

Section 6 Report Review

Attachment to letter dated September 16, 1998

Project: Setting Monumentation Points for Locations of Wildrice

Final or Interim report? Final

Job Number: 84

Report: X is acceptable as is

 is acceptable as is for interim report, but the following comments are made for future reference

 needs some minor revision

Comments: (Note to commenter: If you make comments directly on a copy of the report, write legibly and dark so comments will reproduce well when photocopied.)

Please provide the Austin E.S. office with an electronic copy of the monumentation points in GIS.

FINAL REPORT

As Required By

THE ENDANGERED SPECIES PROGRAM

TEXAS

GRANT NUMBER: E-1

Project 84: Setting Monumentation Points for Location of Wildrice

Project Coordinator:
Karim Aziz

Principle Investigators:
Karim Aziz
Renee Seaman



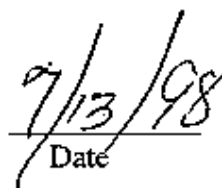
Andrew Sansom
Executive Director

Gary L. Graham, Ph.D.
Director, Wildlife

July 31, 1998

FINAL REPORT**STATE:** Texas**GRANT NO:** E - 1 - 9**PROGRAM TITLE:** Endangered and Threatened Species Conservation**PERIOD COVERED:** September 1, 1996 - August 31, 1997**PROJECT NUMBER:** 84**PROJECT TITLE:** Setting Monumentation Points for Location
Of Wildrice**PREPARED BY:** Karim Aziz30 April 1998

Date

APPROVED BY:Neil (Nick) E. Carter
Federal Aid Coordinator
Texas Parks & Wildlife Department

Date

Established Monument Points for Location of Texas Wild-rice (*Zizania texana*) in the Upper San Marcos River, Hays County, Texas

KARIM AZIZ AND RENEE SEAMAN

Resource Protection Division, Texas Parks and Wildlife Department, Austin, TX.

Abstract. – Semi-permanent monuments were established along the upper San Marcos River Texas to locate and survey Texas wild-rice (*Zizania texana* Hitchcock 1933), a federally endangered aquatic plant (USFWS 1978). Texas wild-rice, stands and individual plants, can be precisely located and identified using these monuments. Monuments were surveyed and tied to the Texas State Plane Coordinate System, allowing spatial integrity to be maintained between individual plants and stands.

Texas wild-rice (*Zizania texana* Hitchcock 1933) (wild-rice) is an endemic aquatic plant found only in the upper San Marcos River, Hays County, Texas. Wild-rice was listed as endangered in 1978 (USFWS 1978) due to the following reasons: limited distribution, pressure from recreation, and periods of reduced streamflow. In addition the introduction of exotic aquatic vegetation may reduce available habitat for Texas wild-rice (Beaty 1975; Vaughan 1986).

Early studies of Texas wild-rice were primarily descriptive in nature. Emery (1967) made general descriptive statements on the distribution of wild-rice. In addition to a general description of wild-rice, Beaty (1972 and 1975) used a large-scale map of the upper San Marcos to plot where areas of wild-rice were found. He used an ordinal scale (sparse, moderate, and heavy) to denote wild-rice density. He also estimated basal area of the plants.

Later studies of Texas wild-rice determined areal coverage in addition to distribution information. Emery (1977, 1981) stressed the importance of

obtaining accurate and precise data for determining both areal coverage and distribution of wild-rice plants. Using a large-scale map, Emery divided the upper San Marcos River into four segments to plot the location of wild-rice. The first segment began at the Missouri Pacific railroad bridge with the last segment ending at the City of San Marcos waste water treatment plant. A floating meter-square frame was used to determine "area of vegetative dominance".

Vaughan (1986) continued Emery's method for calculating areal coverage and the use of the large-scale map for determining distribution. Vaughan used the same reach of river as Emery but divided it into ten segments.

Poole began annual monitoring of wild-rice in 1989. Poole (1992), Poole and Bowles (1996), divided the river into fourteen segments. She extended the reach used by Emery and Vaughan upstream to Spring Lake Dam and downstream to the Blanco River confluence. She used reference points near the river to locate individual plants and stands. Reference points used for the

spatial location of wild-rice were typically objects such as trees, concrete steps, boulders within the river, *etc.* Over time, some reference points have been lost due to floods, trees falling over, and construction activities near the river.

Texas wild-rice was located using a compass bearing and a distance from the reference point to head of the plant or stand. This method of location allows for spatial analysis within an area directly covered by each reference point, but does not allow for accurate longitudinal study over the range of wild-rice.

Poole attempted to use Emery's floating meter-square frame for determining areal coverage but changed method due to difficulties measuring large stands. Instead, Poole calculated areal coverage by measuring length and width of plants or stands. Percent cover was calculated by the following formula: $\text{length} \times \text{width} \times \text{percent cover} = \text{total cover}$. The individual identification of plants or stands combined with the calculation of percent cover allowed Poole to determine changes within specific stands over time (Breslin 1997).

For this effort, monuments were established along the riverbanks near wild-rice plants and surveyed to obtain the following objectives: to increase the accuracy and precision in locating and identifying individual plants and stands, and to maintain spatial integrity between plants throughout their overall distribution. A total of 56 monuments were placed along the banks of the upper San Marcos River using the current (1996-1997) (Poole, personal communication) distribution of Texas wild-rice.

Methods

Monument Description

Monuments were comprised of a numbered brass cap set in concrete (six to eight inches in diameter) just below ground level. Nails (60D) were placed within the monument to facilitate locating them with a metal locator. Monuments that fell within Sewell Park (Southwest Texas State University campus) (SWTSU) on the concrete walk are comprised of a numbered brass cap cemented into place. Detailed field book drawings (Appendix I), and photos (Appendix II), were taken at each site. Monuments were then surveyed establishing a northing, easting and an elevation for each point (Appendix III). In addition, maps displaying the distribution of the monuments were prepared (Appendix IV).

Survey

The monuments were surveyed during December 1997 to March 1998. These time periods were used in order to take advantage of defoliated vegetation during the colder months. The survey is based on the City of San Marcos local benchmark system (Projection group NAD-83 SP Lambert, Texas plane coordinates, South Central Zone). Surveying was conducted using a TopCon GS 211D total station and a Sokkia SDR33 electronic field book/data collector. Data were downloaded to a computer in which coordinates were generated using PacSoft survey software. Points were then imported into AutoCAD and overlaid on a base map of the San Marcos River (River Studies report draft).

Discussion

Using the monuments, Texas wild-rice can be located with minimal effort yet with high degrees of accuracy and precision. In addition, a variety of surveying techniques may be used for locating wild-rice plants, such as: a theodolite/transit and tape measure, or a total station, intersections (using distances from two monuments to a plant), and compass bearing and distance. The ability to accurately locate Texas wild-rice will help researchers maintain spatial integrity of plants and stands and reduce confusion as to plant identities.

Acknowledgments

We wish to extend our thanks and appreciation to the following people for their help in completing this project: The U.S. Fish and Wildlife service provided partial funding for this project through endangered and threatened species conservation funding (WER35); Dr. R. E. Moss and J.M. Poole (TPWD) for providing review comments on the draft report; J.M. Lacy and H. "Corky" Kuhlman (TPWD) for getting us started on the survey; D. Hager, S. Johnston, and T. Jurgensen (TPWD) for field help in setting monuments; and landowners, the City of San Marcos, and SWTSU for granting access to properties along the San Marcos River.

Reference

Beaty, H.E. 1972. A brief report concerning a rare and endangered species of aquatic grass, *Zizania texana* (Texas wildrice) and its status as indicated by recent population study. Baylor University, Waco, TX.

Beaty, H.E. 1975. Texas wildrice. Texas Horticulturist 2, no.1: 9-11.

Breslin, S.L. 1997. The impact of recreation on Texas wild-rice. M.S. thesis, Southwest Texas State University, San Marcos, Texas.

Emery, W.H.P. 1967. The decline and threatened extinction of Texas wildrice (*Zizania texana* Hitch.) Southwestern Naturalist 12:203-204.

Emery, W.H.P. 1977. Current status of Texas wildrice (*Zizania texana* Hitch.) Southwestern Naturalist 22:393-394.

Emery, W.H.P. 1981. Status of Texas wild rice-1981

Hitchcock, A.S. 1933. New species and new names of grasses from Texas. Journal of the Washington Academy of Science 23:449-456.

Poole, J.M. 1992. Interim report on conservation of the upper San Marcos ecosystem: Texas wildrice (*Zizania texana*). Albuquerque, New Mexico: U.S. Fish and Wildlife Service, Region 2.

Poole, J.M. and D.E. Bowles. 1996. Final report. Project No. 49: Texas wild-rice (*Zizania texana* Hitchcock) habitat characterization. Texas Parks and Wildlife Department. Austin, Texas

Poole, J.M. Personal communication. Endangered Resources Branch, Texas Parks and Wildlife Department. March, 1998.

U.S. Fish and Wildlife Service. 1978. Endangered and threatened wildlife and plants. Federal Register 43(81): 17910-17916.

Vaughan, J.E. 1986. Population and autoecological assessment of *Zizania texana* hitch. (Poaceae) in the San Marcos River. M.S. Thesis, Southwest Texas State University, San Marcos, Texas.

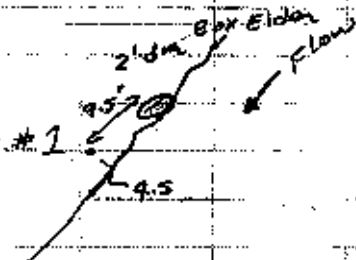
Appendix I: Detailed field drawings of monument locations

see pg. 51 for larger map

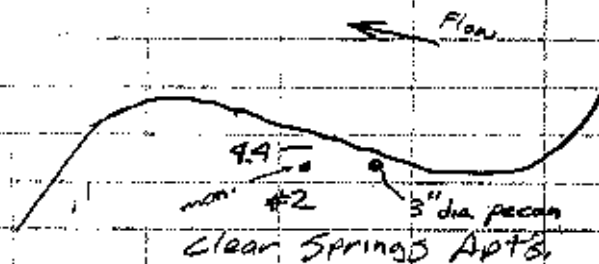
4-8-97 WR monument Seaman, AZ

WRBM
1

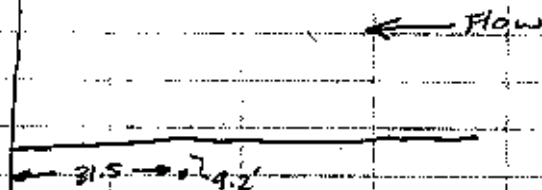
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WR #2



University Drive
bridge

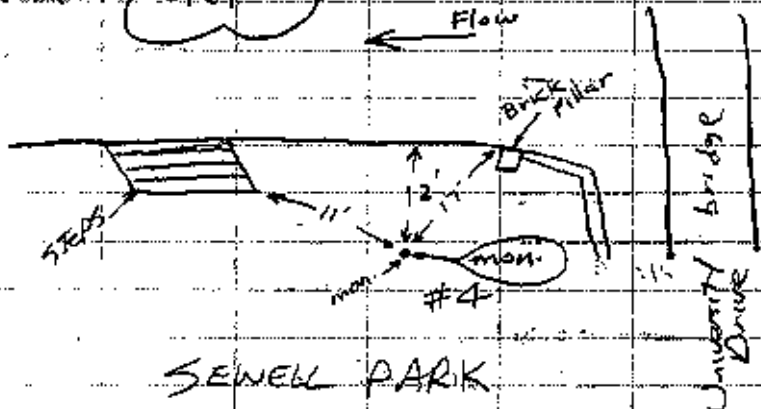


#3

Clear
Springs
APTS.

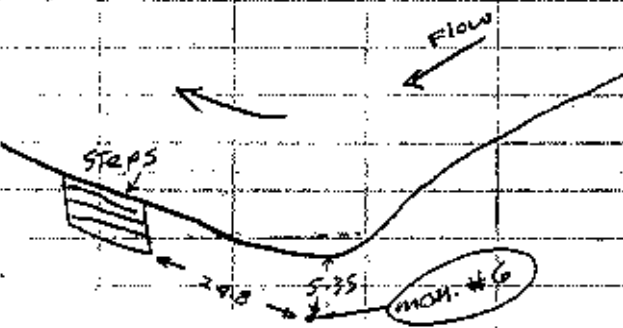
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WR#4



SEWELL PARK

7



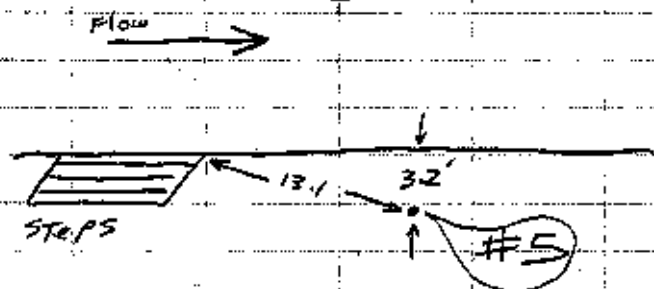
SEWELL
PARK

WR#6

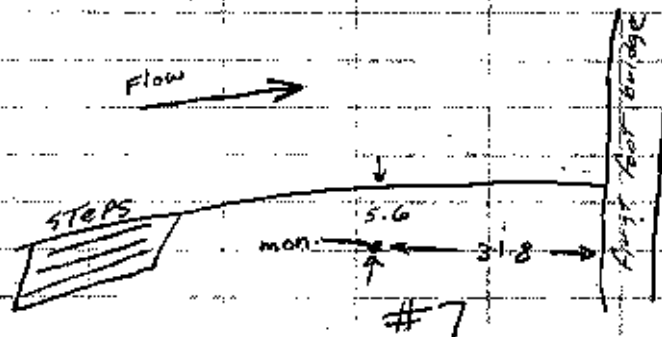
4-8-97

A212, Seaman

WR #5



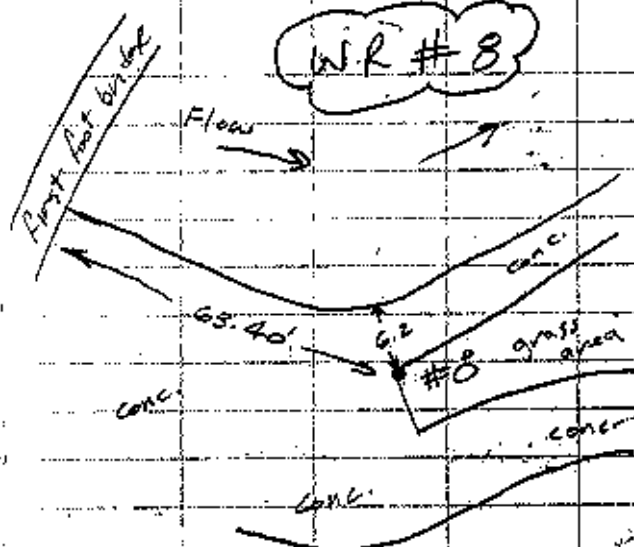
SEWELL Park



SEWELL PARK

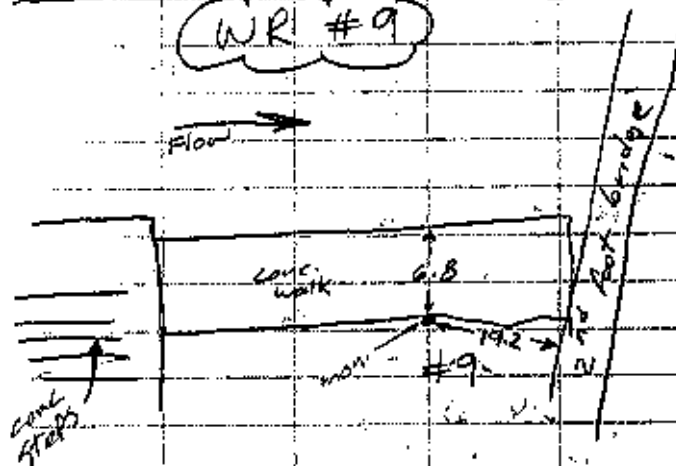
WR #7

WR #8



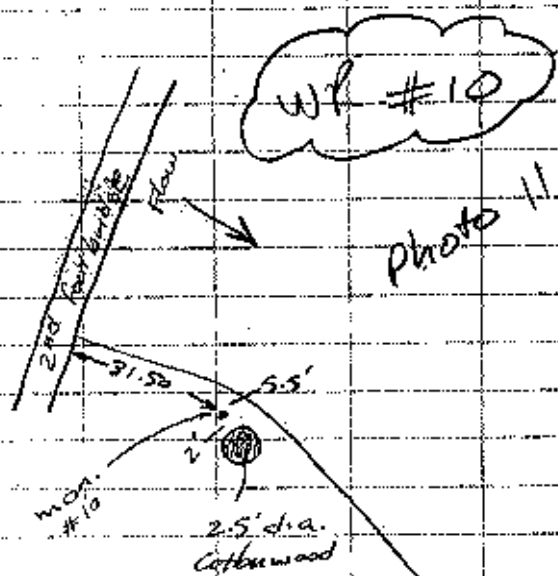
SEWELL PARK

WR #9

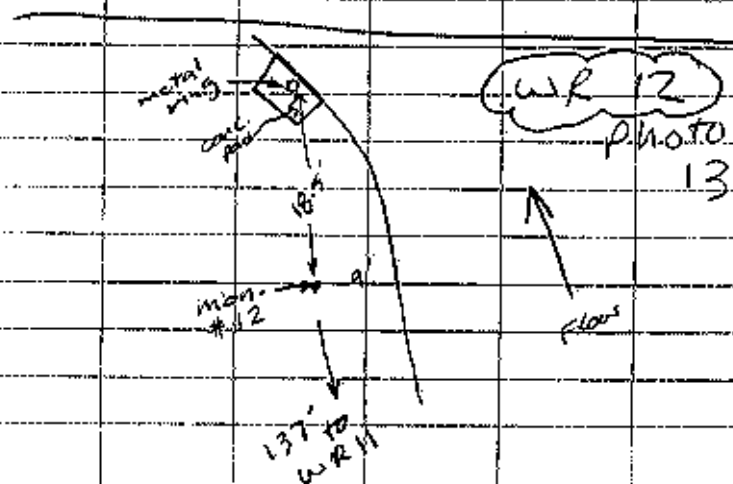
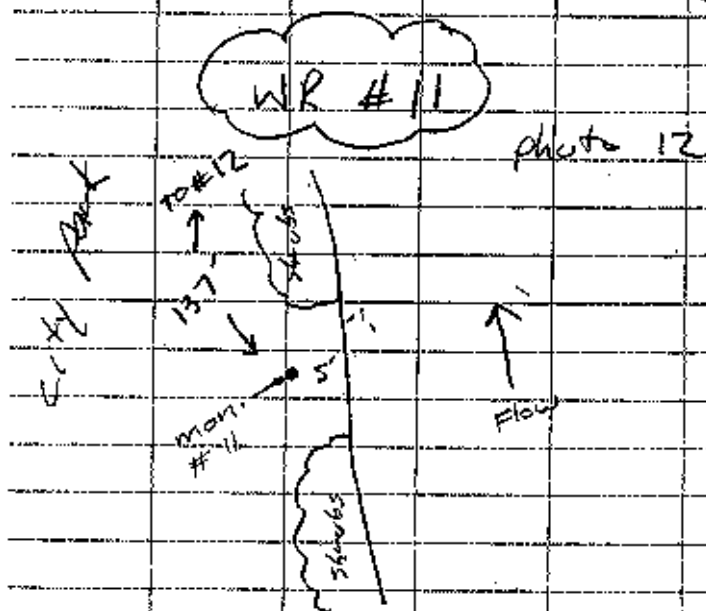


SEWELL PARK

A212, Seaman



(15)



Aziz, Seaman

City Park

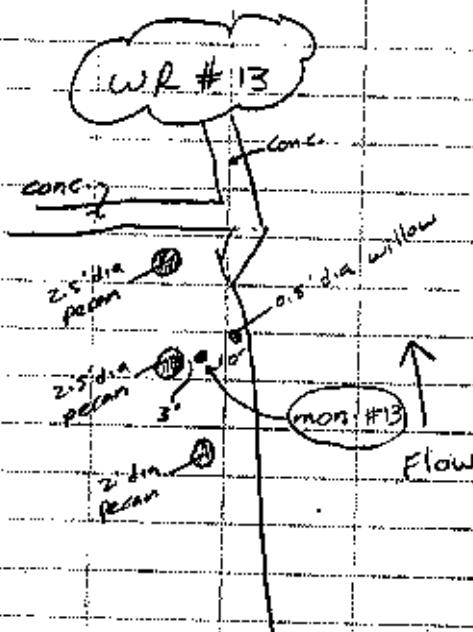
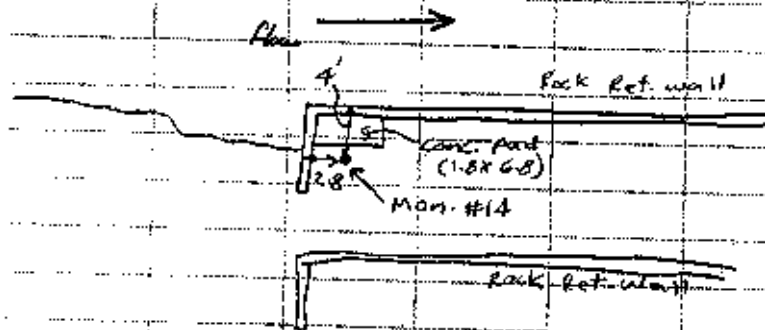
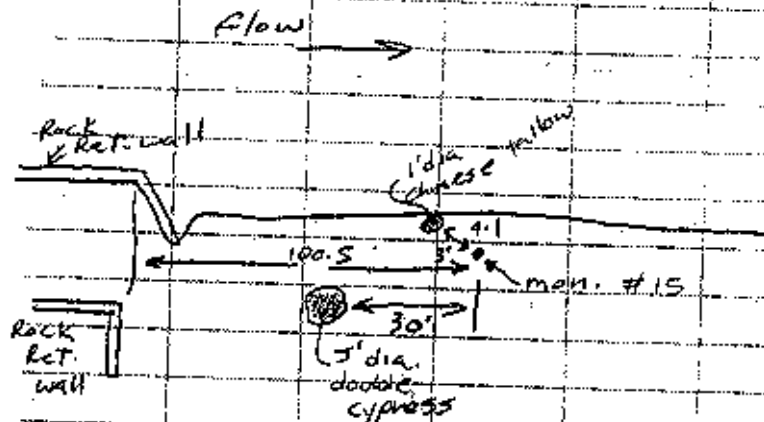


Photo # 14

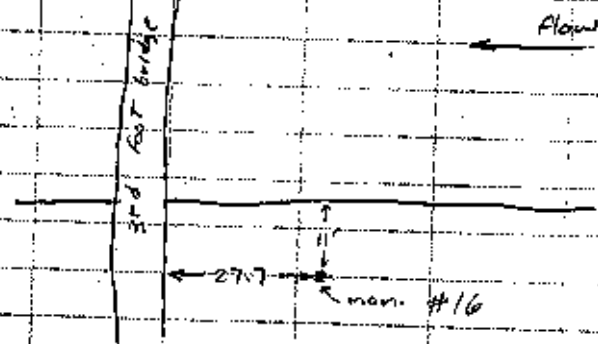
WR #14



WR #15



WR #16

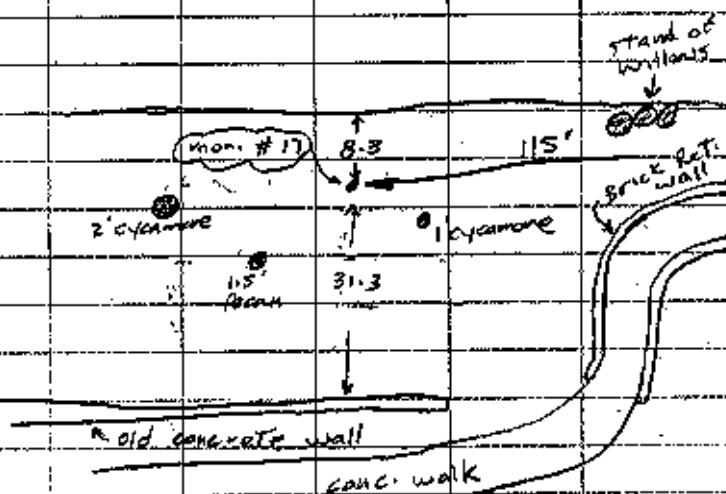


City Park

5-8-97

NR 17

Flow

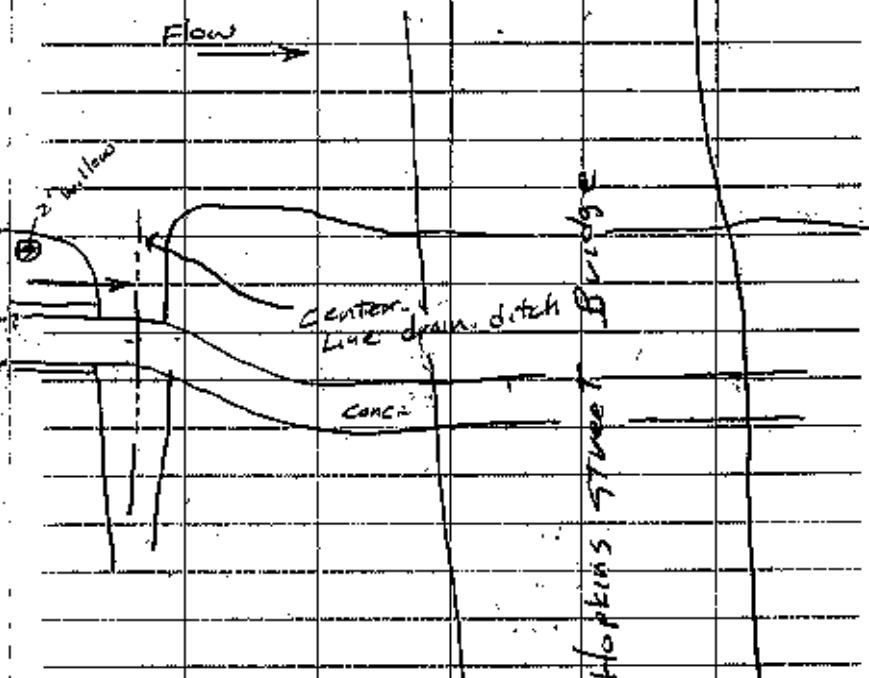


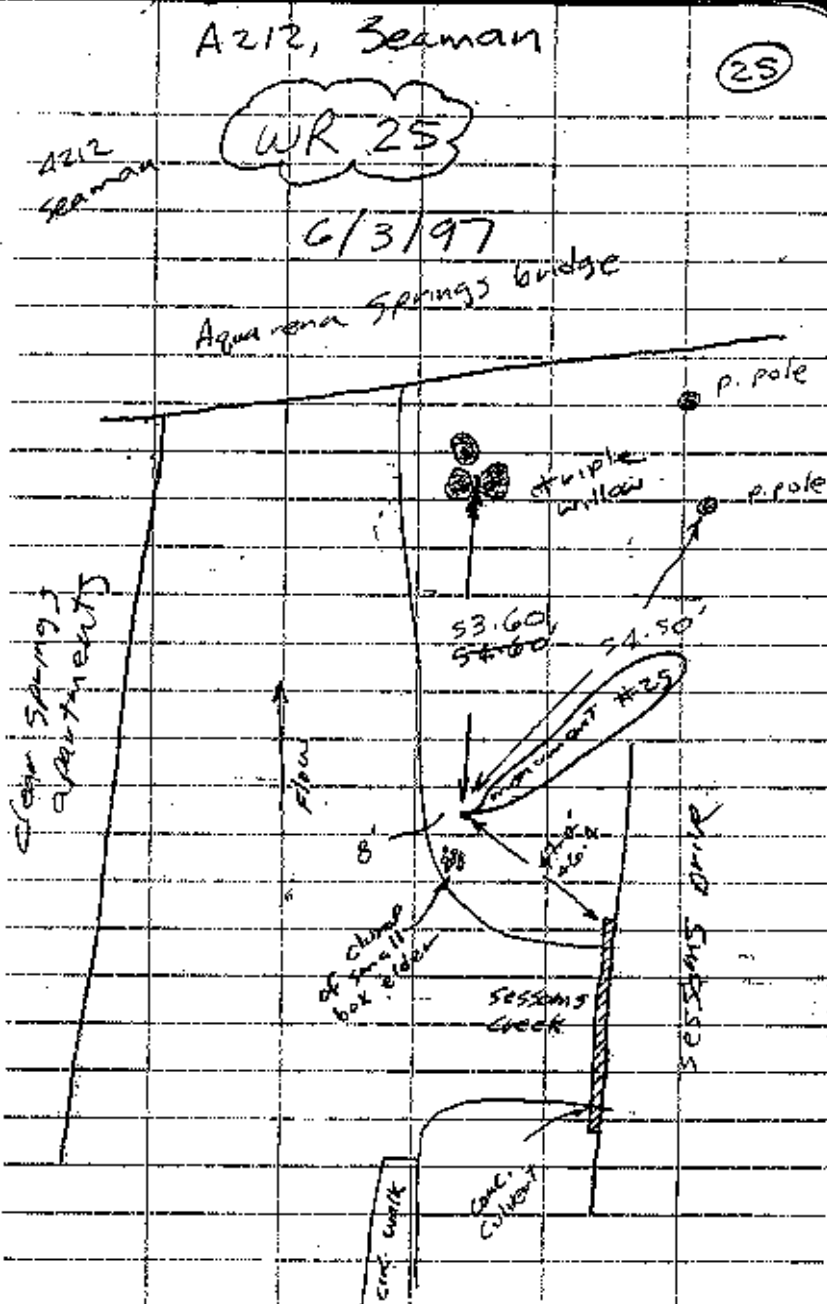
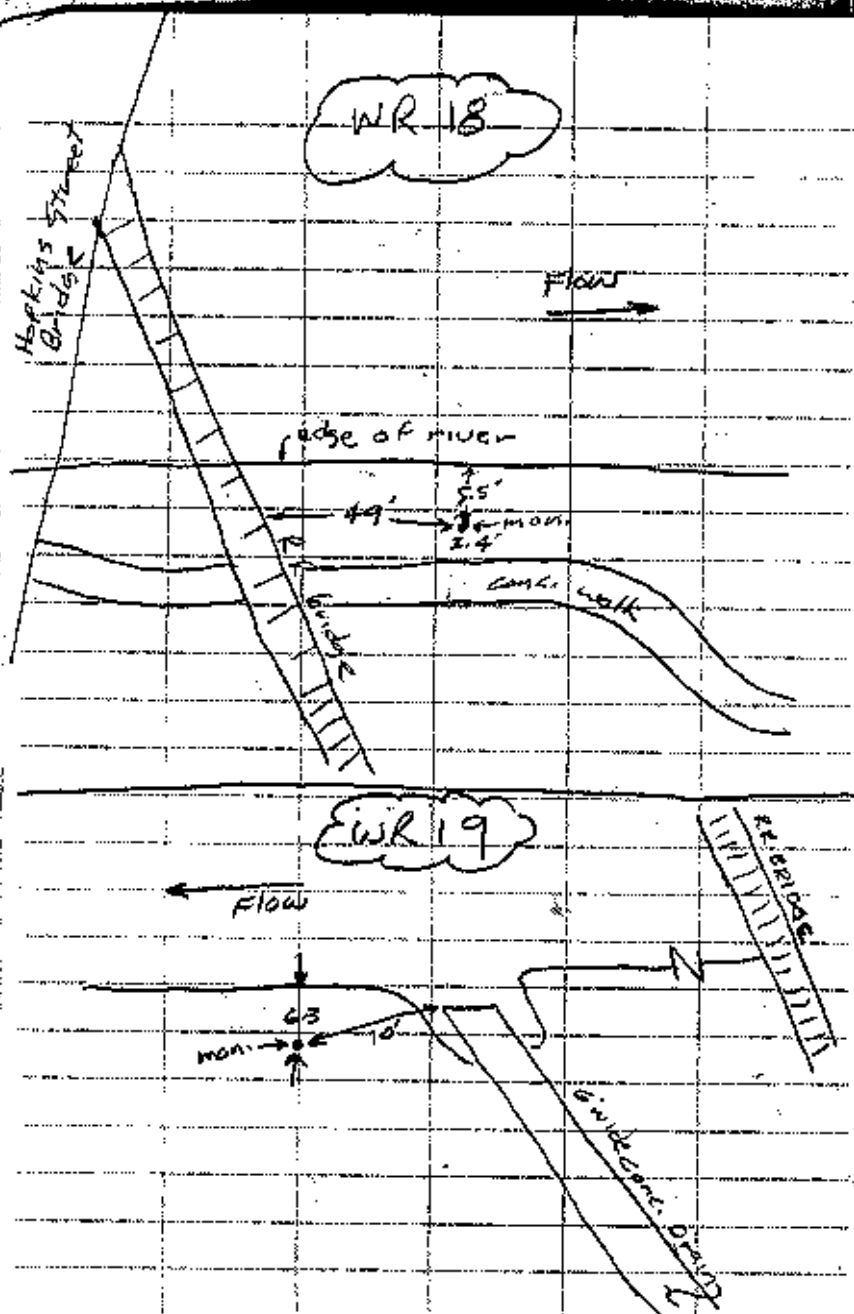
old Federal Fish Hatchery

A212, Seaman

23

Flow





Arr. German

WR 20

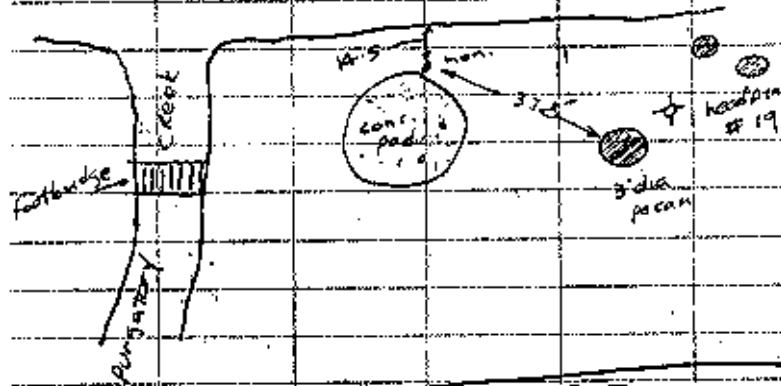
6/3/97

snake island

6/3/97

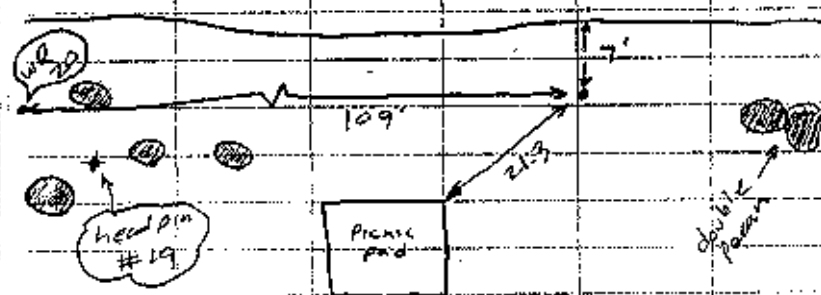
snake
island

Flow \rightarrow



Flow \rightarrow

NR 21



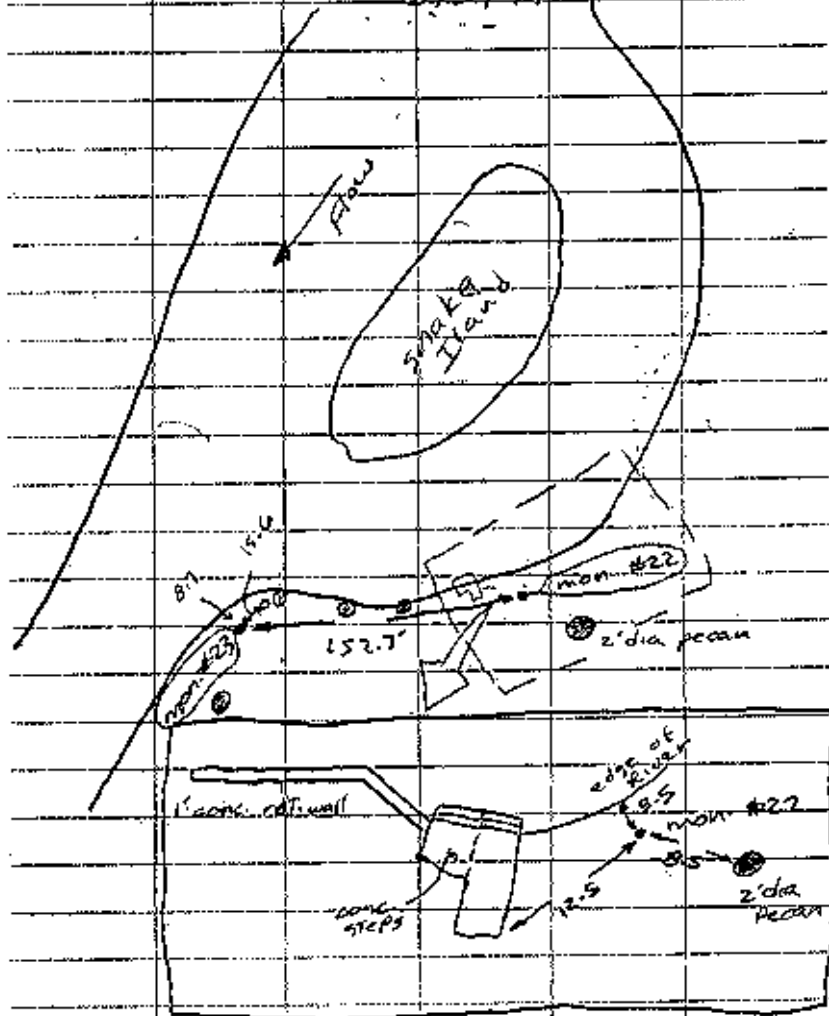
Ariz, Seaman (WR 72423)
6/5/97

Wk 22 & 23

6/15/97

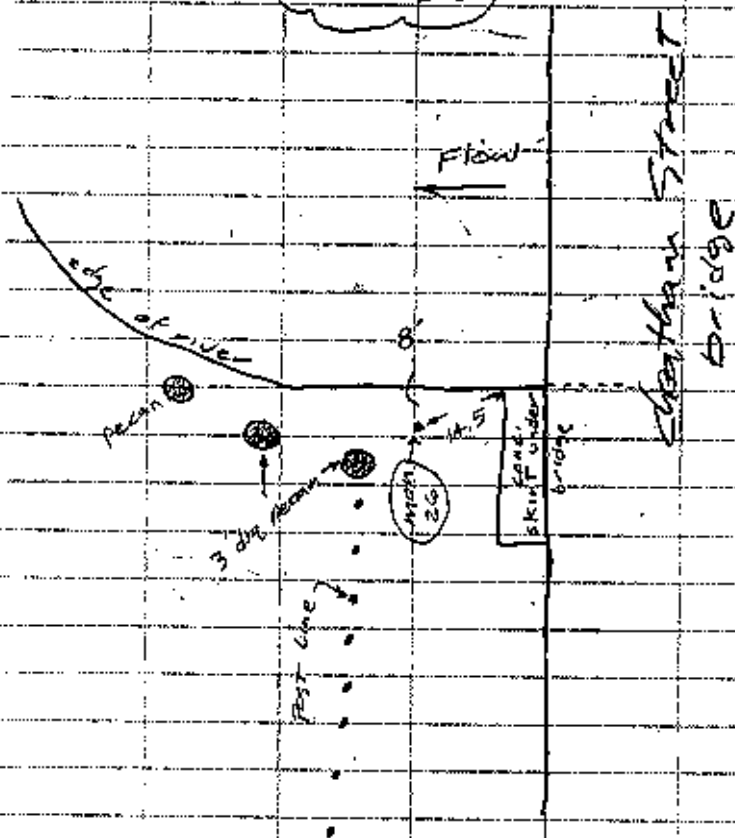
102

Snake Island



A212 Seaman 6/6/97

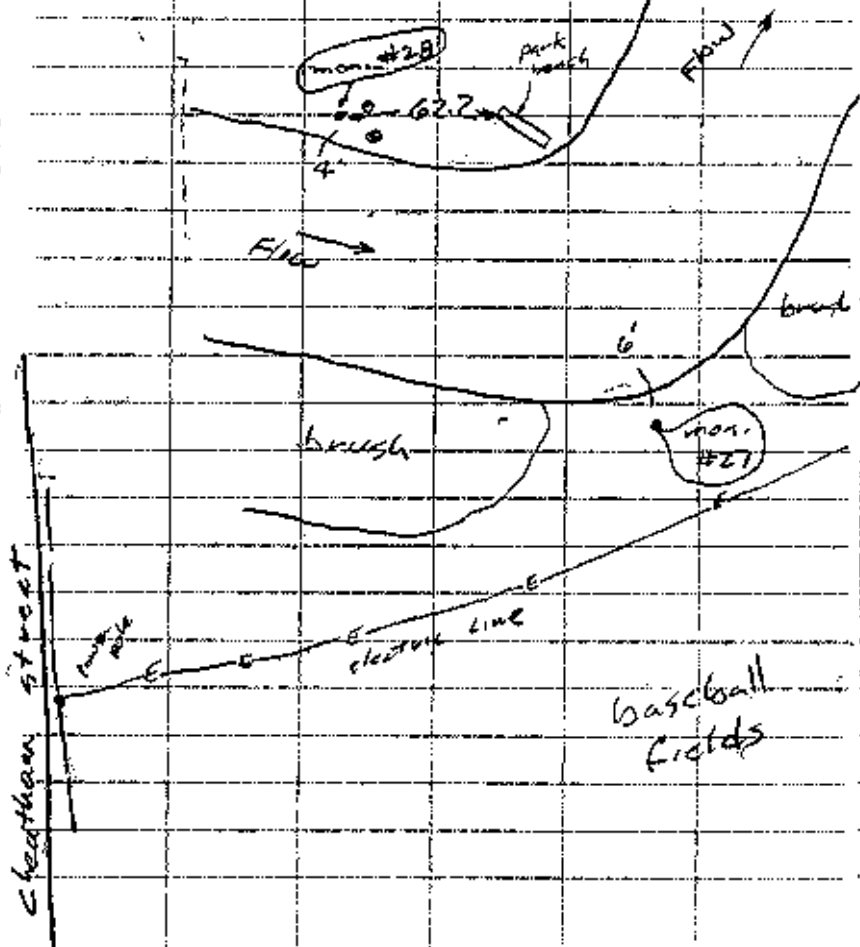
WR 26



A212 Seaman 6/6/97

WR 27, 28

Jogging trail
Glenns Island

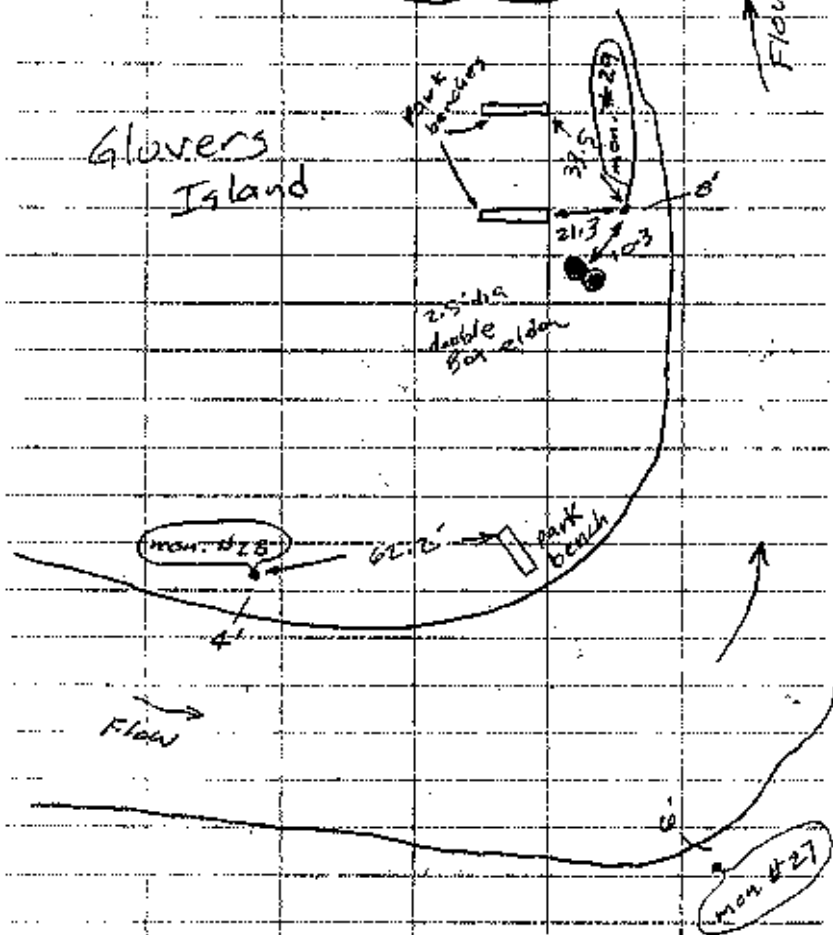


29

Aziz, Seaman 6/6/97

WR 28 & 29

Glovers
Island

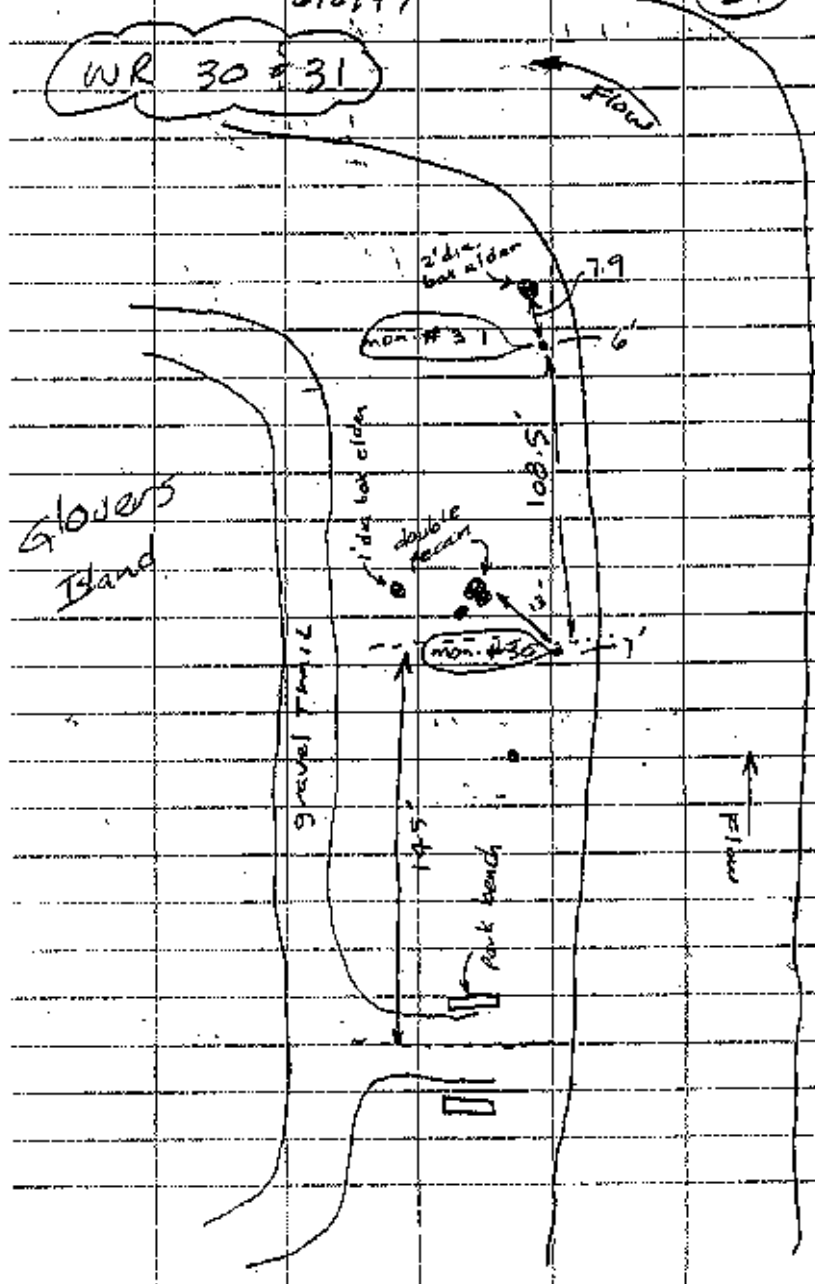


Aziz, Seaman 6/6/97

WR 30 & 31

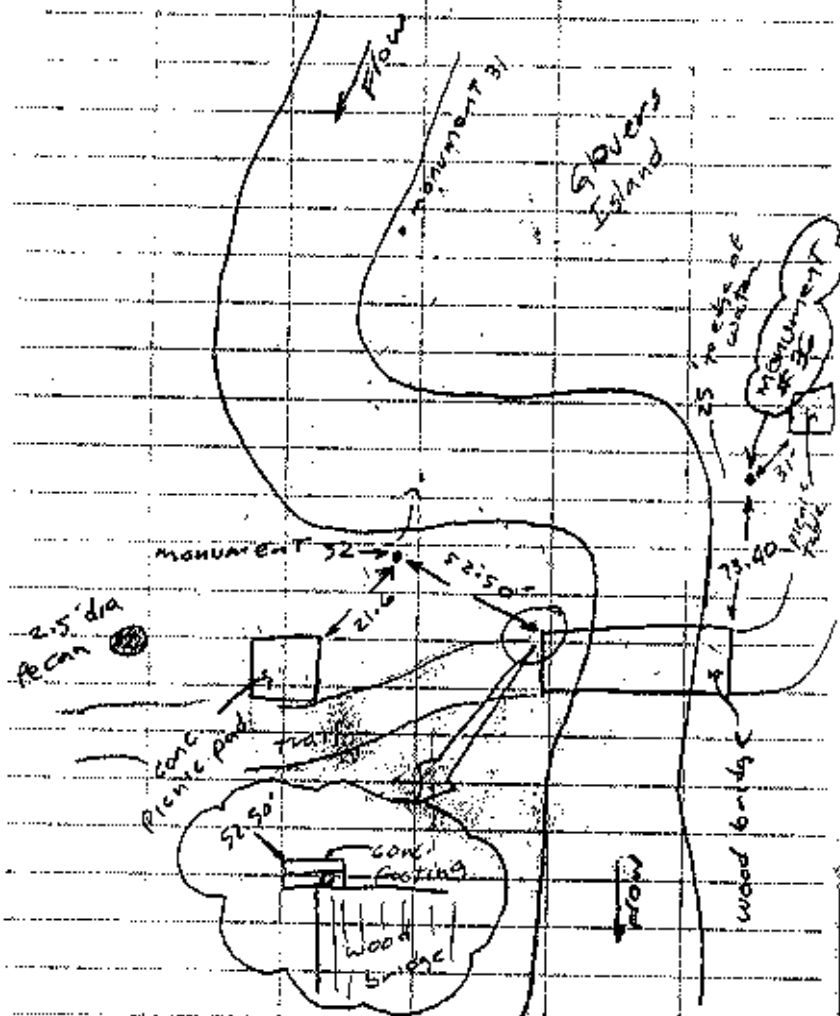
31

Glovers
Island

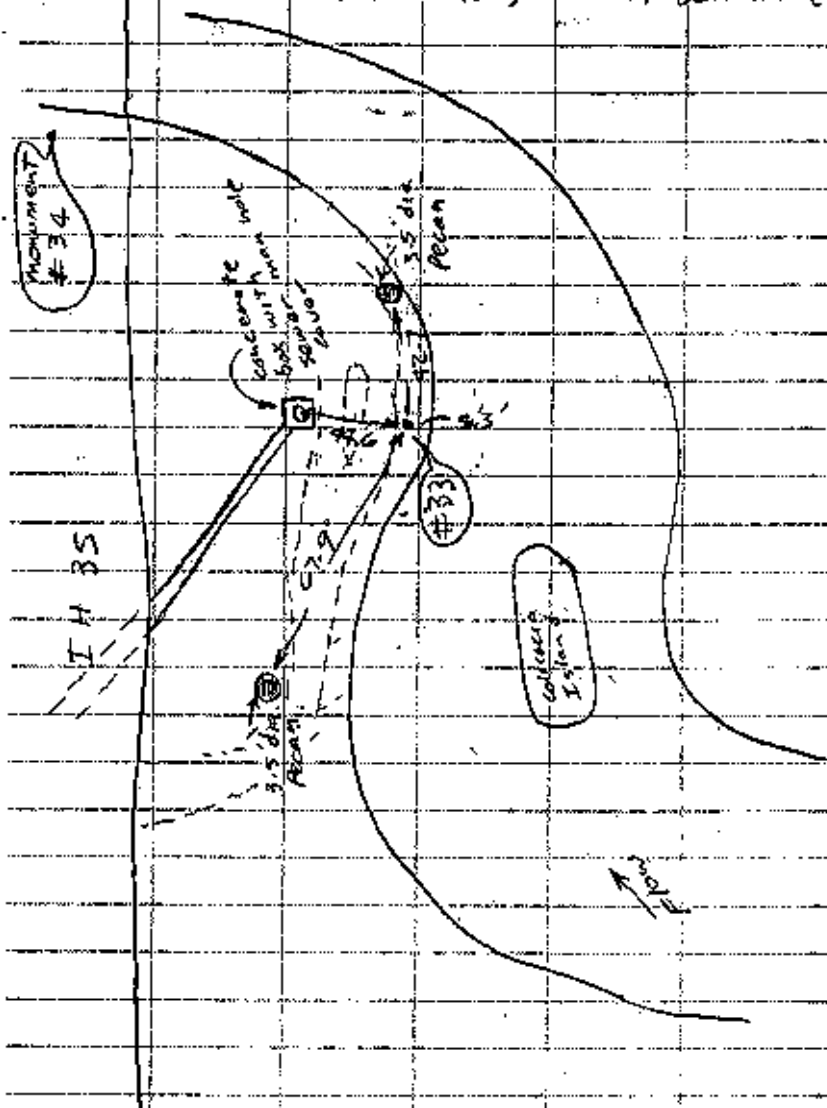


Mon. 32
6/26/97 Arr. Spanish, Johnston

Mon. 36 11/23/97

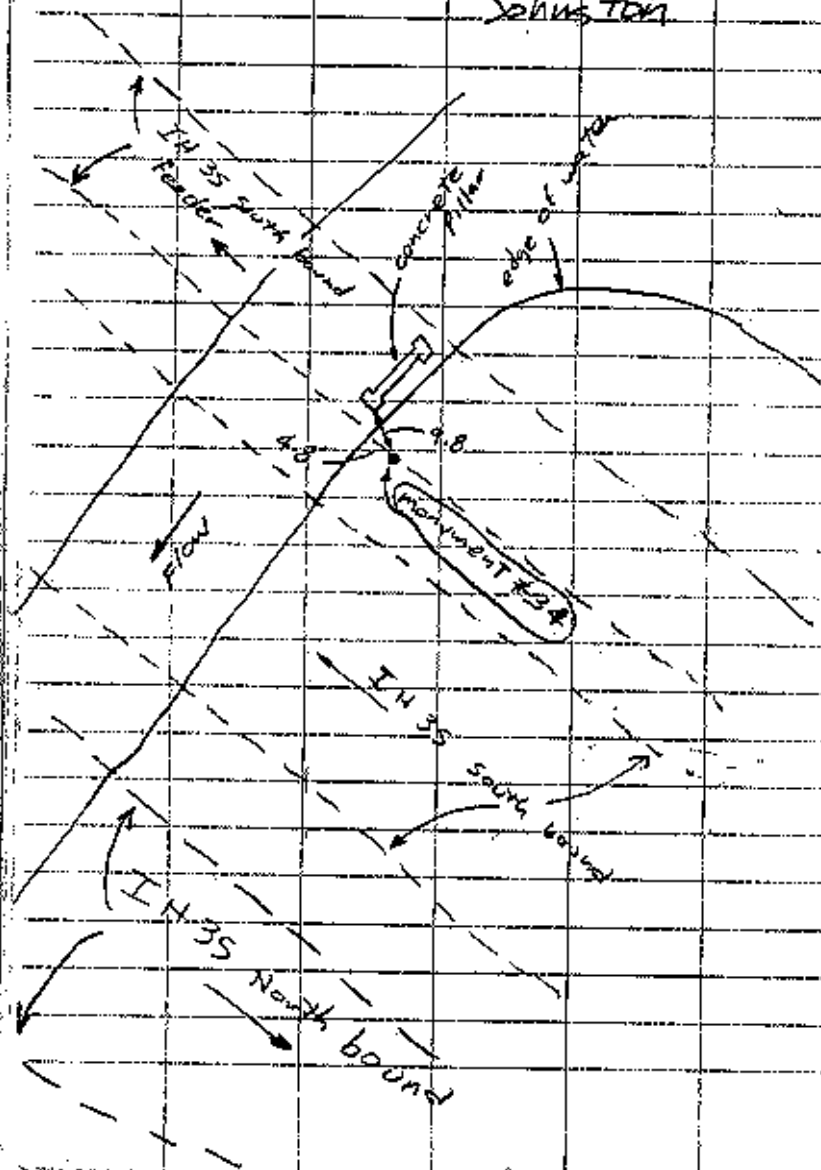


Mon. 33
6/26/97 Arr. Spanish, Johnston



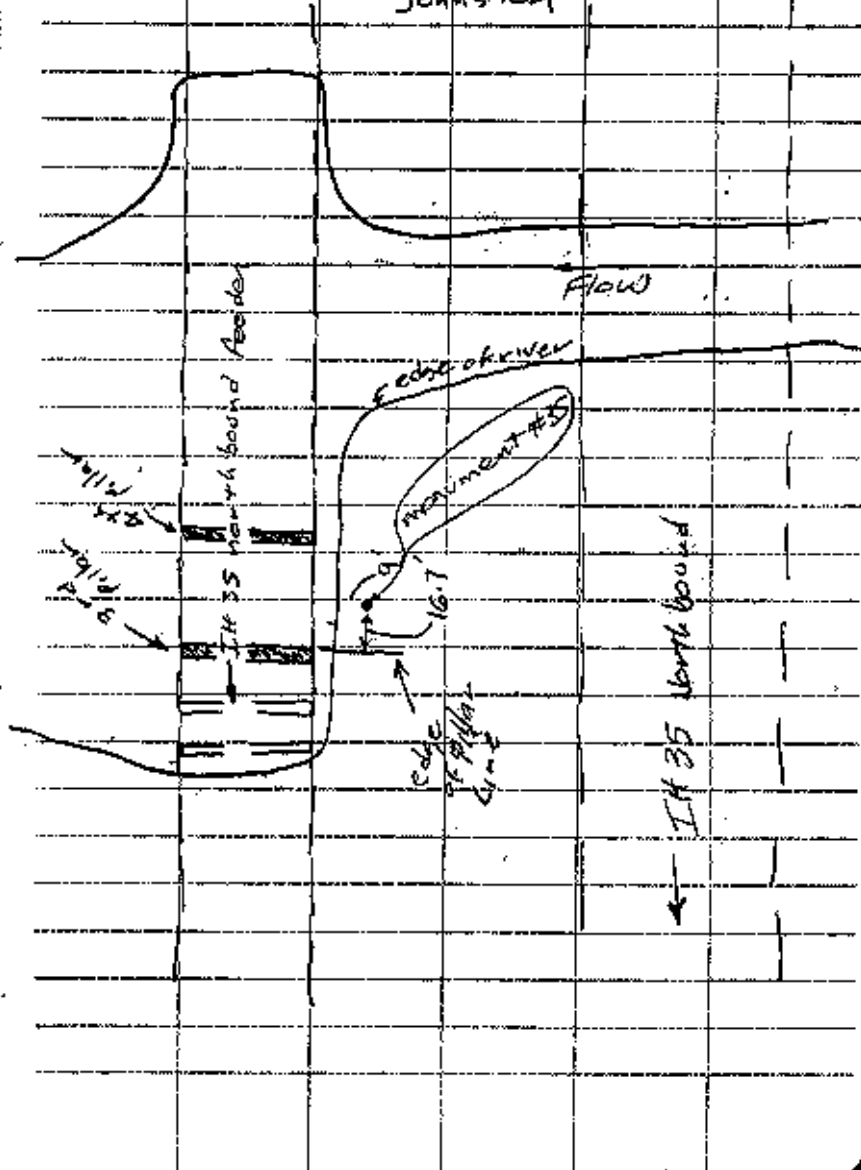
monument #34

6/26/97 Ariz, Seaman,
Johnston



monument #35

6/26/97 Ariz, Seaman,
Johnston

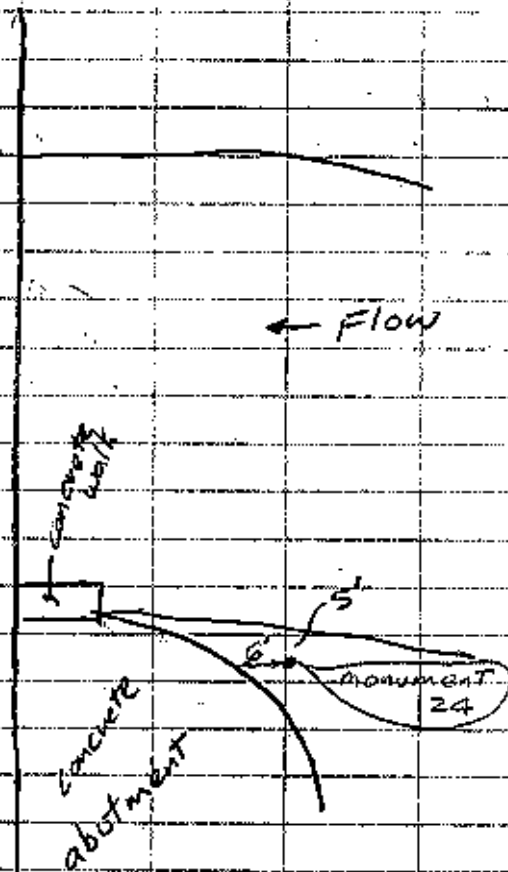


MONUMENT 24

7/3/97

Ariz, Seaman

Chapman Street



(37)

Physical char.

| | feature |
|------------|---------|
| thalweg | line |
| pool | area |
| riffle | area |
| run | area |
| left bank | line |
| right bank | line |
| Substrate | |
| silt | area |
| bedrock | area |
| gravel | area |
| sand | area |

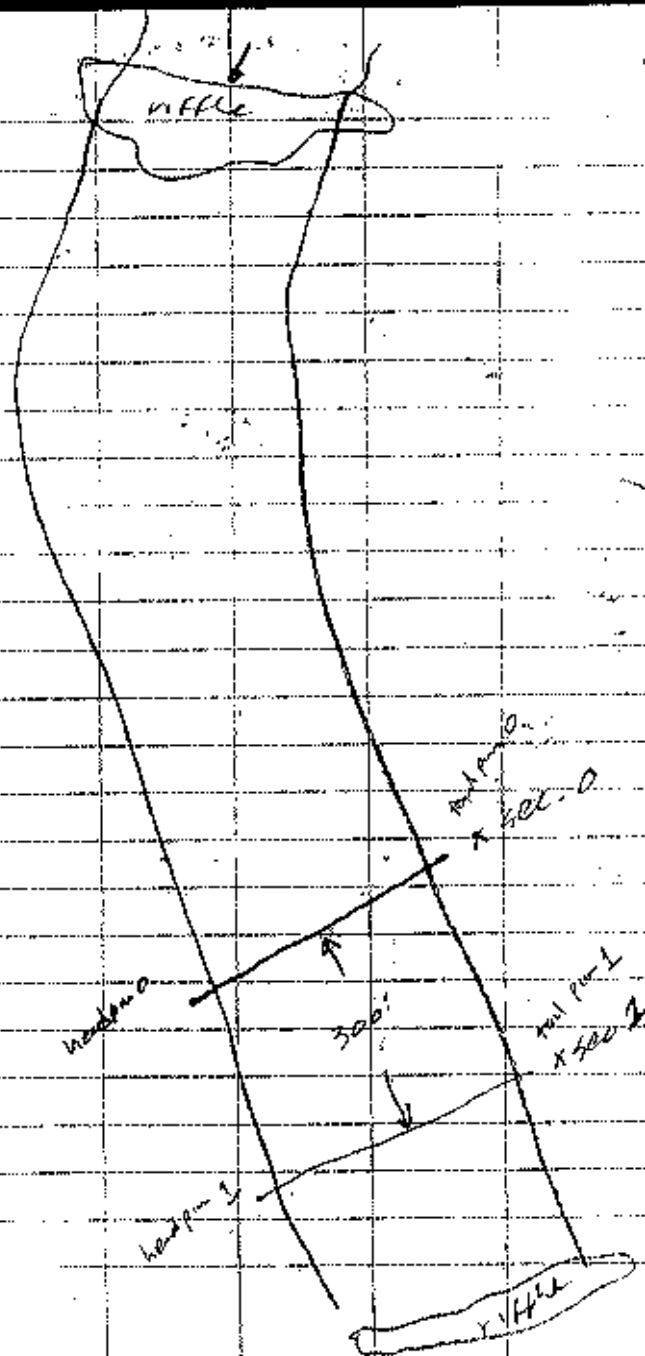
Point D

X section 0-10

head pin

tail pin

B.M.



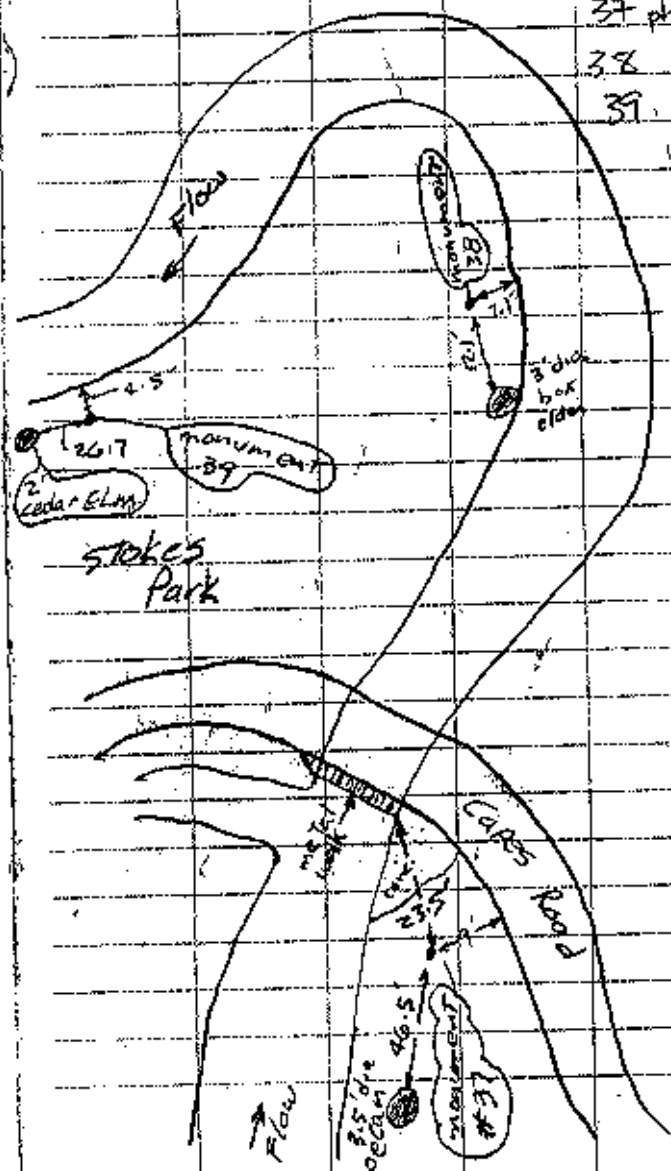
monuments 37, 38 & 39
11/24/97
AZIZ, Seaman

(39)

37 photo 1 & 2

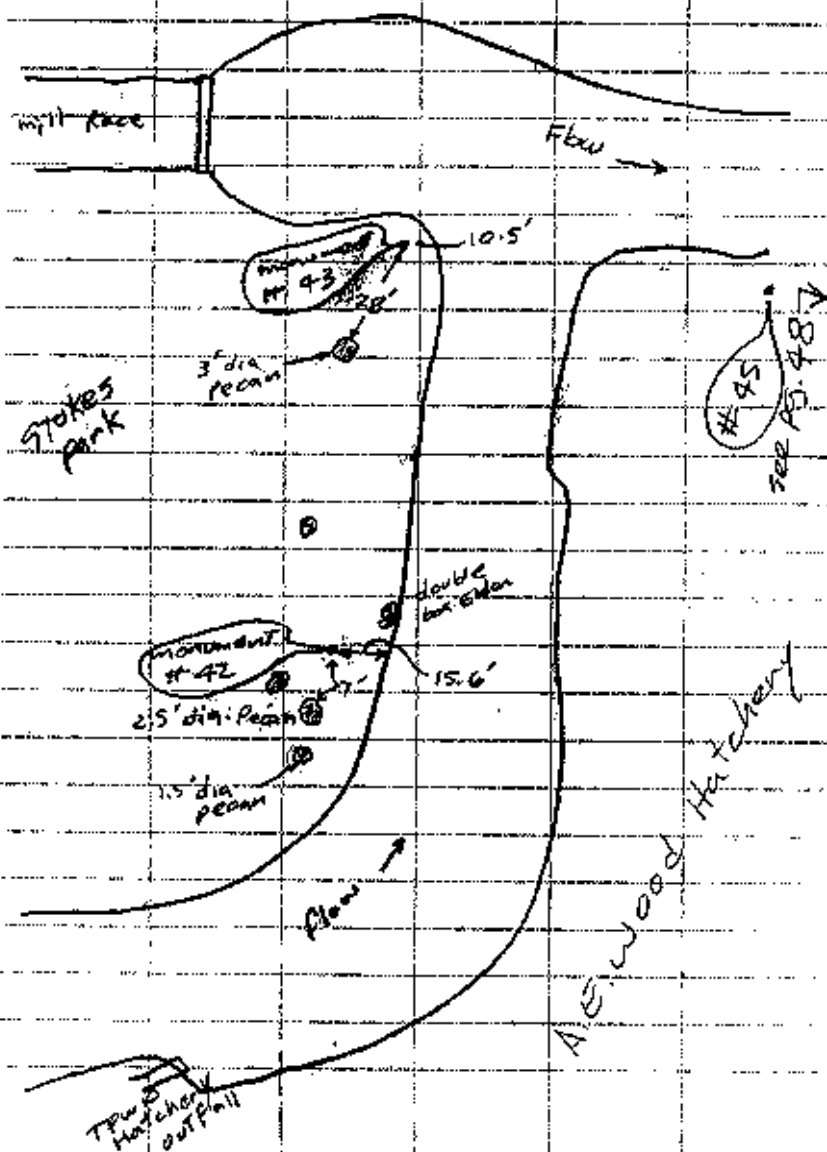
38 3

39 4 & 5



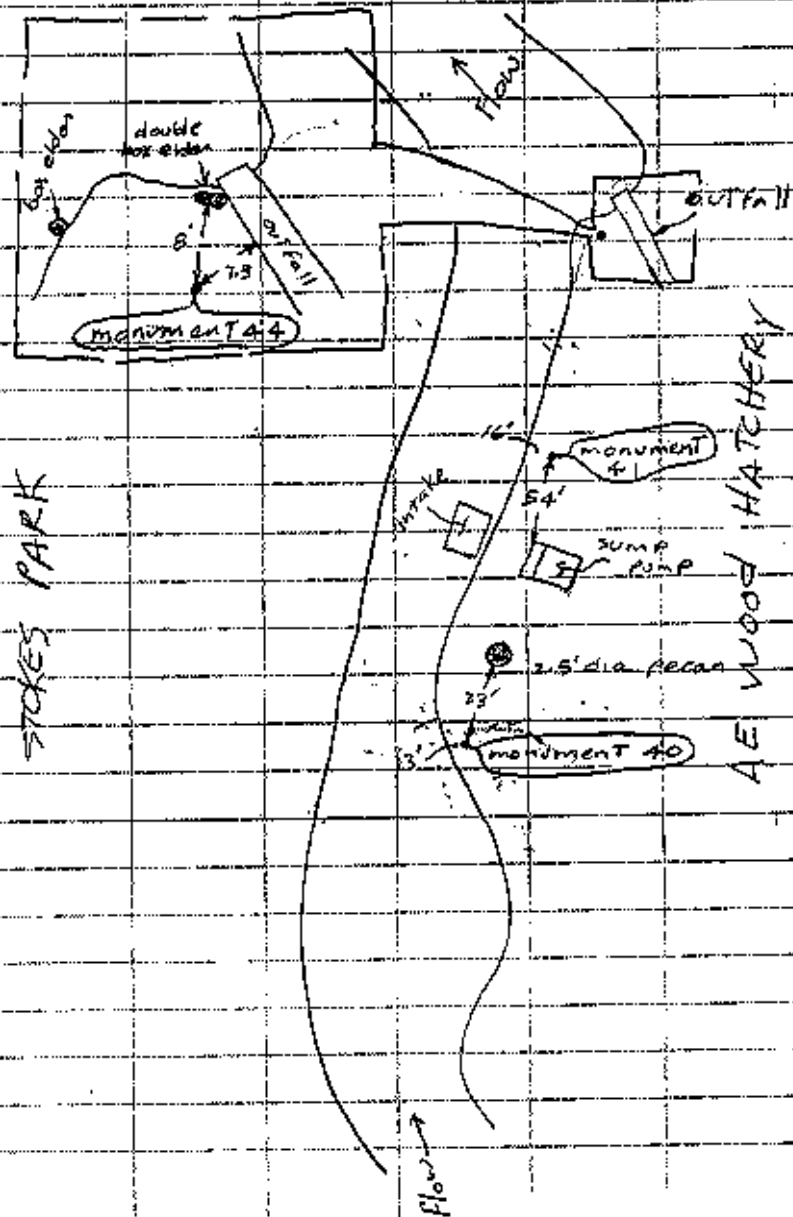


Monument 42 f 43
12-17-97 Aziz, Soaman



monument 40, 41, 44
12-18-97 Aziz Seaman

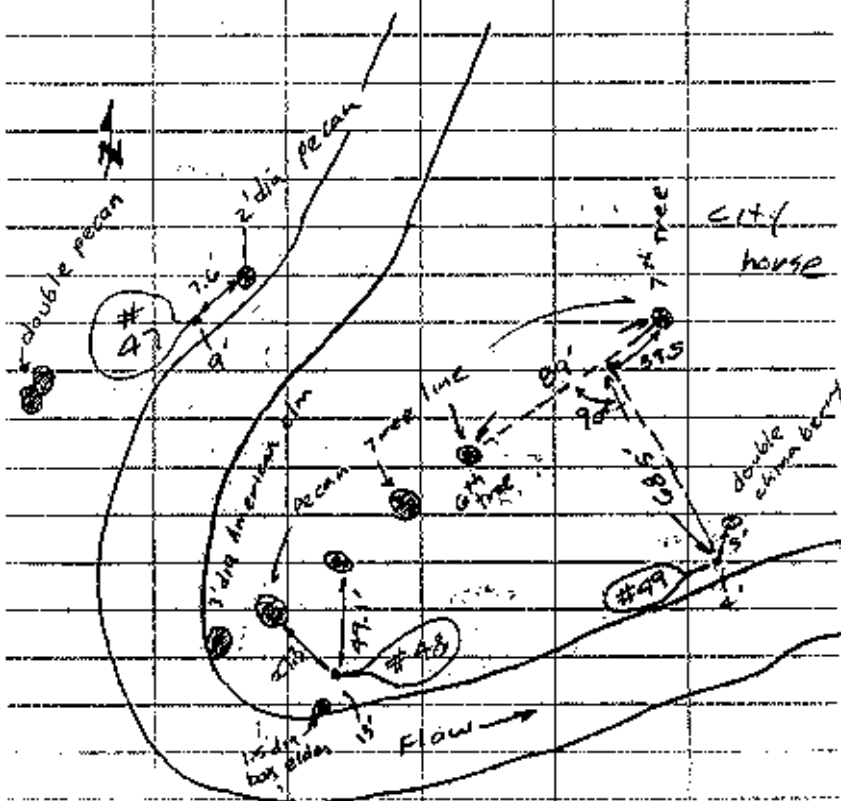
43



(42)

monuments 47, 48, 49, 50 & 54

Aziz, Seaman

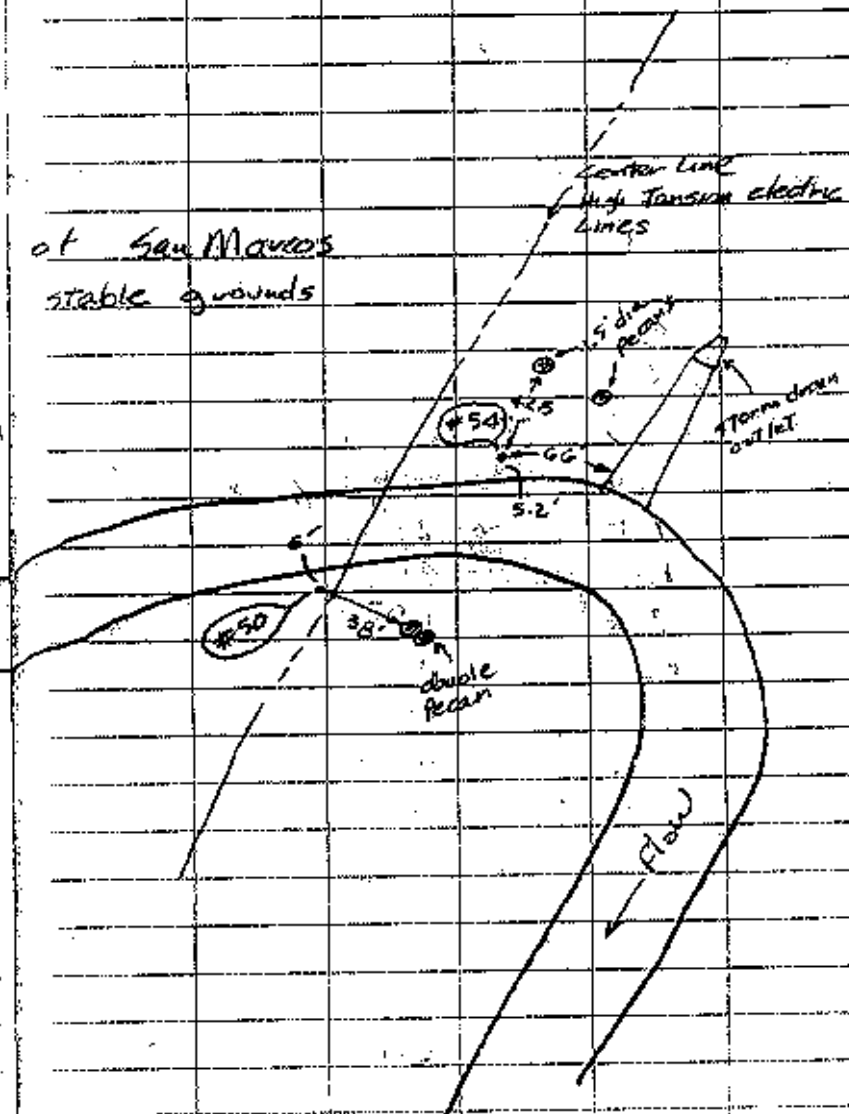


TPWD
AE Wood Hatchery

17/12/98

(43)

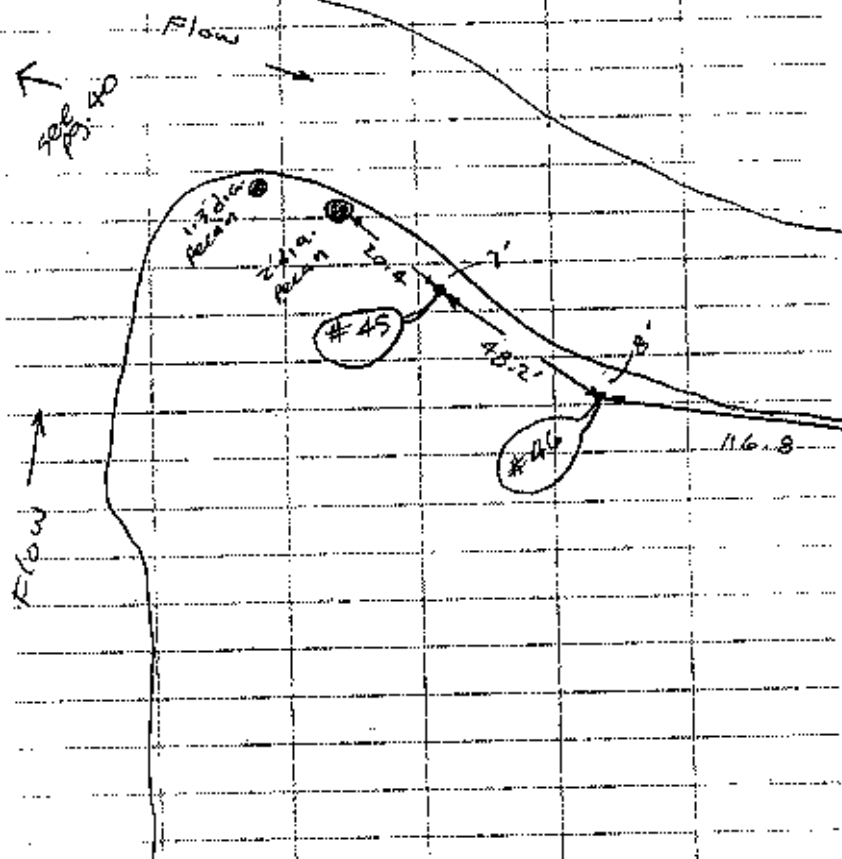
of San Marcos
stable grounds



(48)

3/11/98

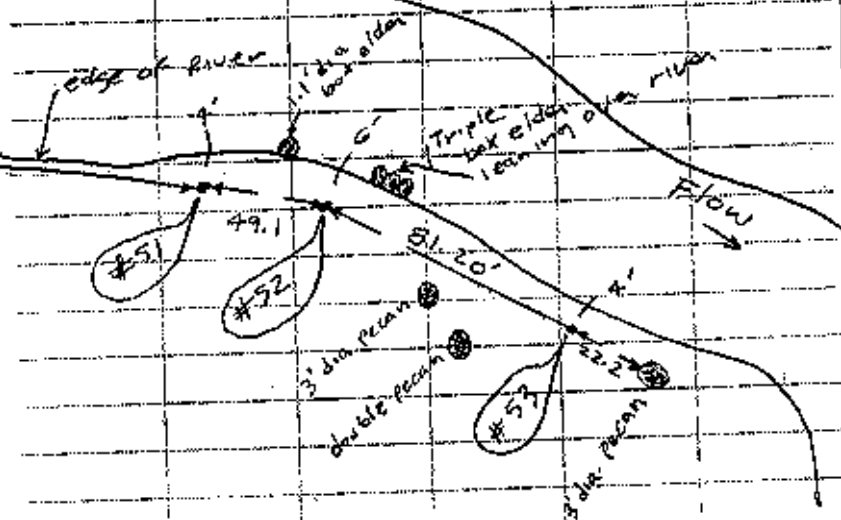
Aziz, Turgensen



TWD
AE wood
Hatchery

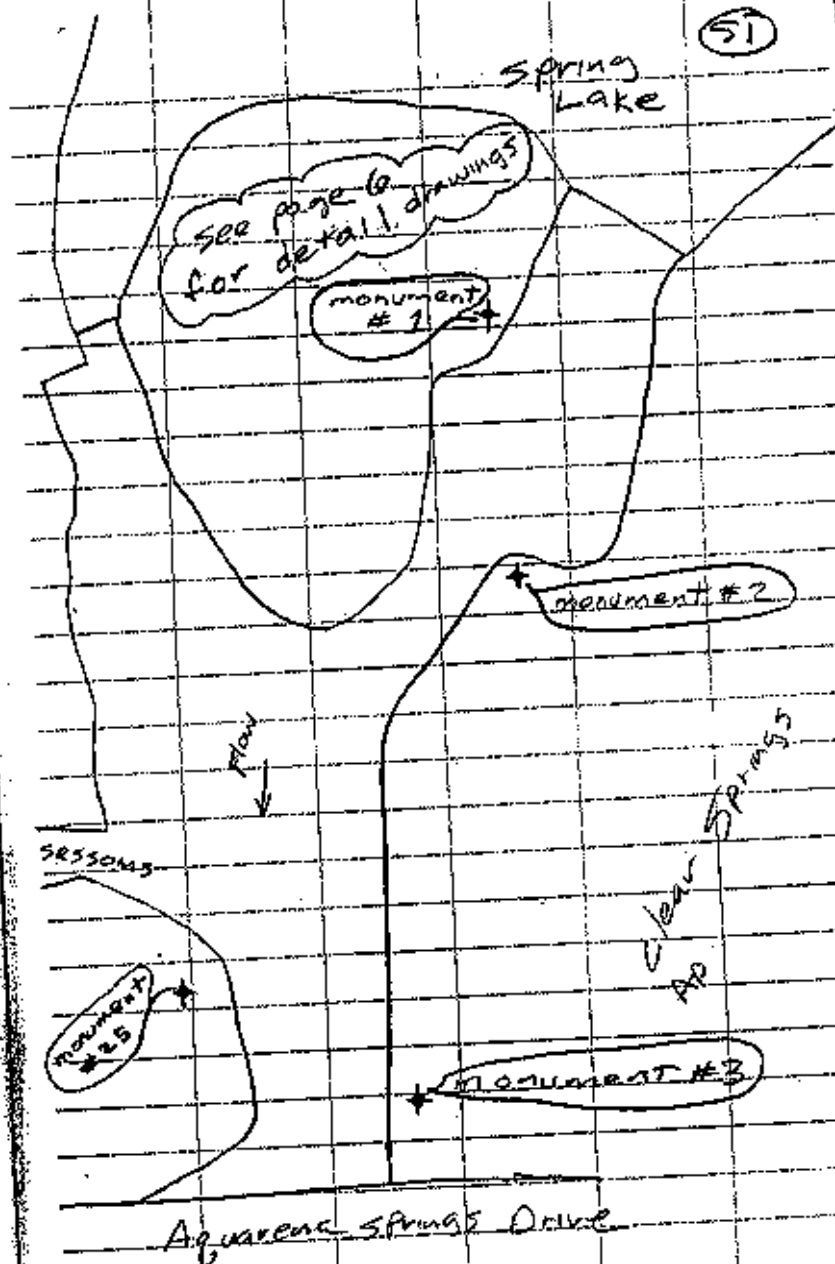
(49)

monuments 45, 46, 51, 52, 53

Just below Mill Race
confluence

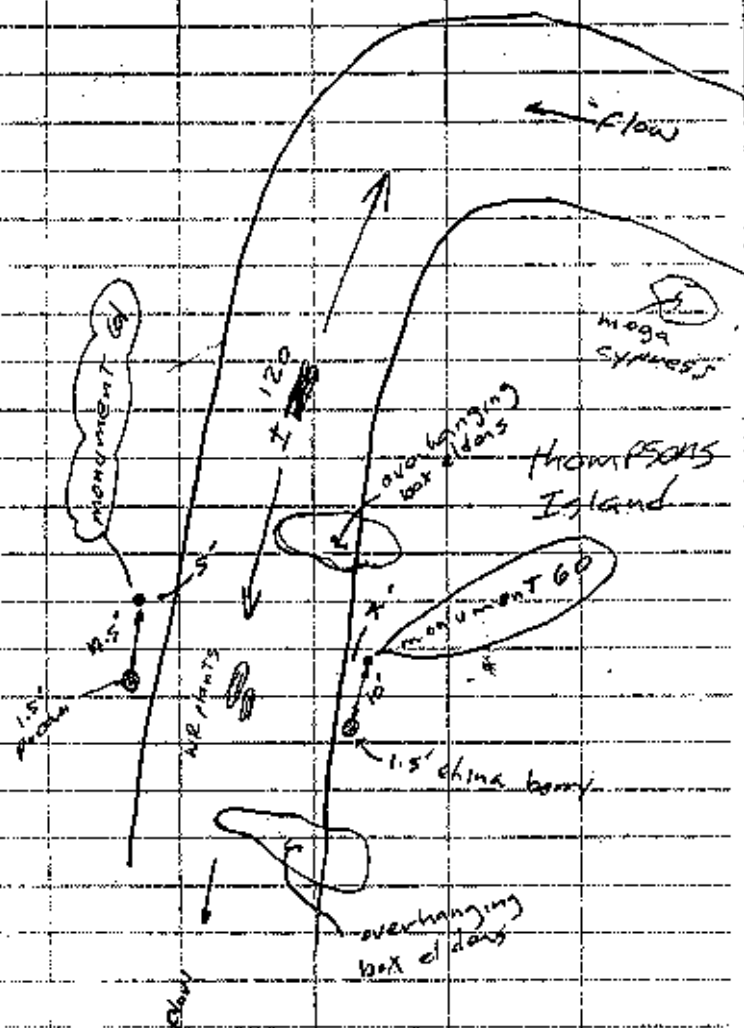
3/20/98

| ID | pt. no. | |
|---------|---------|--------------|
| CP 1298 | 1298 | |
| CP 1336 | 1336 | |
| CP 2554 | 2554 | 600 nail set |
| HAZ | 1355 | |
| CP 1337 | 1337 | |



monuments 6066/

4/14/98



53

| | | | | |
|------|---------------|-----|-----------------|-----|
| K | TP7 | HI | 4.45 | 359 |
| BKS. | HP7 | rod | 5.0' | 365 |
| | v 86° 46' 34" | | 45.88' = 45.807 | |

| | | | |
|---------|-------------------------|------------------------|---------|
| Mon. 61 | H. $13^{\circ}04'07''$ | V. $87^{\circ}26'13''$ | 45.385' |
| Mon. 60 | H. $254^{\circ}14'46''$ | V. $86^{\circ}58'37''$ | 10.945' |

42 m. to 359 to 365

17.10.11 31"

mon 40 2559

| | |
|-------|------|
| mon 4 | 2560 |
|-------|------|

mon 4-4

Appendix II: Photographs of monuments



Monument 2 at Clear Springs Apartments
spillway from Spring Lake in background

Monument #1



Clear
Springs
↓

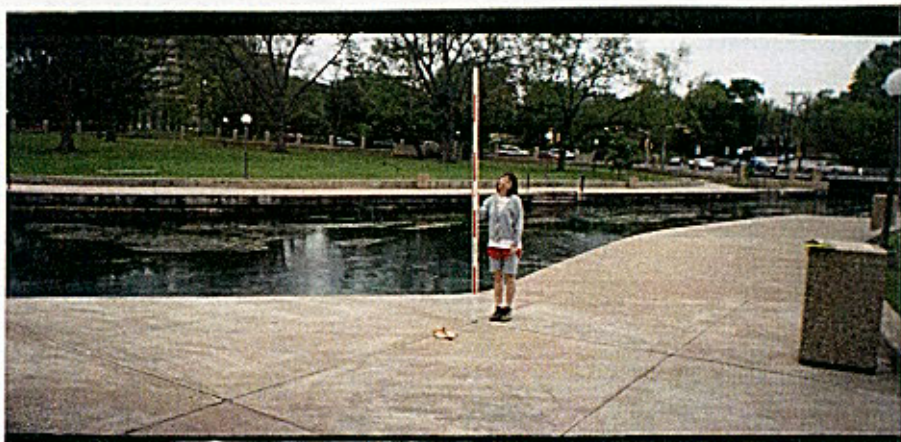
Flow



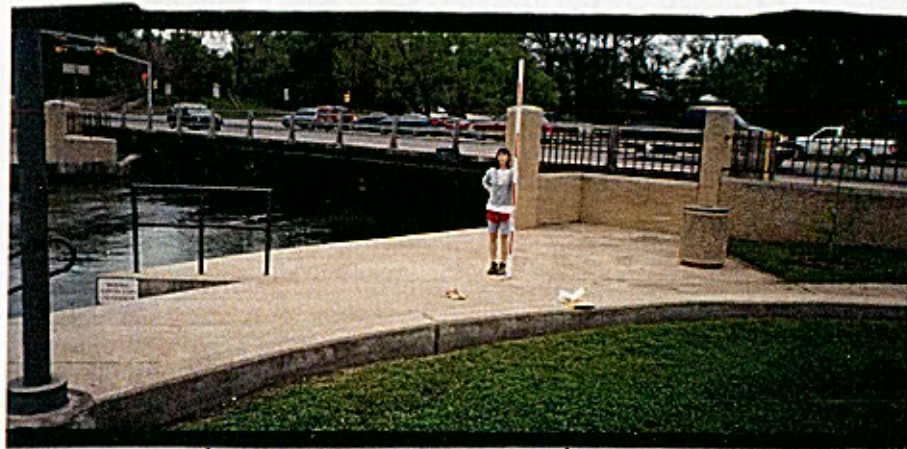
Monument #25
Sessoms at San Marcos R. looking u/s



Monument #3 at Clear Springs Apartments
(looking downstream) Aquaplena Springs Bridge background



Monument 6 Sewell Park (looking upstream)
Aquarena Springs Bridge in background



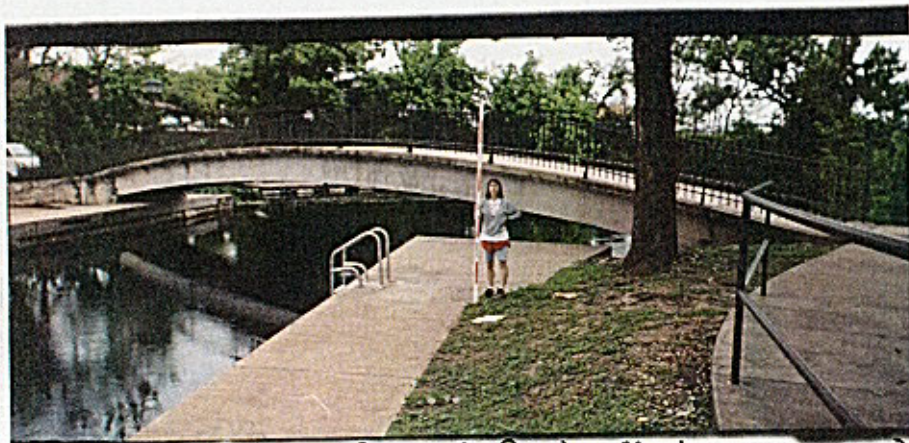
Monument 4 in Sewell Park (looking upstream)
Aquarena Springs Bridge in background



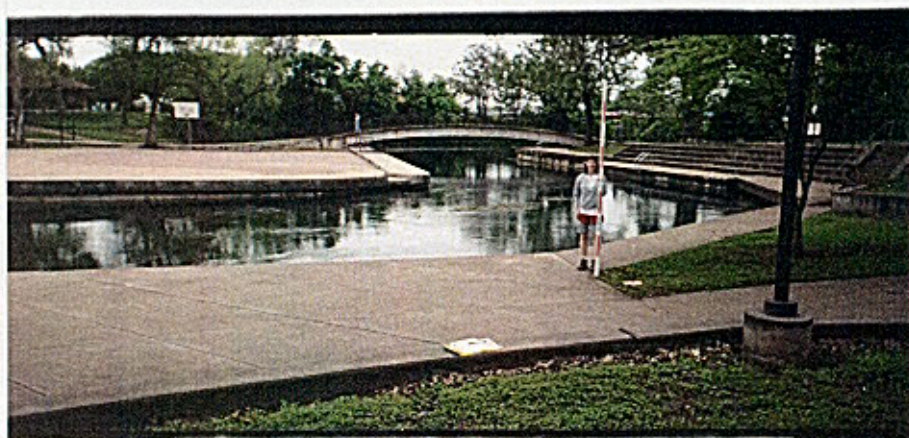
Monument 7 Sewell Park (looking downstream)
1st upstream footbridge in background (river right)



Monument 5 Sewell Park (looking upstream)
Aquarena Springs Bridge in background



Monument 9 Sewell Park (looking downstr.)
2nd footbridge in background



Monument 8 Sewell Park (looking downstream)
2nd footbridge in background (river right)



Monument 11 City Park; Sewell Park
across river ← flow



Monument 10 Sewell Park
2nd footbridge in foreground

Old Federal
Fish Hatchery



Monument 14 looking upstream



Monument 12 City Park (SWTSU campus
in background across river) ← flow

Large cypress tree
Lion's Club
Tube Rental &
City Park



Monument 15 (looking upstream)



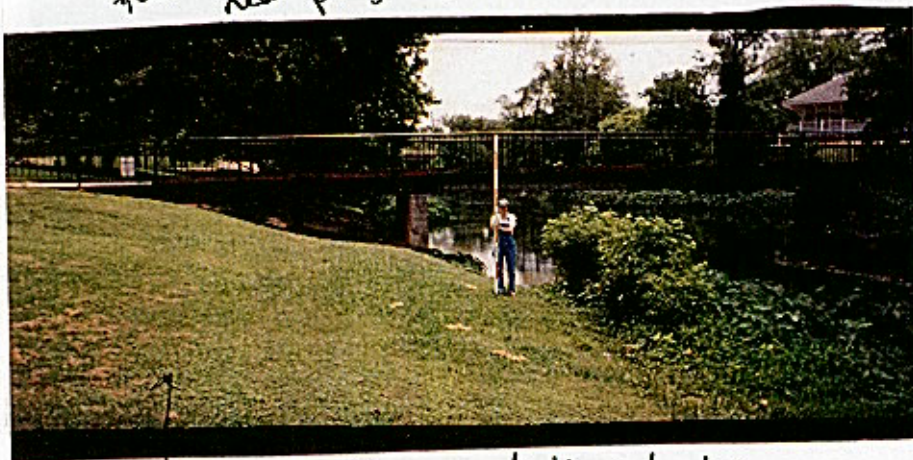
Monument 13 City Park (looking downstream)

Hopkins Street
Bridge



Monument 17 looking downstream

footbridge
near playscape



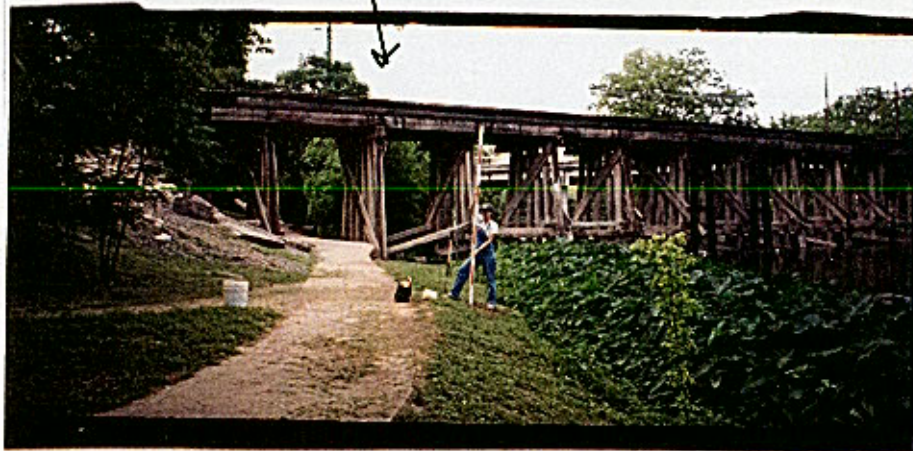
City park Monument 16 looking downstream

footbridge
near playscape



Monument 17 looking downstream
upstream

R.R. bridge at Hopkins St



Monument 18 looking upstream

round
concrete
pad

Monument 20



Bicentennial Park looking upstream

Hopkins St.
bridge



Monument 19 looking upstream

Monument 21



Bicentennial Park looking upstream

Monument 22



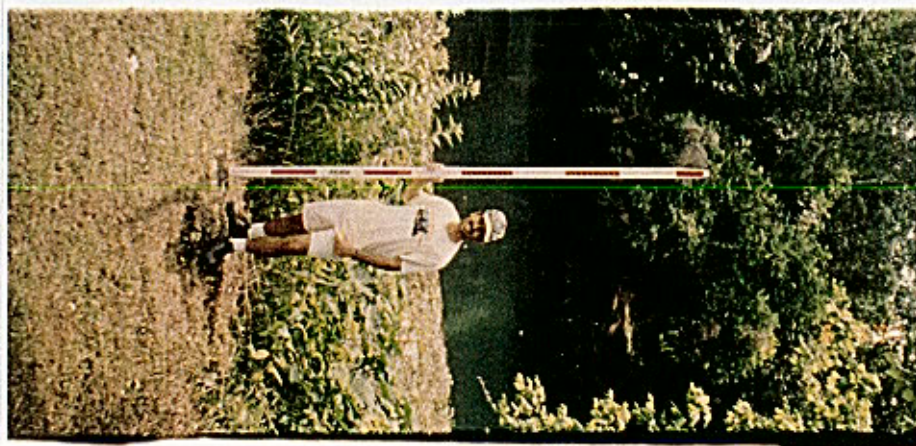
Dianne Sand's backyard (across from
Snake Island) looking downstream



Monument 26 downstream
from Cheatham St. bridge



Monument 27 on river right





Monument 29 Glover's Island



- Monument 28 Glover's Island

Glover's Island



mon. #30 (looking downstream)



Monument 31 Glover's Island
from gravel trail

conc. picnic Pav



monument 32 (looking upstream)

second shot



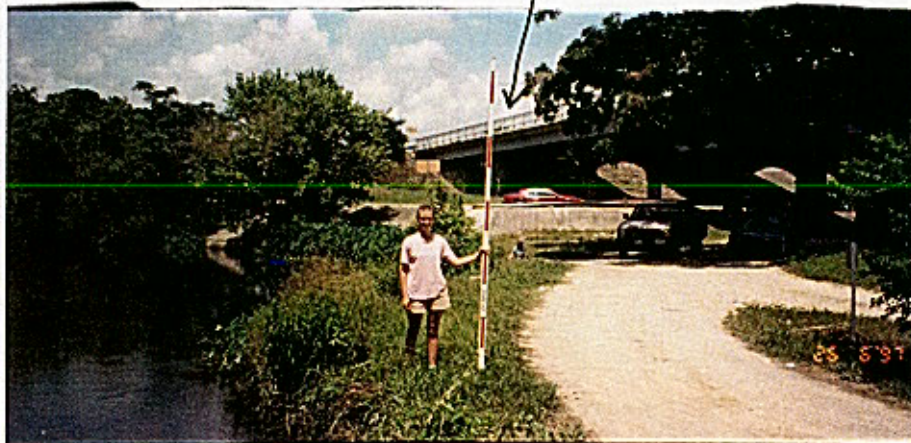
Monument 31 Glover's Island
(looking downstream)

wood bridge



Monument 32 (looking downstream)

IH 35



monument 33 (looking upstream)



monument 35 at northbound feeder lane
of IH 35



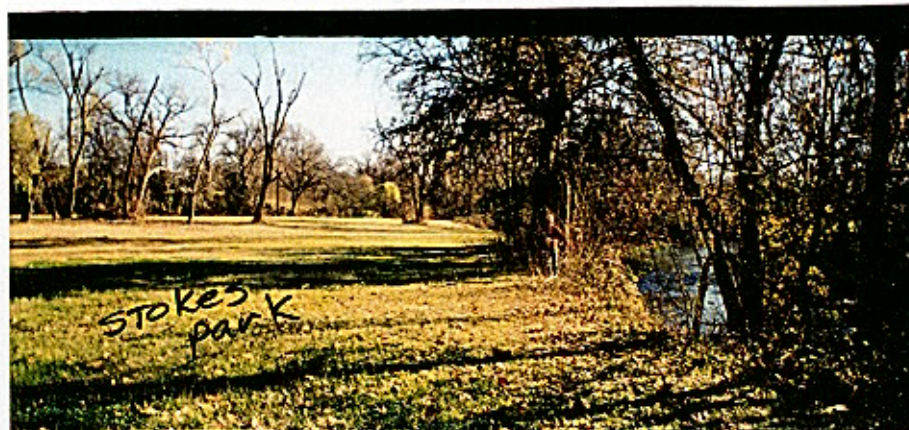
mon # 34 at IH 35

Monument 37 looking ds



Capes Road

Monument 39



looking downstream

Monument 38



looking upstream

Cape's
Road

A.E. Fish
Hatchery
intake

Monument 40



looking downstream

Monument 41

looking upstream



A.E. Wood Fish Hatchery pumps at intake

Monument 43
@ confluence - mill race & natural channel

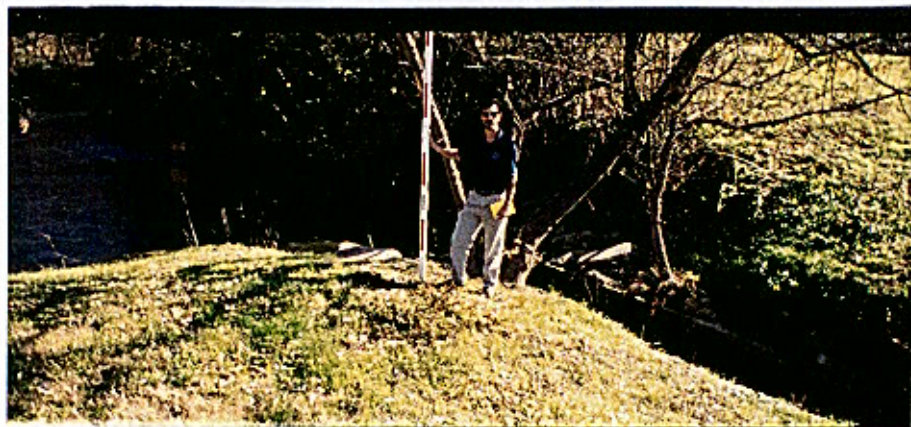


Monument 42 looking downstream



Millrace Dam in background

Monument 44



at A.E. Wood Fish Hatchery
outfall

Monument 45



(looking upstream) gabion below millrace
dam across river in background

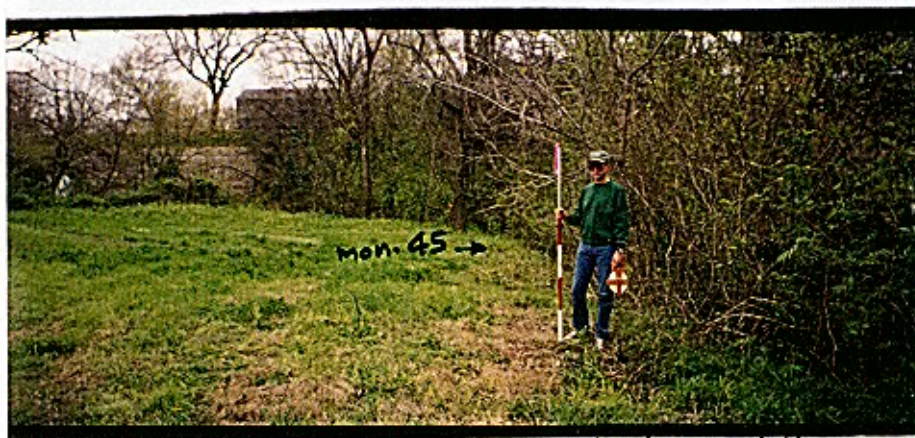
horse stable
grounds

Monument 47



looking downstream

Monument 46



(looking upstream) gabion below Millrace
dam in background to left

looking
upstream

Monument 48



Horse Stable Grounds

Monument 49 looking ds



Horse Stable Grounds.

Monument 51 A.E. Wood
Fish Hatchery



Cape's across river

A.E. Wood Hatchery grounds, looking U/S

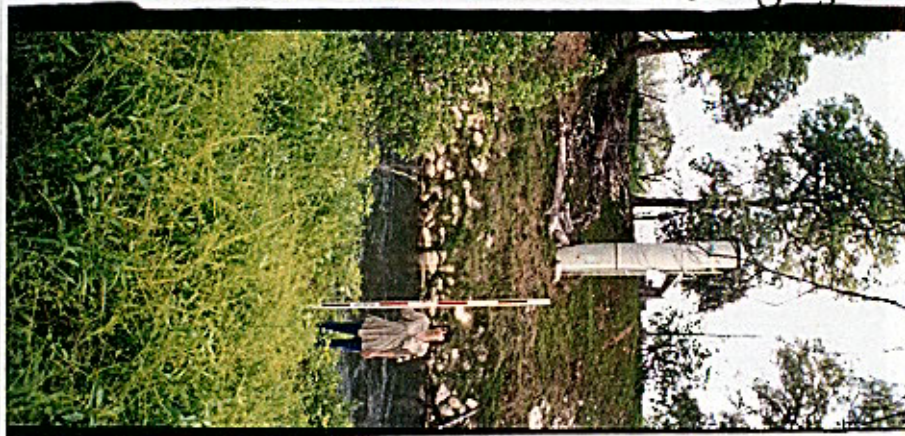


Monument 50 at overhead
power lines

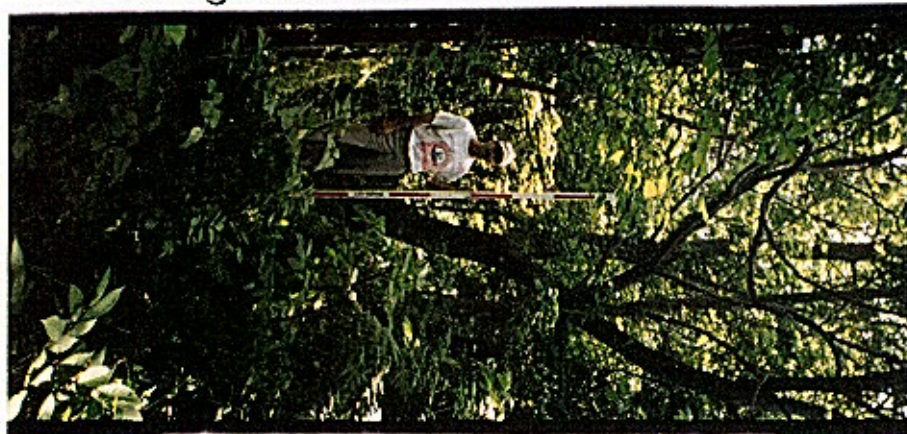
Monument #52 A.E. Wood
Fish
Hatchery



Monument #53 at old USGS H₂O
level gage



Monument #60 (Thornton's property)
looking downstream



Monument 54 looking down stream
conc. drainage structure



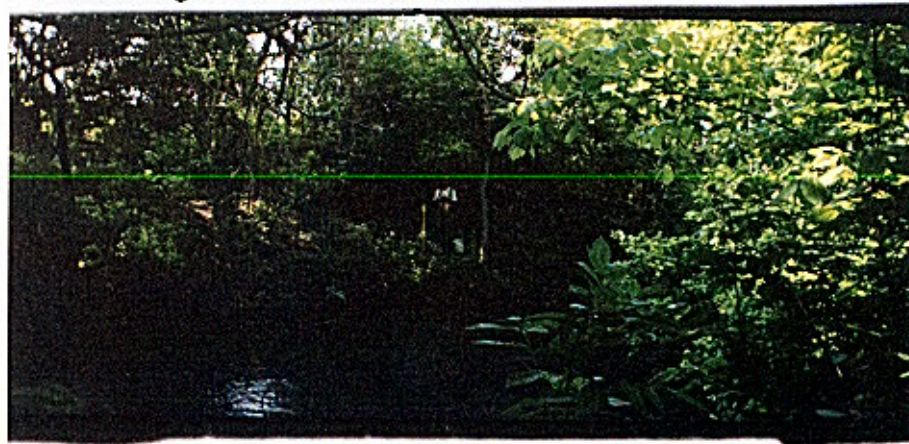
Horse Stable Grounds

location of Texas Wild-rice in relation
to monument #61 on opposite bank



WRH2,3 & 4

Monument #61 (across river)
facing upstream



Appendix III: Coordinate listing of monuments

| Texas wild-rice monuments, based on City of San Marcos bench mark system. | | | | |
|---|--------------|-------------|-----------|--|
| Wr monument | North | East | Elevation | |
| 1 | 13872764.460 | 2306280.060 | 565.750 | |
| 2 | 13872667.450 | 2306312.680 | 566.520 | |
| 3 | 13872412.510 | 2306283.380 | 566.740 | |
| 4 | 13872282.360 | 2306300.590 | 565.210 | |
| 5 | 13872150.850 | 2306246.330 | 564.990 | |
| 6 | 13872097.760 | 2306337.720 | 566.060 | |
| 7 | 13872047.660 | 2306226.130 | 565.310 | |
| 8 | 13872001.410 | 2306130.800 | 564.800 | |
| 9 | 13871850.470 | 2306131.530 | 565.600 | |
| 10 | 13871796.480 | 2306097.830 | 565.240 | |
| 11 | 13871668.860 | 2306023.900 | 564.580 | |
| 12 | 13871620.710 | 2305897.720 | 565.990 | |
| 13 | 13871508.120 | 2305814.390 | 565.460 | |
| 14 | 13871323.080 | 2305683.270 | 564.500 | |
| 15 | 13870826.460 | 2305795.330 | 562.460 | |
| 16 | 13870979.060 | 2305681.560 | 562.740 | |
| 17 | 13871252.980 | 2305729.290 | 562.070 | |
| 18 | 13870285.200 | 2305873.080 | 563.050 | |
| 19 | 13870235.880 | 2305999.430 | 563.720 | |
| 20 | 13869864.420 | 2305996.500 | 564.140 | |
| 21 | 13869774.360 | 2306057.710 | 563.180 | |
| 22 | 13869589.470 | 2306336.700 | 562.560 | |
| 23 | 13869489.250 | 2306221.610 | 562.600 | |
| 24 | 13868304.740 | 2306615.790 | 565.330 | |
| 25 | 13872450.940 | 2306157.270 | 566.510 | |
| 26 | 13868210.910 | 2306654.810 | 557.050 | |
| 27 | 13867888.240 | 2306425.770 | 557.230 | |
| 28 | 13867914.350 | 2306554.940 | 560.950 | |
| 29 | 13867759.030 | 2306583.920 | 555.310 | |
| 30 | 13867727.760 | 2306769.330 | 556.170 | |
| 31 | 13867760.860 | 2306871.770 | 556.040 | |
| 32 | 13867794.390 | 2306973.710 | 560.520 | |
| 33 | 13867458.420 | 2307060.340 | 555.600 | |
| 34 | 13867277.990 | 2307020.090 | 555.490 | |
| 35 | 13867164.610 | 2307195.560 | 555.860 | |
| 36 | 13867926.130 | 2307009.130 | 562.920 | |
| 37 | 13865023.790 | 2307283.120 | 547.920 | |
| 38 | 13864846.220 | 2307335.170 | 546.610 | |
| 39 | 13864938.580 | 2307484.170 | 547.360 | |
| 40 | 13864883.870 | 2307610.980 | 549.320 | |
| 41 | 13864815.770 | 2307753.150 | 546.500 | |
| 42 | 13864954.060 | 2307969.900 | 546.010 | |
| 43 | 13865061.940 | 2308009.790 | 545.450 | |
| 44 | 13864804.910 | 2307894.830 | 545.390 | |
| 45 | 13865036.100 | 2308123.120 | 545.450 | |
| 46 | 13864995.340 | 2308148.760 | 547.570 | |

| | | | | | |
|----|--------------|-------------|---------|--|--|
| 47 | 13864244.440 | 2308158.770 | 545.020 | | |
| 48 | 13864108.160 | 2308171.750 | 545.520 | | |
| 49 | 13864148.850 | 2308346.670 | 540.580 | | |
| 50 | 13864113.340 | 2308491.840 | 543.270 | | |
| 51 | 13864933.420 | 2308247.960 | 546.680 | | |
| 52 | 13864894.520 | 2308278.440 | 545.550 | | |
| 53 | 13864828.790 | 2308325.930 | 544.540 | | |
| 54 | 13864173.750 | 2308574.910 | 544.730 | | |
| 60 | 13865742.180 | 2306757.670 | 548.510 | | |
| 61 | 13865692.370 | 2306744.340 | 549.960 | | |
| | | | | | |

Appendix IV: Maps of distribution of wild-rice monuments

