SPECIES SPECIFIC INVESTIGATIONS AND HABITAT UTILIZATION STUDY

TOLEDO BEND RELICENSING PROJECT

FERC NO. 2305

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1.0 INTRODUCTION

1.1 General Description of the Toledo Bend Project

The Sabine River Authority of Texas (SRA-TX) and the Sabine River Authority, State of Louisiana (SRA-LA) (collectively, the Authorities) collaborated to develop the Toledo Bend Project (Project) located on the Sabine River. Construction was completed in October 1966. The Project is jointly operated by SRA-TX and SRA-LA through Toledo Bend Project Joint Operations (TBPJO).

The Project was originally planned, licensed, and constructed as a water supply facility, but it also provides multiple uses, such as hydroelectric power generation and recreation. The Project is located approximately 156.5 miles upstream of the confluence of the Sabine River and the Gulf of Mexico. Both the Project and this reach of the river serve as the border between the States of Louisiana and Texas.

The Project Reservoir (which is oriented in a southeast to northwest direction), is approximately 85 miles in length. The Project extends approximately 132 river miles (RM) (channel miles) from Toledo Bend Dam, which is located at RM 147,[1] upstream to above Logansport, Louisiana (i.e., Murvaul Bayou), located at RM 279. The Project occupies lands and waters within Panola, Shelby, Sabine, and Newton Counties in Texas and De Soto, Sabine, and Vernon Parishes in Louisiana. Toledo Bend Reservoir is the largest manmade body of water in the southern United States and the fifth largest in surface area in the country.

The Reservoir has approximately 1,200 miles of shoreline with a water surface area of 185,000 acres at the normal maximum reservoir elevation of 172.0 feet mean sea level (msl). The Toledo Bend Reservoir is 7 miles at its widest point and contains a storage volume of 4,477,000 acre-feet between elevations 162 feet and 172 feet. Primary hydroelectric generation occurs between 168 and 172 feet. The watershed above Toledo Bend Dam is approximately 7,178 square miles

[1] River Miles (RM) are measured along the river starting at the confluence of Sabine Lake and the Sabine River.

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with an estimated runoff in 2004 of 3.6 million acre-feet (SRA 2008). Historically, water levels have ranged from 161.3 feet msl to 173.9 feet msl.

As currently licensed, the principal Project works consist of:

- A rolled earth-fill dam with a maximum height of 112 feet and a length of 11,250 feet (including saddle dikes);
- A reservoir covering 185,000 acres with approximately 1,200 miles of shoreline and an active storage capacity of 4,477,000 acre-feet;
- A spillway comprised of a concrete, gravity-type, gated ogee section with a concrete chute and stilling basin located on the left abutment (in Louisiana). The spillway has a maximum length of 838 feet with eleven 40-foot by 28-foot Tainter gates. The top of the gates is at elevation 173 feet and top of the spillway ogee is at elevation 145 feet. A continuous flow of 144 cubic feet per second (cfs) is provided at the spillway;
- A powerhouse located in the right abutment (in Texas) containing two 58,500 horsepower (43.875-MW) vertical Kaplan turbines with direct drive generators, a tailrace channel, and appurtenant electrical and mechanical facilities.

1.2 Relicensing Process

The current Toledo Bend license extends to September 30, 2013. The Authorities intend to relicense the Project using the Integrated Licensing Process (ILP) as promulgated by Federal Energy Regulatory Commission (FERC) regulations issued July 23, 2003 (18 CFR Part 5). Pursuant to FERC's ILP regulations, the Authorities filed their Pre-Application Document (PAD) and Notice of Intent (NOI) with FERC on September 22, 2008. As part of the PAD, the Authorities proposed an aquatic resources study in the lower Sabine River from Toledo Bend Dam downstream approximately 15 miles to Burkeville/Burr Ferry near Highway 63 (RM 132).

Following the Authorities' filing of the PAD and NOI, FERC issued Scoping Document 1 (SD1) on November 21, 2008 and convened scoping meetings and a site tour for agencies and members of the public on December 16 – 17, 2008. Based on the information in the PAD and SD1, as

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well as information exchanged in the scoping meetings, agencies and other stakeholders had until January 21, 2009 to submit comments and study requests. The Authorities received comments and study requests from six resource agencies, one non-governmental organization, and FERC Staff. In total, these commenters recommended forty-four studies, including several studies related to aquatic resources and water quality. The Authorities have carefully reviewed these recommended studies, and have developed this proposed Species Specific Investigation and Habitat Utilization Study Plan.

2.0 GOALS AND OBJECTIVES

The objectives of this study are to identify, collect, analyze, and provide the information necessary to evaluate Project effects on specific species of interest and seasonal habitat utilization patterns of the fish community in the Sabine River below the Toledo Bend Dam. This study supplements the general biological community data developed as part of the "Information Needs for the Section 401 Water Quality Certification Study" by providing detailed and targeted investigations of species that are of special interest to state and federal resource agencies as well as a closer look at seasonal habitat utilization by the fish community in the first 15 miles of the Sabine River below the Project Dam, the river reach most influenced by Project operations.

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In addition to these biological studies, this reach is also being studied to identify any temperature or dissolved oxygen effects of project operation. A ramping study is also being performed in the reach. Further, an operations model is being developed for the Toledo Bend Project to document existing flow conditions and provide a tool for evaluating reservoir levels and flow conditions under various alternative project operation scenarios. Together, this biological and physical information will provide the opportunity to assess project operational effects on downstream aquatic resources and potential enhancement opportunities.

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3.0 STUDY AREA

The study area includes the immediate tailrace and tailrace channel, spillway and spillway channel (RM 147-141), and lower Sabine River downstream to Burkeville/Burr Ferry (RM 132) vicinity. This portion of the river is being studied most intensively for the purposes of FERC

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Relicensing and 401 Water Quality Certification, because of the proximity to the project and the magnitude of project operational effects are greatest in this reach, gradually diminishing downstream as attenuation and accretion flows reduce project effects with increasing distance.

4.0 BACKGROUND AND EXISTING INFORMATION

The purpose of this study will be to collect information in addition to the bioassessment monitoring on specific species of interest to state and federal resource agencies. During consultation, blue sucker, and American eel have been raised as species of interest. Paddlefish are also present downstream of the Toledo Bend Dam, presumably from reservoir fish that dropped downstream. However, paddlefish are not actively managed by the LDWF and no specific sampling is deemed necessary for this species. Other species of interest include large river obligate species such as shoal chub, emerald shiner, Mississippi silvery minnow, scaly sand darter, and bigscale logperch.

Habitats of interest are generally the shallow and edge habitats (both slow and fast) that are most disturbed by peaking flow changes. Normal channel meander and point bar formation processes, along with woody debris accumulations are also key habitat features. The operational effects of the Toledo Bend Project on species that utilize these habitats, particularly during up and down ramping of flows during daily peaking generation cycles from May 1 to September 30, are a key interest. Beyond the hydraulic effects of peaking on fish and their habitat, other potential project effects on aquatic life include altered temperature regimes from the minimum low release and low dissolved oxygen in the tailrace during non-generation periods.

Two study approaches have been developed to evaluate the effects of project operations on aquatic resources, particularly fish. The first approach will be to sample the five bioassessment sites between Toledo Bend Dam (RM 147) and Burkeville (RM 132) before peaking season during the period of rapidly increasing water temperatures and to repeat sampling in the fall period after peaking season when water temperatures are falling. Including the summer critical period (July 1-September 30) sampling for bioassessment data at these same sites, provides a fish

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community assessment series during three seasonal periods, before, during, and after the peaking generation season.

Fisheries data will be segregated by sampling gear type and by mesohabitat type sampled. This will provide a database containing fish species composition and relative abundance in each major mesohabitat type over the three seasons sampled. The data will allow assessment of changes in the abundance and habitat utilization by fish before, during, and after the peaking season. The mid-summer bioassessment data set will help put the seasonal database into perspective on changing fish communities with increasing distance from the dam and dissipating project effects hydrology, dissolved oxygen and water temperature. Data will be evaluated for evidence of project operation effects such as absence of riffle dwelling species, lack of fry in shallow edge habitat, or absence of young of the year fish in the summer and fall. Evidence of such problems could lead a more detailed habitat based assessments in the following year.

The second study approach is to evaluate more closely, species suspected of being influenced by the project. Two species have already been identified by resource agencies for further study in this regard: blue sucker and American eel. Therefore these two species will be investigated more intensively. For American eel, the interest is whether there are substantial numbers of eel migrating up to the base of Toledo Bend Dam, and seeking further upstream migration routes. For blue sucker, a species known to prefer shallow fast water with coarse substrate, particularly during spawning, the question is whether project flow regimes or temperature regimes may be influencing spawning or adversely affecting other habitat necessary for successful recruitment. Documentation of such effects may lead to development of protection, mitigation, and enhancement (PM&E) opportunities through alternative operating regimes, structures, or schedules of operation. In some cases predictive modeling of hydraulic effects on habitat availability and quality may be appropriate.

The study area is the lower Sabine River from the Toledo Bend Dam downstream to Burkeville/Burr Ferry in the vicinity of Highway 63 (RM 132). This study area is the reach that exhibits physical evidence of Project operational effects (scour) between the dam and Burkeville/Burr Ferry (Phillips 2003, 2007, and 2008). Water temperatures can also be cooler

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than ambient conditions at times during the summer in this reach due to the release 144 cfs of cooler hypolimnetic reservoir waters at the spillway dam for minimum flow compliance. This study area includes the following locations:

- The excavated tailrace channel from the powerhouse to the confluence with the lower Sabine River channel;
- The spillway flow channel from the gated spillway portion of the dam through the intersection with the original lower Sabine River channel and down to the confluence with the tailrace channel (RM 147 to 141); and
- The lower Sabine River from its confluence with the tailrace channel down to the vicinity of Burkeville/Burr Ferry (RM 141 to 132).

5.0 PROJECT NEXUS

The operation of the Toledo Bend Project may have an effect on the health of aquatic resources downstream of the dam. This study will provide information that may document specific species/life stage effects most notably due to river hydraulic alterations, temperature alteration, or dissolved oxygen. The information resulting from continued monitoring of the water quality parameters will assist in the development of licensing requirements through the Texas and Louisiana Section 401 water quality certification processes.

6.0 METHODOLOGY

6.1 Overview

Two methods are generally accepted as appropriate for assessing the operational effects of hydropower on downstream aquatic resources. One generally accepted method is to sample the aquatic life directly. Results of such sampling may provide direct empirical evidence of cumulative Project operational effects and non-project effects on the downstream aquatic resources over recent history. Biological data collected along a downstream gradient along with evidence of hydraulic attenuation over the same reach can provide insight into the relationship between aquatic communities and project hydraulics or other operational effects such as changes in temperature.

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A second method is an instream flow study using the IFIM/PHABSIM modeling technique or other habitat simulation methodology. This approach usually involves some form of hydraulic measurements, assessment, or more commonly a model to simulate the effects of altered flows on the physical aquatic habitat in the river, followed by a second modeling step to relate those hydraulic effects to the quantity and quality of fish or other aquatic organism habitat.

Both of these methods may be employed in this study. First, empirical data will be collected intensively over three seasonal periods before, during, and after the peaking season to identify possible project effects. If a specific physical habitat relationship to fish is identified to be of interest, then operational models, ramping study results, temperature and DO data, or physical habitat simulation modeling such as IFIM/PHABSIM may be utilized to evaluate the effects of alternative operations on the identified aquatic resource.

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6.2 Seasonal Fish Sampling

Given the success of the fisheries survey from the *Baseline Fish Collections Lower Sabine River Priority Instream Flow Study* (TWDB 2007 and 2008b), the upcoming fisheries sampling efforts will most likely be similar to those methods previously employed during 2006 and 2007. Additional fish sampling method guidance will come from techniques outlined in *Surface Water Quality Monitoring Procedures, Vol. 2: Methods for Collecting and Analyzing Biological Community Habitat Data* (TCEQ 2007). Lousiana's *Standardized Sampling Proceedures Manual* (LDWF 2005) will also be consulted for potential large river sampling procedure modifications. USEPA guidance on sampling non-wadeable streams and rivers (Flotemersch, et al. 2006) may also be useful for adapting wadeable stream techniques to the lower Sabine River. The fisheries sampling will be segregated by major habitat types (e.g., riffle, run, pool, with and without cover) with the effective sampling gear most feasibly deployed to be used in the identified habitats.

Sampling gear proposed to conduct the fisheries sampling will include seining and electrofishing (both boat and backpack), and possibly hoop net and gill net sampling of deeper water habitats. Proposed sampling gear by habitat type is summarized below for daytime sampling:

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Seine (LDWF)

- *Bag seine - 25 ft x 6 ft x 3/16 in. mesh (Ace, 20 pound) with a 6 ft x 6 ft x 6 ft bag.*
- *Deep pools and runs will be sampled*
- *Riffles, runs, and small pools*
- *Kick sampling, with aggressive substrate disruption upstream of the seine in riffles and shallow runs with gravel to large cobble substrate.*
- *Pivot sweeps or linear hauls may be used as conditions dictate*
- *Record area swept as effort*

Boat Electrofishing

- Deep (>2 feet), navigable habitats that are non-wadeable including backwaters, pools or runs, with and without aquatic cover features, when accessible.

Backpack/Wading Electrofishing

- Shallower or non-navigable backwaters, pools, runs, and riffles including areas with aquatic cover features that typically hold fish (e.g., undercut banks, vegetation, and/or woody debris). This gear may include battery or generator powered backpack electrofishing gear, or any of several different generator powered wading electrofishing techniques (e.g., bank or boat based long line electrofishing or pram electrofishing).

Hoop or Trap Net

- Deep pools, backwaters, and slow runs that are not accessible by seine or may not be efficiently sampled by boat electrofishing due to depth limitations, with or without aquatic cover features. Hoop/Trap mesh, lead/wing specifications will be based on local experience and resource agency guidance.

Gill Net

- Deep pools, backwaters, and slow runs that are not accessible by seine or may not be efficiently sampled by boat electrofishing due to depth limitations, with or without aquatic cover features. Mesh size will be selected for target species or employ graded mixed-size "experimental" mesh panels.

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<#>Deep pools and runs will be sampled with a 9.1 m x 1.8 m x 6.4 mm mesh seine.¶
<#>Riffles, runs, and small pools will be sampled with a 4.6 m x 1.8 m x 4.8 mm mesh seine.¶
<#>Kick sampling, with aggressive substrate disruption upstream of the seine in riffles and shallow runs with gravel to large cobble substrate.¶

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The actual specifications for hoop and gill nets (mesh sizes and sampling duration) will depend upon consultation with resource agency personnel familiar with Sabine River sampling conditions. Specifically, hoop and gill net sampling would be deployed as a supplement to seining and electrofishing, which are proven successful in capturing fish throughout the project area. Hoop and gill nets will be deployed in deeper water habitats where larger fish species often reside beyond the effective range of electrofishing.

Nighttime Fisheries Sampling

Night sampling with electrofishing gear and boat mounted floodlights and night beach seining usually results in higher capture efficiency and more species captured than daytime electrofishing of equal effort due to diurnal shifts in habitat use from deep to shallow water (Flotemersch et al., 2006). However, night sampling is inherently more dangerous due to reduced visibility, particularly in a riverine environment. Therefore limited night fisheries sampling will be attempted, generally following LDWF night sampling protocols, and consistent with sound safety practices (e.g., well rested crew, ample lighting, re-sampling familiar sites close to launch ramps, with limited navigation hazards) to evaluate the efficacy of this technique. A consistent sampling protocol will be followed at all sites. The nighttime sampling period will generally be considered from dusk to approximately 11:00 pm.

Sampling Effort and Schedule

Sampling effort and schedule for the seasonal fisheries habitat utilization study will follow the bioassessment methods, during the critical period, of July 1 through September 30, which is also coincident with the peaking power generation season (May 1 through September 30) at the Toledo Bend Project. The same effort will be applied in the spring, before the peaking power generation season, when water temperatures are rising and during the fall, after the peaking power generation season, when water temperatures are declining.

Study Area 3 Sampling

Study area 3 encompasses the first 15 miles below the Toledo Bend Dam. It includes two Study Reaches and one Study Node. Study Area 3 sampling will be the responsibility of the Sabine

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River Authorities. Study Area, Reach and Site designations will follow the same nomenclature used in the Information Needs for the Section 401 Water Quality Certification Study.

- Area 3, Reach 8 – RM 141-147 (Tailrace Channel to Spillway)

  This Study Reach is the most upstream reach and it is also referred to as the spillway channel, which runs six miles from the spillway to the tailrace channel confluence. Two sites will be sampled one site above the confluence with Toro Bayou and immediately below the spillway and at a temperature monitoring site at RM 146, and one below Toro Bayou in the vicinity of a shoal and a temperature and level logger monitoring site at RM 143.

- Tailrace Channel Node

  The tailrace channel node is not a Sabine River Study Reach, but rather a two mile manmade excavated channel from the powerhouse to the river at RM 141, the boundary between Reaches 8 and 7, and a significant hydrologic node for the river. It is inside the Project Boundary and is considered a part of the Project. However, fish and other aquatic life are present in the tailrace channel and will be investigated as part of the bioassessment. The tailrace channel biological node will be considered a study sampling site.

- Area 3, Reach 7 – RM 131-141 (Burkeville to Tailrace Channel) – 2 Sites

  This Study Reach continues down the Sabine River 10 miles, from the tailrace channel confluence to the bottom of Study Area 3 at Burkeville/Burr Ferry at RM 131. Two sites will be sampled. One is in the vicinity of some shoal habitat and at a temperature and level logger monitoring site at RM 139.5. The second site is the TIFP baseline data site 5080 at Burkeville near RM 132 which is also the most downstream temperature monitoring site, level logger monitoring site, and the Burkeville USGS Gaging Station.

Data Management

All data gathering and management will follow the same procedures established in the Information Needs for the Section 401 Water Quality Certification Study.

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6.3 Species Specific Sampling

The Authorities also intend to perform more intensive sampling beyond that required for bioassessment in the first 15 miles below Toledo Bend Dam (Study Area 3, Reaches 7 and 8). The purpose of these studies is to look more closely at seasonal variation in habitat utilization, and to further investigate habitat utilization by specific fish species of special interest in greater detail. These studies will provide a means to investigate and develop possible aquatic resource enhancement opportunities through detailed assessment of habitat use and effects of project operations. Currently, two species of special interest have been identified, American eel and blue sucker. Additional species or habitat use guilds may be identified and further investigated following one or more of the seasonal habitat utilization sampling events.

American Eel

Eel sampling will be performed at the base of the spillway dam and in the powerhouse tailrace. Two types of specialized gear will be deployed, eel traps/pots and eel ramp traps.

TO BE CONTINUED (add appropriate method descriptions with literature citations)

Blue Sucker

Blue sucker shoal habitat will be monitored to evaluate seasonal and life stage variation in use of this known preferred habitat. However the use of other habitats, particularly by juvenile (age 0+ and 1+) blue suckers is poorly understood as this life stage is rarely captured. Therefore other habitats, particularly deeper water with woody debris, will be thoroughly sampled throughout the three seasonal periods. Additional sampling will be conducted during blue sucker spawning season (April/May) in an attempt to clarify the time of spawning, habitat preferences for spawning in the reach immediately below Toledo Bend Dam. Blue suckers tend to respond well to electrofishing and this will be the sampling method of choice. Care will be taken to avoid excessive sampling mortality by limiting the sampling duration, frequency of use, and seasonal period of use of gill nets and electrofinshing.

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Habitat Modeling

The purpose of these studies are to look more closely at seasonal variation in habitat utilization, and to further investigate habitat utilization by specific fish species of special interest in greater detail. These studies will provide a means to investigate and develop possible aquatic resource enhancement opportunities through detailed assessment of fish habitat use and effects of project operations (e.g., modified hydrology, temperature, DO). If biological sampling indicates enhancement of the fish community may be feasible, particularly for species of management interest, habitat simulation techniques such as IFIM/PHABSIM or similar methodologies, temperature modeling, or DO enhancement measures may be used to simulate potential benefits of alternative project opreations on specific resources of interest.

7.0 SCHEDULE

The preliminary schedule or the conduct of this Study is outlined below:

1. FERC issues the Study Plan Determination: August 7, 2009
2. Study Planning and Literature Review Commences: August 8, 2009
3. Field Data Collection Commences: August 17, 2009
4. File Progress Report (Authorities): October 3, 2009
5. Field Data Collection Ends: July 23, 2010
6. File Initial Study Report (Authorities): October 30, 2010
7. Initial Study Report Meeting (Authorities and Stakeholders): November 15, 2010
8. File Study Report Meeting Summary (Authorities): November 30, 2010
9. File Meeting Summary Comments (Authorities): December 30, 2010
10. File Response to Meeting Summary Comments (Stakeholders): January 28, 2011
11. Study Plan Resolution/Amendments by FERC: February 28, 2011

8.0 BUDGET

This species specific and habitat utilization study would likely take one study season to complete. The estimated budget for the study is approximately $250,000, depending on the number of species and extent of modeling eventually undertaken.

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9.0 DISCUSSION OF ALTERNATIVE APPROACHES

The proposed methods for this study are consistent with professional water quality practices and will meet TCEQ and LDEQ requirements and procedures. The overall approach is commonly used in relicensing proceedings and is consistent with FERC study requirements under the ILP. No alternative measures have been identified at this time.

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ATTACHMENT A

SEASONAL HABITAT UTILIZATION SITES,

TEMPERATURE LOGGER, AND LEVELOGGER LOCATIONS