LEAK DETECTION / LOCATION SURVEY REPORT
FOR
SOUTHWEST TEXAS STATE UNIVERSITY
HAYS COUNTY, TEXAS

April 22, 1996 -- July 26, 1996

By

James R. Shipley
of the
EDWARDS AQUIFER AUTHORITY
Division of Planning and Environmental Management
Leak Detection/Location Program
September, 1996

Edwards Aquifer Authority
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EDWARDS AQUIFER AUTHORITY

6.25-7.5

September 26, 1996

Mr. Enos Jones
Assistant Director Of Utilities
Southwest Texas State University
601 University Drive
San Marcos, Texas 78666

Dear Mr. Jones:

We are pleased to submit this final report of the leak detection survey performed on Southwest Texas State University's water distribution systems. This report lists findings by separate categories for your convenience.

The Edwards Aquifer Authority (Authority) appreciates the cooperation and assistance you have provided during the survey. Special thanks to Mario Mendez and Darrel Graves for their attention and patience during the survey. The Authority hopes that the information provided herein will be beneficial to the University in identifying and targeting areas of actual water loss and potential water loss.

This survey has demonstrated the water saving potential of the Leak Detection Program. Maintaining the best possible program is vital in order to continue the successes realized. For this reason, the Authority is soliciting your comments, both positive and negative, and any suggestions you may have on how to improve our program.

Please respond to this request candidly, as the Authority cannot improve on deficiencies or support positive measures without the knowledge of such conditions.

1615 N. St. Mary's Street • P.O. Box 15830 San Antonio, Texas 78212-9030 • (210) 222-2204

Please convey our commendations and thanks to the Physical Plant Staff for their assistance in this project. The Edwards Aquifer Authority sincerely appreciates your water conservation efforts. Should you require additional information regarding this report or have any water related questions, please do not hesitate to call.

Sincerely,

James R. Shipley

James R. Shipley
Leak Detection Technician II

JRS/ bmc
Enclosures
cc. Mr. Dwight Sturdivant, Supervisor of Utilities

002jrs

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SUMMARY

On April 19, 1996, the Edwards Aquifer Authority (EAA) received a request from Southwest Texas State University (SWT) to perform a leak detection / location survey on its water distribution system. A pre-survey conference was held April 22, 1996, at the Southwest Texas Physical Plant to discuss the work to be performed. It was agreed that EAA would perform sonic leak detection on all available access points and computerized leak location as needed. A final report, including any unusual system condition found, and an updated master water plat would be submitted to the SWT at the conclusion of the survey.

James R. Shipley of EAA began the survey on April 22, 1996. The survey was concluded on July 26, 1996. Over the course of the survey, EAA surveyed a total of 468 access points including 102 service connections, 21 fire hydrants, 183 valves, and 162 other access points covering 10.17 miles of distribution main.

Mr. Shipley detected a total of 52 leaks. These leaks included 11 service leaks, 10 hose bib leaks, 11 main leaks, 10 valve leaks, 3 toilet leaks, 4 sprinkler system leaks, 2 miscellaneous leaks and 1 fire hydrant leak. EAA estimates 76,217 gallons of water per day has been lost from these leaks. The leaks discovered during the survey range from 25,920 gallons per day to small hose bib leaks.

As part of the survey, EAA located 78 valves of various types, 6 back flow preventors, 1 fire hydrant, and 7 meters not shown on the master water plats. EAA surveyors were unable to locate 13 valves of various types shown on the master water plats. An additional 6 items were discovered to need some type of repair or adjustment.

DISCUSSION

A. Total Access Points Surveyed: 468

The following is an outline of the various access points used during the survey:

Service Connections:	102
Valves:	183
Fire Hydrants:	21
Others:	162

B. Total Miles of Distribution Main Surveyed: 10.17

C. Total Leaks Detected: 52

Service line, valve, main, sprinkler system, and fire hydrant leaks were located by acoustic leak detection or by visual inspection. Toilet leaks, hose bib leaks, and miscellaneous leaks were located through building to building surveying.

1.	Service Leaks	11
2.	Main Leaks	11
3.	Hose Bib Leaks	10
4.	Valve Leaks	10
5.	Fire Hydrant Leaks	1
6.	Sprinkler System Leaks	4
7.	Toilet Leaks	3
8.	Miscellaneous Leaks	2

A detailed listing of these leaks is recorded in appendices **A** and **B**. Separate appendices are provided for the Main / West Campus and Aquarena Springs.

D. Detected Utility Side Leaks Not Repaired, as of July 26, 1996: 17

E. Total Estimated Water Leakage In Gallons Per Day as of, July 26, 1996: 76,217

Leakage estimates for repaired leaks are based on hole size and system pressure in pressure per square inch. This information was furnished by Southwest Texas personnel when EAA was not on site at the time of repair. Leakage rates for unrepaired leaks were estimated by the EAA surveyor.

Service Leaks:	21,799 GPD
Fire Hydrant Leaks:	25,920 GPD
Main Leaks:	22,329 GPD
Valve Leaks:	3,662 GPD
Toilet Leaks:	1,080 GPD
Miscellaneous Leaks:	900 GPD
Hose Bib Leaks:	475 GPD
Sprinkler Leaks:	52 GPD

F. Field Survey Findings Vs. Master Water Plats

1. Water system access points that could not be located: 13

Main Line Valves: 10
Service Valves: 3

Suspected locations were surveyed by EAA with a ferromagnetic detector to locate buried valves. When successful, these locations were marked. It is conceivable that additional valves remain to be located within the system. All valve box lids located were painted blue.

A list of these items are included in appendix **D.**

2. Items located, but not shown on plats: 92

Post Indicator Valves:	1
Main Valves:	20
Service Valves:	41
Fire Hydrant Valve:	1
Pressure Regulating Valves:	2
Miscellaneous Valves:	20
Fire Hydrant With Valve:	1
Meter Assemblies:	7
Back Flow Preventors:	6

A list of these items is included in appendix **C.**

G. Miscellaneous Maintenance Needed

Parking lot between Speech-Drama Bldg. @ J.C.Kellam: 3 valve stacks need cleaning
Valve to West Campus elevated storage tank: Needs valve lid
Women's Residence Tower: Needs valve lid
Wood St. Parking Garage: Needs valve lid

H. Revisions To The Master Water System Distribution Plats Included With This Report

The four 48" x 36" Water Distribution Plats furnished by the Southwest Texas State University has been revised to reflect what was found in the field survey.

The two plats depicting Aquarena Springs were hand drawn by EAA. Southwest Texas and City Of San Marcos water distribution plats were used as a guide to develop these these 24" x 36" plats. Mains and service locations shown on these plats were furnished by SWT personnel or were located through the use of the Authority's locating/tracing equipment. Aquarena Springs mains that could not be traced are not shown on the plats.

These plats have been drawn to reflect what was found in the field survey. All main line locations, main sizes, and types of material were furnished by Southwest Texas personnel. The Edwards Aquifer Authority does not certify the scale, or the accuracy of these drawings or their content.

All services, valves, fire hydrants, mains and meter assemblies located were added to the plats. Incorrect services and valve locations were changed on these plats.

Abbreviations Used on the Revised Distribution System Plats:

UTL	Unable To Locate
FH	Fire Hydrant Without Valve
FHWV	Fire Hydrant With Valve
V	Main Valve
BFP	Back Flow Preventor
SV	Service Valve
HP	Hose Bib
M	Meter
PIV	Post Indicator Valve
PRV	Pressure Regulating Valve
ARV	Air Relief Valve
AIP	Abandoned In Place

All mains were surveyed from all available access points.

All valves located were surveyed. When direct contact could not be made, a probe rod was used.

Fire hydrants labeled as fire hydrants without lead valves are hydrants where the lead valve could not be located or does not exist.

Any item circled and highlighted in yellow on the plats indicates that it was added, could not be located, or needs repair. All items are labeled on the plats.

All mains, services, fire hydrants, and valves added to the plats are for access point accounting. The location and placement of these items on the plats are intended to indicate what was actually found during the field survey. Placement of main valves on the plat is the surveyor's best guess of what they control. Every effort was made to ensure the accuracy of these plats, but The Edwards Aquifer Authority does not guarantee their accuracy.

RECOMMENDATIONS AND COMMENTS

I. Revise master water distribution plats from "As built" plans, EAA plats, and utilizing the knowledge and expertise of long term field employees. Master plats should show locations of all main valves, fire hydrants, blow off valves, drain or flush valves, air relief valves, and pressure regulating valves. Revised plats should be made available to the field maintenance staff for use in the operation and maintenance of the water distribution system.

II. The existing Aquarena Springs water distribution system has the following three water sources: City of San Marcos water, Aquarena Springs Irrigation Well water, and Aquarena Springs # 3 Well water. Water supplied from the irrigation well and the # 3 well are **not** chlorinated. The public has access to this **non-chlorinated** water at the restrooms east of The Inn, Pecan Grove, The River Theater, hose bibs at the pool, and at hose bibs through out the park. Because of the age of the park's water distribution systems and the modifications to the park and its structures in the past, it is conceivable that cross connections between the potable and non potable water supplies exist. Numerous mains were located that their origin, the termination point, or the water source can not be determined. The distribution system layout at Aquarena Springs #1 Well, Lake Fountain pump area, and supply to the Aquarena Springs restaurant and office is undocumented and unknown. Please see enclosed plats.

EAA observed city water used for priming wastewater lift pumps, two lake water pumps, and numerous connections to irrigation systems without the use of an approved reduced-pressure backflow assembly. These potentially dangerous cross connections could allow polluting or contaminating material to enter the Aquarena Springs potable water supply. Southwest Texas has the responsibility to prevent contamination of the public water system through the promulgation and enforcement of rules, regulations, and policies necessary to protect the public health. A cross connection control program is essential to ensure that the University's water supply remains safe.

Because of its age, deteriorating condition, lack of accurate distribution system plats, and the potential cross connections, EAA strongly recommends that the existing Aquarena Springs water distribution system be **completely abandoned.**

III. Review the existing water distribution system and planned water system improvements to ensure sufficient access points are in place to facilitate future leak detection/ location surveys.

IV. Consider ductile iron pipe for the primary main line material used for new installation and main replacement. Ductile iron pipe has a proven history of long service life and its sound carrying characteristics for leak detection are far superior to any other type of pipe material. As the production cost of water increase, the need for routine systemwide leak detection surveys will also increase. Leak sounds generated in metallic pipe are louder and have a tendency to travel further than those developed in non-metallic pipe.

V. Establish accounting system for water used for fire fighting, street cleaning, main flushing, etc.

VI. Placement of well flow meters should be checked against meter manufacturer specifications for recommended straight pipe lengths both upstream and downstream of meter. All meters have limitations due to piping configurations. An improperly located or installed meter will degrade the inherent specified accuracy below an acceptable level. Meters installed in close proximity to a bend, valve, or other fitting that is likely to disturb the flow conditions at the meter could invalidate the manufactures meter calibration. EAA recommends that all well meters be tested **in place** yearly for accuracy.

VII. Install meters on all water services, even if the consumer is not to be billed. Set reasonable and prudent standards for each type of water use. There is no inducement to the consumer to conserve or use water wisely when water is supplied without charge or limits. The potential benefits of metering to the University are numerous:

- Conservation of a precious and valuable resource.
- Potential reduction in water consumption and related water and wastewater treatment costs.
- Allow the University to identify and verify all water use to determine water system efficiency.
- Give the University the information needed to select and implement programs to enhance efficiency, prevent waste, and foster water conservation.

Water saved by conservation may allow Southwest Texas to defer capital construction expenditures for new water supplies and water system improvements. The life of water pumping and treatment equipment can be extended because the equipment will not be forced to work as hard to meet demand. For the same reasons, maintenance and operating cost can also be reduced.

VIII. We wish to express our appreciation for the assistance and cooperation we received from the management and staff of Southwest Texas State University. Management's professional and progressive approach to serving the needs of their consumers while helping to conserve a valued resource is commendable. All Physical Plant, West Campus, and Aquarena Springs personnel we worked with were highly trained, meticulous in the performance of their duties, and had a very positive attitude about their jobs and the people they serve. Your efforts and timely repair of the leaks discovered in this survey have saved a significant amount of precious water.

The Edwards Aquifer Authority appreciates the active participation of Mario Mendez, Darrell Graves, Bill Marburger, and Allen Burleson in this survey. Their participation contributed greatly to its success. The contributions of Bob Hogan, Mack Lester, Bobby Nimitz, Joe Rodriguez, and their staffs are appreciated. Please convey our commendations and thanks to all the staff for their diligence in helping to conserve the Edwards Aquifer.

James R. Shipley

James R. Shipley
Leak Detection Technician II

SOUTHWEST TEXAS STATE UNIVERSITY
MAIN AND WEST CAMPUS LEAK LIST / 1996
APPENDIX A

Line #	Date	Address	Loss G.P.M.	Date Repaired	Comments
1	4/24	Sterry Hall	1,440	4/26	Service, Coupling Leak
2	4/30	Main to Hornsby Hall	720	Pending	Main, Four Inch Coupling
3	5/2	Women's Residence Tower	13	Pending	Hose Bib Leak
4	5/2	Home Economics Bldg.	90	Pending	Service, Flange Leak Rear Service
5	5/9	Moore St.	360	Pending	Hose Bib Leak At Valve Pit
6	5/9	Blanco Hall	180	Pending	Service, South Meter Leak
7	5/9	Blanco Hall, between rooms 507-503	180	Date Unknown	Chilled Water Leak
8	5/9	Blanco Hall	720	Pending	Hot Water Heater Leak
9	5/9	Southwest of Blanco Hall	25,920	6/4	Fire Hydrant Leak
10	5/9	Moore St., Southwest of Blanco Hall	180	Pending	Back Flow Preventor Leak
11	5/9	Harris Dining Hall	180	Pending	Service, Meter Leak
12	5/13	The Den	360	5/13	Service, Packing Leak
13	5/13	Bobcat St., south of irrigation well	180	5/14	Main, Coupling Leak
14	5/13	Bexar Hall	26	Pending	Three Hose Bib Leaks
15	5/13	Bexar Hall	360	Pending	Valve, Leak On Boiler # 2
16	5/20	Quad between Flowers Hall @ Psychology	*	5/22	Service, Valved Off

SOUTHWEST TEXAS STATE UNIVERSITY
MAIN AND WEST CAMPUS LEAK LIST / 1996
APPENDIX A

Line #	Date	Address	Loss G.P.M.	Date Repaired	Comments
17	5/20	Arnold Hall Between Admin. and Bldg. A	180	Date Unknown	Valve, Packing Leak
18	5/15	Elliot Hall Bldg. B	13	Pending	Hose Bib Leak
19	5/24	Academy St., Across From Bobcat St.	*	5/27	Service, Cut And Capped
20	5/29	Butler Hall	2,160	Pending	Valve, Cooling Tower Valve Leak
21	5/30	Under Jowers Center	1,440	5/30	Service, To Hose Bib
22	5/30	Main To Hornsby Hall	45	Pending	Main, 45 Degree Bend Leak

* Line was valved or capped off, with out seeing leak. Unable to estimate loss rate.

SOUTHWEST TEXAS STATE UNIVERSITY
AQUARENA SPRINGS LEAK LIST / 1996
APPENDIX B

Line #	Date	Address	Loss G.P.M.	Date Repaired	Comments
1	6/4	Pressure Tank Near Pig Pen	4,420	Date Unknown	Service, Hole in Galv. Line
2	6/4	Volcano Lake Water Pump	1,440	6/4	Service, Pump Priming Line Leak
3	6/4	Walkway In Front of Pig Pen	360	6/5	Valve, Packing Leak
4	6/5	River Theater	360	6/5	Women's Room Toilet Leak
5	6/5	Behind Aquarena Springs Inn	27	6/5	Hose Bib Leak
6	6/7	Walkway Between Restaurant And Office	27	Date Unknown	Valve, Sprinkler Valve Leak
7	6/7	Restroom East Of Aquarena Springs Inn	720	6/7	Two Toilets Leaking
8	6/11	Planter Between Submarine Theater And Office	13	6/11	Hose Bib Leak
9	6/6	Fountain Between Grist Mill and The Casa	13	Pending	Valve, Valve Passing Water
10	6/7	Between Well # 1 And Sky Ride	15,264	6/12	Main, Main Leaking In Six Places
11	6/11	Grassy Area In Front Of Pig Pen	52	Pending	Four Sprinkler Heads Leaking
12	6/7	Irrigation Well Pressure Tank	360	Pending	Service, Pool Supply Line Leak
13	6/24	Walkway Between Rio Cafe And Boat Dock	13	Date Unknown	Valve, Irrigation Valve Leak
14	N/A	Wastewater Lift Station	12,240	Date Unknown	Service

SOUTHWEST TEXAS STATE UNIVERSITY
AQUARENA SPRINGS LEAK LIST / 1996
APPENDIX B

Line #	Date	Address	Loss G.P.M.	Date Repaired	Comments
15	N/A	Pig Pen	6,120	Date Unknown	Main, Two Inch Galv.Main Leak
16	N/A	Inn Mechanical Room	9	7/19	Valve, Valve To Laundry Room Leaking
17	N/A	Front Of Restaurant	9	Pending	Service, 90 Degree Bend Leak
18	N/A	Pig Pen	*	Date Unknown	Main, Valved And Capped Off
19	N/A	Service To Boat Barn	23	7/24	Two Hose Bib Leaks

* Line was capped off without seeing leak. Unable to estimate loss rate.

SOUTHWEST TEXAS STATE UNIVERSITY
ADDED TO PLATS / 1996
APPENDIX C

Line #	Address	Added	Number Added
1	Under Jowers Center	2 Pressure Regulating Valves	2
2	Butler Hall	2 Service Valves 1 Main Valve	3
3	Four inch main to Jowers Center near University Dr.	1 Back Flow Preventor 2 Valves	3
4	Hill House	3 Service Valves 1 Meter	4
5	Aqua Sports	2 Service Valves	2
6	State Street at the Central Plant	MainValve	1
7	Behind Central Plant	Valve	1
8	Buckner Hall	2 Service Valves	2
9	Read Hall	Service Valve	1
10	Elliot Hall	Service Valve	1
11	Between Comanche St. @ New Science Bldg.	Main Valve	1
12	Between James St. @ New Science Bldg.	Main Valve	1
13	New Science	Service Valve	1
14	Health Science Center	Back Flow Preventor	1
15	Between Live Oak St. well site @ Jackson Hall	Service Valve	1
16	Under Jackson Hall	2 Service Valves	2
17	Arnold Hall	4 Service Valves	4

SOUTHWEST TEXAS STATE UNIVERSITY
ADDED TO PLATS / 1996
APPENDIX C

Line #	Address	Added	Number Added
18	Pickard St. @ Guadalupe St.	2 Main Valves	2
19	Medina Hall	Meter Service Valve	2
20	Maintenance-West	2 Valves	2
21	Canyon Hall	Service Valve	1
22	San Saba Hall	Service Valve	1
23	Blanco Hall	2 Meter Assemblies	2
24	West Campus Soccer Field	Back Flow Preventor	1
25	Moore St. at driveway to Medina Hall	1 Service Valve 1 Main Valve	2
26	Between Blanco Hall @ Performing Arts Center	Fire Hydrant Valve	1
27	Academy St. @ Sessoms Dr.	Main Valve	1
28	Under Rec.--Sports	4 Valves Meter	5
29	Between Rec.--Sports @ Lavaca Hall	1 Main Valve 1 Fire Hydrant With Valve	2
30	The Den	Service Valve	1
31	Lavaca Hall	Service Valve	1
32	Glade Theater	Main 1 Main Valve 2 Service Valves	3

SOUTHWEST TEXAS STATE UNIVERSITY
ADDED TO PLATS / 1996
APPENDIX C

Line #	Address	Added	Number Added
33	Home Economics Bldg.	2 Service Valves 1 Back Flow Preventor	3
34	Academy St. @ James St.	Service Valve	1
36	Four inch main behind Home Economics	2 Main Valves	2
37	Four inch main at the President's House	2 Valves	2
38	Food Bank on Academy St.	Meter	1
39	Sterry Hall	Service Valve	1
40	Women's Residence Tower	1 Post Indicator Valve 1 Service Valve	2
41	Wood St. Parking Garage	1 Service Valve 1 Back Flow Preventor	2
42	Wood St. @ Guadalupe St.	Main Valve	1
43	Behind Jones Dining Hall	Main Valve	1
44	University Service Book Store	Service Valve	1
45	University Police Dept.	Service Valve	1
46	Brogden Hall	Service Valve	1
47	Roanoak St. at Commons Hall	Valve	1
48	Between L.B.J. Student Center @ Flowers Hall	3 Main Valves 2 Service Valves	5
49	Roanoak St. @ L.B.J. St.	Main Valve	1
50	Evans Liberal Arts Bldg.	3 Service Valves	3

SOUTHWEST TEXAS STATE UNIVERSITY
ADDED TO PLATS / 1996
APPENDIX C

Line #	Address	Added	Number Added
51	Between the General Classroom Bldg. @ Chemistry Bldg.	1 Valve 1 Back Flow Preventor	2
52	Smith Hall	Meter Assembly	1
53	Pleasant St. @ State St.	Main Valve	1
54	Pleasant St. @ University Press Bldg.	Main Valve	1

SOUTHWEST TEXAS STATE UNIVERSITY
UNABLE TO LOCATE / 1996
APPENDIX D

Line #	Address	Type	Number
1	Hines Academic Center	Service Valve	1
2	Talbot St. at the Learning Resource Center	2 Main Valves	2
3	Construction site between Guadalupe St. @ Live Oak St.	5 Main Valves	5
4	Behind President's House	1 Main Valve	1
5	Behind Lantana Hall	Valve	1
6	Beretta Hall	Valve	1
7	Smith Hall	2 Service Valves	1

SOUTHWEST TEXAS STATE UNIVERSITY
VALVE DETAILS CHANGED ON PLATS / 1996
APPENDIX E

Line #	Location
1	Concho St. @ Edward Gary St.
2	Buckner Hall
3	Comanche St. @ Live Oak St.
4	Live Oak St. Well Site
5	Live Oak St. @ Guadalupe St.
6	Guadalupe St. @ Mathews St.
7	Rec--Sports Bldg.
8	Bobcat St. Irrigation Well Site
9	Flowers Hall
10	Evans Liberal Arts Bldg.
11	Psychology and General Classroom Bldg.
12	Pleasant St. @ State St.
13	Pickard St. to Hornsby Hall