January 11, 2007

Mr. Rick Brown
Interstate Water Management Development Section
Colorado Water Conservation Board
1580 Logan Street, Suite 1600
Denver, Colorado 80203

Subjects: Water Supply Reserve Account 2007 Grant Application for the Upper Black Squirrel Creek Basin - Aquifer Recharge and Storage Evaluation

Dear Rick:

Enclosed is a grant application from the El Paso County Water Authority for their Upper Black Squirrel Creek Basin – Aquifer Recharge and Storage Evaluation Project for $70,000. At the Arkansas Basin Roundtable's (ABRT) meeting yesterday, this grant application was approved with consensus for the Statewide Competing Fund. The ABRT Needs Assessment Committee approved this on a 10-0 vote at their December 8, 2006, meeting to move this to the full Roundtable for their consideration yesterday. This application has received a thorough review and full discussion by our Roundtable at a regularly scheduled and noticed meeting, with a quorum present.

In closing, if I can be of any assistance to you and your staff or the Water Conservation Board in their evaluation, please do not hesitate to contact me at: 719.584.0221 or ahamel@pueblowater.org.

Sincerely,

Alan C. Hamel, Chair

lkm
enc
c: Jay Winner
Jonathon Fox
Gary Barber
Eric Hecox

COLORADO WATER CONSERVATION BOARD

WATER SUPPLY RESERVE ACCOUNT
2006-2007 GRANT APPLICATION FORM

Upper Black Squirrel Aquifer Recharge Investigation, Arkansas

Name of Water Activity/Project **River Basin Location**

$70,000.00 2006-7;	X	Basin Account	X	Yes
		Statewide Account		No

Amount of Funds Requested | Please Check Applicable Box | Approval Letter Signed By Roundtable Chair and Description of Results of Evaluation and Approval Process

*** For the Basin Account, the Application Deadline is 60 Days Prior to the Bimonthly CWCB meeting. The CWCB meetings are posted at www.cwcb.state.co.us and are generally the third week of the month.**

*** For the Statewide Account, the Application Deadline is 60 Days Prior to the March and September CWCB Board Meetings.**

*** In completing the application you may attach additional sheets if the form does not provide adequate space. If additional sheets are attached please be sure to reference the section number of the application that you are addressing (i.e., A.1. etc.).**

Instructions: This application form should be emailed, typed, or printed neatly. The Water Supply Reserve Account Criteria and Guidelines can be found at http://cwcb.state.co.us/IWMD/. **The criteria and guidelines should be reviewed and followed when completing this application**. You may attach additional sheets as necessary to fully answer any question, or to provide additional information that you feel would be helpful in evaluating this application. Include with your application a cover letter summarizing your request for a grant. If you have difficulty with any part of the application, contact Rick Brown of the Intrastate Water Management and Development (Colorado Water Conservation Board) for assistance, at (303) 866-3514 or email Rick at rick.brown@state.co.us.

Generally, the applicant is also the prospective owner and sponsor of the proposed water activity. If this is not the case, contact the Rick Brown before completing this application.

Water Supply Reserve Account – Grant Application Form

Form Revised October 2006

Part A. - Description of the Applicant (Project Sponsor or Owner);

1. Applicant Name(s): El Paso County Water Authority

Mailing address: P.O. Box 1976
Colorado Springs, CO 80901
Attn: Gary Barber, Project Manager

Taxpayer ID#: 84-1428849 Email address: barbergl@aol.com

Phone Numbers: Business: 719-598-0230

Home: 719-282-9888

Fax: 719-598-

2. Person to contact regarding this application if different from above:

Name: Gary Barber

Position/Title Project Manager

3. Provide a brief description of your organization below: Refer to Part 2 of criteria and guidance for required Information. Attach additional sheet(s) as needed.

The El Paso County Water Authority, is organized under an Establishing Contract as a water authority, a body corporate and politic, a separate governmental entity, a political subdivision and a public corporation of the State of Colorado, pursuant to Section 18(2)(a) and 2(b) of Article XIV, Constitution of the State of Colorado, and to § 29-1-204.2, Colorado Revised Statutes approved on or about November 4, 1996. The document is recorded at Reception No. 097075620 of the records of the El Paso County Clerk and Recorder's Office.

The Authority currently has seventeen members, including metropolitan districts, water and sanitation districts, towns and cities within El Paso County. The Authority meets the first Wednesday of each month in the Board of County Commissioners Hearing Room, 3rd Floor, El Paso County Administration Building, 27 East Vermijo, Colorado Springs, Colorado. The monthly meetings are open to the public and carried over the internet by the El Paso County Information Technology Department.

Since its inception, the Authority has completed a Water Report Master Plan and engaged a manager and lobbyist. The members focus on regional approaches to local water supply issues. Current activities include facilitation of a Transit Loss Model Update for Fountain and Monument Creek to increase water use efficiency. In cooperation with the Upper Black Squirrel Management District, the Authority hopes to begin a study with the Colorado Geological Survey to investigate alluvial aquifer storage and recovery in the Upper Black Squirrel Designated Groundwater Basin.

Part B. - Description of the Water Activity – Please Refer to Criteria and Guidance Document for Eligibly Criteria

1. Name of water activity/project:

UPPER BLACK SQUIRREL AQUIFER RECHARGE STUDY AND DEMONSTRATION PROJECT

2. What is the purpose of this grant application? Check one.

- [ ] Environmental compliance and feasibility study
- [ ] Technical assistance regarding permitting, feasibility studies, and environmental compliance
- [X] Studies or analysis of structural, nonstructural, consumptive, nonconsumptive water needs, projects, or activities (Please specify)
- [X] Structural and/or nonstructural water project or activity

3. Please provide an overview of water project or activity to be funded including – type of activity, statement of what the activity is intended to accomplish, the need for the activity, the problems and opportunities to be addressed, expectations of the participants, why the activity is important, the service area or geographic location, and any relevant issues etc. Please include any relevant Tabor issues. Please refer to Part 2 of criteria and guidance document for additional detail on information to include. Attach additional sheets as needed.

The alluvium of Black Squirrel Creek in central El Paso County is within the Upper Black Squirrel Creek Designated Groundwater Basin.

Colorado Water Resources Circular #32, published by the Colorado Water Conservation Board, provides an overview of water resources in El Paso County (1976). The Circular documents 400,000 acre-feet of water in storage in the Black Squirrel alluvial aquifer in 1964 declining to 350,000 acre-feet by 1974, a loss of 50,000 acre-feet. That trend has continued to the present, perhaps affording an opportunity to recharge that portion of the alluvium that once stored water. Once placed back in the aquifer, the water is no longer subject to loss by evaporation, as is the case in surface storage facilities. Cherokee Metropolitan District is well along in its effort to investigate recharging treated effluent into the Black Squirrel alluvial aquifer. Pilot studies indicate the concept is feasible, recharge rates are good and water quality may actual improve.

The EPCWA applied for a Severance Tax Grant in the 2006-7 application period and was told $40,000 would be available, subject to General Assembly approval, in July 2007. Individual project cooperators have pledged an additional $70,000.00. Colorado Geologic Survey, as the study investigator, has expanded the scope of work to include a pilot recharge project based on initial study results and analysis. Existing municipal supply systems could access recharged water, representing a substantial cost savings over new construction. Agricultural interests could be restored, enhanced and/or sustained by thoughtful management of the recharge and recovery administration.

This funding request suggests that a cooperative, regional approach to recharge of the Black Squirrel could benefit many parties. Rather than allow return flow to travel downstream to the Arkansas River, store the effluent in the alluvial aquifer at approximately the same elevation. If other sources of water can be identified, in wet years when irrigation demand is reduced, perhaps more water can be recharged and captured in storage. In a drought condition, the aquifer can be pumped to supplement supplies. This form of water banking has proven successful in many parts of the arid West.

4. Please provide a brief narrative of any related or relevant previous studies. Attach additional sheets as needed.

Attached is the December, 2005 Severance Tax Trust Fund Operational Account 2006-7 Grant Application. This application includes a write-up of historic research and includes graphs from the Upper Black Squirrel Designated Groundwater Management Districts well monitoring program.

5. Please provide a copy of the proposed scope of work. Please refer to Part 2 of the criteria and guidance document for detailed requirements. Attach additional sheets as needed.

See attached Scope of Work by Colorado Geologic Survey dated November 27, 2006.

6. List the names and addresses of any technical or legal consultants retained to represent the applicant or to conduct investigations for the water activity/project.

Name	Address/Phone Number
Ralph Topper, CPG Project Manager	Colorado Geological Survey Department of Natural Resources 1313 Sherman Street, Room 715 Denver, CO 80203 303-866-2611

7. Water Availability and Sustainability – this information is needed to assess the viability and effectiveness of the water project or activity. Please provide a description of each water supply source to be utilized for, or the water body to be affected by, the water activity. For water supply sources being utilized, describe its location, yield, extent of development, and water right status. For water bodies being affected, describe its location, extent of development, and the expected effect of the water activity on the water body, in either case, the analysis should take into consideration a reasonable range of hydrologic variation. Attach additional sheets as needed.

The initial study will provide the basis for pilot recharge project located with in the Upper Black Squirrel Designated Groundwater Basin. One element of investigation is the overlying land ownership. It is of interest to note the substantial State Land Board land holdings in the basin (see map attached).

Source water initially is likely to be Denver Basin aquifer return flows. The goal is to validate the potential for significant non-evaporative storage (the 1976 CWCG/USGS study documents 50,000 af of draft) to justify infrastructure development to deliver rotating fallowed agricultural water as a source.

8. If you have not specifically and fully addressed the Evaluation Criteria found in Part 3 of the criteria and guidance document please provide additional detail here. Attach additional sheet(s) if needed.

See attached Evalution Criteria statement

9. Additional Information – If you feel you would like to add any additional pertinent information please feel free to do so here. Attach additional sheets as needed.

Here is a matrix of current funding participants:

Entity Name	EPCWA(CWCB Grant)	Upper Black Squirrel M.D.	Cherokee	Sunset	Meridian Ranch	Woodmen Hills	Colo. Sprgs Utilities	Dev. Advsry. Bd.	SB 179 Funding	Total
2007	$40,000	$10,000	$10,000	$5,000	$5,000	$5,000	$5,000	$5,000	$70,000	$155,000
2008 (1)	$0	$5,000	$5,000	$5,000	$0	$0	$5,000	$5,000	$0	$25,000
Total:	$40,000	$15,000	$15,000	$10,000	$5,000	$5,000	$10,000	$10,000	$70,000	$180,000

Sponsor a Policy Conference on Groundwater Recharge and Recovery $20,000

TOTAL: $200,000

Notes:

(1) Costs for 2008 are estimates only and subject to annual budget approval.

(2) Current cost estimate for Scope of Work by Colorado Geologic Survey approximately $178,000

The above statements are true to the best of my knowledge:

Signature of Applicant: signed: G.L. Barber

Print Applicant's Name: Gary Barber

Project Title: Upper Black Squirrel Aquifer Recharge Study and Demonstration Project

Return this application to:

Mr. Rick Brown
Intrastate Water Management and Development Section
COLORADO WATER CONSERVATION BOARD
1580 Logan Street, Suite 600
Denver, CO 80203

To submit applications by Email, send to: rick.brown@state.co.us

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Reference Information

The following information is available via the internet. The reference information provides additional detail and background information regarding these criteria and guidelines and water policy issues affecting our state.

Colorado Water Conservation Board Policies

Loan and Grant policies and information are available at - http://cwcb.state.co.us/Finance/

Water Supply Reserve Account Criteria and Guidelines –
http://cwcb.state.co.us/IWMD/tools.htm#Water_Supply_Reserve_Account

Interbasin Compact Committee and Basin Roundtables

Interbasin Compact Committee By-laws and Charter –
http://dnr.state.co.us/Home/ColoradoWaterforthe21stCentury/Interbasin+Compact+Committee/IbccHomePage.htm

Basin Roundtable By-laws –
http://dnr.state.co.us/Home/ColoradoWaterforthe21stCentury/IbccHome.htm

Legislation

House Bill 05-1177 - Also known as the Water for the 21st Century Act –
http://cwcb.state.co.us/IWMD/statutes.htm

House Bill 06-1400 – Adopted the Interbasin Compact Committee Charter –
http://cwcb.state.co.us/IWMD/statutes.htm

Senate Bill 06-179 – Created the Water Supply Reserve Account –
http://cwcb.state.co.us/IWMD/statutes.htm

Statewide Water Supply Initiative

General Information - http://cwcb.state.co.us/IWMD/

Phase 1 Report - http://cwcb.state.co.us/IWMD/PhaseIReport.htm

Map of the Upper Black Squirrel Creek basin

R66W R65W R64W R63W R62W R61W

T11S T12S T13S T14S T15S T16S T17S T18S T19S

Upper Black Squirrel Creek drainage

Denver Basin boundary

Calhan

Judge Orr Rd

Colorado Springs

Ellicott

Ellicott Hwy

Black Squirrel Creek

Fountain Creek

Chico Creek

El Paso County

Pueblo County

24 94 25

Legend

- Upper Black Squirrel Creek designated basin boundary
- Quaternary alluvium
- Municipality

Land Owner

- Private
- State of Colorado
- US Dept. of Defense
- US BLM
- US Forest Service

N

Miles

0 1 2 4 6

EL PASO COUNTY WATER AUTHORITY

El Paso County Planning Department, 27 E. Vermijo, Colorado Springs, CO 80903, (719) 520-6300

January 28, 2006

Via Ordinary Mail and Electronic Mail

COLORADO WATER CONSERVATION BOARD
Attn: Mr. S.S. Biondo, CCO
1313 Sherman Street, Room 721
Denver, CO 80203

Re: Severance Tax Trust Fund Grant Application, FY 2007

Dear Mr. Biondo

Enclosed please find a Grant Application entitled *Black Squirrel Aquifer Recharge Investigation* on behalf of the El Paso County Water Authority. I am available at your convenience in person or by telephone to respond to any questions you may have concerning this application. Thank you for your consideration of this request.

Sincerely,

Gary Barber
Manager

cc: Directors, EPCWA
Mr. Ralf Topper, CGS
Ms. Kathy Hare, Upper Black Squirrel Groundwater Management District
Mr. Kip Petersen, Cherokee Metropolitan District
Mr. Pete Susemihl
Mr. Steve Miller, CWCB

DEPARTMENT OF NATURAL RESOURCES

COLORADO WATER CONSERVATION BOARD

SEVERANCE TAX TRUST FUND OPERATIONAL ACCOUNT
2006-2007 GRANT APPLICATION

Upper Black Squirrel Aquifer Recharge Investigation

(Project Name)

The CWCB Severance Tax Trust Fund Operational Account exists primarily to provide grants for regional water resources planning studies and associated demonstration projects, within mineral impacted areas of the State. Grants are approved when the study or demonstration project benefits a wide range of people and organizations, and/or a large geographical area.

* Application Deadline = January 31, 2006 for Funds Available July 1, 2007.

* Funding recommendations will be considered at the March 2006 CWCB Board Meeting.

Instructions: This application form should be emailed, typed, or printed neatly. You may attach additional sheets as necessary to fully answer any question, or to provide additional information that you feel would be helpful in evaluating this application. If you have difficulty with any part of the application, please contact the Colorado Water Conservation Board's Steve Biondo for assistance at (303) 866-3495 or email Steve at steve.biondo@state.co.us.

Part A. - Description of the Applicant (Project Sponsor or Owner):

1a. Applicant Name(s): El Paso County Water Authority

Mailing address: P.O. Box 1976
Colorado Springs, CO 80901
Attn: Gary Barber, Project Manager

Taxpayer ID#: 84-1428849 Email address: Barbergl@aol.com

Phone Numbers: Business: 719-598-0230

Home: 719-282-9888

Fax: 719-598-0260

2a. Person to contact regarding this application if different from above:

Name: same

Position/Title:

Mailing Address:
Business #:
Home #:

3a. Please provide a brief description of your organization below:
(Attach separate sheets and a map, if needed)

A WATER AUTHORITY UNDER 29-1-204 C.R.S. THAT INCLUDES: DONALA WATER & SANITATION DISTRICT; CHEROKEE METROPOLITAN DISTRICT; COLORADO CENTRE METROPOLITAN DISTRICT; EL PASO COUNTY; FOREST LAKES METROPOLITAN DISTRICT; PAINT BRUSH HILLS METROPOLITAN DISTRICT; SECURITY WATER & SANITATION DISTRICT; CITY OF FOUNTAIN; SUNSET METROPOLITAN DISTRICT; STRATMOOR HILLS WATER & SAN. DISTRICT; TRIVIEW METROPOLITAN DISTRICT; TOWN OF MONUMENT WOODMEN HILLS METROPOLITAN DISTRICT ; WOODMOOR WATER & SANITATION DISTRICT; WIDEFIELD WATER & SANITATION DISTRICT, AND THE TOWN OF PALMER LAKE.

Part B. - Description of the Study or Demonstration Project

1b. Name of the study or project: Upper Black Squirrel Aquifer Recharge Investigation

2b. What is the purpose of this grant application? Check one.

X	Study
	Demonstration project.
	Other (Please describe)

3b. General location of the study or demonstration project. (Please include county, and approximate distance and direction from the nearest town):

The Upper Black Squirrel Aquifer lies in Central El Paso County on the Eastern edge of Colorado Springs. The designated basin includes all or portions of Townships 11-15 South, Range 61-65 West. The basin is under the authority of the Upper Black Squirrel Groundwater Management District.

4b. Please provide a brief narrative description of the proposed study or demonstration project including purpose, need, and service area. (Attach scope of study, if available)

As described in the attached white paper, the Upper Black Squirrel is an alluvial aquifer that has experienced depletion over the last several decades. Along with irrigated agriculture, the basin provides municipal water supply for El Paso County water purveyors on the eastern edge of Colorado Springs. The Pikes Peak Region is naturally constrained to the West, forcing employment and housing eastward. This growth pattern is increasing demand on the resources of the Black Squirrel. Schreiver Air Base, the site of important Homeland Security facilities, is entirely located within the designated basin. Schriever's water and sewer provider, Cherokee Metropolitan District, has explored a limited recharge effort at the basin's southern boundary.

The grant would fund an investigation of recharge capacity for the entire basin, looking at recharge rates, non-evaporative storage capacity (possibly 100,000 acre-feet +) and water quality impacts. Beneficiaries include agricultural uses, existing and future municipal supply and individual well users.

5b. Please indicate which program your project will benefit most AND describe its relationship to local water planning and to the MEGA Board- energy and mineral development:

x	Water Supply Protection Program
x	Water Supply Planning and Finance Program
	Stream and Lake Protection Program
	Conservation and Drought Planning Program
	Flood Protection Program
	Water Information Program
	Other (Please describe):

Relationship Description:

Storage of water in the Black Squirrel alluvial aquifer could increase efficient use of non-renewable resources from the Denver Basin aquifers and enhance reliability and sustainability of groundwater supplies.

6b. Please list the names and address of technical or legal consultants retained to represent the applicant or to conduct investigations for the proposed study/demonstration project:

Name **Address and Phone**

Ralf Topper, Colorado Geological Survey, 1313 Sherman St., Denver, CO 80203

303-866-2029

7b. List any feasibility study or scope of study that has been completed, or is in progress, for the proposed study/demonstration project. (please submit one copy with this application):

Scope of Work to be developed in cooperation with Colorado Geological Survey, Upper Black Squirrel Groundwater Management District, Cherokee Metropolitan District, Sunset Metropolitan District, Pikes Peak Council of Government with input from the Natural Resource Conservation Service.

8b. What is the estimated cost of the study/demonstration project? Please include estimated Study, Planning, Engineering, and Construction costs, if known:

Estimated Planning/Study Costs:	$ 100,000.00
Estimated Engineering Costs:	$
Estimated Construction Costs:	$
Estimated Total Costs:	$ 100,000.00

9b. How much funding are you requesting? $ 50,000.00

Where will the rest of the funding come from?

El Paso County Water Authority	$	50,000.00
	$	
	$	

Part C. Project Sponsor Financial Information

1c. Please provide a brief narrative description of potential sources of funding (in addition to the CWCB) which have been explored for the proposed study or demonstration project. (Examples would be Local County and Town Governments, Water Conservancy Districts, USDA Rural Development, The Natural Resources Conservation Service, The U.S. Environmental Protection Agency, Commercial Banks, etc.)

The El Paso County Water Authority would facilitate the investigation. We expect to fund the matching dollars from member & non-member agencies who would potentially benefit from future projects, including: Cherokee Metropolitan Dist., Sunset Metropolitan Dist., Woodmen Hills Metropolitan Dist., Paint Brush Hills Metropolitan Dist. and Meridian Metropolitan Dist, Colorado Springs Utilities, the Pikes Peak Council of Governments, the Natural Resources Conservation Service and the Upper Black Squirrel Groundwater Management Dist.

The above statements are true to the best of my knowledge:

Signature of Applicant:

Print Applicant's name: Garald L. Barber

Title: Manager, El Paso County Water Authority

Date: January 28, 2006

Please return this application to:

COLORADO WATER CONSERVATION BOARD

Attn: Mr. S. S. Biondo, CCO

1313 Sherman Street, Room 721

Denver, CO 80203

To submit applications by Email send to: steve.biondo@state.co.us

To submit applications by Fax send to (303) 894-2578

For questions, call Telephone No. (303) 866-3495

Upper Black Squirrel Aquifer Recharge

Introduction

As the 21st Century begins, El Paso County stands on the threshold of becoming the most populous county in Colorado. The Statewide Water Supply Initiative (SWASI), commissioned by the Colorado General Assembly to help the State understand the water supply needs of the future, projects El Paso County population in 2030 at over 800,000 persons[1]. The demand for water in the Arkansas Basin will grow by 98,000 acre-feet, but nearly 80% of the requirement will be satisfied by the Southern Delivery System (SDS) and Preferred Storage Option Plan (PSOP) projects[2]. Yet the report also projects our local shortfall of water supply availability in that same year will be 8,000 acre-feet, primarily in the urbanized portions of the unincorporated County[3]. Further, the report notes that the current source of supply, the aquifers of the Denver Basin, are themselves non-renewing. Therefore the shortfall of water supply will likely be substantially greater.

The dilemma for the Front Range of Colorado derived from dependence on groundwater was a major finding of SWASI: "*5. Increased Reliance on Nonrenewable, Non-tributary Groundwater for Permanent Water Supply Brings Serious Reliability and Sustainability Concerns in Some Areas, Particularly Along the Front Range.*" While SWASI did not include the alluvial aquifers on the Eastern Plains of Colorado, a similar statement could apply to the Black Squirrel Creek Designated Groundwater Basin. As a source of agricultural, domestic and municipal water supply, the drought of 2002 raised the same reliability and sustainability questions. Perhaps a simple solution might be to recharge the Black Squirrel aquifer as a site for non-evaporative water storage.

Alluvial aquifer storage and recovery are established practices in other Western States. Locally, the water supply districts in El Paso County have banded together as a Water Authority to begin to address the water supply solutions collectively by emphasizing Efficient Use and Sustainable Supply.

Assumptions

1. Efficient Use includes conservation of existing supplies along with cooperation between agencies. All El Paso County water providers implement block rate pricing plans to provide an economic incentive for conservation. Cooperation is most effective when municipal infrastructure can be interconnected.

2. Sustainable Supply means extending the life of groundwater aquifers by fully consuming water that is pumped along with identifying alternative sources of water to offset or reduce dependence on the non-tributary aquifers. The El Paso County Water Authority is facilitating an update and expansion of the U.S. Geological Survey's Transit Loss Model for Fountain and Monument Creeks. When completed in 2007, this Model will allow agencies to demonstrate dominion and control over return flow allowing reuse to extinction or exchange of

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[1] CWCB, Statewide Water Supply Initiative Report, CDM, November, 2004, Appendix A, p.4.

[2] Ibid, p. 6-10, 6-13.

[3] Ibid, p. 6-18.

non-native waters in the streams.

3. Recharge of a groundwater aquifer can have a broad impact on regional water resources, both in quantity and quality.

Concept: Store treated effluent in the Black Squirrel Creek Designated Ground Water Basin. Recharge treated effluent or other source water into the alluvium of upper Black Squirrel Creek.

Discussion

The alluvium of Black Squirrel Creek in central El Paso County is within the Upper black Squirrel Creek Designated Groundwater Basin and as such is administered by the Management District.

Colorado Water Resources Circular #32, published by the Colorado Water Conservation Board, provides an overview of water resources in El Paso County. The Circular documents 400,000 acre-feet of water in storage in the Black Squirrel alluvial aquifer in 1964 declining to 350,000 acre-feet by 1974[4], a loss of 50,000 acre-feet. That trend has continued to the present, perhaps affording an opportunity to recharge that portion of the alluvium that once stored water. Once placed back in the aquifer, the water is no longer subject to loss by evaporation, as is the case in surface storage facilities.

Cherokee Metropolitan District is well along in its effort to investigate recharging treated effluent into the lower Black Squirrel alluvial aquifer. Pilot studies indicate the concept is feasible, recharge rates are good and water quality may actual improve. Sources of water for recharge are limited, however, to wastewater return flow from non-tributary aquifers of the Denver Basin. If other water districts and utilities are involved there might be an opportunity to use wastewater return flows from transbasin diversions. Is there potential for greater recharge and storage?

This alternative suggests that a cooperative, regional approach to recharge of the Black Squirrel could benefit many parties. Rather than allow return flow to travel downstream to the Arkansas River, store the effluent in the alluvial aquifer at approximately the same elevation. If other sources of water can be identified, in wet years when irrigation demand is reduced, perhaps more water can be recharged and captured in storage. In a drought condition, the aquifer can be pumped to supplement supplies. This form of water banking has proven successful in many parts of the arid West.

Next Steps

1. El Paso County Water Authority will apply for a CWCB Severance Tax Grant (FY 2007) to support a pre-feasibility study by the Colorado Geological Survey of the Upper Black Squirrel alluvial aquifer. The study will review prior investigations, collect current aquifer data, conduct field investigations and incorporate the data into new interpretations of the area's hydrogeology for the purpose of determining storage rate, capacity and water quality impacts.
2. EPCWA will facilitate a dialogue among interested parties to provide matching funds for the grant and project coordination during the study period.

Direct comments to: Gary Barber, El Paso County Water Authority, (719) 598-0230

[4] CWCB, Water Resources of El Paso County, Livingston, Klein & Bingham, USGS, 1976, p. 62.

Appx Location Cherokee N. Wells 1-8 w/o 2

Monitoring Wells BS-6 BS-7

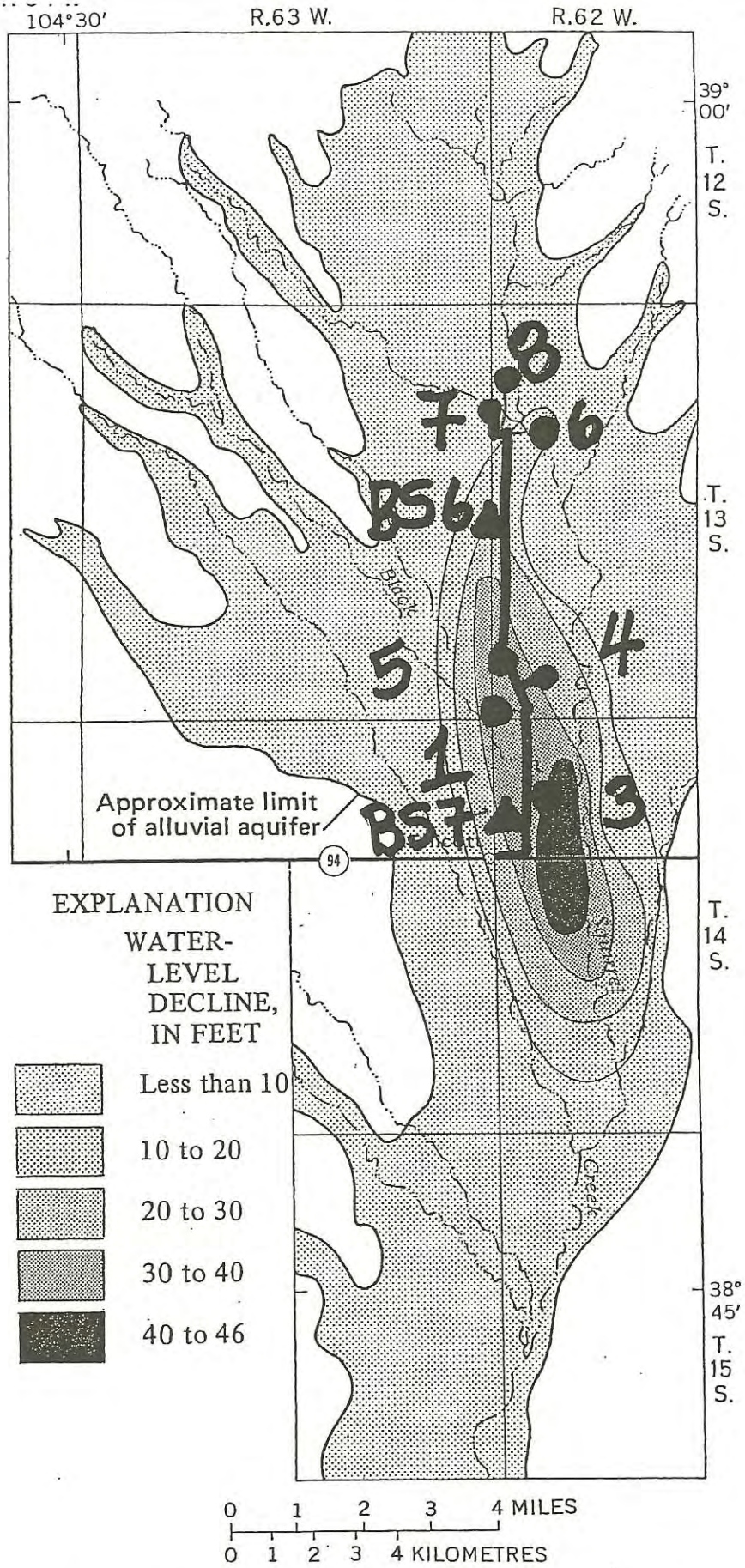
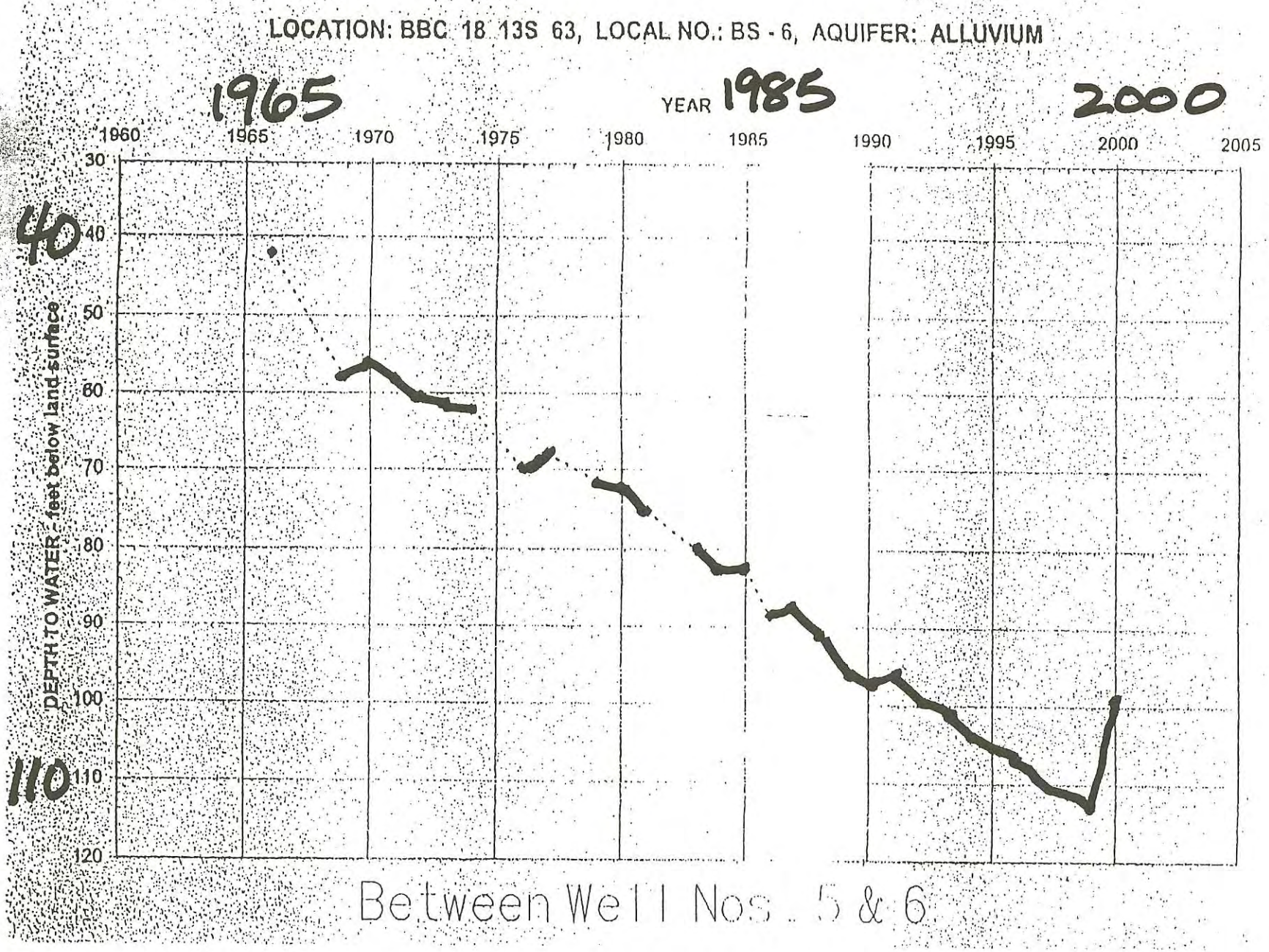
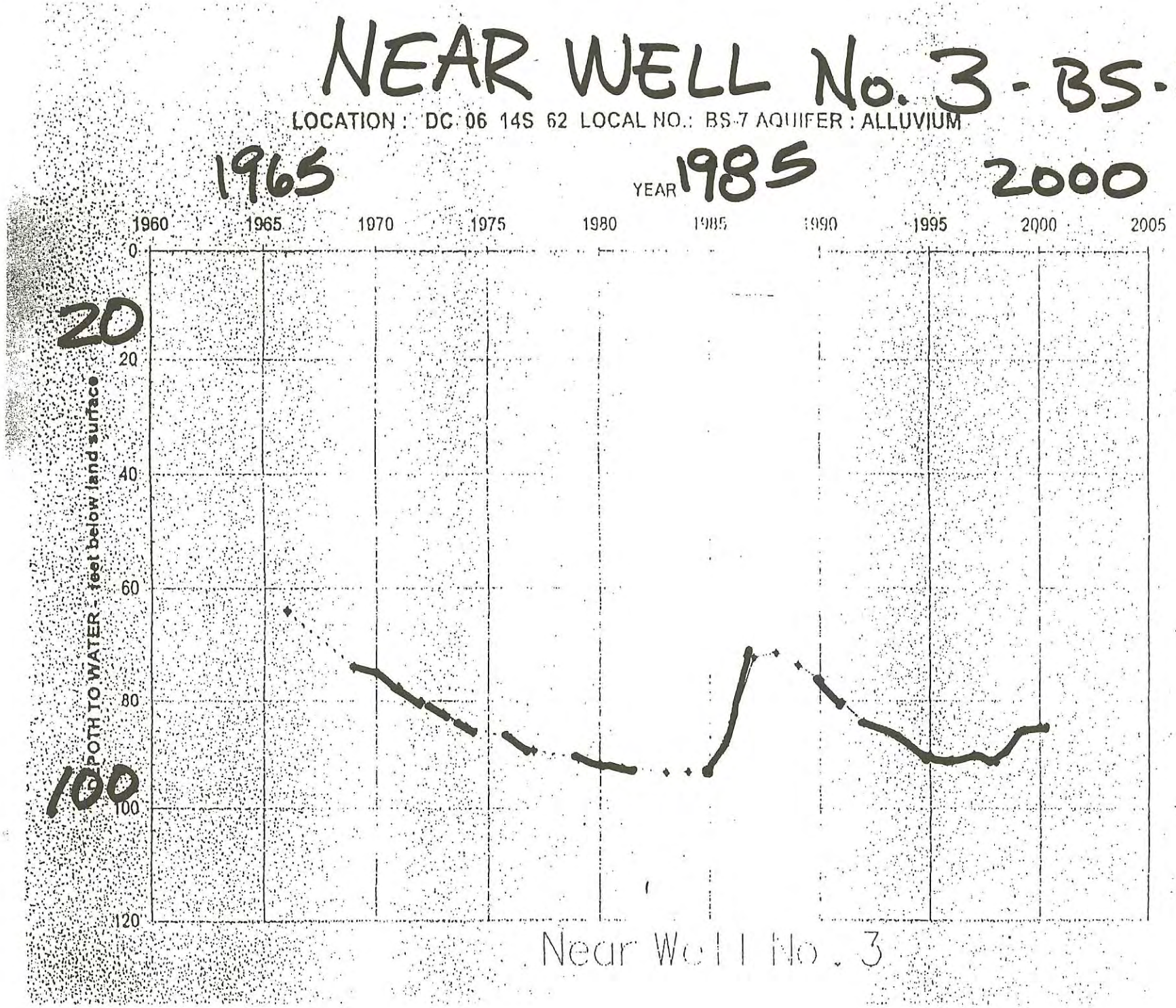


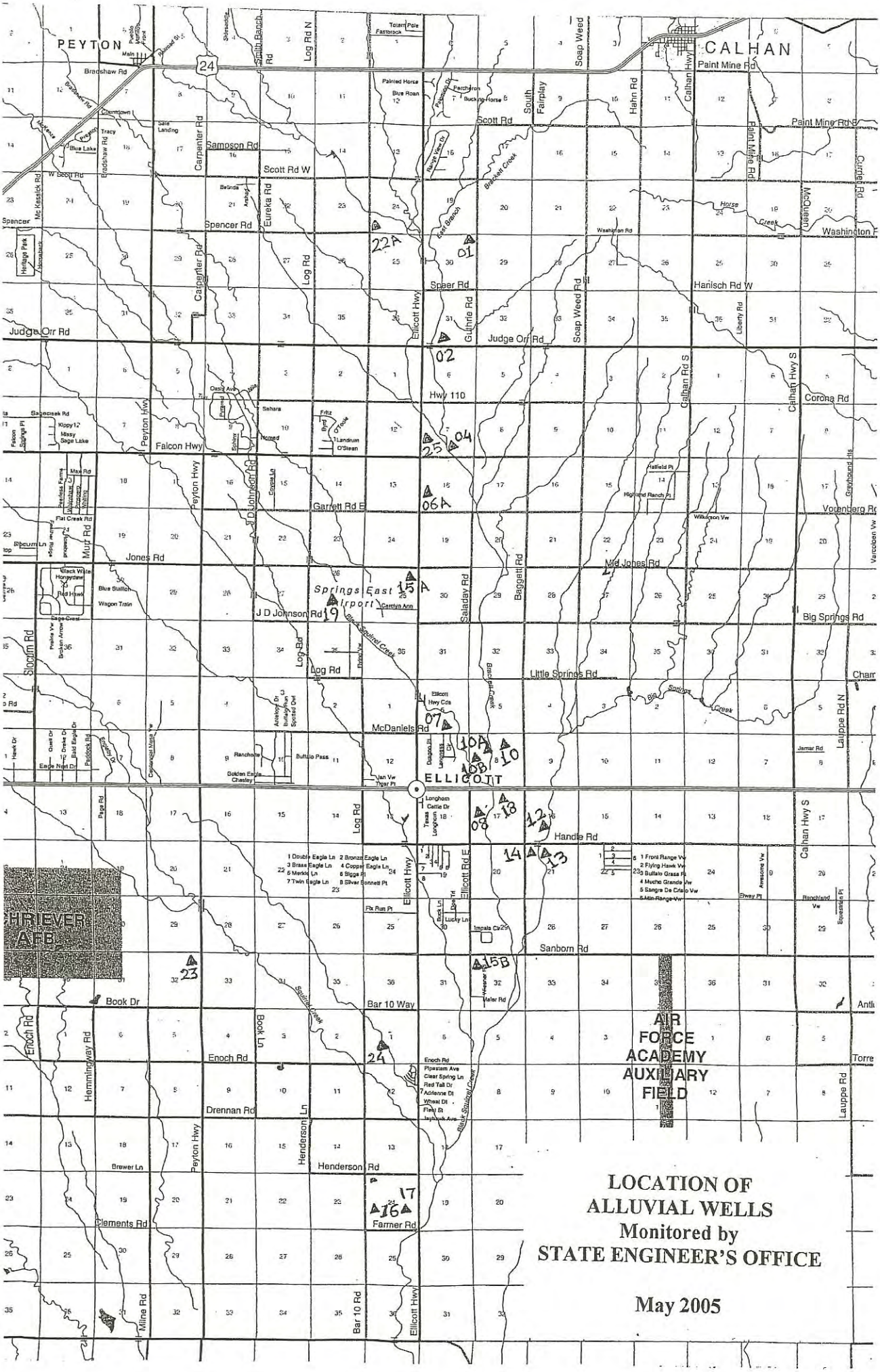
Figure 35. — Water-level decline in the alluvial aquifer, spring 1964 to spring 1974, upper Black Squirrel Creek basin.

BETWEEN Well Nos 5+6 - BS-6



NEAR WELL No. 3 - BS-7





LOCATION OF ALLUVIAL WELLS Monitored by STATE ENGINEER'S OFFICE

May 2005

Well Name: BS-07
Permit #: 17425 - F - Location #: SC01406206CD USGS Site ID:

Division: 2 Water District: County: EL PASO
Location: Q160 Q40 Q10 Section Twnshp Range PM Distance from section lines:
SE SW 6 14 S 62 W S From N/S line: From E/W line:
UTM Coordinates (NAD83): Northing (UTM y): 4300725.7 Easting (UTM x): 553621.5 GPS
Latitude/Longitude (decimal degrees): 38.853723 -104.382028

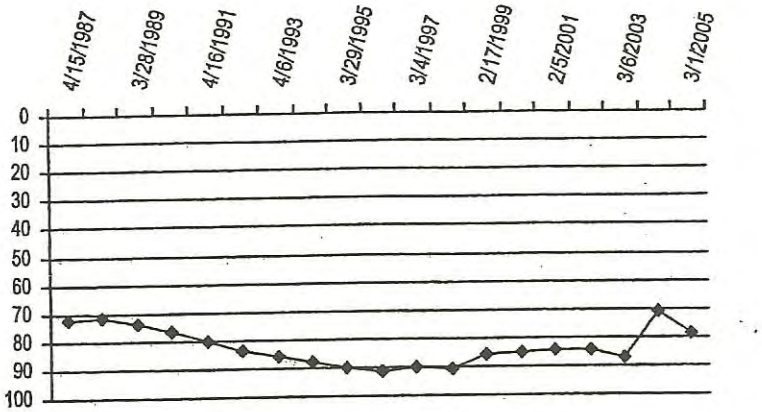
Surface Elevation (ft): 6060
Well depth (ft): 110
Aquifer(s): QUATERNARY ALLUVIUM

Water Level Change
1 year: -7.73
5 year: 6.09
10 year: 11.51

Measurements from last 10 years

Date	Depth to WL (ft)	Elev of WL (ft)	Change (ft)
3/29/1995	90.25	5969.75	-2.20
3/21/1996	91.18	5968.82	-0.93
3/4/1997	90.25	5969.75	0.93
2/27/1998	90.88	5969.12	-0.63
2/17/1999	85.95	5974.05	4.93
2/1/2000	84.83	5975.17	1.12
2/5/2001	84.55	5975.45	0.28
2/26/2002	84.35	5975.65	0.20
3/6/2003	86.95	5973.05	-2.60
2/19/2004	71.01	5988.99	15.94
3/1/2005	78.74	5981.26	-7.73

All Historic Measurements



Well Name: BS-06A
Permit #: 11031 - FP - Location #: SC01306218CB USGS Site ID:

Division: 2 Water District: County: EL PASO
Location: Q160 Q40 Q10 Section Twnshp Range PM Distance from section lines:
S NW 18 13 S 62 W S From N/S line: From E/W line:
UTM Coordinates (NAD83): Northing (UTM y): 4307440.7 Easting (UTM x): 553454.5 GPS
Latitude/Longitude (decimal degrees): 38.914242 -104.383430

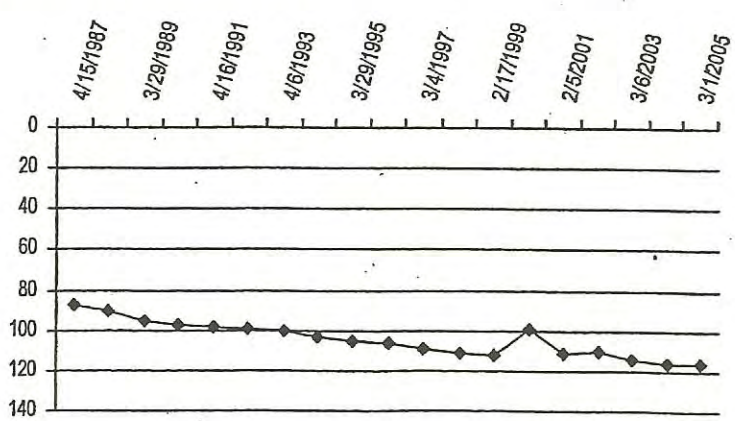
Surface Elevation (ft): 6250
Well depth (ft): 187
Aquifer(s): QUATERNARY ALLUVIUM

Water Level Change
1 year: 0.36
5 year: -17.06
10 year: -10.89

Measurements from last 10 years

Date	Depth to WL (ft)	Elev of WL (ft)	Change (ft)
3/29/1995	105.37	6144.63	-2.12
3/21/1996	106.60	6143.40	-1.23
3/4/1997	109.70	6140.30	-3.10
2/27/1998	111.20	6138.80	-1.50
2/17/1999	112.45	6137.55	-1.25
2/1/2000	99.20	6150.80	13.25
2/5/2001	111.60	6138.40	-12.40
2/26/2002	110.42	6139.58	1.18
3/6/2003	114.20	6135.80	-3.78
2/19/2004	116.62	6133.38	-2.42
3/1/2005	116.26	6133.74	0.36

All Historic Measurements



STATE OF COLORADO

COLORADO GEOLOGICAL SURVEY

Department of Natural Resources
1313 Sherman Street, Room 715
Denver, CO 80203
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November 27, 2006

Upper Black Squirrel Creek Basin
- Aquifer Recharge and Storage Evaluation

Objective:

The objective of this project is to evaluate and refine the existing knowledge of the hydrogeology of the alluvial aquifer system in the Upper Black Squirrel Creek Basin for the purposes of assessing the potential for aquifer recharge and storage implementation. Geographic, geologic, hydrologic and water quality data will be collected and analyzed to evaluate the recharge potential, storage capacity, and water quality impacts in the study area. A phase 2 scope of work is proposed to tune into a select site or sub-basin for potential pilot project implementation.

Discussion:

In January 2006 the El Paso County Water Authority submitted a grant application to the Severance Tax Trust Fund Operational Account administered by the Colorado Water Conservation Board. That grant application requested funding in the amount of $50,000 to be used towards funding an investigation of recharge capacity and potential in the Upper Black Squirrel Creek Basin in conjunction with matching funds provided by El Paso County Water Authority. In addition, Water Authority representatives plan to apply for additional funds from the Water Supply Reserve Account established under Senate Bill 06-179 through their local Basin Roundtable. The Colorado Geological Survey was identified as the contractor to perform the study.

A draft scope of work to study and evaluate the aquifer recharge and storage potential of the Upper Black Squirrel Creek Basin was submitted to the Authority, via Mr. Gary Barber, on September 7, 2006. In a subsequent meeting on November 14, 2006, Authority members proposed adding a Phase 2 component to the scope of work to accommodate site-specific data collection for potential pilot project implementation. Authority members also recommended increasing the reporting and project management tasks identified in the initial proposal for the purpose of accommodating additional time for meetings and presentations and a larger distribution for the Final Report. As a result of this meeting, the original draft proposal has been modified and a Phase 2 component added. This final proposal does not address policy issues, legal ramifications, or management within a designated basin.

Background:
The alluvium of Black Squirrel Creek and its tributaries in central El Paso County are within the Upper Black Squirrel Creek Designated Ground-Water Basin, and as such administered by that Management District. Colorado Water Resources Circular #32, published by the Colorado Water Conservation Board (1976), provides an overview of water resources in El Paso County. The Circular documents 400,000 acre-feet of water in storage in the Black Squirrel alluvial aquifer in 1964 declining to 350,000 acre-feet by 1974, a loss of 50,000 acre-feet. That trend has continued to the present, perhaps affording an opportunity to recharge that portion of the alluvium that once stored water.

The alluvium within the Upper Black Squirrel Creek Basin was identified as a favorable recharge site in a mid-1970's U.S. Geological Survey study (1977). Cherokee Metropolitan District is well along in its effort to investigate recharging treated effluent into the lower Black Squirrel alluvial aquifer. Pilot studies (Southern Well Field Replacement Water Infiltration Basin) indicate the concept is feasible, recharge rates are good and water quality may actually improve. However, sources of water for recharge are mostly limited to wastewater return flow from non-tributary aquifers of the Denver Basin. If other water districts/utilities are involved there is the potential to use wastewater return flows from other exhaustible sources, such as transbasin diversions, for recharge. Storage of water in the Black Squirrel Creek alluvial aquifer could foster more efficient use of non-renewable resources from the Denver Basin aquifers and enhance reliability and sustainability of ground water supplies. In addition, water storage in this aquifer can serve as a sub-regional water supply management tool. Beneficiaries include agricultural users, existing and future municipal supplies, and individual well users.

Approach:
Anticipated activities are described below and consist of historical data collection, field work to acquire new data, technical analyses, mapping, assessment of evaluation criteria, and reporting. This information and data will be formatted and entered into a geodatabase to accommodate analysis and display in Geographic Information System (GIS) compatible software. An anticipated timeline and associated costs are listed in Table 1. The initial phase of work is anticipated to commence in April 2007 and be complete by June 2008. If additional funding is acquired, a Phase 2 component will commence in July 2008 and be completed by December 2008. The location of the initial study area coincides with the designated basin and is shown on the attached map.

Task 1 - Historical Data Compilation and Site Characterization

- Conduct Literature Review
  An initial step will be to obtain and review existing literature and data that will be used to better characterize the aquifer configuration, hydrologic properties, and water level data. This will include studies from federal agencies, state agencies, universities, consultants, and local water management districts. Information provided by the members of the Water Authority will also be key resources.

- Involve Local Experts
  Local experts will be identified and interviewed to obtain additional background information and insight into the areas of geology, hydrology, local land use issues, utility infrastructure, previous recharge studies and pilot operations. It is anticipated that local knowledge will provide valuable information for potential recharge sites, local water rights/use issues, land ownership, existing infrastructure, water supply options, environmental issues, and technical and regulatory impediments to implementation of artificial recharge projects.

- Obtain Water Well Records from the Office of the State Engineer
  The well permit files and records managed by the Office of the State Engineer/Division of Water Resources will be obtained in digital form to conduct analysis and mapping of number of active water supply wells, decreed amounts of withdrawal, and types of water use for wells completed within the alluvial aquifer.

- Characterize the Alluvial Aquifer
  Using the information compiled from literature, data sources, and local experts, technical analyses will be undertaken to identify:

  - Configuration of the alluvial aquifer (aerial extent and depth)
  - Spatial relationship with underlying Denver Basin bedrock aquifers
  - Historic and current water levels, water level trends
  - Spatial distribution of aquifer property data
  - Estimate of amount of water in storage
  - Estimate of amount of available storage capacity
  - Annual amount of natural recharge
  - Annual amount of ground water withdrawal
  - Ground water flow pathways

- Characterize the Land Use and Ownership
  Using information compiled from the Department of Local Affairs, El Paso County, study participants and local experts, the current land use designations and land ownership categories will be compiled and mapped as a GIS layer.

- Identify the Existing Water Delivery Infrastructure
  The existing water delivery infrastructure will be compiled and mapped as a GIS layer using information from applicable state agencies, El Paso County, water districts, study participants, and local experts.

Spatial characterization of the aquifer, land use/ownership, water use, and infrastructure will be addressed by the following tasks:

- Determine a database structure for data entry, formatting, and display in GIS-compatible format.
- Obtain existing electronic databases, GIS shapefiles, maps, tables, and figures.

- Digitize pertinent analog maps for incorporation into GIS project files.
- Prepare digital contour and/or point plot maps to portray characteristics of interest, incorporating historic and newly acquired data.

It should be noted that the availability of specific sources of water will not be investigated as part of this study, but if this type of information becomes available during the course of this study it will be presented.

Task 2 – Field Data Collection

A field study workplan will be developed to fill some of the data gaps identified in Task 1. The fieldwork will consist of drilling and constructing observation wells, geological and geophysical logging, sediment sample collection, conducting aquifer pump tests, and monitoring seasonal water levels. It is anticipated that existing wells would be accessible for conducting aquifer pump tests and monitoring water levels.

- Installing New Wells
  CGS will develop a data collection program to include installation of new monitoring wells taking into consideration site access, well drilling, well construction and surface completion, soil and water sample collection, soil and water sample testing, water level measurements, field QA/QC protocols, and field documentation requirements.
  - It is anticipated that a maximum of six new observation wells will be installed. All boreholes will be drilled to bedrock, with an estimated maximum depth of 180 feet.
  - Each boring will be visually logged and described by a qualified geologist. Geophysical logs including natural gamma ray and inductance will be run in each boring to characterize the heterogeneity of the aquifer. Select samples will be retained for geotechnical and possible geochemical analysis.

- Aquifer Testing
  If feasible, aquifer pump tests will be conducted to evaluate the hydrologic characteristics of the alluvial aquifer. Aquifer pump tests will require access to existing wells equipped with suitable pumps and power, where discharging water can be conveyed so as not to influence the test.
  - It is anticipated that up to two pump tests may be conducted. Pump tests will be conducted at a sustainable constant flow rate for a period not greater than eight hours. Water levels will be measured with an in-well pressure transducer and datalogger.
  - Appropriate aquifer testing and discharge permits will be acquired from State regulatory agencies.

- Water Quality
  Water quality considerations and water chemistry equilibrium are critical aspects of a potential recharge program. Potential source waters will not be evaluated as part of this project, but ambient water quality conditions will be quantified.

- Major ion water chemistry and total dissolved solids are the primary parameters to be analyzed.
- Water quality samples will be collected and submitted for laboratory analysis at each of the aquifer test locations.

- Water Level Monitoring
  Water storage capacity is dependent upon the thickness and configuration of the unsaturated zone in the aquifer. As referenced in the grant application, the Black Squirrel alluvial aquifer has experienced declining head for decades. In addition to long-term trends, seasonal variations in water levels need to be understood.
  - A monitoring well network will be established that provides spatially representative water level data throughout the alluvial aquifer. Where available, existing monitoring wells from the USGS, Division of Water Resources, or district monitoring networks will be incorporated to tie into historic water levels.
  - Water levels in monitoring wells will be measured on a monthly basis for six months from June through December to assess seasonal variations.
  - Hydrographs from representative water wells will be prepared based on historic and field collected data.

Task 2 (2) – Phase 2 Field Data Collection

Phase 2 will focus in on one of the final candidate sites or sub-basins identified in the initial phase of work. Additional field data will be collected to refine our understanding of the hydrogeology of a select site in anticipation of pilot project implementation. This phase of work, if funded, will be conducted after completion of the initial fieldwork plan outlined in Task 2. The fieldwork will consist of drilling and constructing observation wells, geophysical logging, conducting aquifer pump tests, and monitoring seasonal water levels. It is anticipated that existing wells would be accessible for conducting aquifer pump tests and monitoring water levels.

- Installing New Wells
  CGS will develop a data collection program to include installation of new monitoring wells taking into consideration the results and recommendations from the initial fieldwork plan.
  - It is anticipated that a maximum of four new observation wells will be installed. All boreholes will be drilled to bedrock, with an estimated maximum depth of 180 feet.
  - Each boring will be visually logged and described by a qualified geologist. Geophysical logs including natural gamma ray and inductance will be run in each boring to characterize the heterogeneity of the aquifer. Select samples will be retained for geotechnical and possible geochemical analysis.

- Aquifer Testing
  If feasible, aquifer pump tests will be conducted to evaluate the site-specific hydrologic characteristics of the alluvial aquifer. Aquifer pump test will require access to existing wells equipped with suitable pumps and power, where discharging water can be conveyed so as not to influence the test.

- It is anticipated that up to two additional pump tests may be conducted. Pump tests will be conducted at a sustainable constant flow rate for a period not greater than eight hours. Water levels will be measured with an in-well pressure transducer and datalogger.
- Appropriate aquifer testing and discharge permits will be acquired from State regulatory agencies.

- Water Quality
  Water quality considerations and water chemistry equilibrium are critical aspects of a potential recharge program. Potential source waters will not be evaluated as part of this project, but ambient water quality conditions will be quantified.
  - Major ion water chemistry and total dissolved solids are the primary parameters to be analyzed.
  - Water quality samples will be collected and submitted for laboratory analysis at each of the aquifer test locations.

- Water Level Monitoring
  The new monitoring wells will be incorporated into the established monitoring well network and measured on a monthly basis through the end of the funding period.

Task 3 – Data Analysis, Evaluation, and Mapping

The objective of this task is to characterize the hydrogeology of the Black Squirrel Creek alluvial aquifer, compute available storage capacities, and recharge potential based on evaluation criteria that will incorporate physical, environmental, and economic considerations. The study will also identify appropriate recharge technologies based on hydrogeologic conditions such as vertical heterogeneity of the aquifer. A preliminary list of evaluation criteria includes:

- Physical considerations, including
  - Overall hydrogeologic characteristics
  - Vertical stratigraphic characteristics (variability) of the aquifer
  - available storage capacity
  - infiltration rates
  - groundwater recharge and discharge areas
- Environmental considerations, including
  - water quality
  - land use categories
- Economic considerations, including:
  - land ownership and site access
  - existing infrastructure

It should be noted that this study will not investigate or address costs related to the design, construction, or operation of potential recharge project implementation, the availability of specific sources of water, engineering considerations, or legal issues. If this type of information becomes available during the course of this study it will be incorporated.

Data analysis and evaluation of the aquifer for recharge suitability will be achieved through completion of the following tasks:

- Compilation of a database in GIS-compatible format.
- Creation of GIS shapefiles and layers, maps, tables, and figures.
- Prepare digital contour and/or point plot maps to portray features or characteristics of interest, incorporating both historic and newly acquired data.

Task 3 (2) – Phase 2 Data Analysis, Evaluation, and Mapping

The site-specific data collected in Task 2 (2) will be incorporated into the database and GIS layers generated in Task 3 to better characterize the hydrogeology of the select site. Additional maps, tables, and figures will be prepared to portray the hydrologic features of the site.

Task 4 - Reporting

Stakeholder Meetings

- A series of meetings will be conducted with the El Paso County Water Authority representatives and contributing stakeholders as determined by the Authority's project manager. The purpose of these meetings will be to present draft products and solicit feedback, to communicate progress on this project, and to obtain addition technical input.
- Additionally, CGS staff will be available to meet with funding partners, legislative committees, special commissions, roundtables, etc. for the purpose of promoting the project, soliciting additional funds, or educational outreach.
- The proposed budget accommodates up to four (4) full-day and eight (8) half-day meetings. The exact number and duration of meetings will be identified in coordination with the Authority's project manager based on schedule and remaining available budget.

Project Report

- A comprehensive report will be prepared that includes figures, maps, tables, and appendices. The report will be technical in nature and supplemented by appendices that contain data and technical analyses that are summarized in the report.
- Six (6) copies of the draft version of the report will be submitted in electronic (MS Word or Adobe PDF) format to the Authority's project manager for review, with a two-week turnaround anticipated. CGS will address comments, in consultation with the Authority's project manager, and will submit the Final Report in electronic and hard-copy formats.

- It is anticipated that twenty-five (25) final copies of the report will be delivered to the El Paso County Water Authority for distribution to contributing stakeholders and sponsoring agencies.
- GIS files and databases generated as part of this project will be transmitted on CD-ROM following submittal of the Final Report.

Task 4 (2) – Reporting (Phase 2)

The Phase 2 work plan and associated budget accommodates up to four (4) additional stakeholder meetings and a supplemental final project report. The distribution, timing, and number of copies of both draft and final reports are anticipated to be consistent with the deliverables of Task 4.

Task 5 - Project Management

This task includes coordination of staff responsibilities and duties, coordination of stakeholder meetings, tracking work accomplished, budget and schedule management, and reporting the status of work activities.

- CGS will provide up to six (6) bi-monthly progress reports
- The progress reports will include a summary description of work accomplished during the previous two months and will describe the percent of task completion, budget spent by task, and total budget remaining. The progress report also will describe any technical, budget and schedule concerns and proposed corrective actions.
- CGS will submit monthly invoices based on staff billing rates and hours, third-party expenses, and other direct costs.

Task 5 (2) - Project Management (Phase 2)

This task extends the project management activities outlined in Task 5 through the Phase 2 performance period. Invoices for work performed and other direct costs will continue to be submitted on a monthly basis. It is anticipated that two (2) additional bi-monthly reports will be generated.

Respectfully submitted,

Ralf Topper, CPG
Project Manager

Table 1 Summary of Costs by Task

Initial Task	Phase 2 Task	Description	Timeline	Budget Amount	Phase 2 Budget
1		Historical Data Compilation and Site Characterization	Apr07 – Jul07	$ 35,360	
2		Field Data Collection	Jul07 - Dec07	$ 54,500	
	2 (2)	Phase 2 – Field Data Collection	Jul08 – Dec08		$ 21,550
3		Data Analysis, Evaluation, and Mapping	Nov07 – Apr08	$ 14,100	
	3 (2)	Phase 2 - Data Analysis, Evaluation, and Mapping	Sep08 – Dec08		$ 6,720
4		Reporting	May07 – Jun08	$ 28,400	
	4 (2)	Phase 2 – Reporting	Jul08 – Dec08		$ 10,165
5		Project Management	Apr07 – Jun08	$ 4,660	
	5 (2)	Phase 2 – Project Management	Jul08 – Dec08		$ 1,615
Project Task Total Costs				**$ 137,020**	**$ 40,050**
Initial and Phase 2 Cost				**$ 177,070**	