ATTACHMENT A

WORK AUTHORIZATION NO. 6

This Work Authorization is made pursuant to the terms and conditions of the Agreement entered into by and between Williamson County, Texas, a political subdivision of the State of Texas, (***the "County"***) and SWCA Environmental Consultants (***the "Consultant"***).

Part1. The ***Consultant*** will provide the following services for monitoring Georgetown Salamanders at Twin Springs Preserve and Swinbank Spring. The proposed scope of work is intended to partially satisfy the requirements for Georgetown Salamander research specified in the Williamson County Regional Habitat Conservation Plan and to provide the County with information on population status of salamanders and water quality/quantity at the two springs.

Part 2. The maximum amount payable for services under this Work Authorization without modification is $50,002.00.

Part 3. Payment to the ***Consultant*** for the services established under this Work Authorization shall be made in accordance with the Agreement.

Part 4. This Work Authorization shall become effective on the date of final acceptance of the parties hereto and shall terminate on December 31, 2012, unless extended by a Supplemental Work Authorization.

Part 5. This Work Authorization does not waive the parties' responsibilities and obligations provided under the Agreement.

ATTACHMENT A (con't.)

Part 6. This Work Authorization is hereby accepted and acknowledged below.

CONSULTANT:
SWCA Environmental Consultants

By: _____
Signature

Gary L. Galbraith
Printed Name

Principal
Title

October 25, 2011
Date

COUNTY:
Williamson County, Texas

By: _____
Signature

~~Dan A. Gattis~~ Lisa L. Birkman
Printed Name

~~County Judge~~ Presiding Commissioner
Title

July 12, 2011
Date

LIST OF EXHIBITS

Exhibit A - Services to be Provided by County

Exhibit B - Services to be Provided by Consultant

Exhibit C - Work Schedule

Exhibit D - Fee Schedule

Exhibit B

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Sound Science. Creative Solutions.

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3 June 2011

Williamson County Conservation Foundation
350 Discovery Boulevard
Cedar Park, Texas 78613

Re: Proposal for Georgetown Salamander (*Eurycea naufragia*) Research for the Williamson County Regional Habitat Conservation Plan – Year 2

SWCA Environmental Consultants (SWCA) appreciates the opportunity to provide the Williamson County Conservation Foundation with this proposal to conduct Georgetown salamander (*Eurycea naufragia*) research as called for in the Williamson County Regional Habitat Conservation Plan.

The proposed work tasks are described in greater detail in the attached scope of services. If you have any questions about the included scope of services, feel free to contact me at our office at (512) 476-0891 or by e-mail at ccrawford@swca.com.

Respectfully,

Craig Crawford

Craig Crawford, P.G.
Project Manager

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INTRODUCTION

The Georgetown salamander (*Eurycea naufragia*) is an amphibian in the Plethodontidae family that is endemic to springs flowing from the northern segment of the Edwards Aquifer near Georgetown, Texas. This species is considered by the U.S. Fish and Wildlife Service (USFWS) as a candidate for Federal listing (66 FR 54807). Georgetown salamanders are thought to be threatened by habitat loss as many of the springs where this species formerly lived have been degraded. In fact, the species name *naufragia* means remnants in Latin and refers to the few remaining remnants of habitat for this salamander. While the USFWS considers listing of the Georgetown salamander to be warranted, publication of a proposal to list the species has been precluded by other, higher priority listing actions (USFWS 2004). In their 2008 Candidate Notice of Review (73 FR 75176), the USFWS lowered the listing priority number (LPN) for this species from a 2 to an 8. It is their opinion that current and planned conservation actions taken by Williamson County reduced the magnitude of the threat to the Georgetown salamander to a moderate level. Their rational includes:

> *Williamson County and the Williamson County Conservation Fund are currently actively working to protect habitat and acquire land within the contributing watershed for the Georgetown salamander. Also, they are planning to conduct monitoring and data-collecting activities in an effort that is expected to lead to the development of a conservation strategy for this species. Although this species still meets our definition of a candidate, these conservation actions reduce the magnitude of the threat to the Georgetown salamander to a moderate level by reducing the amount of development occurring in the portion of the watershed that affects the species. Thus, we have changed the LPN for this species.*

The overarching objective of SWCA Environmental Consultant's (SWCA) proposal is to characterize salamander habitat utilization of the open space at Twin Springs and one other reference population, to describe and monitor this habitat for water quality and quantity on a seasonal and annual basis, to determine short- and long-term Georgetown salamander population trends, and to make recommendations designed to ensure minimal conflict between development and the ecological health of the salamander and its habitat.

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BACKGROUND AND SCOPE OF SERVICES

Background

The Georgetown salamander is a small (less than 3 inches long) salamander that inhabits springs and spring runs within the San Gabriel watershed. The species is known to occur only in Williamson County, Texas, where it has been found at springs in association with the South, Middle, and North Forks of the San Gabriel River, The Cowan and Berry Creek drainages, and in one cave (Bat Well) near the Sun City Development. Habitat for the Georgetown salamander and *Eurycea* salamanders in general, is described as shallow pools of well-oxygenated, sediment-free water that occur in caves and at springs and spring runs. The USFWS identifies the primary threats to the Georgetown salamander as degradation of water quality and quantity due to urbanization.

The Georgetown salamander is entirely aquatic and, based on similarities with other *Eurycea* species, it is expected that water quality degradation from various contaminants, decreased dissolved oxygen, increased sediments, and increased nutrients can cause disease and deformities, which could then result in salamander population declines. Urbanization and increases in impervious cover can increase contaminant loads in springs and groundwater, as well as alter local hydrologic regimes by increasing storm runoff and decreasing baseflows in drainages. Increased storm runoff may result in a decrease in aquifer recharge, increased variability in water availability and flow, and decreased water quality. Decreases in baseflow result in a decrease in water availability at spring locations with decreased spring flow especially problematic during periods of drought.

A total of 15 Georgetown salamander locations are currently known, all of which are in Williamson County and given the rapid rate of urban development and current lack of understanding of existing habitat conditions, perceived threats and long-term ecological needs of this species, federal listing within the next few years is a distinct possibility. To the extent possible it is in the best interests of Williamson County to develop proactive habitat management and monitoring plans that strive to remove threats and conserve populations to the maximum extent practicable.

The following scope of services proposes to utilize the best available scientific information to evaluate, protect, and monitor Georgetown salamanders and their habitat on the Twin Springs Preserve property.

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Scope of Services

SWCA proposes to accomplish project objectives through implementation of three work tasks:

- water quality and quantity assessment,
- monthly surface counts, and
- to map and characterize habitat.

SWCA will coordinate efforts with Dr. Benjamin A. Pierce, a local Southwestern University professor and expert on amphibians and salamanders.

Task I Water Quality/Quantity Assessment

SWCA will establish a water quality/quantity monitoring station for quarterly site visits at Twin Springs and Swinbank Springs, where physical, chemical, and meteorological parameters will be considered for inclusion in a long-term monitoring program and include:

1. Physical environment: air and water temperatures, precipitation rates (frequency and duration), groundwater flow quantity (flow meter) and quality.
2. Hydrologic / meteorological data: quarterly spring discharge; and water velocity.
3. Water Quality: pH, dissolved oxygen concentration, water temperature, and total dissolved solids (TDS).
4. Water Chemistry: anionic composition, e-coli, fecal coliform, organochlorine pesticides, chlorinated herbicides, organophosphorus pesticides, atrazine, and biological oxygen demand (BOD).

The physical environment, hydrologic, and water quality data will be collected on-site during the quarterly site visits by utilizing HACH handheld pH, dissolved oxygen, and TDS meters. Water velocity and discharge data will be collected with a Global Water digital flow probe. Water samples will be collected quarterly at both sites and submitted to the Lower Colorado River Authority (LCRA) Environmental Services laboratory for water chemistry analysis. Additional samples will be collected in the event of a significant precipitation event, or if any noticeable alterations or disturbances are observed.

Cost for Task I $16,558.00

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Task II Monthly Visual Encounter Surveys[1]

Monthly or bimonthly visual encounter surveys (surface counts) have been conducted at Twin Springs Preserve for the past 2.5 years and at a reference site (Swinbank Spring) for the past 4 years. These surveys provide relative estimates of surface abundance of salamanders at these sites, along with information about the distribution of salamanders within the spring run. Over the past 12 months, recaptures of salamanders marked in the summer of 2010 have been providing information on growth rates and movement of salamanders within the spring run. Visual encounter surveys and salamander recapture studies will be continued at these two sites over the next 12 months (July 2011 through June 2012).

Monthly visual encounter surveys will be conducted by Dr. Pierce and his students at Southwestern University. For each visual encounter survey, a transect is established along the spring run, beginning at the spring outflow and extending 25 to 30 meters downstream. All potential cover objects that are submerged in the spring run will be overturned to look for salamanders. The number of salamanders observed will be recorded, as well as the position of each salamander along the transect. Based on visual observation, each salamander is placed into one of three size classes (<2.5 cm, 2.2 to 5.1 cm, or >5.1 cm). Attempts are made to capture each salamander with a dip net. Captured salamanders are observed for the presence of color marks applied in the summer of 2010, and all marked salamanders are anesthetized and photographed for later measurement of size. Each captured salamander is also observed for the presence of eggs. The salamanders are then returned to the point at which they were captured in spring. At the conclusion of each visual encounter survey, temperature (°C), oxygen concentration (mg/l), and specific conductivity are measured at 1-m intervals along the transect.

Objectives

1. Conduct monthly visual encounter surveys of *E. naufragia* at Twin Springs Preserve and Swinbank Spring.
2. Monitor status of salamanders at each site.
3. Based on recaptures of salamanders marked in the summer of 2010, estimate movement and growth of salamanders at each site.
4. Gather abundance and ecological data that can be used in development of conservation management strategies.

Cost for Task II $9,193.00

[1] Task II will be performed by Dr. Pierce of Southwestern University as a sub-contractor to SWCA.

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Task III Locate Additional Populations of *Eurycea Naufragia*[2]

Presently, *Eurycea naufragia* is known from only 15 sites in Williamson County; viable populations of salamanders may no longer be present at some of these sites. Within the past year, Dr. Pierce and Andy Gluesenkamp of the Texas Parks and Wildlife Department have located two additional sites where salamanders are found (Cedar Hollow and Walnut Springs). Salamanders are likely found at additional sites that have not yet been examined for their presence. Better delineation of the geographic range of the species and accurate information about the number of existing populations is imperative for developing a long-term conservation strategy for the species.

Most of the likely locations for additional populations are on private land. Dr. Pierce and a student will use maps, scientific databases, historical records, and personal contacts to identify potential spring sites where salamanders might be found. Landowners will be identified from county tax records and contacted for permission to visit the site. After obtaining permission from the landowner, the site will be visited and a visual encounter survey conducted there. In addition, general habitat features of the site will be recorded and a water sample taken. We anticipate obtaining permission to survey six to 10 sites over the next 12 months.

Objectives

1. Identify additional *E. naufragia* populations.
2. Better delineate geographic range and abundance of the species in Williamson County.

Cost for Task III $10,233.00

[2] Task III will be performed by Dr. Pierce of Southwestern University as a sub-contractor to SWCA.

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Task IV Map and Characterize Habitat of *Eurycea Naufragia*[3]

Detailed habitat information is essential for developing long-range conservation and management plans for the Georgetown salamander. We will undertake a detailed assessment of the physical and biological characteristics of salamander habitat at Twin Springs Preserve and Swinbank Spring. This information will provide a baseline for monitoring long-term changes to the physical and biological habitats where the salamanders are found. Changes in invertebrate communities, for example, are often associated with habitat degradation and can signal alterations in the habitat that may have long-term effects on the salamanders.

Habitat mapping and invertebrate surveys will be carried out by Dr. Romi Burks and her students at Southwestern University. They will establish a transect down the spring run at each site and carry out detailed mapping of the physical habitat including total wetted surface area; water depth; percent of habitat type (riffle, pool, bedrock glide); embeddedness; substrate type, size, and percent; aquatic vegetation; canopy cover; and surrounding vegetation within 10 m of the spring run. To provide a quantitative assessment of invertebrates, they will conduct a monthly sampling routine at the two locations (Twin Springs and Swinbank Spring) from July 2011 through June 2012. Field sampling will include establishing composite sites to sample each month at each site. Individual sites will not be resampled due to the short colonization period. At each location, four sites will be selected to examine the expected spatial heterogeneity of the invertebrate assemblage. The four sites will be located across a gradient of flow:

1. near the outflow,
2. within 1 to 3 m of the outflow,
3. within 5 to 10 m of the outflow, and
4. within 10 to 20 m of the outflow.

Sampling at composite sites will include a combination of techniques including turnover of rocks, quadrat sampling, collection of moss and/or leaf litter, and drift nets where possible. Subsamples from different techniques will be placed in Whirl-Pak bags with spring water and then taken to the lab and refrigerated until they can be thoroughly examined for invertebrates.

Dr. Burks and students will identify all invertebrates at least to the level of Family (with the exception of chironomids, i.e. midges, which will be identified to Tribe). Alongside sampling in the spring months (February through May), the team will also set out emergence traps to capture adult invertebrates required for species identification.

[3] Task IV will be performed by Dr. Pierce of Southwestern University as a sub-contractor to SWCA.

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Outcomes of the invertebrate sampling will include a taxa list for each location and quantification of species richness, community diversity, and invertebrate abundance at each location throughout the year.

Objectives

1. Provide basic ecological data on habitat of *E. naufragia* that can be used to develop long-range conservation and management plans for the species.
2. Assess and quantify habitat characteristics of *E. naufragia* at Twin Springs and Swinbank Spring.
3. Assess and quantify invertebrate communities of *E. naufragia* at Twin Springs and Swinbank Spring.
4. Provide baseline data on physical and biological habitats of *E. naufragia* that can be used to assess long-term changes at sites where salamanders occur.

Cost for Task IV $14,018.00

Total Cost $50,002.00

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Re: Proposal for Georgetown Salamander (*Eurycea naufragia*) Research for the Williamson County Regional Habitat Conservation Plan – Year 2

WCCF Work Authorization

Passed in Commissioners Court this 12th day of ~~June~~ July, 2011

By _____

Title Presiding Commissioner

EXHIBIT C - WORK SCHEDULE

SWCA and Southwestern University began work on the project in July 2011 and will continue to collect data through July 2012. A draft report will be submitted to the WCCF for review and comment in August 2012 and a final report will be prepared following receipt of WCCF comments.

EXHIBIT D - FEE SCHEDULE

SWCA proposes to conduct the services described in Exhibit B on a time and materials basis not to exceed $50,002.00 in accordance with SWCA's Standard Rate Schedule.