Flows
Hurricane Harvey August 25-29, 2017
Estimated Peak Inflow
Into Lake Conroe
130,000 cfs
22.4
Release from
Lake Conroe Dam
79,141 cfs
HWY 105
76,000 cfs
18.5
21.1
Lake Creek
Sendera Ranch Rd
62,600 cfs
I-45
115,000 cfs
Caney Creek
Near Splendora, TX
37,000 cfs
Peach Creek
Splendora, TX
31,300 cfs
27.0
19.7
East Fork
San Jacinto River
New Caney, TX
73,600 cfs
29.5
Spring Creek
Tomball, TX
48,800 cfs
Spring Creek
Spring, TX
82,100 cfs
West Fork San Jacinto
Near Porter, TX
130,000 cfs
27.4
Cypress Creek
Westfield, TX
24,100 cfs
31.2
35.2
Lake Houston
Estimated Peak Inflow
400,000 cfs
(Based on Limited Available Information)
Conroe
Cut and Shoot
Shenandoah
The Woodlands
Pinehurst
Tomball
Spring
Kingwood
Humble
Splendora
San Jacinto River Authority
USGS Stream Gage
Direction of Flow
Rainfall Totals (inches)
N
0
2.5
5
10
Miles

Attachment 10

Month: August

San Jacinto River Authority
Water Releases Report

	Lake Level	Time		Total	Gate Openings (cfs)					cubic ft/sec			Acre Feet			
Date	Elevation	Open	Closed	Seconds	No. 1	No. 2	No. 3	No. 4	No. 5	S.O.	S.P.	Total	S.O.	S.P.	Total	Accumaltive
8/27/17	201.04	0:25	3:00	9,300			529				529	529	-	113	113	113
	201.17	3:00	4:10	4,200		530	530				1,060	1,060	-	102	102	215
	201.23	4:10	6:20	7,800		531	531	531			1,592	1,592	-	285	285	500
	201.42	6:20	7:20	3,600	533	533	533	533			2,130	2,130	-	176	176	676
	201.52	7:20	9:20	7,200	533	533	533	533	533		2,667	2,667	-	441	441	1,117
	201.95	9:20	10:00	2,400	537	1,074	537	1,074	537		3,759	3,759	-	207	207	1,324
	202.14	10:00	12:00	7,200	1,077	1,077	1,077	1,077	1,077		5,384	5,384	-	890	890	2,214
	202.68	12:00	12:45	2,700	1,086	1,629	1,086	1,629	1,086		6,516	6,516	-	404	404	2,618
	202.81	12:45	13:15	1,800	1,088	1,632	1,632	1,632	1,088		7,074	7,074	-	292	292	2,910
	202.88	13:15	14:20	3,900	1,634	1,634	1,634	1,634	1,634		8,171	8,171	-	732	732	3,642
	203.02	14:20	15:00	2,400	2,183	2,183	2,183	2,183	2,183		10,916	10,916	-	601	601	4,243
	203.24	15:00	15:45	2,700	3,289	2,193	3,289	2,193	3,289		14,254	14,254	-	884	884	5,127
	203.41	15:45	17:00	4,500	3,300	3,300	3,300	3,300	3,300		16,498	16,498	-	1,704	1,704	6,831
	203.67	17:00	17:53	3,180	4,422	3,317	4,422	3,317	4,422		19,900	19,900	-	1,453	1,453	8,284
	203.82	17:53	19:45	6,720	4,435	4,435	4,435	4,435	4,435		22,177	22,177	-	3,421	3,421	11,705
	204.37	19:45	20:45	3,600	5,593	4,475	5,593	4,475	5,593		25,729	25,729	-	2,126	2,126	13,832
	204.61	20:45	22:45	7,200	5,615	5,615	5,615	5,615	5,615		28,075	28,075	-	4,640	4,640	18,472
	205.06	22:45	23:15	1,800	6,783	6,783	6,783	6,783	6,783		33,917	33,917	-	1,402	1,402	19,874
	205.20	23:15	23:45	1,800	7,921	7,921	7,921	7,921	7,921		39,604	39,604	-	1,637	1,637	21,510
	205.37	23:45	0:00	900	10,182	10,182	10,182	10,182	10,182		50,908	50,908	-	1,052	1,052	22,562
8/28/17	205.42	0:00	0:15	900	10,182	10,182	10,182	10,182	10,182		50,908	50,908	-	1,052	1,052	23,614
	205.47	0:15	2:00	6,300	12,378	12,378	12,378	12,378	12,378		61,891	61,891	-	8,951	8,951	32,565
	205.80	2:00	12:00	36,000	14,640	14,640	14,640	14,640	14,640		73,201	73,201	-	60,497	60,497	93,062
	206.17	12:00	0:00	43,200	15,828	15,828	15,828	15,828	15,828		79,141	79,141	-	78,487	78,487	171,549
8/29/17	205.26	0:00	3:30	12,600	15,828	15,828	15,828	15,828	15,828		79,141	79,141	-	22,892	22,892	194,441
	204.76	3:30	4:30	3,600	14,357	14,357	14,357	14,357	14,357		71,787	71,787	-	5,933	5,933	200,373
	204.56	4:30	6:30	7,200	13,234	13,234	13,234	13,234	13,234		66,170	66,170	-	10,937	10,937	211,311
	204.33	6:30	7:00	1,800	12,121	12,121	12,121	12,121	12,121		60,604	60,604	-	2,504	2,504	213,815
	204.17	7:00	8:15	4,500	11,031	11,031	11,031	11,031	11,031		55,157	55,157	-	5,698	5,698	219,513
	204.05	8:15	9:00	2,700	9,943	9,943	9,943	9,943	9,943		49,717	49,717	-	3,082	3,082	222,594
	203.92	9:00	9:45	2,700	7,748	7,748	7,748	7,748	7,748		38,741	38,741	-	2,401	2,401	224,996
	203.85	9:45	10:15	1,800	5,543	5,543	5,543	5,543	5,543		27,717	27,717	-	1,145	1,145	226,141

Month: August

San Jacinto River Authority
Water Releases Report

	203.81	10:15	22:30	44,100	4,434	4,434	4,434	4,434	4,434		22,172	22,172	-	22,447	22,447	248,588
	203.42	22:30	0:00	5,400	3,300	3,300	3,300	3,300	3,300		16,501	16,501	-	2,046	2,046	250,634
8/30/17	203.33	0:00	6:30	23,400	3,300	3,300	3,300	3,300	3,300		16,501	16,501	-	8,864	8,864	259,498
	203.09	6:30	16:15	35,100	2,186	2,186	2,186	2,186	2,186		10,929	10,929	-	8,806	8,806	268,304
	202.83	16:15	18:45	9,000	1,633	1,633	1,633	1,633	1,633		8,163	8,163	-	1,687	1,687	269,991
	202.76	18:45	23:15	16,200	1,305	1,305	1,305	1,305	1,305		6,525	6,525	-	2,427	2,427	272,417
	202.68	23:15	0:00	2,700	1,087	1,087	1,087	1,087	1,087		5,433	5,433	-	337	337	272,754
8/31/17	202.67	0:00	19:45	71,100	1,087	1,087	1,087	1,087	1,087		5,433	5,433	-	8,868	8,868	281,622
	202.40	19:45	21:45	7,200	541	1,082	541	1,082	541		3,787	3,787	-	626	626	282,248
	202.36	21:45	0:00	8,100	541	541	541	541	541		2,705	2,705	-	503	503	282,751
				-							-	-	-	-	-	-
				-							-	-	-	-	-	-
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Month: August

San Jacinto River Authority
Water Releases Report

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Month: August

San Jacinto River Authority
Water Releases Report

*FNI Discussion

Attachment 11

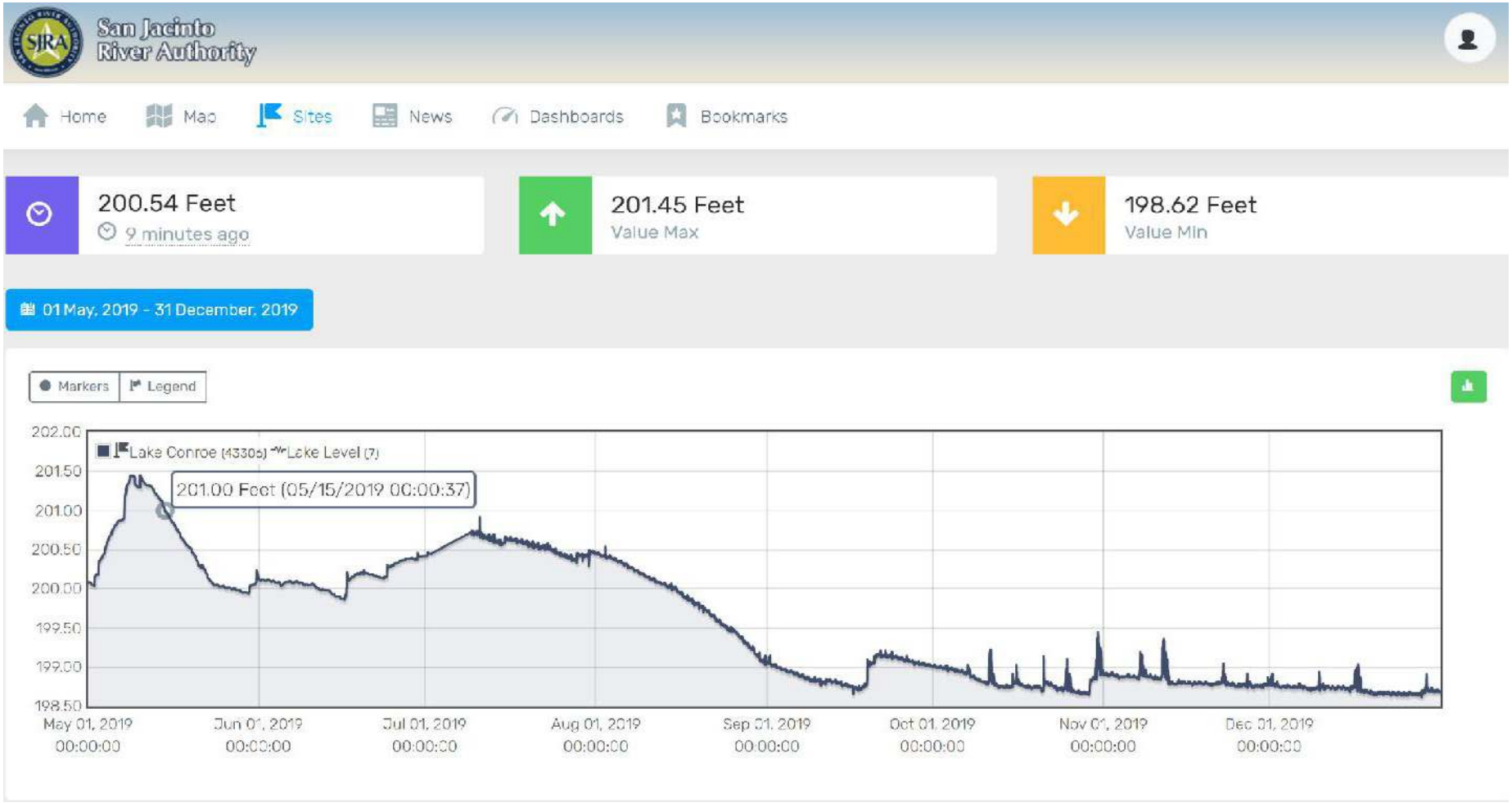
Lake Conroe – Lake Levels, August 1 through November 30, 2018

From San Jacinto River Authority Contrail® System, Lake Conroe Dashboard, Lake Level, *available at* https://sanjacinto.onerain.com/sensor/?time_zone=US%2FCentral&site_id=13189&site=b6f6df4e-f5a5-4398-a2e9-1a3508c4e9b5&device_id=15&device=28823576-054f-43ef-bff3-c1acb76595f2&data_start=2018-08-01%2000%3A00%3A00&data_end=2018-11-30%2023%3A59%3A59&bin=86400&range=Custom%20Range&markers=false&legend=true&thresholds=true&refresh=off&show_raw=true&show_quality=true.

Attachment 12

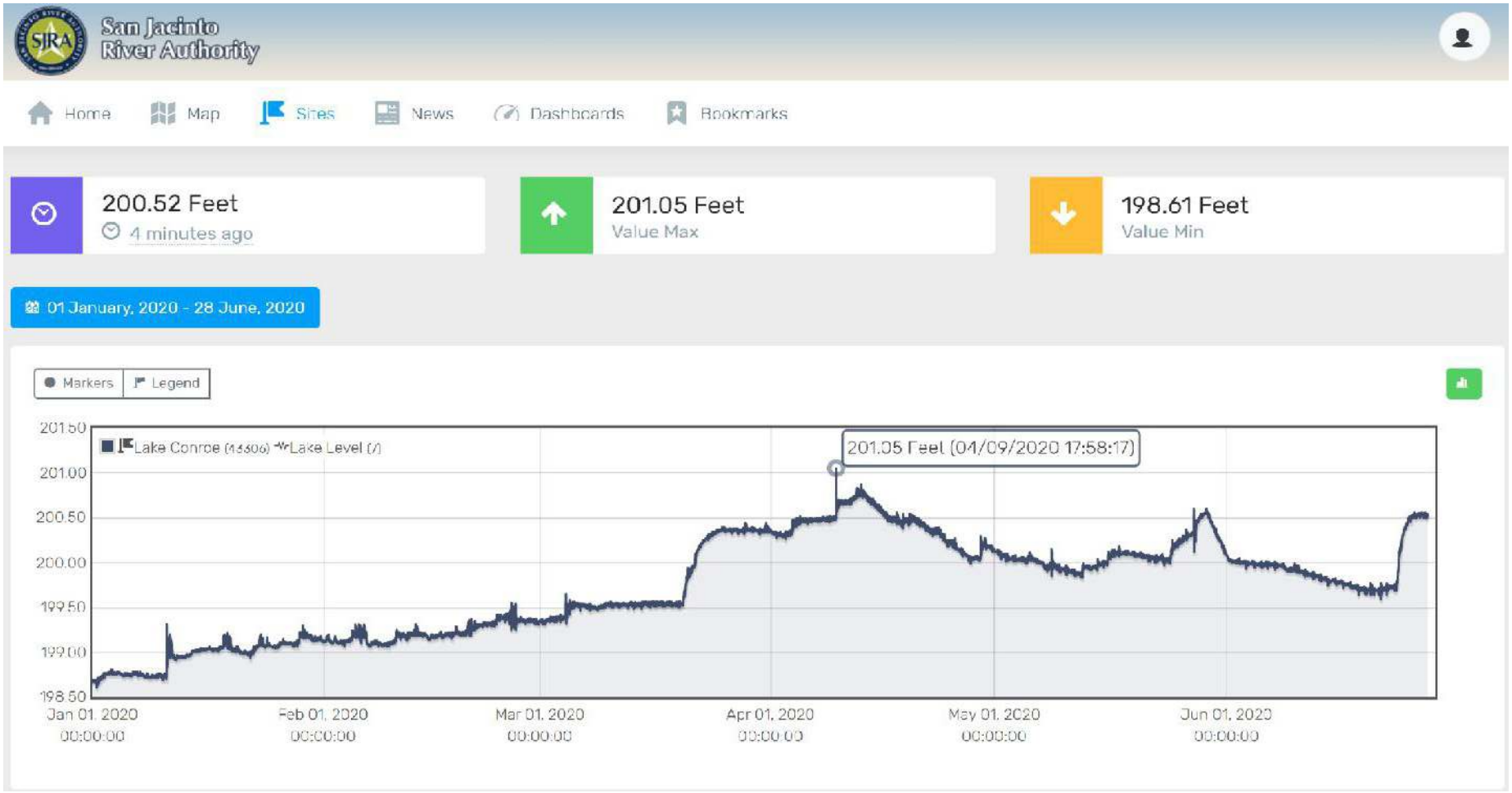
Lake Conroe – Lake Levels – May 1, 2019 through June 28, 2020

May 1 through December 31, 2019



From San Jacinto River Authority Contrail® System, Lake Conroe Dashboard, Lake Level, *available at* https://sanjacinto.onerain.com/sensor/?time_zone=US%2FCentral&site_id=13189&site=b6f6df4e-f5a5-4398-a2e9-1a3508c4e9b5&device_id=15&device=28823576-054f-43ef-bff3-c1acb76595f2&data_start=2019-05-01%2000%3A00%3A00&data_end=2019-12-31%2023%3A59%3A59&bin=86400&range=Custom%20Range&markers=false&legend=true&thresholds=true&refresh=off&show_raw=true&show_quality=true.

January 1 through June 28, 2020



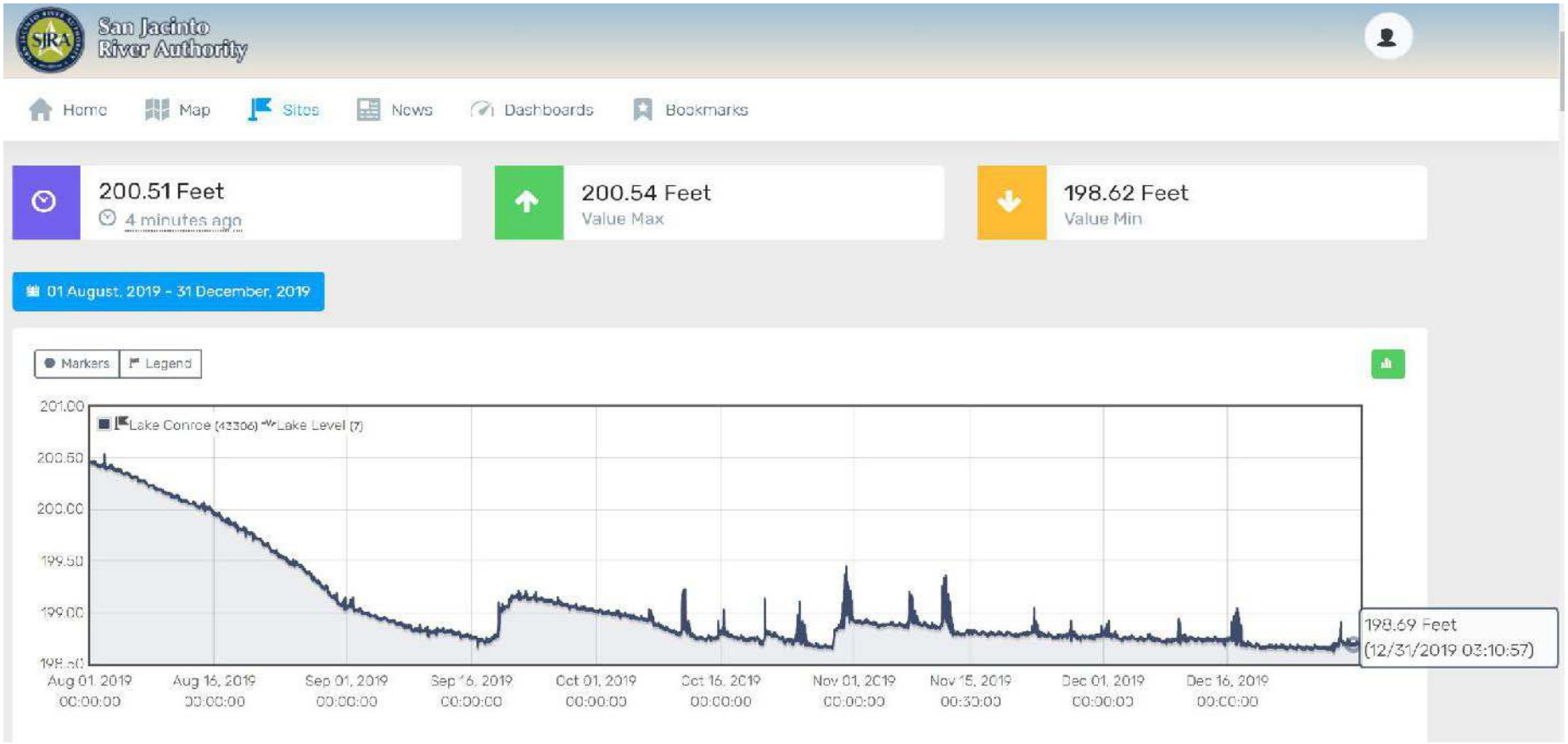
From San Jacinto River Authority Contrail® System, Lake Conroe Dashboard, Lake Level, *available at* https://sanjacinto.onerain.com/sensor/?time_zone=US%2FCentral&site_id=13189&site=b6f6df4e-f5a5-4398-a2e9-1a3508c4e9b5&device_id=15&device=28823576-054f-43ef-bff3-c1acb76595f2&data_start=2020-01-01%2000%3A00%3A00&data_end=2020-06-28%2023%3A59%3A59&bin=86400&range=Custom%20Range&markers=false&legend=true&thresholds=true&refresh=off&show_raw=true&show_quality=true.

April 8 through 10, 2020

From San Jacinto River Authority Contrail® System, Lake Conroe Dashboard, Lake Level, *available at* https://sanjacinto.onerain.com/sensor/?time_zone=US%2FCentral&site_id=13189&site=b6f6df4e-f5a5-4398-a2e9-1a3508c4e9b5&device_id=15&device=28823576-054f-43ef-bff3-c1acb76595f2&data_start=2020-04-08%2000%3A00%3A00&data_end=2020-04-10%2023%3A59%3A59&bin=86400&range=Custom%20Range&markers=false&legend=true&thresholds=true&refresh=off&show_raw=true&show_quality=true.

Attachment 13

Lake Conroe – Lake Levels, August 1 through December 31, 2019



From San Jacinto River Authority Contrail® System, Lake Conroe Dashboard, Lake Level, *available at* https://sanjacinto.onerain.com/sensor/?time_zone=US%2FCentral&site_id=13189&site=b6f6df4e-f5a5-4398-a2e9-1a3508c4e9b5&device_id=15&device=28823576-054f-43ef-bff3-c1acb76595f2&bin=86400&range=Custom%20Range&markers=false&legend=true&thresholds=true&refresh=off&show_raw=true&show_quality=true&data_start=2019-08-01%2000%3A00%3A00&data_end=2019-12-31%2023%3A59%3A59.