

MEMORANDUM

TO: Austin-Lower Colorado River Authority Water Partnership Technical Committee

FROM: Richard Hoffpauir
Consultant

Kris Martinez, P.E.
Lower Colorado River Authority

DATE: April 21, 2009

RE: Evaluating the Impacts of Proposed Diversions from Little Bear Creek into
Stoneledge Quarry

1. Summary

The City of Austin proposes to use the Stoneledge Quarry to enhance the discharge at Barton Springs. The project will also serve as a pilot study to evaluate the benefits of developing recharge enhancement projects. A portion of the storm flows from Little Bear Creek would be diverted into a conveyance channel that connects with the quarry. Once impounded, the water would slowly recharge the Barton Springs Edwards Aquifer (BSEA) through the quarry's karst features. The storage capacity of the quarry is 385 acre-feet (ac-ft).

The TCEQ Water Availability Model (WAM) Run 3 Version 05/31/05 was used to evaluate the impact of the proposed diversion from Little Bear Creek on LCRA's downstream water rights associated with the Garwood, Lakeside, Pierce Ranch and Gulf Coast irrigation operations. The model was also used to estimate the amount of additional releases that would be needed to support downstream environmental flows conditions related to LCRA's Water Management Plan (WMP). Using a priority date senior to LCRA's Garwood water right, WAM results indicate that the proposed diversion on Little Bear Creek could cause a reduction in run-of-river (ROR) availability for the downstream water rights associated with the Gulf Coast and Lakeside irrigation operations. These two water rights are junior to the Garwood water right. The maximum reduction in ROR availability on a ten-year average basis is estimated to be approximately 15 acre-feet per year (ac-ft/yr). This reduction in availability would have to be made up with stored water releases from lakes Buchanan and Travis. WAM results also indicate that additional releases would be needed to support downstream environmental flows related to LCRA's WMP. The maximum amount of additional releases on a ten-year average basis is estimated to be 24 ac-ft/yr. The total combined impact from the reduction in ROR availability and additional releases is estimated to be 39 ac-ft/yr. An amount greater than 39 ac-ft/yr would need to be released to overcome delivery losses between the lakes, environmental flow gage points and the irrigation divisions. Delivery losses are estimated

to be 3.1%. An additional release of 1.2 ac-ft/yr would be needed to make up for delivery losses. Therefore, about 40.2 ac-ft/yr would need to be released from lakes Buchanan and Travis to make up for the total estimated impacts.

2. Background

The inactive Stoneledge Quarry is located off-channel and near Little Bear Creek within the Onion Creek watershed of the Colorado River. Approximately 0.34 square miles (215 acres) of drainage area have been impounded by the quarry since excavation began in the 1970's. The water table of the BSEA at times intersects and is exposed at the lowest points within the quarry. Supplementing storage within the quarry with flows from Little Bear Creek would supplement the recharge over time to the BSEA.

A bypass weir will be used to restrict diversions from Little Bear Creek to events of 50 cfs or greater. Approximately half of the flows on Little Bear Creek in excess of 50 cfs can be diverted by gravity into the connecting conveyance channel as long as storage capacity is available. The location of the proposed diversion is below almost all of the known natural stream recharge features on Little Bear Creek based on stream flow measurements. There is approximately 10.9 square miles (6,984 acres) of upstream contributing drainage area, as shown in Figure 1. The location of the Stoneledge Quarry in relation to the City of Austin is shown in Figure 2.

3. WAM Simulation Results

The WAM results indicate the average annual diversion of flows from Little Bear Creek into Stoneledge Quarry could be 155.5 ac-ft/yr. During a repeat of the drought hydrology from 1947 through 1956, the WAM estimates an average diversion of 1.5 ac-ft/yr would be available. As shown in Figures 3 and 4, the annual simulated diversion from Little Bear Creek is zero for approximately 40% of the period of record.

Figure 1. Location of the Stoneledge Recharge Enhancement Project

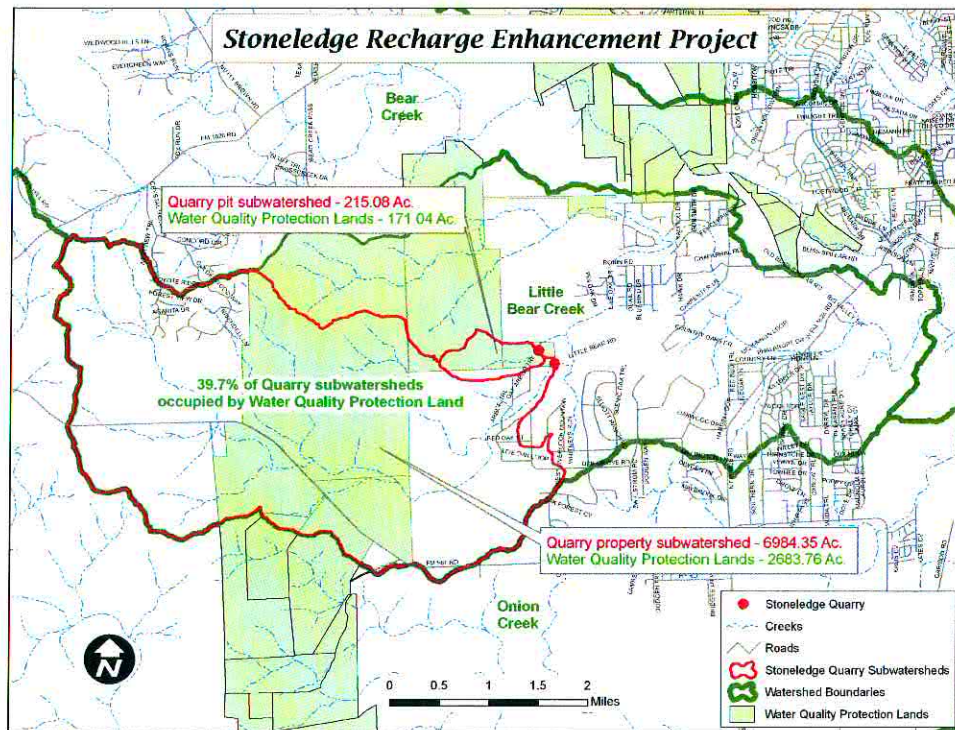


Figure 2. Location of Stoneledge Quarry in relation to Austin

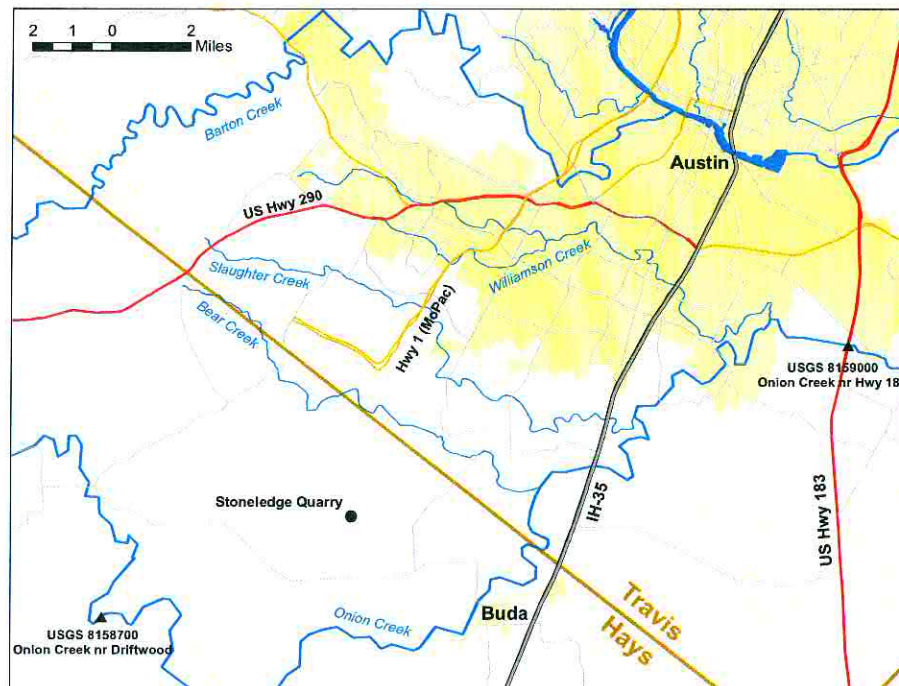


Figure 3. Diversions from Little Bear Creek

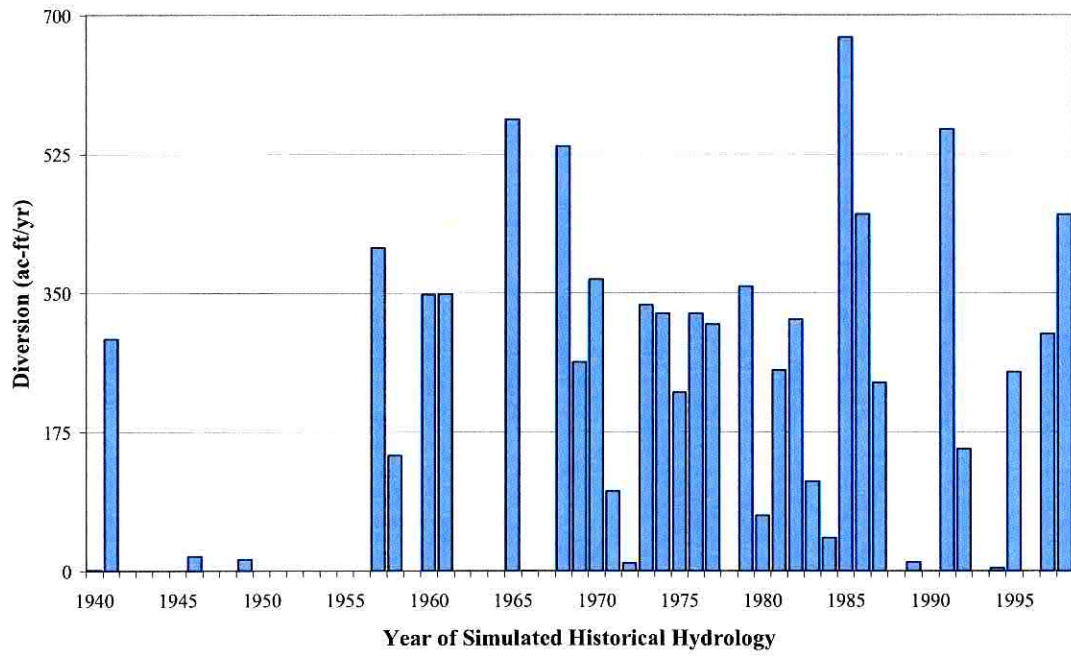
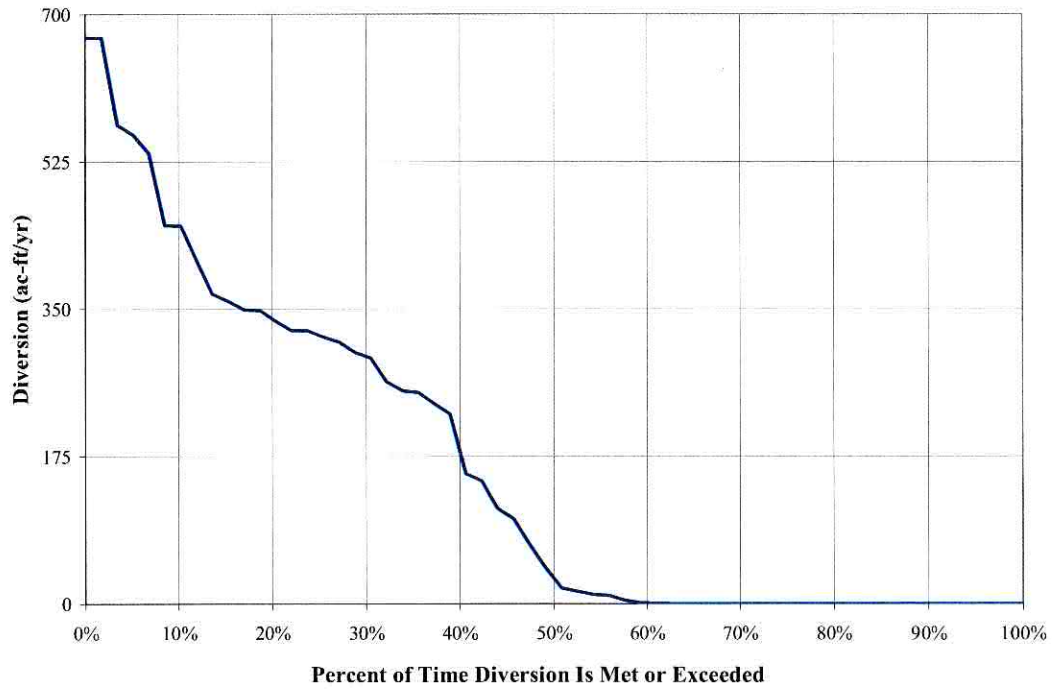
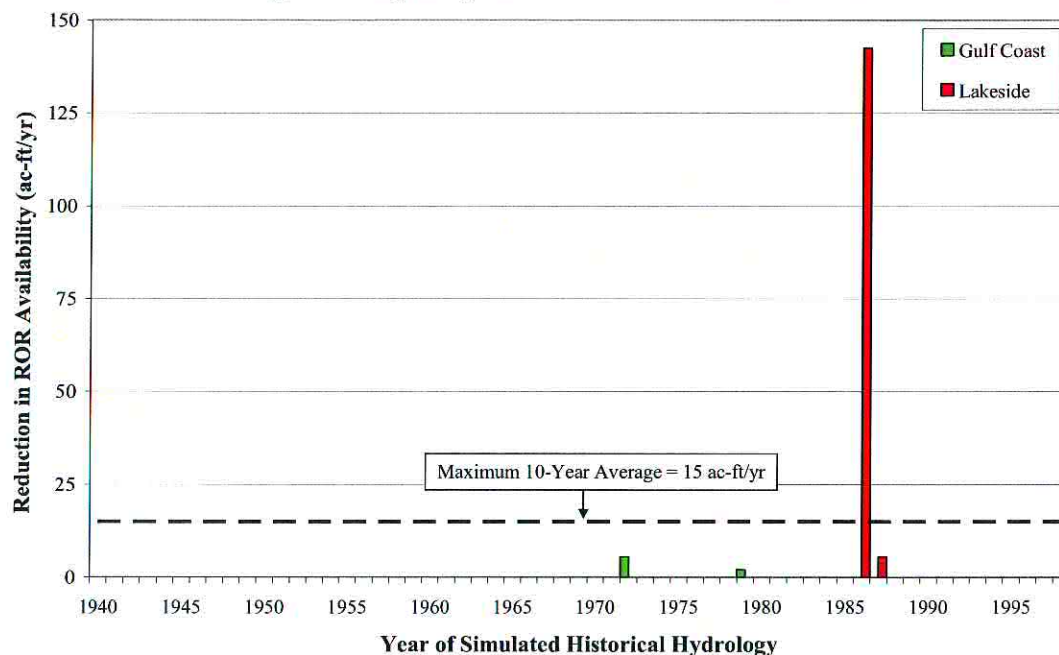


Figure 4. Reliability of Diversion from Little Bear Creek



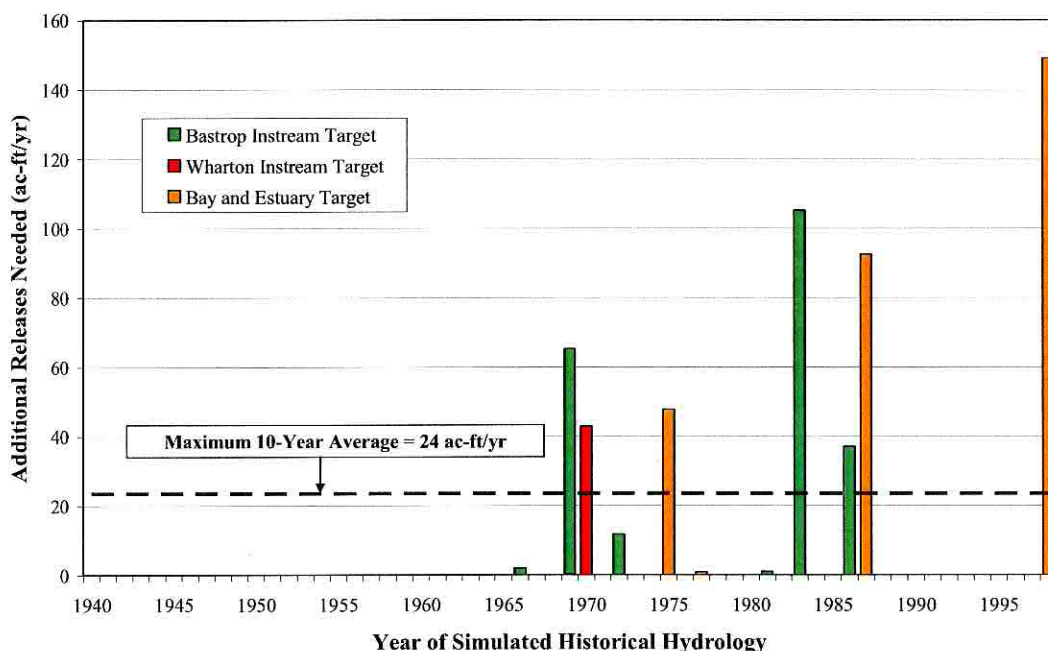
Proposed diversions from Little Bear Creek into the Stoneledge Quarry were modeled with a priority date senior to LCRA's irrigation rights, simulating an operation that would allow diversions to occur without reduction from downstream priority calls on inflow. The maximum reduction in ROR availability on a ten-year average basis for LCRA's downstream irrigation water rights is estimated to be 15 ac-ft/yr. Figure 5 illustrates the WAM's estimated reduction of water availability to LCRA's irrigation rights downstream of the Onion Creek watershed as a result of the seniority assumption for Stoneledge Quarry.

Figure 5. Reduction in Run-of-River Availability for Downstream LCRA Irrigation Rights by Senior Diversions on Little Bear Creek



Senior diversions into Stoneledge Quarry from Little Bear Creek would also reduce the flow on Onion Creek that contribute to flow in the Colorado River. To make up for the reduction, LCRA would need to release more water to support instream flows on the Colorado River and freshwater inflows to Matagorda Bay. The maximum amount of additional releases on a ten-year average basis is estimated to be 24 ac-ft/yr. Figure 6 shows the estimated amount of additional releases needed to support environmental flows under LCRA's WMP.

Figure 6. Additional Releases Needed to Supplement Downstream Environmental Flows due to Senior Diversions on Little Bear Creek



The total combined impact from the reduction of ROR availability and additional releases needed for environmental flows is estimated to be 39 ac-ft/yr. An amount greater than 39 ac-ft/yr (i.e. approximately 40.2 ac-ft/yr) would need to be released due to downstream delivery losses. The losses incurred in delivering water to the confluence of the Colorado River and Onion Creek were estimated using a methodology described in the “Downstream Contract Conveyance Losses” memorandum (Landreth, 11/15/07). Using this methodology, delivery losses were estimated to be 3.1%. Thus, an additional release of 1.2 ac-ft/yr would be needed to make up for delivery losses.

4. Further Study

The draft version of Permit 5731 (LCRA’s unappropriated flows permit) was included in the simulation though the impacts are not reported in this memo. When the special conditions are finalized and the permit is granted, it may be necessary to revisit the WAM impact analysis. Permit 5731 will carry a senior priority date to any surface water diversion permit sought for the Stoneledge Quarry project.

Increases to spring flow discharge as a result of enhanced recharge to the BSEA were not added to the WAM. If Barton Springs experiences a quantifiable increase in spring flow, this information could be encoded into the WAM as a flow adjustment or return flow event. The increase in available State water at Barton Springs may offset some modeled impacts to LCRA’s downstream water rights and environmental flow maintenance. Similarly, the rate of recharge from Stoneledge Quarry used in the WAM is an approximation based on limited data. Additional monitoring will help to improve the

WAM representation of the rate of recharge, and therefore help to improve the simulated time series of available storage capacity to be filled by diversions from Little Bear Creek and the quarry's natural drainage area.

The City of Austin Watershed Protection and Development Review Department has and continues to collect stream flow and precipitation data at the proposed diversion channel location on Little Bear Creek. The data covers November 3, 2003 through the present in 1-minute increments. These data were used to calibrate an equation for naturalized flow transfer within the WAM. As more data become available, the equation of gaged to ungaged transfer of naturalized flow within the WAM may be improved.

**INTERLOCAL AGREEMENT BETWEEN THE CITY OF AUSTIN, LOWER
COLORADO RIVER AUTHORITY AND BARTON SPRINGS/EDWARDS
AQUIFER CONSERVATION DISTRICT REGARDING
THE STONELEDGE QUARRY RECHARGE ENHANCEMENT PROJECT**

The **CITY OF AUSTIN** (the "City"), the **LOWER COLORADO RIVER AUTHORITY** ("LCRA") and the **BARTON SPRINGS/EDWARDS AQUIFER CONSERVATION DISTRICT** (the "District") (hereafter referred to as the "Parties") enter into this Interlocal Agreement ("Agreement") pursuant to Texas Government Code Chapter 791 ("Interlocal Cooperation Act") to work together and commit various resources to develop the Stoneledge Quarry Edwards Aquifer Recharge Enhancement Project.

**I.
RECITALS**

WHEREAS, the Barton Springs Segment of the Edwards Aquifer (the "Aquifer") is a unique underground system of water bearing formations in Central Texas, wherein water enters the Aquifer through the ground as surface stream inflow and rainfall infiltration, which is rapidly transported in the subsurface by solution conduits and the intrinsic permeability of the rock, and leaves the Aquifer through well withdrawals and spring flows;

WHEREAS, the complex springs known as Barton Springs is located inside the municipal boundaries of the City and is the primary direct natural outlet for water flowing through the Aquifer and the only known habitat for the endangered Barton Springs Salamander *Eurycea sosorum*, and the Austin Blind Salamander, *Eurycea waterloensis*, which is a candidate for endangered species listing under the federal Endangered Species Act;

WHEREAS, Barton Springs is an important recreational, cultural, historical, and water resource for Austin and Central Texas;

WHEREAS, the Aquifer is a federally-designated sole-source of drinking water, which serves as a primary source of drinking water for tens of thousands of people and is a vital resource to the general economy and welfare of the City of Austin and the State of Texas;

WHEREAS, increasing the amount of clean water entering the Aquifer will benefit the Aquifer, the springs, the Colorado River, and aquatic and terrestrial species dependent on this water;

WHEREAS, the City has purchased an 85 acre tract in northern Hays County that includes an 18 acre quarry ("Stoneledge Quarry");

WHEREAS, the City proposes to construct, operate and maintain an Aquifer recharge project at Stoneledge Quarry that will divert flood flows above 50 cubic feet per second from Little Bear Creek into Stoneledge Quarry, which is expected to seep into the Aquifer over a period of time thereby increasing Aquifer storage and enhancing flows at Barton Springs;

WHEREAS, the City through land purchases and conservation easements now protects over 23,000 acres of land to benefit water quality and quantity that contributes to Barton Springs, including over 40 percent of the watershed upstream of Stoneledge Quarry;

WHEREAS, the City has substantial investment in preserving water quality and quantity in the Barton Springs Zone;

WHEREAS, the Project is a cooperative effort by the City, LCRA, and the District;

WHEREAS, the Hill Country Conservancy has assisted in purchase and plan development of the project;

WHEREAS, the Barton Springs/Edwards Aquifer Conservation District is a Groundwater Conservation District created by an act of the 70th Legislature for the purpose of providing for conservation, preservation, protection, recharging, and prevention of waste of groundwater and of groundwater reservoirs in the Barton Springs segment of the Edwards Aquifer;

WHEREAS, the District has analyzed the estimated downgradient area of the Aquifer that will be provided enhanced flow by the Project and has determined that downgradient areas are predominately built out, are away from major pumping centers, and expect no significant new well permits for this area;

WHEREAS, the Lower Colorado River Authority (LCRA) is a conservation and reclamation district and political subdivision for the state created under Article XVI, Section 59 of the Texas Constitution;

WHEREAS, LCRA holds downstream senior water rights in the lower Colorado River and has obligations to maintain certain instream flows in the lower Colorado River;

WHEREAS, LCRA has pending before the Texas Commission on Environmental Quality ("TCEQ") an application for all remaining unappropriated flows in the lower Colorado River (Application No. 5731);

WHEREAS, flow from Barton Springs enters Lady Bird Lake and typically flows downstream through Longhorn Dam, thereby contributing to the instream flow needs of the lower Colorado river at the Austin gage immediately downstream of Longhorn Dam and the needs of downstream senior water rights;

WHEREAS, the LCRA and the District entered into a Memorandum of Understanding, dated March 7, 1988, with the stated purpose of “establish[ing] a cooperative framework within which they both may work toward their common goal of conservation and protection of the Barton Springs segment of the Edwards Aquifer” and whereby LCRA expressed its willingness to cosponsor projects and provide in-kind services and support for projects that conserve and develop the aquifer in a cost-effective and beneficial manner, specifically recognizing that excess flood flows may be an appropriate source of water for such projects;

WHEREAS, the LCRA and the City entered into a Settlement Agreement dated June 18, 2007, whereby LCRA and the City created a formal water resource management partnership for the purposes of “evaluat[ing] and implementing strategies that will optimize water supplies to meet water needs of the [City’s and LCRA’s] customers and the environment”;

WHEREAS, the Stoneledge Quarry Edwards Aquifer Recharge Enhancement Project meets the stated purpose of the 1988 MOU between LCRA and the District and which is consistent with the purposes of the 2007 Settlement Agreement between LCRA and Austin;

NOW THEREFORE, in consideration of these premises, the mutual covenants of each party, and other good and valuable consideration, the receipt and sufficiency of which are acknowledged, the Parties agree as follows:

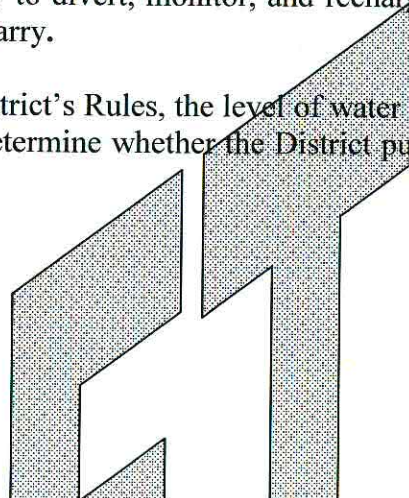
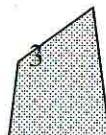
II. DEFINITIONS

2.01. Project. Stoneledge Quarry Edwards Aquifer Recharge Enhancement Project, consists of the construction, operation and maintenance of the Facilities described in Section 2.02, and is located adjacent to Little Bear Creek in Hays County, (approximately 2.6 miles NW of the intersection of FM 1626 and FM 967) on 85 acres of property purchased by the City. This 85 acres contains the 18 acre quarry adjacent to Little Bear Creek and all the area on which the Facilities will be constructed, operated and maintained. [Attached as Exhibit A.]

2.02. Facilities. Flood diversion structures necessary to divert, monitor, and recharge flood waters from Little Bear Creek into Stoneledge Quarry.

2.03. Drought Trigger Levels. As defined in the District’s Rules, the level of water in the Aquifer and flow amounts at Barton Springs that determine whether the District puts into effect certain Aquifer pumping restrictions.

III.



CITY OF AUSTIN RESPONSIBILITIES

3.01. The City will fund construction, operation, and maintenance of all of the Facilities associated with the Project. The Facilities will be designed to divert into Stoneledge Quarry flows in Little Bear Creek above 50 cubic feet per second, which occurs during flood events.

3.02. The City will apply for and pay all necessary application costs and notice fees associated with obtaining State water rights permits from the Texas Commission on Environmental Quality and any other necessary permits from local, state or federal agencies.

3.03. The City will monitor and keep records of inflows into Stoneledge Quarry for the first 10 years of operation and will report to the other Parties on an annual basis.

3.05. The City will fund separate research related to Aquifer water as it deems appropriate.

3.06. The City will work with the other Parties on the development and implementation of a monitoring plan for the Project.

IV.

LOWER COLORADO RIVER AUTHORITY RESPONSIBILITIES

4.01. LCRA will reserve 40.2 acre-feet of firm water per year for use by the Project, as presented in surface water modeling technical memorandum attached as **Exhibit B**. The reservation shall be effective upon execution of this Agreement and shall continue for a period of fifty (50) years from the date the issuance of the applicable State water rights permit for this project.

4.02. LCRA will provide in-kind staff services, as determined by LCRA as necessary, to support acquisition of applicable State water rights permits for this project and will participate in review and evaluation of project implementation and monitoring.

4.03. LCRA will support issuance of the applicable State water rights permit for the Project.

V.

BARTON SPRINGS/EDWARDS AQUIFER CONSERVATION DISTRICT RESPONSIBILITIES

5.01. The District will examine the feasibility of adjusting Drought Trigger Levels to account for additional water in the Aquifer due to recharge from the Stoneledge Quarry.

5.02. Any future withdrawals by current or new exempt users notwithstanding, the District will not consider water entering the Aquifer resulting from Project as new water supply to be permitted by the District as available during severe drought and will designate them for Ecological Flows as allowed under current rules.

5.02. Any future withdrawals by current or new exempt users notwithstanding, the District will not consider water entering the Aquifer resulting from Project as new water supply to be permitted by the District as available during severe drought and, to the extent such new supplies are quantified by scientific consensus as sustainable additional net recharge during severe drought, the District will designate them as Ecological Flows, as allowed under current rules.

5.04. The District will provide in-kind staff services, as determined by the District as necessary, to support acquisition of water rights and applicable State permits.

5.05. The District will contribute data collected under previous studies, including tracing, water quality sampling, monitoring wells, and water level measurements.

VI. WATER RIGHTS

6.01. The Parties agree that water entering the Colorado River via Barton Springs and Barton Creek is state water subject to the prior appropriation system and a call by senior downstream water rights in the Colorado River Basin.

6.02. The Parties agree that water discharging from the Aquifer into Barton Springs is subject to use authorized under the City's water rights and LCRA's downstream senior water rights and LCRA Water Management Plan.

6.03 The Parties recognize that the owner of the property overlying the groundwater within the boundaries of the District may have a legal claim to the groundwater, subject to restrictions and regulations imposed by the District.

VII. INTERGOVERNMENTAL COMMUNICATIONS

7.01 To provide for consistent and effective communication between BSEACD, Austin, and the LCRA, each Party shall appoint a Principal Representative to serve as its central point of contact on matters relating to this Agreement. The BSEACD has designated W. F. "Kirk" Holland as its Principal Representative, Austin has designated David A. Johns as its Principal Representative, and LCRA has designated _____ (Manager Water Supply Planning) as its Principal Representative.

VIII. GENERAL PROVISIONS

8.01. Interpretation. Except where the context otherwise clearly requires, in this Agreement:

- (a) words imparting the singular will include the plural and vice versa;
- (b) all exhibits attached to this Agreement are incorporated by reference for all purposes as if fully copied and set forth at length; and
- (c) references to any document mean that document as amended or as supplemented from time to time; and references to any party mean that party, its successors, and assigns.

8.02. Entire Agreement. This Agreement, including any attached exhibits, constitutes the entire agreement between the parties regarding recharge of Stoneledge Quarry and supersedes all prior or contemporaneous understandings or representations, whether oral or written, respecting recharge of Stoneledge Quarry.

8.03. Amendment. No amendment of this Agreement will be effective until the amendment has been reduced to writing, each party has duly approved it, and is signed by the authorized representatives of the parties. Any amendment will incorporate this Agreement in every particular not otherwise changed by the amendment.

8.04 Termination of 1988 MOU Between LCRA and District. The Memorandum of Understanding between Lower Colorado River Authority and Barton Springs-Edwards Aquifer Conservation District, dated March 7, 1988, is hereby terminated.

8.05. No Amendment of Other Agreements. Unless otherwise expressly stipulated, this Agreement is separate from and will not constitute an amendment or modification of any other agreement between the parties.

8.06. Other Instruments, Actions. The parties agree that they will take such further actions and execute and deliver any other consents, authorizations, instruments, or documents that are necessary or incidental to achieve the purposes of this Agreement.

8.07. No Third Party Beneficiaries. Except as expressly provided in this Agreement, nothing will be construed to confer upon any person other than the parties any rights, benefits or remedies under or because of this Agreement.

8.08. No Joint Venture, Partnership, Agency. This Agreement will not be construed in any form or manner to establish a partnership, joint venture or agency, express or implied, nor any employer-employee or borrowed servant relationship by and among the parties.

8.09. Applicable Law. This Agreement will be construed under and according to the laws of the State of Texas.

8.10. Severability. The provisions of this Agreement are severable. If any court of competent jurisdiction will ever holds any word, phrase, clause, sentence, paragraph, section, or other part of this Agreement or the application of it to any person or circumstance to be invalid or unconstitutional for any reason, it will not affect the remainder of this Agreement and, in such event, this Agreement will be construed as if it had never contained such invalid or unconstitutional portion in it.

8.11. Venue. Venue for any suit arising under this Agreement will be in Travis County, Texas.

8.12. Duplicate Originals. The parties may execute this Agreement in one or more duplicate originals each of equal dignity.

8.13. Expiration of Agreement. This Agreement terminates upon the earlier of the expiration of the LCRA's reservation of water for this project or upon the termination or denial of the required State water rights permit, unless otherwise extended by separate written agreement.

8.14. Effective Date. This Agreement will be effective upon due execution by all parties.

APPROVED AS TO FORM:

CITY OF AUSTIN:

Assistant City Attorney

By:

Rudy Garza
Assistant City Manager

Date:

APPROVED AS TO FORM:

**LOWER COLORADO RIVER
AUTHORITY:**

By:

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Attorney

Date: _____

APPROVED AS TO FORM:

**BARTON SPRINGS/EDWARDS
AQUIFER CONSERVATION
DISTRICT:**

Attorney

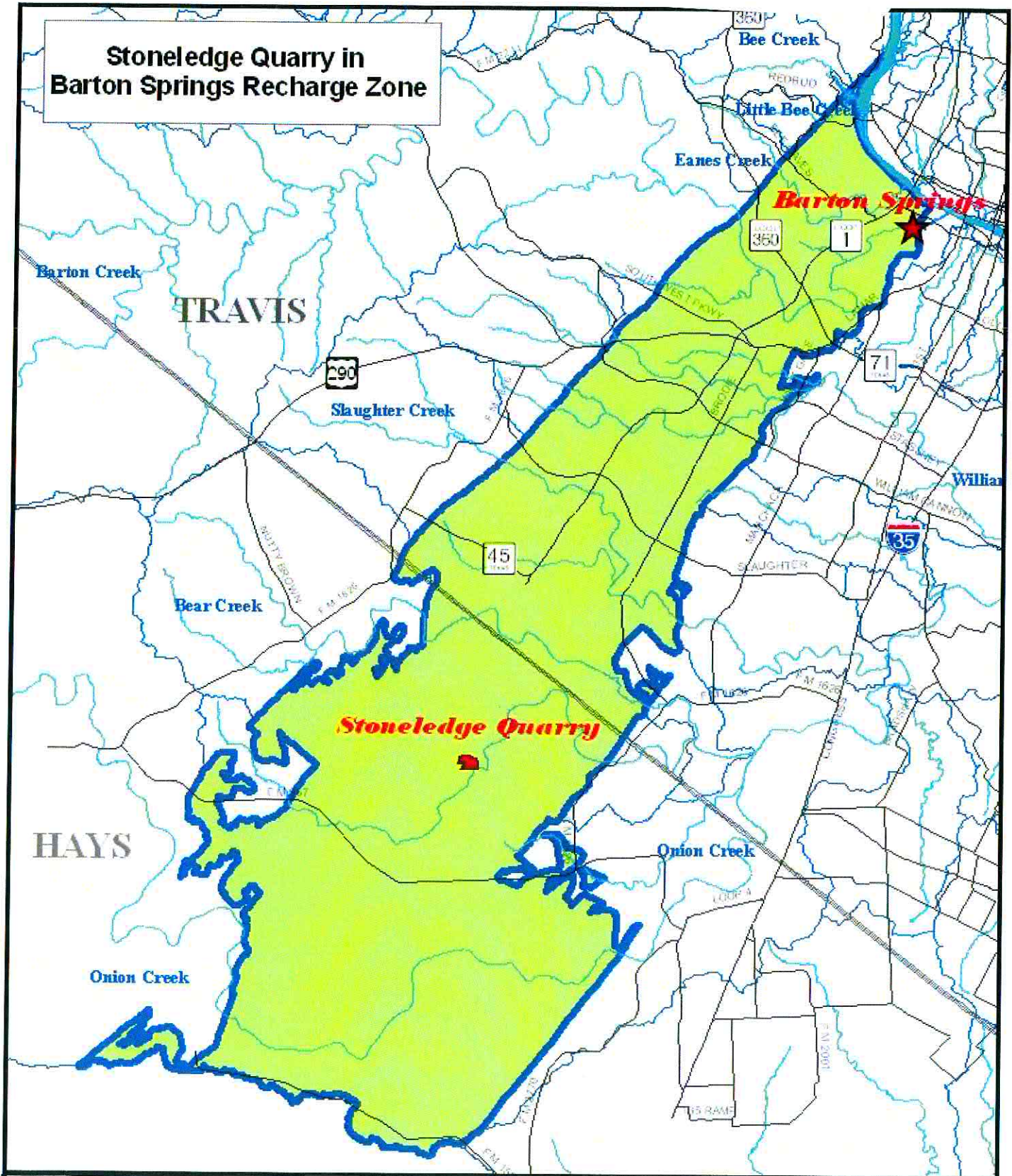
By: _____

Date: _____

ATTEST: By: _____

Date: _____

**Stoneledge Quarry in
Barton Springs Recharge Zone**



Stoneledge Quarry

BCC Watersheds

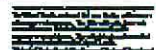
Barton Springs

County Line

Barton Springs
Recharge Zone

Water Features

Roads



0.5 0.45 0 0.5 1.0 Miles



