SABINE AND NECHES RIVERS AND SABINE LAKE BAY BASIN AND BAY AREA STAKEHOLDER COMMITTEE

RECOMMENDATIONS REPORT

FINAL SUBMISSION TO THE ENVIRONMENTAL FLOWS ADVISORY GROUP AND THE TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

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FINAL SUBMISSION TO THE ENVIRONMENTAL FLOWS ADVISORY GROUP AND THE TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

May 2010

The Honorable Allan Ritter, Co-presiding Officer
Environmental Flows Advisory Group

Mark R. Vickery, P.G., Executive Director
Texas Commission on Environmental Quality

Dear Representative Ritter and Mr. Vickery,

For your consideration, the Sabine and Neches Rivers and Sabine Lake Bay Basin and Bay Area Stakeholder Committee (Sabine-Neches BBAC) hereby submits its final report pursuant to its charge under Senate Bill 3 (80th R, 2007). This charge is to review the Sabine and Neches Rivers and Basin Expert Science Team (Sabine-Neches BBEST) recommendation for environmental flows and to weigh the environmental need for water with the need for water for other purposes, including human needs, and to make recommendations on "environmental flow standards" for the Bay-Basin complex.

Respectfully submitted,

Jerry L. Clark
Chair

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1 EXECUTIVE SUMMARY

Senate Bill 3 was intended to create a basin-by-basin process for developing "environmental flow standards" to provide the appropriate amount of instream flows and freshwater inflows by balancing the environmental need with the need for water for humans and other purposes. The Sabine River Basin-Neches River Basin-Sabine Lake system, along with the Trinity River Basin-San Jacinto Trinity River Basin-Galveston Bay systems were the first bay-basin complexes required to engage in the Senate Bill 3 process.[1] The Sabine-Neches Bay and Basin Expert Science Team (Sabine-Neches BBEST) submitted its Environmental Flows Recommendations Report on November 30, 2009. After reviewing the Sabine-Neches BBEST environmental flow analyses and environmental flow recommendations and considering them in conjunction with other factors, the Sabine and Neches Rivers and Sabine Lake Bay Basin and Bay Area Stakeholder Committee (Sabine-Neches BBASC) is pleased to provide this Recommendations Report to the Environmental Flows Advisory Group (EFAG) and Texas Commission on Environmental Quality (TCEQ).

1.1 CHARGE

The Sabine-Neches BBASC Charge is to review the Sabine-Neches BBEST recommendation for environmental flows and to weigh the environmental need for water with the need for water for other purposes, including human needs, and to make recommendations on "environmental flow standards" for the Bay-Basin complex.

1.2 STUDY AREA

The Study Area defined for the Sabine-Neches BBASC is the Sabine River Basin, the Neches River Basin, and the Sabine-Neches Estuary (Sabine Lake). Each basin has a watershed of approximately 10,000 square miles with the total drainage of some 20,000 square miles being received by the Sabine-Neches Estuary.

1.3 STATUTORY BACKGROUND

Texas lawmakers passed Senate Bill 3 (SB 3) in the 2007 80th Regular Session of the Texas Legislature. SB 3 is the third in a series of three omnibus water bills relating to the

[1] TEX WATER CODE ANN. § 11.02362(b)(1).

State of Texas meeting the future needs for water. Senate Bill 1 (SB 1, 1997) established a bottom-up approach to water resource planning. Senate Bill 2 (SB 2, 2001) addresses groundwater issues and established a program to develop the information to determine the needs of water for the environment. The SB 2 instream flow program was established because of the lack of data needed to determine the amount of water that is needed for the environment.

Prior to SB 3, the balancing of the effect of authorizing a new use of water with the need for that water to maintain a sound ecological system was done on a case-by-case basis as part of the water rights permitting process. This made water resources planning under SB 1 difficult because the effect of a strategy on the environment is not known at the planning stage. SB 3 was intended to establish a basin-by-basin process for developing recommendations to achieve the appropriate balance of water for environmental needs and water for other purposes, including human needs.

1.4 COMMENTS ON SABINE-NECHES BBEST ENVIRONMENTAL FLOWS RECOMMENDATIONS

In keeping with its Charge, the Sabine-Neches BBASC reviewed the Sabine-Neches BBEST Environmental Flows Recommendations Report. The fundamental comment of the Sabine-Neches BBASC is that while SB 3 requires the BBASCs to weigh the environmental need for flows with the need for water for other purposes, the Sabine-Neches BBEST developed a flow regime based on a desktop procedure known as the Hydrology-Based Environmental Flow Regime (HEFR). ***The result is an environmental flow regime that mimics historical flows which may or may not represent the least amount of water that can be reserved for the environment and still have a sound ecological system.***

1.5 IMPACT OF SABINE-NECHES BBEST FLOW REGIME

The application of the Sabine-Neches BBEST environmental flow recommendations as applied to reservoir projects with new and/or amended permits would require releasing massive amounts of water that might otherwise be stored for future use within the project. Consequently, the requirement for these pass-through flows would significantly reduce the expected reservoir water levels and therefore would reduce the availability of firm yield for water supply from these projects. In addition, the lower water levels would trigger more

frequent drought contingency restrictions, would adversely impact reservoir recreation, thwart economic development, and negatively affect reservoir fisheries.

1.6 CONSIDERATION OF WATER NEEDS FOR OTHER USES

The primary task of the Sabine-Neches BBASC is to balance the need for water for instream flows and freshwater inflows with other needs. Balancing these needs with the environmental need for water is problematic because the Sabine-Neches BBEST report did not determine the amount of water needed for instream flows and freshwater inflow.

1.6.1 WATER SUPPLY

The Sabine-Neches BBASC study area contains substantial water resources that are important existing and projected water supplies. As discussed in Section 7 Impact of Sabine-Neches BBEST Flow Regime, the flow regime derived using the default HEFR analysis would substantially reduce water supply (depending upon the assumptions, by as much as 70% of the Texas yield of Toledo Bend Reservoir, and as much as 50% of new reservoir projects). This would reduce the economic viability of these basins, significantly reducing the long-term ability to provide for the future needs of the State of Texas.

1.6.2 ECONOMIC VALUE OF RESERVOIR RECREATION

The Sabine-Neches BBEST flow regime recommendations, if adopted by TCEQ as environmental flow standards, would severely impact lake levels for those reservoirs requiring new and amended permits. The harm to Sabine and Neches Basins reservoir recreation and the resulting economic consequences, both local and state, under the estimated frequency of low water levels to accommodate the Sabine-Neches BBEST recommendations has not been studied but these consequences could be significant. The economic consequences could include depressed waterfront property values, decreased tourism and the resulting trickledown effect to local businesses, jobs, and the local tax base. ***The potential economic impact of environmental flow standards on reservoirs should be studied before environmental flow standards are enacted.***

1.6.3 RESERVOIR FISHERY RESOURCES

A sound ecological environment is one that supports a healthy diversity of fish and aquatic life in a holistic approach that includes rivers, tributaries, lakes, and estuaries.

Reservoirs should be included, along with rivers and estuaries when assessing environmental health.

1.7 OTHER FACTORS

Other factors, some of which are unique to the Sabine and Neches River Basins, should be considered prior to the establishment of environmental flow standards. These include:

- Sabine River Compact;
- The Sabine River is shared with Louisiana;
- Federal Energy Regulatory Commission (FERC) requires relicensing of the Toledo Bend Project by 2013;
- SB 2 instream flow studies are underway in the Lower Sabine Basin;
- Legal Liability;
- U.S. Army Corps of Engineers (USACE) Sabine-Neches Waterway (SNWW) Channel Improvement Project is underway;
- Cutoff Bayou (change in the proportion of flows to Louisiana and Texas in the Lower Sabine River);
- Lower Neches Saltwater Barrier; and
- Proposed Lower Sabine Saltwater Barrier.

1.8 RECOMMENDATIONS

1.8.1 RECOMMENDATION 1

The Sabine-Neches BBASC recommends the following definition for balancing the needs of Texas citizens with a sound ecological environment for the Sabine and Neches River Basins and Sabine Lake Estuary.

A sound ecological environment is one that:

- ***supports a healthy diversity of fish and other aquatic life;***
- ***sustains a full complement of important species;***
- ***provides for all major aquatic habitat types including rivers and streams, reservoirs, and estuaries;***
- ***sustains key ecosystem processes; and***
- ***maintains water quality adequate for aquatic life.***

1.8.2 RECOMMENDATION 2

Neither environmental flow standards nor environmental flow set-asides should be established until more information is available regarding the amount of water needed to support a sound environment.

1.8.3 RECOMMENDATION 3

The Sabine-Neches BBASC recommends that efforts be undertaken to initiate and complete the instream flow studies required under SB 2 (2001) in order to develop the type of data required to better understand the amount of instream flow needed for a sound ecological system in order to balance the environmental need for water with other needs for water as directed by SB 3 (2007). The SB 2 studies should include the upper Sabine River Basin and Neches River Basin, in addition to the ongoing Lower Sabine River Priority Instream Flow Study.

1.8.4 RECOMMENDATION 4

The Sabine-Neches BBASC recommends continued efforts in Texas, coordinated with Louisiana, to protect and restore Sabine Lake Estuary wetlands identified by the U.S. Corps of Engineers (USACE).

1.8.5 RECOMMENDATION 5

The Sabine-Neches BBASC and Sabine-Neches BBEST should proceed with the development of a Work Plan that:

- Establishes a five-year review cycle of the basin and bay environmental flow analyses and environmental flow regime recommendations, integrated with the SB 1 Regional Planning five-year cycle;

- Suggests adjustments to the SB 2 instream flow program to obtain information useful to the SB 3 process; and

- Prescribes specific monitoring, studies, and activities that are closely aligned with existing programs as much as possible (e.g. Texas Clean Rivers Program).

1.8.6 RECOMMENDATION 6

TCEQ along with the Sabine-Neches BBASC and Sabine-Neches BBEST should address the implementation of environmental flow standards and set-asides in advance of weighing the environmental flow needs against the need for water for other purposes.

The impact of environmental flow standards and set-asides on the amount of water available for uses other than environmental flow cannot be determined without more detail on how environmental flow standards and set-asides will be imposed.

1.8.7 RECOMMENDATION 7

The Sabine-Neches BBASC recommends that no requirement to produce overbank flows or high flow pulses be imposed on a reservoir owner until a liability shield is in place.

As discussed in the Sabine-Neches BBEST report, two components of HEFR-created flow regimes raise flooding liability issues. In recent history, any time a reservoir operator releases water without the reservoir being full, there is the risk of lawsuits related to downstream flooding. Obviously, releases to create overbank flows falls into this category. Releasing water to meet requirements for high flow pulses can also expose a reservoir owner to potential liability if the water released combines with downstream runoff to create a flooding situation downstream of the reservoir.

1.8.8 RECOMMENDATION 8

The Sabine-Neches BBASC recommends that the legislature through the TCEQ provide funding for the BBASC to properly review the Sabine-Neches BBEST recommendations and to provide funding for further studies or any reports that may be required under SB 1, SB 2, SB 3 and coordinate with Regional Water Planning Groups.

2 PREAMBLE

The Sabine-Neches Rivers and Sabine Lake Bay Basin and Bay Area Stakeholder Committee (Sabine-Neches BBASC) was appointed by the Texas Environmental Flows Advisory Group (EFAG) under Senate Bill 3 (SB 3),[2] the third in a series of three omnibus water bills related to the State of Texas meeting the future needs for water while maintaining the biological soundness of the state's rivers, lakes, bays, and estuaries.

SB 3 was intended to create a basin-by-basin process for developing recommendations for flow regimes adequate to meet a sound ecological environment in Texas rivers and bay systems by weighing the environmental need for water with other needs for water.

A basin and bay expert science team (Sabine-Neches BBEST) appointed by the Sabine-Neches BBASC was given a one year time period to develop environmental flow analyses to determine the flow needed to support a "sound ecological environment," without regard to the need for water for other uses. This time interval was apparently based on the legislature's assumption that the information was readily available to determine the flow needed to support a "sound ecological environment." The Sabine-Neches BBASC was given six months to consider the BBEST's recommendations in conjunction with other needs for water, including human needs. This information was to be used by the Texas Commission on Environmental Quality (TCEQ) to promulgate environmental flow standards to be utilized in the decision making process for water rights matters and if needed, to establish an amount of unappropriated water to be set aside for the environment.

[2] 80th Texas Legislature (2007). Senate Bill 3. http://www.capitol.state.tx.us/BillLookup/History.aspx?LegSess=80R&Bill=SB3, retrieved 21 April 2010.

The Sabine-Neches BBEST submitted its Environmental Flows Recommendations Report (Recommendations Report) on November 30, 2009.[3] After reviewing the Sabine-Neches BBEST report, SB 3, the need for water for purposes other than those considered by the BBEST, and other factors, the Sabine-Neches BBASC is pleased to provide this Recommendations Report to the EFAG and the TCEQ.

[3] Sabine-Neches BBEST, Environmental Flows Recommendations Report, http://www.sratx.org/BBEST/RecommendationsReport/, retrieved 23 March 2010.

3 CHARGE

The Sabine-Neches BBASC is charged with reviewing the Sabine-Neches BBEST's environmental flow analysis and environmental flow recommendations and to consider them in conjunction with other factors including the present and future need for water other uses. Essentially, this requires the Sabine -Neches BBASC to:

- *Balance the environmental need for water with the need for water for other purposes;*
- *Submit its comments to the TCEQ and the EFAG;*
- *Comment on environmental flow standards and strategies to meet those standards; and*
- *Submit a work plan to address environmental flow issues, in conjunction with the Sabine-Neches BBEST.*

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4 STUDY AREA

The Study Area defined for the Sabine-Neches BBASC is the Sabine River Basin and the Neches River Basin and the Sabine-Neches Estuary (Sabine Lake) with each basin having a watershed of approximately 10,000 square miles with the total drainage of some 20,000 square miles being received by the Sabine-Neches Estuary.

4.1 SABINE RIVER BASIN

The Sabine River originates in Texas northeast of Dallas and flows southeast towards Logansport, Louisiana, then south to Sabine Lake. The crescent-shaped basin is 48 miles across at its widest point and over 300 miles in length from its headwaters to its mouth at the northeast end of Sabine Lake (580 river miles). All or part of 21 Texas counties and seven Louisiana parishes are in the Sabine Basin. The total drainage area of the Basin is 9,756 square miles, with 7,396 square miles (76 percent) in Texas and 2,360 square miles (24 percent) in Louisiana. The Sabine River Authority of Texas (SRA-TX), the Sabine River Authority, State of Louisiana (SRA-LA), and the Sabine River Compact Administration (SRCA)[4] all have responsibilities relating to the waters of the Sabine Basin.[5]

The Sabine River Basin has 14 major reservoirs (storage > 5,000 ac-ft), 11 in Texas, two in Louisiana, and one jointly in Texas and Louisiana. All of these projects are non-Federal reservoirs constructed for the purposes of water supply, hydropower, and recreation. There are no flood control reservoirs in the Sabine River Basin.

SRA-TX is authorized to store water in the upper Sabine Basin in Lake Tawakoni and Lake Fork, and in the lower Sabine Basin in Toledo Bend Reservoir. SRA-TX and SRA-LA jointly own and operate Toledo Bend Reservoir through the Toledo Bend Project Joint Operation (TBPJO) with the Reservoir being shared equally. Toledo Bend Reservoir was constructed for the purposes of water supply, hydroelectric power generation, and recreation and is licensed by the Federal Energy Regulatory Commission (FERC). The FERC license

[4] Sabine River Compact Administration Louisiana and Texas (2008). Fifty-Fourth Annual Report.
[5] Sabine River Authority of Texas (1999). Comprehensive Sabine Watershed Management Plan, http://www.sratx.org/srwmp/comprehensive_plan/, retrieved 21 April 2010.

expiring in September 2013 currently requires a minimum flow release of 144 cfs (104,000 ac-ft/yr) from the spillway at Toledo Bend Reservoir.

Relicensing of the TBPJO Project is currently underway with the anticipated completion of the process in September 2013. This process is intended to assess the impact of the Project upon the environment and resources (Cultural, Land Use and Recreation, Terrestrial, and Water Resources and Aquatics) based upon the current conditions and any impacts that may occur in the future as a result of the Project operations.

4.2 NECHES RIVER BASIN

The Neches River Basin is situated in east Texas between the Trinity River Basin to the west, the Sabine River Basin to the north and east, and the Neches-Trinity Coastal Basin to the south. It consists of the main stem Neches River, with headwaters in Van Zandt County, and the Angelina River which joins the Neches River in Jasper County just upstream of B.A. Steinhagen Reservoir. The basin covers approximately 10,000 square miles, is approximately 210 miles long, and ranges in width from just a few miles wide near its mouth to roughly 70 miles wide at its broadest point. Within the basin are 12 water supply lakes (10 of which are major reservoirs), the largest being Sam Rayburn Reservoir which serves as a hydropower, water supply, and flood control project. Sam Rayburn has nearly 4 million acre feet of total combined storage capacity (which includes flood control pool) and is the largest reservoir completely within the State of Texas. Both B.A. Steinhagen and Sam Rayburn Reservoirs are Federal USACE projects with the Lower Neches Valley Authority (LNVA) as the local sponsor. The Neches River empties into the northwest end of Sabine Lake near Port Arthur, Texas. The Angelina-Neches River Authority (ANRA), LNVA , and the Upper Neches River Municipal Water Authority (UNRMWA) have responsibilities relating to the waters of the Neches River Basin in the Sabine-Neches Study Area. The City of Dallas through its Dallas Water Utilities (DWU) department is a partner with UNRMWA for a major reservoir, Lake Palestine, located in the upper Neches River Basin.

One new reservoir project is currently proposed for construction within the Neches River Basin, Lake Columbia by the ANRA. A water rights permit has been issued to the ANRA by the TCEQ for Lake Columbia and the project is actively pursuing applications for

additional state and federal environmental permits required for construction. This project is proposed to meet anticipated future demands within the region.

The LNVA manages and operates the Neches River Saltwater Barrier under an agreement with the USACE. In accordance with its permit as issued by TCEQ, there is a minimum pass-through flow requirement of 400 cfs for the saltwater barrier.

4.3 SABINE NECHES ESTUARY

Sabine Lake is an approximately 50,000 acre (volume about 300,000 acre-feet), shallow, brackish water lake located on the Texas-Louisiana state line. The estuary and its surrounding marshes have been heavily modified. In the past 130 years, a wide range of man-made activities have altered Sabine Lake and its surrounding wetlands and marshes. The current ship channel, the Sabine-Neches Waterway (SNWW), completed in 1972 consists of a 40-ft channel to the Port of Beaumont and a 30-ft channel to the Port of Orange.[6] The Calcasieu Ship Channel is maintained at 40-ft depth and 400-ft width. The Gulf Intracoastal Waterway (GIWW) completed in 1933 and other canals through the marsh have linked Sabine Lake to Calcasieu Lake in multiple locations.[7]

These navigation channels affect the Sabine-Neches Estuary in at least two ways. First, during times of high tide, they allow saltwater to intrude into the estuary and further upstream into the rivers, lakes, bayous, the GIWW, and marshes. Secondly, during times of flooding, they move fresh water out of the estuary more quickly reducing the amount of marsh land flooding; thereby, giving less retention time for freshwater flows and the accumulation of sediments in the marsh.[8] Moreover, the USACE is planning additional navigational access improvements in Sabine Lake. The USACE has completed a draft study

[6] Sutherlin, J. (1996). Historical Development of the Marsh System on the West Side of Sabine Lake. Sabine Lake Conference: Where Texas and Louisiana Come Together. Beaumont, Texas.
[7] Paille, R. (1996). Water Exchange Patterns and Salinity of Marshes Between Calcasieu and Sabine Lakes. Sabine Lake Conference: Where Texas and Louisiana Come Together. Beaumont, Texas.
[8] Boesch, D. F., M. N. Josselyn, et al. (1994). "Scientific assessment of coastal wetland loss, restoration and management in Louisiana." Journal of Coastal Research (Special Issue No. 20).

of the feasibility and environmental impact of deepening the SNWW from 40-ft to 48-ft.[9] A final report is expected in August 2010.

4.4 UNIQUE ASPECTS OF THE STUDY AREA

In addition to the geographical descriptions of the two river basins and estuary in the study area presented above, there are several unique aspects and ongoing activities that should be kept in mind throughout the remainder of this Recommendations Report. Unique aspects of the Study Area include:

- The Lower Sabine River is shared equally by Texas and Louisiana and is governed by the Sabine River Compact, which provides for equitable apportionment of waters between Texas and Louisiana in the Stateline reach. SB 3, as a Texas statute, does not apply to Louisiana and Louisiana is under no obligation to comply with any Texas environmental flow standard for its portion of the Sabine River.

- SB 1 Regional Water Planning Groups for this area are primarily Regions I and D, with limited areas of the Sabine Basin included in Region C and the Neches Basin in Region H;

- SB 2, or the Texas Instream Flow Program (TIFP), studies include only the lower Sabine River from Toledo Bend Reservoir to tidal (see Figure 1. Sabine-Neches BBASC Study Area Map, below). The State of Louisiana owns half the flow in this state line reach, but does not have a program similar to SB 2.

- The Toledo Bend Reservoir Project Joint Operations – FERC relicense of Toledo Bend hydropower facility must be completed by September 2013;

- The Lower Neches River contains the only Saltwater Barrier for these basins – and there is a minimum flow release requirement which was established for this facility;

[9] Draft Feasibility Report for Sabine-Neches Waterway Channel Improvement Project Southeast Texas and Southwest Louisiana, prepared by U.S. Army Corps of Engineers Galveston District Southwestern Division, December 2009.

- The ANRA has received a TCEQ permit for storage and diversion of state waters on the Angelina River for the Lake Columbia project and is in the process of obtaining additional federal permits and financing for the construction of this future project;

- At Cutoff Bayou the Sabine River is migrating to the East to Louisiana's Old Sabine River channel affecting environmental flows and water supply users in Texas and is problematic for the stakeholder weighting process; and

- USACE has proposed deepening (with selective widening) of existing ship channel through the Sabine-Neches Estuary to the Port of Beaumont.

Additional details of the significance of these aspects are discussed in Section 9, Other Factors.

Figure 1. Sabine-Neches BBASC Study Area Map

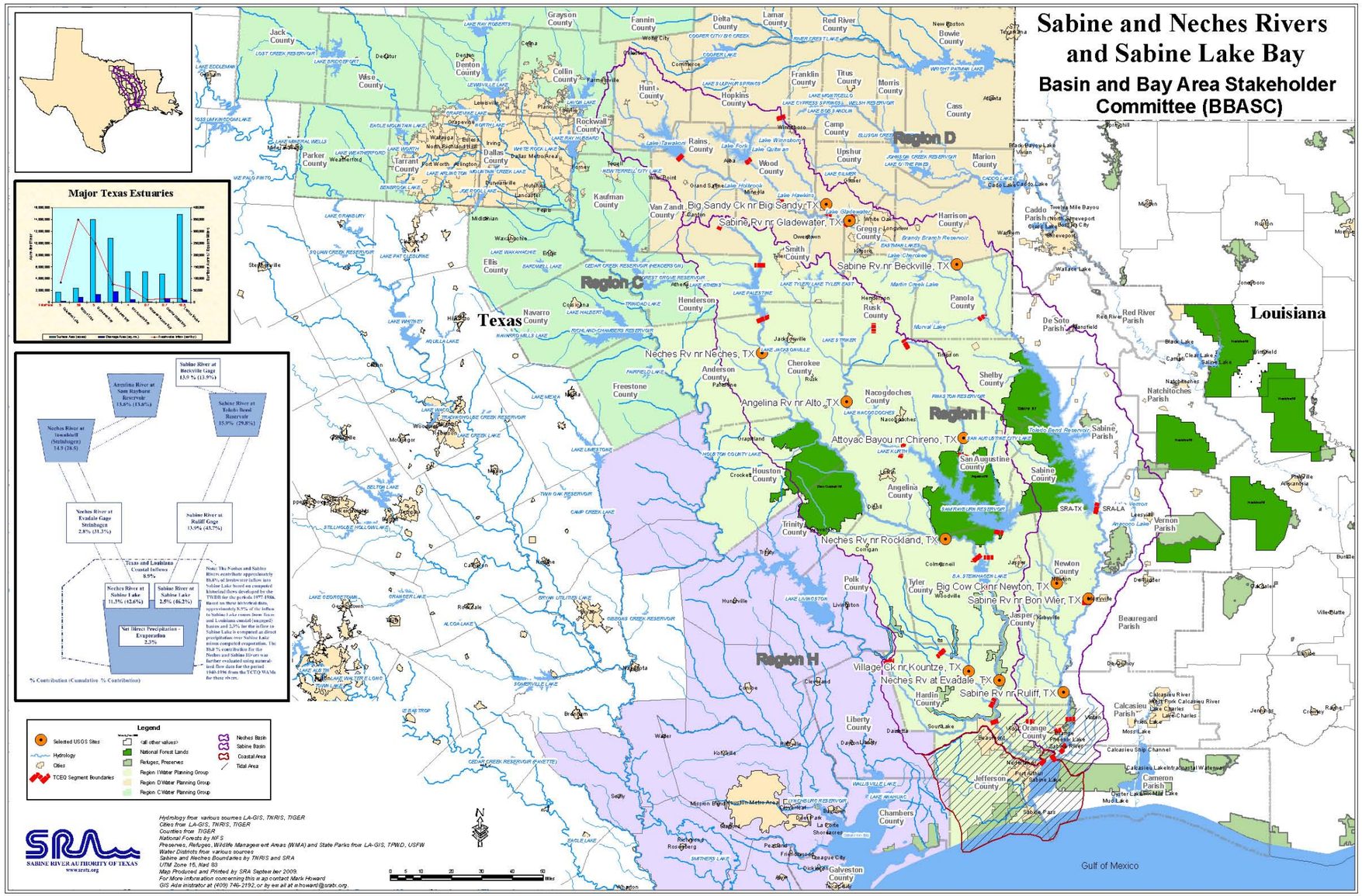

Table 1. Classified Segments of the Sabine and Neches Rivers and Coastal Basins

Classified Segments Sabine and Neches Rivers and Coastal Basins						
Segment Code	Segment Name	Segment Type	Segment Length/Area	USGS Gage Name	USGS Gage Num.	Tx Plan Region
SABINE BASIN						
501	Sabine R Tidal	Tidal Stream	24 miles			I
502	Sabine R above Tidal	FW Stream	77 miles	Sabine River nr Ruliff	8030500	I
503	Sabine R above Caney Creek	FW Stream	60 miles	Sabine River nr Bon Weir	8028500	I
504	Toledo Bend Reservoir	Reservoir	181,600 acres			I
505	Sabine R above Toledo Bend	FW Stream	104 miles	Sabine River nr Beckville	8022040	I/D
506	Sabine R below Lk Tawakoni (downstream end)	FW Stream	118 miles	Sabine River nr Gladewater	8020000	D
507	Lake Tawakoni	Reservoir	37,879 acres			D
508	Adams Bayou Tidal	Tidal Stream	8 miles			I
509	Murvaul Lake	Reservoir	3,827 acres			I
510	Lake Cherokee	Reservoir	3,981 acres			I/D
511	Cow Bayou Tidal	Tidal Stream	20 miles			I
512	Lake Fork Reservoir	Reservoir	27,690 acres			D
513	Big Cow Creek	FW Stream	30 miles	Big Cow Creek nr Newton	8029500	I
514	Big Sandy Creek	FW Stream	58 miles	Big Sandy Creek nr Big Sandy	8019500	D
515	Lake Fork Creek	FW Stream	21 miles			D
NECHES BASIN						
601	Neches R Tidal	Tidal Stream	27 miles			I
602	Neches R Below BA Steinhagen Lk	FW Stream	84 miles	Neches River at Evadale	8041000	I
603	B.A. Steinhagen Lake	Reservoir	13,700 acres			I
604	Neches R Below Lk Palestine	FW Stream	225 miles	Neches River near Rockland	8033500	I
				Neches River at Neches	8032000	I
605	Lake Palestine	Reservoir	23,500 acres			I
606	Neches R above Lake Palestine	FW Stream	27 miles			I/D
607	Pine Island Bayou	FW Stream	81 miles			I
608	Village Creek	FW Stream	53 miles	Village Creek nr Kountze	8041500	I
609	Angelina R below Sam Rayburn Reservoir	FW Stream	13 miles			I
610	Sam Rayburn Reservoir	Reservoir	106,666 acres			I
611	Angelina R Above Sam Rayburn Res	FW Stream	104 miles	Angelina River nr Alto	8036500	I
612	Attoyac Bayou	FW Stream	82 miles	Attoyac Bayou nr Chireno	8038000	I
613	Lake Tyler/Lake Tyler East	Reservoir	4,880 acres			I
614	Lake Jacksonville	Reservoir	1,320 acres			I
615	Angelina River/ Sam Rayburn reservoir	Reservoir	5,068 acres			I
NECHES-TRINITY COASTAL BASIN						
701	Taylor Bayou Above Tidal	FW Stream	34 miles			I
702	Intracoastal Waterway Tidal	Tidal Stream	63 miles			I
703	Sabine-Neches Canal Tidal	Tidal Stream	16 miles			I
704	Hillebrandt Bayou	FW Stream	14 miles			I
SABINE LAKE						
2411	Sabine Pass	Estuary	2 miles			I
2412	Sabine Lake	Estuary	54,000 acres (SRA)	44,160 acres (TCEQ)		I
GULF OF MEXICO						
2501	Gulf of Mexico	Ocean	3,879 sq. mi.			I
LADEQ STREAM SEGMENTS						
110101	Toledo Bend Reservoir	Reservoir				
110201	Sabine River, TB Dam to Old River below Sabine Island WMA	FW Stream				
110202	Pearl Crk, headwaters to Sabine River (Scenic)	FW Stream				
110301	Sabine River, Old River below Sabine Island WMA to Sabine Lk	Estuary				
110302	Black Bayou, Pirogue Ditch to Sabine Lake	Estuary				
110303	Sabine Lake	Estuary				
110304	Sabine Pass	Estuary				
110401	Bayou Toro, headwaters to LA-473	FW Stream				
110402	Bayou Toro, LA-473 to Sabine River	FW Stream				
110501	West Anacoco Creek, headwaters to Vernon Lake	FW Stream				
110502	East Anacoco Creek, headwaters to Vernon Lake	FW Stream				
110503	Vernon Lake	Reservoir				
110504	Bayou Anacoco, Vernon Lake to Anacoco Lake	FW Stream				
110505	Anacoco Lake	Reservoir				
110506	Bayou Anacoco, Anacoco Lake to Cypress Creek	FW Stream				
110507	Bayou Anacoco, Cypress Creek to Sabine River	FW Stream				
110601	Vinton Waterway, Vinton to ICWW	Estuary				
110602	Black Bayou, ICWW to Pirogue Ditch	Estuary				
110701	Sabine River Basin Coastal Bays/Gulf Waters to LA 3-mile limit	Ocean				

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Texas lawmakers passed Senate Bill 3 in the 2007 80th Regular Session of the Texas Legislature. SB 3 is the third in a series of three omnibus water bills relating to the State of Texas meeting the future needs for water. Senate Bill 1 (1997) established a bottom-up approach to water resource planning. Senate Bill 2 (2001) addresses groundwater issues and established a program to study instream flows. The Senate Bill 2 instream flow program was established because of the lack of data needed to determine the amount of water that is needed for the environment.

Prior to SB 1, SB 2, and SB 3, Texas law recognized the importance of balancing the biological soundness of the state's rivers, lakes, bays, and estuaries with the public's economic heath and general well-being. The Texas Water Code requires that TCEQ, "while balancing all other interests and to the extent practicable, provide for the freshwater inflows and instream flows necessary to maintain the viability of the state's streams, rivers and bay and estuary systems in the commission's regular granting of permits for the use of state waters."[10]

Even though Texas has long been the leader in documenting existing and historical flows, the information necessary to determine the instream flows and freshwater inflows needed to support ecologically sound river and bay systems is lacking. Prior to SB 3, the balancing of the effect of authorizing a new use of water with the need for that water to maintain a sound ecological system was done on a case-by-case basis as part of the water rights permitting process. This made water resources planning under SB 1 difficult because the effect of a strategy on the environment is not known at the planning stage. SB 3 was intended to establish a basin-by-basin process for developing recommendations to achieve the appropriate balance of water for environmental needs and water for other purposes, including human needs. This balancing process would be used by the TCEQ to promulgate "environmental flow standards" for basin and bay systems. These standards would be utilized in water resource planning, the decision-making process for new water right

[10] TEX. WATER CODE ANN. § 11.0235(c) (emphasis added).

applications and in establishing an amount of unappropriated water to be set aside for the environment.[11]

SB 3 created a legislative committee, the EFAG, which is charged with appointing stakeholder committees (Bay and Basin Area Stakeholders Committees "BBASC") for each bay-basin complex and providing comments on BBASC recommendations. Each BBASC is charged with appointing a team of experts to "develop environmental flow analyses and a recommended environmental flow regime" for its bay-basin system.[12] The Bay and Basin Expert Science Teams (BBEST) for the Trinity River-San Jacinto River-Galveston Bay system and the Sabine River-Neches River-Sabine Lake system were only given one year to develop environmental flow analyses and recommended environmental flow regimes.[13] A major shortcoming of the SB 3 process is that the schedule does not allow for the development of multi-year, site-specific instream flow and freshwater inflow studies to determine ecological flow needs mandated by SB 2. As is discussed in detail in Section 6, the short time provided in SB 3 for the BBESTs to develop environmental flow analyses and develop environmental flow regimes that would provide for freshwater inflows and instream flows needed to support a sound ecological system presents a serious problem to accomplishing the intent of SB 3.

[11] TEX WATER CODE ANN. § 11.1471.
[12] TEX WATER CODE ANN. § 11.02362(m).
[13] TEX WATER CODE ANN. § 11.02362.

6 COMMENTS ON SABINE-NECHES BBEST ENVIRONMENTAL FLOW RECOMMENDATIONS

In keeping with its Charge, the Sabine-Neches BBASC reviewed and has the following comments on the Sabine-Neches BBEST Environmental Flows Recommendations Report.[14]

The Sabine-Neches BBASC disagrees with the Sabine-Neches BBEST report in several fundamental respects.

- The Sabine-Neches BBEST's definition of a sound ecological system does not focus on the current makeup of important species and does not adequately cover all of the important habitat types in the study area;

- The flow regime produced by the Sabine-Neches BBEST is more reflective of the existing flows than environmental need for flows; and

- Estuary soundness can best be addressed through physical changes to reduce the frequency and distance of saltwater intrusion into the surrounding tidal wetlands rather than imposing the HEFR-created flow regimes from the most downstream gages.

The Sabine-Neches BBASC agrees with the Sabine-Neches BBEST's general findings that:

- The current conditions of the Sabine and Neches Rivers and the Sabine Lake Estuary are sound;

- The flows in the Sabine and Neches Rivers and inflows to the Sabine Lake Estuary will change over time; and

[14] Sabine and Neches Rivers and Sabine Lake Bay Basin and Bay Expert Science Team (November 2009). Environmental Flows Recommendations Report. http://www.sratx.org/BBEST/RecommendationsReport/, retrieved 30 March 2010.

- Future study, data gathering and adaptive management are necessary to determine whether or not changes in environmental flows will maintain a sound ecological environment.

The Sabine-Neches BBEST stated its goal was to maintain a "sound ecological environment" in the Sabine and Neches Basins and the Sabine Lake Estuary. Their rationale for a "sound ecological environment" recognized that the ecology of our Texas rivers and estuaries are dynamic systems in that what exists today differs from what existed in the past and these will change over time in the future.

6.1 SABINE-NECHES STAKEHOLDERS COMMENTS REGARDING SABINE-NECHES DEFINITION OF A SOUND ECOLOGICAL ENVIRONMENT

The Sabine-Neches BBEST report stated that the current state of the environment in the Sabine and Neches River Basins and the Sabine Lake Estuary is generally sound, that it currently exhibits good overall water quality and has a diverse and healthy population of fish and aquatic life. The BBEST also adopted the SAC definition of a sound ecological environment which is:

- Sustains a full complement of native species in perpetuity;
- Sustains key habitat features required by these species;
- Retains key features of the natural flow regime required by these species to complete their life cycles, and
- Sustains key ecosystem processes and services, such as elemental cycling and the productivity of important plant and animal populations.

The BBEST's finding that the existing state of the ecology is sound shows that the ecosystem is resilient. Many changes have occurred over time as a result of natural events (hurricanes, droughts, floods, etc.) as well as manmade alterations (ship channel construction and deepening, Intracoastal Waterway construction, fish stocking, introduction of non-endemic plant and animal species, land use changes, reservoir construction, hydropower generation, water diversions, interbasin transfers, return flows, population growth, etc.), and yet, these systems are still sound.

The Sabine-Neches BBASC Charge requires us to:

1. Balance the natural environment within the boundaries of manmade changes;

2. Address gaps in our knowledge of the needs for humans and the environment (both the Sabine-Neches BBEST and SAC have recognized the paucity of specific scientific studies and, as pointed out by the SAC in reference to the instream flow regime matrices produced by the Hydrology-Based Environmental Flow Regime [HEFR] model are based on little or no consideration of the actual flow requirements for specific aquatic organisms);[15] and

3. Agree that future changes require an integrated approach to managing whole ecosystems (river basins including reservoirs and estuaries) with increasing levels of understanding (adaptive management) within a broad range of disciplines (ecology, economics, food supply, water supply, water conservation, drought planning, reuse, recreation and fisheries in lakes, rivers and estuaries, etc.) which identify and balance the needs of man and the environment.

6.2 SABINE-NECHES STAKEHOLDERS DEFINITION OF A SOUND ECOLOGICAL ENVIRONMENT

The Sabine-Neches BBASC has determined that both the scope of the Sabine-Neches BBEST study area and standard by which the study area was assessed needs adjustment. As mentioned in Sections 8.2 and 8.3, the reservoirs in the study area contribute a significant amount of areas for recreation and habitat for aquatic species, yet no consideration for these areas was given in the Sabine-Neches BBEST report. The Sabine-Neches BBASC believes this definition should be broadened to consider all important species. Some of the more important species in the study area are introduced by man (Striped Bass and Florida Largemouth Bass).

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[15] SAC. Discussion Paper: Moving from Instream Flow Regime Matrix Development to Environmental Flow Recommendations. Draft, January 29, 2010. Presented at the February 11, 2010, SAC Meeting. http://www.tceq.state.tx.us/permitting/water_supply/water_rights/eflows/txenvironmentalflowssac.html, retrieved 21 April 2010.

The Sabine-Neches BBASC recommends (Section 10.1 Recommendation 1) the following definition for balancing the needs of Texas citizens with a sound ecological environment for the Sabine and Neches River Basins and Sabine Lake Estuary.

A sound ecological environment is one that:

- ***supports a healthy diversity of fish and other aquatic life;***
- ***sustains a full complement of important species;***
- ***provides all major aquatic habitat types including rivers and streams, reservoirs, and estuaries;***
- ***sustains key ecosystem processes; and***
- ***maintains water quality adequate for aquatic life.***

6.3 STATE SCIENCE ADVISORY COMMITTEE GUIDANCE

SB 3 created the SAC to serve as an objective scientific body to advise and make recommendations to the EFAG and serve as liaison to each BBEST to facilitate coordination and consistency as the SB 3 process is conducted in the major river basins and estuaries in Texas. In order to achieve consistency between river basins, the SAC developed a series of guidance documents related to the four disciplines: hydrology, biology, water quality and geomorphology. The Sabine-Neches BBEST recommendations and recognitions related to flow components were produced using SAC guidance documents, as they became available. With limited time and resources, the Sabine-Neches BBEST twelve month process was a work in progress which coincided with development of SAC guidance documents within this same time frame. SAC guidance documents[16] included:

1. Geographic scope;
2. Use of hydrologic data for development of instream flow recommendations using HEFR (Hydrology-Based Environmental Flow Regime);
3. Fluvial sediment transport (geomorphology);

[16] Available at http://www.tceq.state.tx.us/permitting/water_supply/water_rights/eflows/txenvironmentalflowssac.html, retrieved 21 April 2010.

4. Freshwater inflow for Texas Estuaries;

5. Water quality; and

6. Biological overlays.

Some of these documents are guidance for performing site-specific ecological studies to obtain data to replace the "professional judgment" that, with the exception for the gage records, was used as input for most of the information that is used in the HEFR process.

6.4 PROBLEMS WITH USING HEFR CREATED FLOW REGIMES AS A SURROGATE FOR FLOWS NEEDED BY THE ENVIRONMENT

SB 3 charges the BBESTs with developing a science-based environmental flow regime for the bay/ basin systems studied. The Sabine-Neches BBASC's understanding of the intent of SB 3 was for the BBESTs to determine the minimum amount of water that could be reserved for instream flows and freshwater inflows that would support an ecologically sound environment. Simply imposing a flow regime based on statistical analysis of historical flows or existing flows does not satisfy the statute. The historical flows are certainly a flow regime that supports an ecologically sound environment. However, there are definitely flow regimes requiring less instream flow and freshwater inflow that also would support an ecologically sound environment. What the legislature intended was the development of some basis for relating ecological soundness to flow that could be used to determine the instream flows and freshwater inflows needed to support a sound ecological environment.

In terms of the language of SB 3, there is the question whether the words "adequate," "needed," and "necessary" all have the same meaning when used to describe the amount of instream flow and freshwater inflow to be determined or considered by the BBESTs, the BBASCs, and the TCEQ. For example, an environmental flow regime is a schedule of flow "adequate" to support a sound ecological environment.[17] The test for the TCEQ is to balance other needs with providing the amount of instream flows and freshwater inflows "necessary."[18] Some contend that the term "adequate" means equal to or exceeding the amount of freshwater inflows and instream flows required to maintain a sound ecological

[17] TEX. WATER CODE ANN. § 11.002(16).
[18] TEX. WATER CODE ANN. § 11.0235(c).

system. This construction of the term "adequate" is negated by other language in SB 3. The BBESTs are to develop "environmental flow analysis." SB 3 defines environmental flow analysis as "the application of a scientifically derived process for predicting the response of an ecosystem to changes in instream flows or freshwater inflows."[19] A process for predicting ecosystem response is not needed unless the amount of instream flows and freshwater inflows required to support a sound ecological system has to be determined. Additionally, if the BBESTs do not provide the BBASCs with an amount of water needed to support a sound ecological system, the BBASCs would have to determine the amount of environmental flows needed or balance the amount of water needed for other uses with the amount of water needed for the environment plus water not needed for the environment. Neither of these makes any sense.

Rather than develop cause and effect relationships, the process thus far under SB 3 has been to use default,[20] desktop[21] methods. The desktop methods only look at the similarity of a future flow regime to a historical flow regime. They do not predict a response to altered flows.

Prior to SB 3, the State used another default, desktop model to generate stream flow conditions in the absence of site-specific information. The legislature determined that the then existing methods were inadequate.

> *(d-3) The legislature finds that while the state has pioneered tools to address freshwater inflow needs for bays and estuaries, there are limitations to those tools in light of both scientific and public policy evolution. To fully address bay and estuary environmental flow issues, the foundation of work accomplished by the state should be improved. While the state's instream flow studies program appears to encompass a comprehensive and scientific approach for establishing a process to assess instream flow needs for rivers and streams across the state, more extensive review and examination of the details of the program, which may not be fully developed until the program is under way, are needed to ensure an effective tool for evaluating riverine environmental flow conditions.*
>
> TEX. WATER CODE ANN. § 11.0235(d-3).

[19] TEX. WATER CODE ANN. § 11.002(16).
[20] "Default" is used here to mean that the model inputs other than flow were presumed.
[21] "Desktop" signifies a model with little or no site-specific data.

The scientific concern with the state's methods (estuary and instream) is that there is very little connection between the hydrology and ecology. General, qualitative concepts regarding the ecologically important flow regime components are artificially quantified using coefficients based on nothing more than "professional judgment."[22] The HEFR method is just another of the many desktop methods that tries to predict environmental flow needs from gage records.

SB 3 requires that an environmental flow regime be adequate and necessary to provide for a sound ecological environment:

> *(16) "Environmental flow regime" means a schedule of flow quantities that reflects seasonal and yearly fluctuations that typically would vary geographically, by specific location in a watershed, and that are shown to be adequate to support a sound ecological environment and to maintain the productivity, extent, and persistence of key aquatic habitats in and along the affected water bodies.*

TEX. WATER CODE ANN. *§ 11.002(16).*

> *(c) The legislature has expressly required the commission while balancing all other public interests to consider and, to the extent practicable, provide for the freshwater inflows and instream flows necessary to maintain the viability of the state's streams, rivers, and bay and estuary systems in the commission's regular granting of permits for the use of state waters. As an essential part of the state's environmental flows policy, all permit conditions relating to freshwater inflows to affected bays and estuaries and instream flow needs must be subject to temporary suspension if necessary for water to be applied to essential beneficial uses during emergencies.*

TEX. WATER CODE ANN. § 11.0235(c).

Under the HEFR methodology, historical flows are sorted into categories labeled subsistence flows, base flows, high flow pulses, and overbank inflows. While it appears that aquatic ecologists generally agree that these components of a flow regime are probably important, the HEFR coefficients which in effect establish how much of each of these components is "needed" to sustain a sound ecological environment are based on "best professional judgment" rather than scientifically derived. The HEFR analysis and as a result

[22] "Professional Judgment" is judgment about what a value should be made by someone that holds him or herself to be a professional in a field. Although some judgment is required in most ecological analysis, problems arise when the analyses is primarily based on professional judgment but the result is imposed like it was calculate from a formula where all of the terms are measured values.

any standards based on the HEFR analysis simply reflect the degree to which a project may change the flow rather than any prediction of the ecological effects of a particular change in flow. At this point, it is mere conjecture as to which aspects of the HEFR analysis using the default coefficients are overprotective and which are under protective. In other words, the HEFR regimes as produced by the Sabine-Neches BBEST are far from a scientific determination of the flows needed by the environment. The point is stated in the Sabine-Neches BBEST report:

> … *SB 3 requires that environmental flow standards be predicated upon the best science and data currently available and intends that adaptive management be employed to refine the flow standards in the future. The timing constraints in SB 3 dictate that "desktop methods" be utilized which are primarily based on statistical evaluations of historical flows and therefore establish the flows that have occurred rather than a determination of the flows that are needed to support a sound ecological environment.*

Sabine-Neches BBEST Recommendations Report, page 13.

While the Sabine-Neches BBEST developed a HEFR flow regime at 12 gages, the report does not purport that the flow regime developed represents the minimum instream flows and freshwater inflows that will sustain an ecologically sound environment. The Sabine-Neches BBEST report states that "the final report reflects the evolving and transitional understanding as the year unfolded and additional information and data was brought into the process." HEFR-generated flow regimes for the flow components (subsistence, base, high pulse and overbank) for the twelve selected USGS streamflow gages in the study area (six in the Neches and six in the Sabine Basin) have significant limitations in that they:

1. Represent **a** flow regime, but not the only flow regime needed to support a sound environment (the Decision Tree created by the Sabine-Neches BBEST demonstrates user input – decisions/ assumptions can create a number of different flow regimes);

2. Are based on historical daily flow records (1940 to 2008) which reflect reservoir construction, hydropower generation, water diversions, return flows, interbasin transfers, land use changes, population growth, etc. over the 68 year period;

3. Include a total of 24 reservoirs with eight of these constructed during what was considered the pre-reservoir period (1940 to 1960);

4. Include interbasin transfers of water during this historical period (for example: there are some 15 trans basin diversions in the Sabine Basin with seven of these importing water into the Basin);

5. Are a "desktop method," like the Lyons Method and Consensus Criteria Method, which share in a common flaw, chiefly the lack of a clear link between the computed flows and environmental ecology; and

6. Are a relatively new tool developed by the Texas Parks and Wildlife Department (TPWD) with input from other agencies and have no track record of application – currently lack support from the other disciplines (biology, water quality and geomorphology) which is needed to increase confidence that the method has any legitimate value – and desperately need an extensive calibration/ verification process to move from a purely theoretical basis to a realistic application.

The order of the SB 3 process presents another problem for the BBASCs. The BBESTs are tasked with developing an environmental flow regime that does not take into account uses of water for other purposes. The BBASCs must then balance the need for water for the environment with the need for water for other purposes, including human needs. Even if the BBESTs provide the BBASCs with the amount of instream flows and freshwater inflows needed to support a sound ecological system, the BBASCs do not know how their recommendations will be implemented by TCEQ. The manner in which the recommendations are implemented can change the amount of water allocated to each computed use from the amounts intended by the BBASCs.

6.5 COMMENTS ON SABINE LAKE ESTUARY RECOMMENDATIONS

The Sabine-Neches BBEST described the current condition of the Sabine-Neches Estuary and the lower tidal reaches of the Sabine and Neches Rivers as generally sound, exhibiting good overall water quality and having diverse fish and wildlife communities even though numerous man-made changes have greatly altered the once basically freshwater qualities of Sabine Lake proper. SAC guidance reviewed available methods for possible

application in recommendations for estuary inflows. After consideration of the State Methodology, the Salinity zone approach, and HEFR analyses, the Sabine-Neches BBEST chose to recommend HEFR inflows from the most downstream U.S. Geological Survey (USGS) streamflow gages as inflows sufficient to meet estuary needs. It also recognized the ongoing work in surrounding marshes of Sabine Lake in Texas and Louisiana which have established a goal to minimize impacts of saltwater intrusion via secondary channel routes into the marshes.

The Sabine Lake Estuary is the smallest major estuary along the Texas coast, but receives the largest volume of freshwater inflow. The state line separating Louisiana and Texas runs through the middle of Sabine Lake from the mouth of the Sabine River through the ship channel at the lower end of the Lake into the Gulf of Mexico. The methods referenced above have only considered current conditions. The USACE has spent approximately $15 million since the year 2000 on modeling and feasibility studies for a project to deepen the existing 40 foot ship channel to 48 feet from the open Gulf of Mexico to the Port of Beaumont (with selective widening). The USACE has completed extensive three-dimensional hydro-dynamic salinity modeling to predict salinity changes from the project which has included present and future water supply conditions using the 2007 Texas State Water Plan (2060 conditions) as well as predicted future sea level rise and its impact on salinity. The basic conclusion from this body of work recognizes the current and future conditions, and proposes mitigation/ restoration of wetlands habitat in Texas and Louisiana due to future incremental salinity increases due to the proposed channel deepening (with selective widening) project. Additionally, Louisiana has developed a Comprehensive Master Plan for a Sustainable Coast[23] that includes rebuilding/ restoration projects of Louisiana's coastal wetlands from the tidal waters of the Sabine River and the eastern shore of Sabine Lake to Calcasieu Lake based on the loss of marsh habitat and other ecological changes to this coastal environment resulting from the last century of man's activities throughout this area. These efforts are being coordinated with other restoration efforts on Federal lands such as the 125,000 acre Sabine National Wildlife Refuge (SNWR) which is administered by the U.S. Fish and Wildlife Service (USFWS).

[23] Coastal Protection and Restoration Authority of Louisiana, http://www.lacpra.org/, retrieved 29 March 2010.

The Sabine-Neches BBASC finds no basis for the HEFR-derived flow regimes when these other factors are considered. Available information and current study efforts have noted key observations in this regard as follows:

- Over 130 years of alterations/changes which have resulted in a Sabine Lake Estuary that is still in a state of significant transition;

- Existing conditions are generally sound with good overall water quality and a healthy diversity of fish and wildlife;

- "Draft Feasibility Report for Sabine-Neches Waterway Channel Improvement Project Southeast Texas and Southwest Louisiana" prepared by the USACE (December 2009) describes the ship channel project which plans to deepen the existing ship channel (40 ft – 48 ft). This proposed project includes Texas and Louisiana estuarine environments. Noted components of the USACE Report include:

    - Three dimensional hydro-dynamic salinity modeling to predict incremental salinity changes resulting from the deepening project;

    - Texas/ Louisiana tidal waters studies which include bottomland hardwoods, cypress-tupelo swamps and open marshes along the lower Neches and Sabine Rivers as well as the open marsh areas surrounding Sabine Lake in Texas and Louisiana; and

    - Utilization of the 2007 Texas Water Plan to examine existing and future water supply conditions (year 2060);

- The USACE Study Area identified 15 Texas hydrologic unit habitat areas encompassing approximately 110,000 acres and 11 Louisiana hydrologic unit habitat areas covering approximately 200,000 acres for mitigation/restoration consideration resulting from project salinity changes. This compares to about 50,000 acres of open water habitat that comprises Sabine Lake.

- The Coastal Protection and Restoration Authority of Louisiana has developed a Comprehensive Master Plan for a Sustainable Coast. A number of restoration projects have been listed and are in various stages of construction. Construction efforts in wetlands include shoreline protection barriers, beneficial use of dredge and spoil materials, revegetation, restoring base elevations of natural bayou channels and various control structures to slow saltwater intrusion and retain freshwater runoff. The Black Bayou Hydrologic Restoration project is an example of this effort:

    - Black Bayou Hydrologic Restoration project encompasses a 25,529 acre wetland bordered by the GIWW on the north and the Sabine River and Sabine Lake as the western boundary; and

    - Restoration strategies include rock dikes, barge bay weirs, fixed crest weirs, self-regulating tidegates, spoil materials used to build up open water areas and revegetation practices to reduce wave action across open water areas.

The Sabine-Neches BBASC recommends continued efforts in Texas, coordinated with Louisiana, to protect and restore wetlands identified by the USACE in Section 10.4 Recommendation 4.

7 IMPACT OF SABINE-NECHES BBEST FLOW REGIME

The application of the Sabine-Neches BBEST environmental flow recommendations as applied to reservoir projects with new and/or amended permits would REQUIRE releasing flows (when available) that might otherwise be stored for future use within the permitted project. Consequently, the requirement for these pass-through flows would significantly reduce the expected reservoir water levels and therefore would reduce the availability of firm yield for water supply from these projects. In addition, the lower water levels would trigger more frequent drought contingency restrictions, would adversely impact reservoir recreation, thwart economic development, and negatively affect reservoir fisheries.

In keeping with their Charge, the Sabine-Neches BBASC has reviewed the Sabine-Neches BBEST's environmental flow analyses and environmental flow recommendations in conjunction with other factors, including the present and future needs for water for other uses related to water supply planning.

7.1 METHODOLOGY

The Sabine-Neches BBASC determined that an analysis of the impact of environmental flow recommendations on existing and proposed water supply projects which require new or amended water rights permits was crucial to fulfilling its Charge. Due to time and funding constraints, the SRA-TX agreed to contract with the engineering consultant firm, AECOM, to provide that analyses as an in-kind service to the BBASC. The results of that analysis are outlined within the report attached as Attachment A which is also summarized briefly below.

A quantitative analysis was performed using the official State of Texas model for water availability within the Sabine Basin in order to evaluate the frequency of attainment of the environmental flow recommendations under various assumptions and conditions within the basin and the predicted effects on reservoir yield and water levels. This analysis included an assessment of the potential impact of incorporating the appropriate environmental flow recommendations at the designated locations within the basin as might be dictated under future TCEQ water rights permits for:

- Toledo Bend Reservoir, which currently has pending an additional water rights permit application (declared by TCEQ to be administratively complete on May 15, 2003) and will likely require other amendments in order to meet the SB 1 recommended water strategies for other nearby regions; and

- Two proposed new reservoir projects in the upper Sabine River Basin (Mineola Reservoir [also known as Carl Estes] and Big Sandy Reservoir) that currently have no existing water rights permits and would be considered "junior" to the recommended environmental flow requirements.

AECOM and SRA-TX indicated that this analysis was coordinated with the TCEQ, TWDB, TPWD, and the SAC in order to reconcile the computational methodology within this respective group and attempt a reasonable interpretation of how the HEFR-derived environmental flow regime values might be implemented as an environmental flow prescription or as an environmental permit condition within the Sabine Basin. However, the report acknowledges that the interpretation of these implementation requirements requires many different assumptions and that many different options currently exist for TCEQ to ultimately consider adopting as the approved permitting process or standard. The interpretation used within this study attempts to follow the implementation guidance provided by the Sabine Neches BBEST in their report to the BBASC and to also follow recent draft permits issued by the TCEQ which include a similar HEFR-derived environmental flow matrix.

7.2 IMPACTS ON FIRM YIELD

Toledo Bend Reservoir is shared between the SRA-TX and the SRA-LA. Currently, SRA-TX holds a water rights permit from the State of Texas for 750,000 acre-feet per year and has an application pending for an additional amount. Because of the pending permit application and the potential for future amendments to the existing water rights permit, the potential impacts of applying the Sabine-Neches BBEST environmental flow recommendations on the full yield of Toledo Bend Reservoir were assessed and are tabulated in Table 2 below. The Sabine-Neches BBASC has determined that the impacts shown in this table are unreasonably excessive and demonstrate the inappropriateness of using this desktop methodology for determining the environmental flow requirements.

Although this analysis represents what might be considered "worst-case" assumptions, the results demonstrate that one of the largest reservoirs within the State of Texas, located on one of the most prolific rivers within the state, could likely never have been built under these permit conditions.

The results for the proposed Mineola Reservoir and the proposed Big Sandy Reservoir, which are both located in the upper basin of the Sabine River, are shown in Table 3 and Table 4. While the proportionate impact on these proposed upstream reservoir projects is less severe than for Toledo Bend Reservoir, this impact is also a significant and potentially unacceptable reduction to the economic viability of these two projects.

Table 2. Sabine-Neches BBEST Environmental Flow Recommendations - Impacts on Toledo Bend Reservoir (Conservative Case with Hydropower Pool at 168-ft)

Conditions	**Firm Yield** (ac-ft)	**Environmental Flow Impact** (ac-ft)	**SRA-TX Firm Yield*** (ac-ft)
Base Model	1,909,000	-	954,500
Subsistence Flows	1,870,000	(39,000)	915,500
Subsistence and Base Flows	1,674,000	(235,000)	719,500
Subsistence, Base, and Pulse Flows	1,292,000	(617,000)	337,500
Subsistence, Base, Pulse, and Overbank Flows	1,236,000	(673,000)	281,500

*SRA-TX currently holds a water rights permit for 750,000 ac-ft/yr

Table 3. Sabine-Neches BBEST Environmental Flow Recommendations - Impacts on Mineola Reservoir

Conditions	**Firm Yield** (ac-ft)	**Impact** (ac-ft)
Base Model	182,000	-
Subsistence Flows	169,000	(13,000)
Subsistence and Base Flows	153,000	(29,000)
Subsistence, Base, and Pulse Flows	136,000	(46,000)
Subsistence, Base, Pulse, and Overbank Flows	136,000	(46,000)

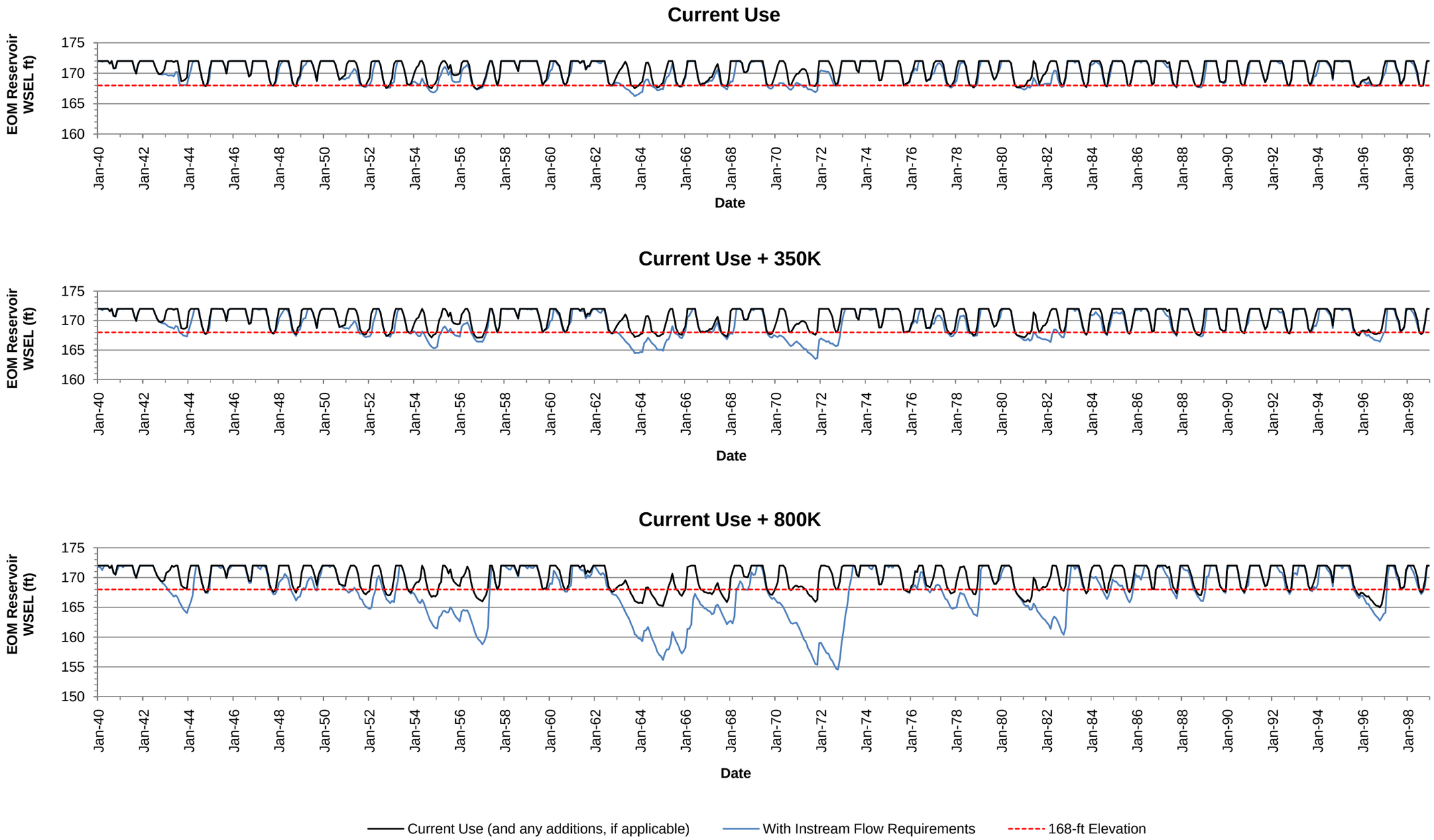
Table 4. Sabine-Neches BBEST Environmental Flow Recommendations - Impacts on Big Sandy Reservoir

Conditions	**Firm Yield** (ac-ft)	**Impact** (ac-ft)
Base Model	51,000	-
Subsistence Flows	50,000	(1,000)
Subsistence and Base Flows	35,000	(16,000)
Subsistence, Base, and Pulse Flows	27,000	(24,000)
Subsistence, Base, Pulse, and Overbank Flows	24,000	(27,000)

7.3 IMPACTS ON LAKE LEVELS

In order to better understand how implementation of the recommended environmental flow regime might impact Toledo Bend Reservoir water levels in the immediate future, additional analysis was conducted using similar assumptions and modeling protocols as used for the yield analysis but with revised diversion rates more appropriate for the near future. Graphs are provided in Figure 2 showing predicted Toledo Bend Reservoir water levels under historical rainfall conditions and current usage of all water rights and comparing conditions with and without the environmental criteria. Three different usage rates from Toledo Bend Reservoir are shown: current usage rates and two incremental increases in current usage up to a reasonable larger diversion amount that might be needed in the near the future. The analysis shows that reservoir water levels would be reduced as a result of the environmental flow criteria during critical periods by as much as 2-4 feet under current water usage conditions and by as much as 10 or more feet under the higher water usage assumption. Likewise, under these same assumptions, the amount of time that the reservoir would remain below minimum lake levels considered appropriate for recreational use would be greatly increased. The Sabine Neches BBASC considers this condition of lower lake levels to be unacceptable due to the considerable economic impact that the region would incur.

Figure 2. End-of-Month Reservoir Water Surface Elevation at Toledo Bend Reservoir



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8 CONSIDERATION OF WATER NEEDS FOR OTHER USES

The primary task of the Sabine-Neches BBASC is to balance the need for water for instream flows and freshwater inflows with other needs. In the following sections the needs for water for other uses are identified. Balancing these needs with the environmental need for water is problematic because the Sabine-Neches BBEST report did not determine the amount of water needed for instream flows and freshwater inflow.

8.1 WATER SUPPLY

The Sabine-Neches BBASC study area contains substantial water resources that are important existing and projected water supplies. As discussed in Section 7 Impact of Sabine-Neches BBEST Flow Regime, the flow regime derived using the default HEFR analysis would substantially reduce water supply (depending upon the assumptions, by as much as 70% of the Texas yield of Toledo Bend Reservoir, and as much as 50% of new reservoir projects). This would reduce the economic viability of these basins, significantly reducing the long-term ability to provide for the future needs of the State of Texas.

With the passage of SB 1 in 1997, the Texas Legislature created sixteen Regional Water Planning Groups (RWPGs) to coordinate the water planning process using a stakeholder based, consensus driven approach. As part of each five-year planning cycle, each RWPG evaluates population projections, water demand projections, and existing water supplies during drought, and identifies water needs and recommends strategies and projects to conserve or obtain more water to meet these needs. In "Water for Texas 2007," the current Texas water plan, the RWPGs have identified management strategies and projects to generate additional water supplies to meet future needs through 2060.

The Sabine and Neches River Basins are predominately in Regions D and I, but a small portion of the westernmost Neches Basin is in Region H and portions of three counties in the upper Sabine Basin are in Region C. As per the 2007 State Water Plan, in 2000, these four Regions had populations in excess of 11.8 million and that population is projected to grow to over 26.6 million by 2060 – an increase of about 126%. Over the same time period, water demand for those regions was projected to grow 89%. Overall, in Texas, the

combined projected 2060 demands for these four Regions are approximately 25% of the projected state-wide demands and the combined projected 2060 shortages are an even higher percentage of the projected state-wide shortage. For the 24 major reservoirs in the Sabine-Neches River Basins (see Table 5. Sabine-Neches Major Reservoirs, below), five of those reservoirs have firm yield supplies in excess of 100,000 ac-ft and are an important part of the current and future water supply for the Sabine and Neches River Basins and the State. Therefore, ensuring prudent management of the water resources in the Sabine-Neches River Basins is critical to meeting future water needs in Texas.

Texas has constructed water supply reservoirs to store water during wet periods and provides permits for storage and diversion based on the minimum firm yield of the reservoirs during drought-of-record conditions. Hence, reservoir operating guides are based on storing upstream runoff for maintaining a full reservoir conservation pool in the event that the next day may be the beginning of a drought-of-record. Texas water suppliers are required by TCEQ to develop water conservation and drought contingency plans that document procedures to meet the water supply needs of Texas' citizens during a drought-of-record. The Sabine-Neches BBEST HEFR flow regime prescriptions call for pass-through flows that would have serious negative consequences for meeting present and future water needs. In addition, the impact of these flow recommendations on water conservation and drought management strategies is expected to be substantial. In addition, new reservoirs and reservoirs which require amended permits will be negatively impacted in a significant manner if the Sabine-Neches BBEST flow recommendations are adopted by TCEQ as environmental flow standards

Finally, the economic value of water supply for growth and maintenance of job creating industry, energy supply, and agriculture should not be underestimated. As stated by the TCEQ in "A Regulatory Guidance Document for Applications to Divert, Store or Use State Water,"[24] Texas' limited water resources should be used in the most cost effective beneficial and environmentally sensitive manner to ensure sustainable water use and economic growth

[24] Texas Natural Resource Conservation Commission (now TCEQ) (June 1995). A Regulatory Guidance Document for Applications To Divert, Store or Use State Water, RG-141.

for the future. TCEQ should not implement environmental flow standards until the economic impact of those standards has been studied.

Table 5. Sabine-Neches Major Reservoirs

Reservoir Name	Dam Name	Owner	Conservation Pool (ft msl)	Conservation Pool Capacity (Acre-Feet) *	Conservation Pool Surface Area (Acre)	Drainage Area (sq mi)	Main Purpose(s)	Year of Completion	River Basin	Stream	County	Water Planning Region	Low Flow Releases (cfs)
Anacoco, Lake	Lower Anacoco Dam	Louisiana Deptment of Wildlife and Fisheries	188	24,000	2,624		recreation, flood control	1951	Sabine, La	Bayou Anacoco	Vernon		
Brandy Branch Cooling Pond	Brandy Branch Dam	AEP-Southwestern Electric Power Company	340	29,513	1,242	3	industrial	1983	Sabine	Brandy Branch	Harrison	D	
Cherokee, Lake	Cherokee Dam	Cherokee Water Company	280	46,700	3,987	158	water supply, recreation, power plant cooling	1948	Sabine	Cherokee Bayou	Gregg, Rusk	I	
Fork Reservoir, Lake	Lake Fork Dam	Sabine River Authority of Texas	403	675,819	27,690	493	municipal, industrial, irrigation	1980	Sabine	Lake Fork Creek	Hopkins, Rains, Wood	D	4
Gladewater, Lake	Gladwater Dam	City of Gladewater	300	6,950	800	35	water supply	1952	Sabine	Glade Creek	Upshur	D	
Hawkins, Lake		Wood County	344	11,890	776	30	recreation, flood control	1962	Sabine	Little Sandy Creek	Wood	D	
Holbrook, Lake	Wood County Dam No. 2	Wood County	372	7,990	653	15	recreation, flood control	1962	Sabine	Keys Creek	Wood	D	
Martin Lake	Martin Lake Dam	TXU Generation Company LP	306	77,619	5,020	130	Industrial	1974	Sabine	Martin Creek	Rusk, Panola	I	
Murvaul, Lake	Murvaul Dam	Canadian River Municipal Water Authority	265	44,650	3,800	115	water supply, recreation	1958	Sabine	Murvaul Bayou	Panola	I	
Quitman, Lake	Wood County Dam No. 1	Wood County	395	7,440	814	31	recreation, flood control	1962	Sabine	Dry Creek	Wood	D	
Tawakoni, Lake	Iron Bridge Dam	Sabine River Authority of Texas	438	927,440	36,700	756	municipal water supply	1960	Sabine	Sabine River	Hopkins, Rains, Wood	D	6
Toledo Bend Reservoir	Toledo Bend Dam	Sabine River Authorities of Texas and Louisiana	172	4,477,000	181,600	7,178	water supply, hydroelec, recreation	1969	Sabine	Sabine River	Newton, Panola, Sabine, Shelby	I	144
Lake Vernon		Louisiana Deptment of Wildlife and Fisheries	242	57,000	4,224		water supply	1961	Sabine Basin, La	Bayou Anacoco	Vernon		
Winnsboro, Lake	Wood County Dam No. 4	Wood County	419	8,100	806	27	recreation, flood control	1962	Sabine	Big Sandy Creek	Wood	D	
Athens, Lake	Lake Athens Dam	Athens Municipal Water Authority	440	32,790	1,520	22	water supply, recreation	1963	Neches	Flat Creek	Henderson	I	
B A Steinhagen Lake	Town Bluff Dam	Corps of Engineers-SWF	83	94,200	13,700	7,573	water supply, hydropower	1951	Neches	Neches River	Tyler, Jasper	I	
Jacksonville, Lake	Buckner Dam	City of Jacksonville	422	30,500	1,320	34	water supply, recreation	1957	Neches	Gum Creek	Cherokee	I	
Kurth, Lake	Kurth Dam	Abitibi Consolidated Industries	198	16,200	770	4	industrial	1961	Neches	Angelina River	Angelina	I	
Nacogdoches, Lake		City of Nacogdoches	279	41,140	2,212	89	water supply, recreation	1977	Neches	Bayou Loco	Nacogdoches	I	
Palestine, Lake	Blackburn Crossing Dam	Upper Neches River Municipal Water Authority	345	411,840	25,560	839	water supply, other, recreation	1971	Neches	Neches River	Anderson, Cherokee, Henderson, Smith	I	5
Pinkston Reservoir		City of Center	298	7,380	523	14	water supply	1977	Neches	Sandy Creek	Shelby	I	
Sam Rayburn Reservoir	Sam Rayburn Dam	Corps of Engineers-SWF	164	2,898,500	114,500	3,449	flood control, water supply, hydroelectric	1965	Neches	Angelina River	Jasper	I	
Striker, Lake	Striker Creek Dam	Angelina-Nacogdoches Co WCID	293	26,960	2,400	182	industrial, recreation	1957	Neches	Striker Creek	Rusk, Cherokee	I	
Tyler, Lake	Whitehouse Dam	City of Tyler	375	73,700	4,800		water supply	1967	Neches	Prairie Creek	Smith	I	

* There are 24 reservoirs > 5,000 acre-feet content; with 5 having > 100,000 content

8.2 ECONOMIC VALUE OF RESERVOIR RECREATION

The Sabine-Neches BBEST flow recommendations, if adopted by TCEQ as environmental flow standards, would severely impact lake levels for those reservoirs requiring new or amended permits resulting in a reduced value for the area's recreational interests. The harm to Sabine-Neches Basin reservoir recreation and the resulting economic consequences, both local and state, under the increased frequency of low water levels required to accommodate the Sabine-Neches BBEST recommendations would likely be significant, possibly including depressed lakefront property values, decreased tourism and resulting loss of economic activity for local businesses, jobs, and the local tax base. The potential economic impact of environmental flow standards on reservoirs should be studied before environmental flow standards are enacted.

Texas public reservoirs serve as the primary freshwater recreation sites in the state.[25] The *Texas Parks and Wildlife for the 21st Century* report documents the popularity of water-based recreation in Texas, finding that 70% of the top twenty most visited state parks are located on water and provide water recreation opportunities.[26]

Included in the benefits of Texas reservoirs are the resulting economic growth from recreational opportunities these reservoirs have created. Reservoirs and the freshwater fisheries they contain serve as the foundation for a multi-million-dollar fishing industry in the state. In addition to fishing, boating, skiing and other water related recreation are big business in Texas, and some of the most expensive and desirable real estate in Texas is lakefront property.[27]

Reservoir construction flourished in the 1960s resulting from the drought in the 1950s and the freshwater fishery in Texas is largely dependent on those reservoirs. Prior to that time, there was little freshwater fishing in the state of Texas. Reservoirs have public access as opposed to rivers which in Texas generally run through private property with limited

[25] TPWD (2005). 2005 Land and Water Resources Conservation and Recreation Plan, http://www.tpwd.state.tx.us/publications/pwdpubs/pwd_pl_e0100_0867/water_priorities/priority_rec_water/, retrieved 23 March 2010.
[26] TPWD (2005).
[27] McKinney, L. (July 2007). pp 23 - 31.

access. A direct benefit of the amount of freshwater resources in Texas, the state became an early leader in some areas related to freshwater fishing now taken for granted – the first bass boat was developed in Texas in 1948 by the Skeeter Boat Company of Kilgore, the first soft plastic bait was developed by Cream Lure Company from Tyler, Texas, in the early 1950s, and the first organized tournament anywhere in the United States was held in Texas in 1955.[28]

A TPWD study based on data in the 2006 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation shows that original expenditures made by hunters, anglers and wildlife watchers in Texas generate rounds of additional spending throughout the economy. For example, a retailer buys more inventory and pays bills, wholesalers buy more from manufacturers, and all these pay employees who then spend their paychecks. The sum of these impacts is the total economic impact resulting from the original expenditures. Since outdoor recreation dollars are often spent in rural or lightly populated areas, such as the areas surrounding Sam Rayburn, Toledo Bend, and Lake Fork, the economic contributions of fish and wildlife resources can be especially important to rural and outlying suburban-exurban economies.[29]

The reservoir recreation economy is a significant source of local government tax revenue and jobs in these rural areas. For example, a 1996 TPWD economic study of Lake Fork[30] found there was about $27.5 million dollars in direct expenditures by anglers at Lake Fork, a largely rural area, and about seven million of that came from non-residents of the State of Texas. The total economic value was determined to be $38.2 million dollars in economic value to that local area from that one fishery.[31]

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[28] Texas Parks and Wildlife Commission (May 2004). Public Hearing, http://www.tpwd.state.tx.us/business/feedback/meetings/2004/0527/transcripts/public_hearing/, retrieved 24 March 2010.

[29] TPWD (February 2008). News Release: Feb. 26, 2008: Hunting and Fishing a $14.4 Billion Industry in Texas , http://www.tpwd.state.tx.us/newsmedia/releases/?req=20080226g, retrieved 23 March 2010.

[30] Hunt K. M. and R.B. Ditton (1996). A social and economic study of the Lake Fork reservoir recreational fishery. Special report to the Texas Parks and Wildlife Department and the Sabine River Authority. Texas A&M University.

[31] Texas Parks and Wildlife Commission (May 2004).

Texas residents and out of state visitors alike are attracted to Sabine and Neches Basin reservoirs for their aesthetic qualities as well as for sport fishing and the reservoirs are among the top sport fishing reservoirs in the state. The April 2010 issue of Texas Parks & Wildlife Magazine states "[s]urrounded by towering pines, Sam Rayburn is also one of the Lone Star State's most scenic water bodies. … Largemouth bass are … the main draw on Sam Rayburn. However, the lake also boasts an impressive fishery for crappie, bluegill and catfish." [p. 26][32] In terms of the Sharelunker program, Sam Rayburn, Lake Fork, and Toledo Bend are included in the top five trophy lakes in Texas.[33]

In addition to the economic benefits of reservoir recreation to local economies, income from reservoir recreation also benefits the TPWD. Fishing license sales and associated Federal Aid funds from taxes on fishing equipment are the largest sources of revenue for the TPWD. Boat registration fees are an important source of revenue for the Department as well.[34] The revenue from the sale of all hunting and fishing licenses and stamps, as well as the money from boat registration fees, goes into the Game and Fish Fund used in TPWD's inland and coastal fisheries research, surveys and hatcheries and in TPWD wildlife surveys, research and hunting programs and in enforcement of game, fish and boater-safety laws.[35]

8.3 RESERVOIR FISHERY RESOURCES

A sound aquatic environment is one that supports a healthy diversity of fish and aquatic life in a holistic approach that includes rivers, tributaries, lakes, and estuaries. Reservoirs should be given equal standing with rivers and estuaries in terms of their fisheries resources.

SB 3, as implemented, does not consider the value of the reservoir fishery. Frequency and severity of reservoir drawdowns would be more severe as a result of imposing the HEFR matrix to river segments below existing reservoirs. Reservoirs provide valuable fisheries, aquatic habitat, and other ecological benefits from littoral/ shoreline areas such as migratory waterfowl habitat that were not considered in biological overlays associated with

[32] Wise, D. (April 2010). Texas Parks & Wildlife Magazine, pp 22-29.
[33] Texas Parks and Wildlife Commission (May 2004).
[34] TPWD (2005).
[35] TPWD (August 2004). Texas Parks & Wildlife Magazine. http://www.tpwmagazine.com/archive/2004/aug/atissue/, retrieved 24 March 2010.

hydrology modeling. The reduction in reservoir habitat caused by releases of water that may or may not be needed to maintain sound conditions in the river downstream need to be addressed prior to adopting standards based on the HEFR analyses. Other reasons that reservoirs should be given equal standing with rivers and estuaries in terms of their fisheries resources include:

- In addition to the fishery, reservoirs provide many acres of riparian and littoral zone habitat for a host of aquatic and near-shore life. Sam Rayburn and Toledo Bend Reservoir combined have approximately 2,000 miles of shoreline, with much of this being National Forests property, in addition to the 20 other major reservoirs in the Neches River Basin and the Texas portion of the Sabine Basin.

- Both reservoir and riverine resources are valuable and environmental flows recommendations should consider both habitats, from both an economic and ecological standpoint Important reservoir species include blue, flathead, and channel catfish, freshwater drum, white bass, yellow bass, spotted bass, largemouth bass, striped bass, white and black crappie, many species of sunfish, spotted, alligator, and longnose gar, and gizzard and threadfin shad, and a host of smaller fishes that aren't routinely assessed in reservoirs.

- There are unanswered questions regarding BBEST recommendations including the environmental need for all of the water required to meet the flow regime. But there was no consideration given to the effect of the Sabine-Neches BBEST recommendations on reservoir ecology. Reservoir levels and the timing of environmental flow releases are important to the reservoir fishery in terms of spawning habitat, sports fishing, home values, and fisheries-related commercial activities around the reservoirs. Reservoir levels should not be reduced by releases for instream flow and freshwater inflow in excess of the environmental need.

- The Federal Aid in Sport Fish Restoration Act (16 U.S.C. 777-777k, 64 Stat. 430) (Dingell-Johnson Act)[36] recognizes the value of stream and reservoir fisheries and established funding to preserve and enhance the reservoir fishery. The Act "provides Federal aid to the States for management and restoration of fish having material value in connection with sport or recreation in the marine and/or fresh waters of the United States." Funding provides for "acquisition and improvement of sport fish habitat, stocking of fish, research into fishery resource problems, surveys and inventories of sport fish populations, and acquisition and development of access facilities for public use."

- TPWD produces periodic reservoir fishery performance reports in compliance with requirements under the Dingell-Johnson Act and publishes the reports on its website.[37] Reports include assessments of fish populations, habitat availability, angler success, and economic benefits from the fishery. Reports are provided for 168 large reservoirs in Texas and an additional seven small reservoirs.

- The reservoir fishery is a secondary benefit from reservoirs built for other purposes but it should not be omitted from considerations for protecting a sound environment. The July 2007 edition of Texas Parks & Wildlife Magazine has an excellent discussion of the balancing act required to manage many of our reservoirs, first for their intended primary use as water supply and secondarily for other beneficial uses such as fishing and recreation.[38]

- The HEFR analysis did not consider the value of reservoirs as habitat for ducks and other resident and migratory birds. Sporting magazines are full of references to reservoir duck hunting[39] and the weekly TPWD migratory bird reports are full of references to reservoirs. Comments on low reservoir levels and impacts to

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[36] http://www.fws.gov/laws/lawsdigest/fasport.html, retrieved 29 March 2010.
[37] TPWD. Lake Survey Reports, http://www.tpwd.state.tx.us/publications/pwdpubs/lake_survey/, retrieved 21 April 2010.
[38] TPWD (July 2007). Texas Parks & Wildlife Magazine, http://www.tpwmagazine.com/archive/2007/jul/ed_2/, retrieved 21 April 2010.
[39] Texas Sportsman Magazine, http://www.texassportsmanmag.com/hunting/ducks-geese-hunting/tx_aa105203a/, retrieved 21 April 2010.

duck populations are a part of these reports.[40] SRA-TX, TPWD, and Ducks Unlimited (DU) teamed up to provide the North Toledo Bend Wildlife Management Area.[41] This 3,650 acre habitat has been a popular duck hunting area and it, and similar areas in and around Texas reservoirs, stands to be impacted by instream flow releases.

[40] http://www.tpwd.state.tx.us/newsmedia/releases/?req=20090121a&nrtype=all&nrspan=2009&nrsearch=

[41] TPWD (January 2009). Weekly Migratory Bird Hunting Report, http://www.tpwd.state.tx.us/huntwild/hunt/wma/find_a_wma/list/?id=33, retrieved 21 April 2010.

9 OTHER FACTORS

Other factors, some of which are unique to the Sabine and Neches River Basins, should be considered prior to the establishment of environmental flow standards. These include:

9.1 SABINE RIVER COMPACT

The Sabine River Compact, granted by an Act of the Congress of the United States,[42] was ratified by the 53rd Texas Legislature in 1953 and signed by representatives of Texas, Louisiana, and the United States. The Compact provides for the equitable apportionment of the waters of the Sabine River and its tributaries between the States of Louisiana and Texas. Texas retains free and unrestricted use of the water of the Sabine River and its tributaries above the Stateline, subject only to the provisions that the minimum flow of 36 cfs must be maintained at the Stateline. All free water[43] and stored water in the Stateline reach, without reference to origin, will be divided equally between the two states. "Stateline" refers to the point on the Sabine River where its waters in downstream flow first touch the States of both Louisiana and Texas.

9.2 THE SABINE RIVER IS SHARED WITH LOUISIANA

The Sabine River is shared with the State of Louisiana from, and including, Toledo Bend Reservoir to the mouth of the Sabine River at Sabine Lake and through Sabine Lake to the Gulf of Mexico. SB 3, as a Texas statute, does not apply to Louisiana and Louisiana is under no obligation to comply with any Texas environmental flow standard for its portion of the Sabine River. TCEQ has not determined how it would implement environmental flow standards on streams under the jurisdiction of two states. The provisions of the Sabine River Compact must be considered in any implementation of environmental flow standards on the Sabine River. There is no apparent basis to require Louisiana to release its water to meet Texas environmental flow standards. Sabine-Neches BBASC must therefore assume that all water released to meet the flow regime would be Texas water. This doubles the

[42] Approved November 1, 1951 (Public Law No. 252; 82nd Congress, First Session.
[43] "Free Water" means all waters other than stored water.

problem created by deriving environmental flow requirements on a default HEFR analysis rather than determining the environmental flow needs using more than gage records.

9.3 FEDERAL ENERGY REGULATORY COMMISSION RELICENSING OF THE TOLEDO BEND PROJECT IN 2013

The relicensing of the Toledo Bend Project is ongoing at this time. This process involves numerous Toledo Bend Reservoir water resource management issues in addition to downstream flow needs including: shoreline management, protection of cultural resources that may be exposed due to the lowering of lake levels, impact on recreation sites and recreational boating, local and regional economic impacts due to lower lake levels.

Associated with the relicensing process are ongoing flow, water quality, riparian, and aquatic studies on the Sabine River below Toledo Bend. TCEQ should not consider adopting environmental flow standards for the Lower Sabine River based on a desktop method while these studies are in progress and may yield valuable information.

9.4 SENATE BILL 2

The Lower Sabine River Priority Instream Flow Study (Lower Sabine ISF), a first tier study[44] under SB 2, is currently in the study design phase and is targeted for completion by December 2013. Studies have already been initiated in the fields of biology, hydrology, geomorphology, and large woody debris. Additional studies are underway and more are planned for completion prior to 2013. These studies should produce the data that advances the determination of the environmental need for water. Results from these studies along with the FERC re-license studies are needed for determination and implementation of environmental flow standards on the Sabine River.

The upper Sabine River and the Neches River are listed in the Programmatic Workplan for the second tier of instream flow studies. The Programmatic Workplan states "…the upper Sabine River subbasin is no less important [than the lower Sabine Basin] for its potential to supply water to users in other nearby regions. Indeed, the water-rich Sabine River Basin should be studied in its entirety because of its abundant water supplies and their

[44] Texas Parks and Wildlife Department, Texas Commission on Environmental Quality, and Texas Water Development Board. Texas Instream Flow Studies: Programmatic Workplan, December 19, 2002.

potential for use in the future." The TCEQ should consider the results of SB 2 studies on the upper Sabine River basin and the Neches River basin prior to the development of and implementation of environmental flow standards for the Sabine and Neches Rivers. It is noted that time and resources for these studies are years away but it appears better to delay a decision that could be so important for the State of Texas than to promulgate standards based on a HEFR-generated guess.

9.5 LEGAL LIABILITY

The Sabine-Neches BBEST recognized that legal challenges are likely to arise from implementation of environmental flow regimes including liability for any damage resulting from managing for environmental flows. As a result of that recognition, the Sabine-Neches BBEST declined to recommend any overbank flow regime and highly qualified high flow pulse recommendations because of the potential for legal challenge, property damage, and most importantly the threat to human life. Environmental flow standards that require releasing high flow pulses and/or over banking flows should not be adopted in Texas until there is a shield from legal liability for releasing water that could otherwise been stored.

9.6 U.S. ARMY CORPS OF ENGINEERS SABINE-NECHES WATERWAY CHANNEL IMPROVEMENT PROJECT

The Sabine-Neches BBEST recognized the ongoing efforts by the USACE in modeling salinity in the estuary as a part of its ongoing considerations for further deepening the Sabine-Neches Ship Channel, a project that proposes to deepen the channel from 40-ft to 48-ft (with selective widening) from the Gulf of Mexico through Sabine Lake and up to the Port of Beaumont. A draft report[45] was released for public review in December 2009, and a final report is expected in August 2010. This report included a sophisticated hydrodynamic salinity model of Sabine Lake and the tidal waters in Texas and Louisiana associated with Sabine Lake. In addition to the approximately 50,000 surface acres of Sabine Lake, this report studied some 110,000 acres of associated wetlands in Texas and some 200,000 acres of associated wetlands in Louisiana. The USACE study included existing and 2060 water usage from the 2007 Texas Water Plan. Specific recommendations are made in this report

[45] USACE (December 2009). Draft Feasibility Report for Sabine-Neches Waterway Channel Improvement Project Southeast Texas and Southwest Louisiana, prepared by U.S. Army Corps of Engineers Galveston District Southwestern Division.

for mitigation and restoration of wetlands habitat in Texas and Louisiana to offset the incremental changes resulting from deepening the ship channel.

9.7 LOWER NECHES SALTWATER BARRIER

The LNVA manages and operates the Neches River Saltwater Barrier under an agreement with the USACE. In accordance with its permit as issued by TCEQ, there is a minimum pass-through of 400 cfs for the saltwater barrier.

9.8 PROPOSED LOWER SABINE SALTWATER BARRIER

Early studies have been performed to evaluate placement of a saltwater barrier in the Lower Sabine River. Permanent saltwater barriers protect upstream habitat and freshwater intake structures from saltwater intrusion on the Neches to the west and Calcasieu to the east.

9.9 CUTOFF BAYOU

The Sabine River splits into two main channels about six river miles downstream of SH12 in Orange County. The eastern split (Old River) is utilized via a raw water diversion canal by the SRA-LA for its lower basin water supply source. The western split (Sabine River), which is the Texas/ Louisiana state line channel, is utilized via a raw water diversion canal by the SRA-TX as its lower basin water supply source. The Sabine River Compact provides that the States of Texas and Louisiana share the water supply of the Sabine River equally, and historically the split has been near equal under low flow conditions. In September 2005 Hurricane Rita made landfall near Sabine Lake and proceeded north, roughly up the Sabine River. During assessment of damages after the storm, SRA-TX measured flows at the split (Cutoff Bayou) and evidence of a change in the proportion of flows to Louisiana and Texas was noted. According to flow measurements made by SRA-TX, the flow of the Sabine River that remains in Texas channels has been historically calculated at approximately 50 percent. Based on recent flow measurements obtained in 2005 and 2007, about 70 percent of Sabine River flow upstream of Cutoff Bayou is now being diverted into the Old River channel in Louisiana.

If recently observed trends were to continue, there is potential for flow during normal flow, and especially during low flow, conditions to be essentially eliminated in the Sabine River within Texas below Cutoff Bayou. These conditions may establish the Old River in Louisiana as the sole conveyance channel to the Gulf of Mexico through that reach.

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10 RECOMMENDATIONS

Based upon its review of the Sabine-Neches BBEST environmental flow analyses and environmental flow recommendations, and considering them in conjunction with other factors as described above, the Sabine-Neches BBASC makes the following recommendations to the EFAG and TCEQ.

10.1 RECOMMENDATION 1

The Sabine-Neches BBASC recommends the following definition for balancing the needs of Texas citizens with a sound ecological environment for the Sabine and Neches River Basins and Sabine Lake Estuary.

A sound ecological environment is one that:

- ***supports a healthy diversity of fish and other aquatic life;***
- ***sustains a full complement of important species;***
- ***provides for all major aquatic habitat types including rivers and streams, reservoirs, and estuaries;***
- ***sustains key ecosystem processes; and***
- ***maintains water quality adequate for aquatic life.***

10.1.1 RATIONALE

SB 3 did not define "sound ecological environment." The Sabine-Neches BBEST adopted the definition of "sound ecological environment" stated by the SAC in its guidance.[46] The Sabine-Neches BBEST definition, however, focused on native species and river habitat. The fact is, there have been changes to the environment that have been intended. For example, reservoirs have been constructed and aquatic communities have been modified by stocking recreationally important species. Yet, the Sabine-Neches BBEST

[46] SAC (2009). Methodologies for Establishing a Freshwater Inflow Regime for Texas Estuaries Within the Context of the Senate Bill 3 Environmental Flows Process, http://www.tceq.state.tx.us/assets/public/permitting/watersupply/water_rights/eflows/fwi20090605.pdf, retrieved 21 April 2010.

determined that the existing condition of the environment is sound.[47] The intent of the proposed definition is to broaden the focus to include all important species and all of the types of habitat found in the Sabine River-Neches River-Sabine Estuary System.

10.2 RECOMMENDATION 2

Neither environmental flow standards nor environmental flow set asides should be established until more information is available to determine the amount of water needed to support a sound environment.

10.2.1 RATIONALE

The Sabine-Neches BBASC recommends that HEFR-derived flow regimes not be used to develop environmental flow standards and environmental flow set-asides. As discussed above, the HEFR method only looks at the change in flows. It is not an environmental flow analysis as that term is defined in SB 3 in that it does not predict the environmental response to changes in instream flows and freshwater inflow. Engaging in the SB 3 weighing process without having a reasonably accurate estimate of the flows needed for the environment may needlessly reduce the amount of water available for other purposes. There is no urgency justifying developing environmental flow standards prior to having the information needed under SB 3. Current water use practices in these basins have maintained a sound ecological environment. Changes in water use in these basins will be incremental over the 50-year SB 1 regional planning horizon, with no significant changes in the near future. Even if the environmental need for water was known, there are unresolved issues that must be resolved prior to developing environmental flow standards. The most important of these are:

- Unresolved liability considerations,[48] especially for the overbank and pulse flow components of the HEFR-derived environmental flow regime;

- Several issues regarding implementation of environmental flow standards and establishing environmental set-asides including how the standards would be implemented in a bi-state river such as the Lower Sabine River; and

[47] It is likely, but not known, that flows under today's conditions would not comply with all aspects of a HEFR-produced flow regime at all gages used by the BBEST in its report.
[48] See Recommendation 7.

- The effect of ongoing actions such as the Toledo Bend Project FERC relicensing process and the SB 2 Lower Sabine ISF.

10.3 RECOMMENDATION 3

The Sabine-Neches BBASC recommends that efforts be undertaken to initiate and complete the instream flow studies required under SB 2 (2001) in order to develop the type of data required to better understand the amount of instream flow needed for a sound ecological system in order to balance the environmental need for water with other needs for water as directed by SB 3 (2007). The SB 2 studies should include the upper Sabine River Basin and Neches River Basin, in addition to the ongoing Lower Sabine River Priority Instream Flow Study.

10.3.1 RATIONALE

Engaging in the type of environmental flow analysis and weighing process contemplated by SB 3 requires ecological data that is currently not available. It cannot be done based solely on gage records. It is also questionable whether the proposed SB 2 sampling effort limited to the segment below Toledo Bend Reservoir will result in any information regarding instream flows and freshwater inflow needed for a sound ecological system. A better approach would be to compare the ecology below two reservoirs where one has been used for water supply substantially more that the other or compare the ecology above, in, and below a reservoir.

10.4 RECOMMENDATION 4

The Sabine-Neches BBASC recommends continued efforts in Texas, coordinated with Louisiana, to protect and restore Sabine Lake Estuary wetlands identified by the USACE.

10.4.1 RATIONALE

These efforts will require coordination with Louisiana efforts to rebuild coastal wetlands and coastal shorelines in Texas and Louisiana. This will restore the vital role that coastal wetlands and coastal shorelines play in wetlands habitat for fish and aquatic life and also provide needed hurricane protection buffers to developed areas. Fighting saltwater

encroachment with releases of freshwater is a highly inefficient strategy that will ultimately fail.

10.5 RECOMMENDATION 5

The Sabine-Neches BBASC and Sabine-Neches BBEST should proceed with the development of a Work Plan that:

- ***Establishes a five-year review cycle of the basin and bay environmental flow analyses and environmental flow regime recommendations, integrated with the SB 1 Regional Planning five-year cycle;***
- ***Suggests adjustments to the SB 2 instream flow program to obtain information useful to the SB 3 process; and***
- ***Prescribes specific monitoring, studies, and activities that are closely aligned with existing programs as much as possible (e.g. Texas Clean Rivers Program).***

10.5.1 RATIONALE

The Sabine-Neches River Basins and Sabine Lake Estuary have abundant uncontrolled runoff that provides plentiful and variable environmental flows. Texas has a strong, vibrant economy for which surface water supplies play a major role. Given that Texas' population is projected to double within the 50-year SB 1 regional planning horizon, prudent water resource management suggests further studies need to be undertaken to address the gaps in our knowledge regarding environmental needs to make an informed decision in the SB 3 balancing exercise.

10.6 RECOMMENDATION 6

TCEQ along with the Sabine-Neches BBASC and Sabine-Neches BBEST should address the implementation of environmental flow standards and set-asides, in advance of weighing the environmental flow needs against the need for water for other purposes.

10.6.1 RATIONALE

The impact of environmental flow standards and set-asides on the amount of water available for uses other than environmental flow cannot be determined without more detail on how environmental flow standards and set-asides will be imposed. For example, even if the HEFR-produced flow regimes were indicative of the need for environmental flow, there are substantial problems in applying flow frequency information to water rights.

10.7 RECOMMENDATION 7

The Sabine-Neches BBASC recommends that no requirement to produce overbank flows or high flow pulses be imposed on a reservoir owner until a liability shield is in place.

10.7.1 RATIONALE

As discussed in the Sabine-Neches BBEST report, two components of HEFR-created flow regimes raise flooding liability issues. In recent history, any time a reservoir operator releases water without the reservoir being full there is the risk of lawsuits related to downstream flooding. Obviously, releases to create overbank flows falls into this category. Releasing water to the meet requirements for high flow pulses can also expose a reservoir owner to potential liability if the water released combines with downstream runoff to create a flooding situation downstream of the reservoir.

10.8 RECOMMENDATION 8

The Sabine-Neches BBASC recommends that the legislature through the TCEQ provide funding for the BBASC to properly review the Sabine-Neches BBEST recommendations and to provide funding for further studies or any reports that may be required under SB 1, SB 2, SB 3 and coordinate with Regional Water Planning Groups.

10.8.1 RATIONALE

The Sabine-Neches BBASC received and reviewed the recommended environmental flow regime from the Sabine-Neches BBEST, but was provided no information as to the effect on new and amended water rights. To address this critical issue, SRA-TX provided unbudgeted funding for a consultant to apply the flow regimes to TCEQ's water availability model (WAM) to determine the changes in the firm yields on existing and proposed water supply projects. In addition SRA-TX developed the recommendations report from their own staff resources. While the BBEST obviously needs adequate funding to develop the recommended environmental flow regimes, the BBASC also requires some funding to assess the effect of the flow regimes and to provide a report to the EFAG and TCEQ.