

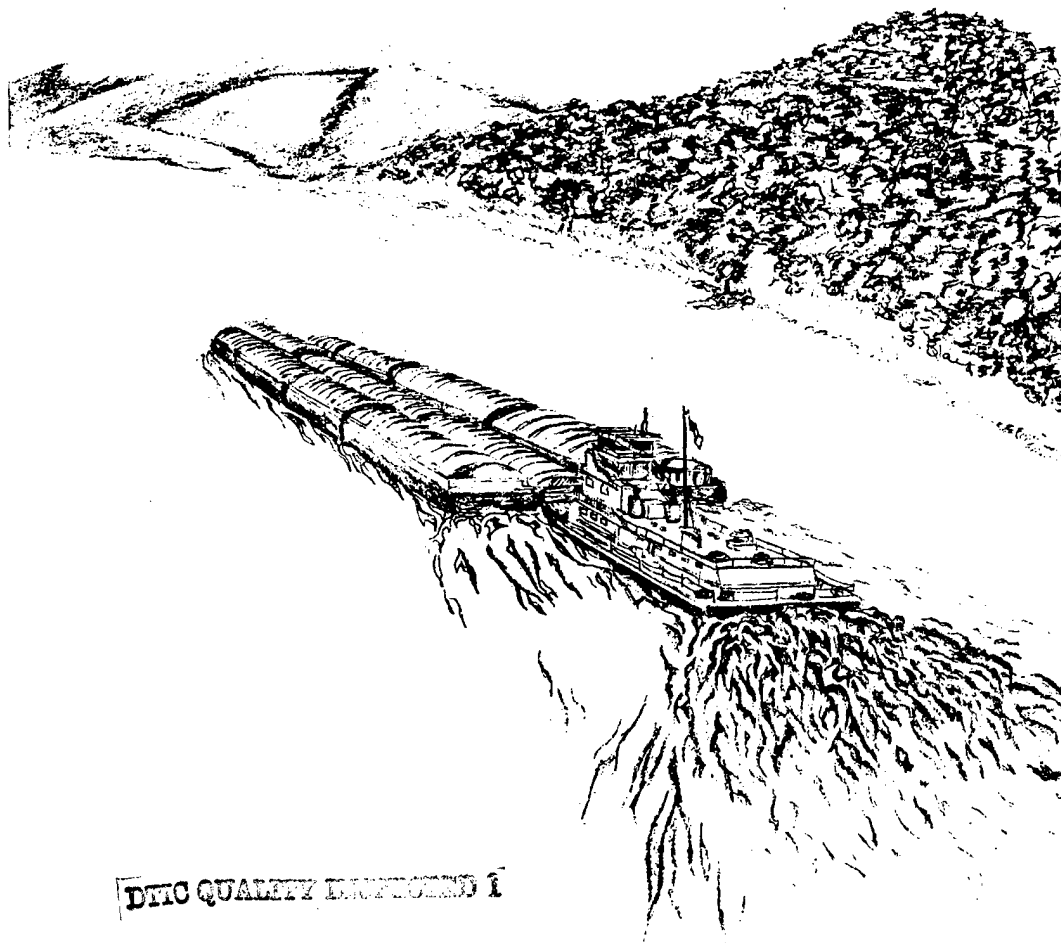
Long Term Resource Monitoring Program

# Special Report

98-S001A

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## Physical Changes Associated with Navigation Traffic on the Illinois and Upper Mississippi Rivers (Appendices)



DMC QUALITY IMPROVEMENT 1

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July 1998

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**PHYSICAL CHANGES ASSOCIATED  
WITH NAVIGATION TRAFFIC ON THE  
ILLINOIS AND UPPER MISSISSIPPI RIVERS  
(APPENDICES)**

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July 1998

## Preface

The Long Term Resource Monitoring Program (LTRMP) was authorized under the Water Resources Development Act of 1986 (Public Law 99-662) as an element of the U.S. Army Corps of Engineers' Environmental Management Program. The LTRMP is being implemented by the Environmental Management Technical Center, a U.S. Geological Survey science center, in cooperation with the five Upper Mississippi River System (UMRS) States of Illinois, Iowa, Minnesota, Missouri, and Wisconsin. The U.S. Army Corps of Engineers provides guidance and has overall Program responsibility. The mode of operation and respective roles of the agencies are outlined in a 1988 Memorandum of Agreement.

The UMRS encompasses the commercially navigable reaches of the Upper Mississippi River, as well as the Illinois River and navigable portions of the Kaskaskia, Black, St. Croix, and Minnesota Rivers. Congress has declared the UMRS to be both a nationally significant ecosystem and a nationally significant commercial navigation system. The mission of the LTRMP is to provide decision makers with information for maintaining the UMRS as a sustainable large river ecosystem given its multiple-use character. The long-term goals of the Program are to understand the system, determine resource trends and effects, develop management alternatives, manage information, and develop useful products.

This report was prepared under Strategy 1.2.2, *Determine Effects of Navigation on Selected Components and Processes of the Upper Mississippi River System Ecosystem*, of the Operating Plan<sup>1</sup> (U.S. Fish and Wildlife Service 1993). This report was developed with partial funding provided by the Long Term Resource Monitoring Program. The appendices are part two (98-S001A) of the two-part set of this report. Part one (98-S001) is the initial distribution of the report and part two is available on request.

### Suggested citation:

Bhowmik, N. G., D. Soong, J. R. Adams, R. Xia, and B. S. Mazumder. 1998. Physical changes associated with navigation traffic on the Illinois and Upper Mississippi Rivers (Appendices). Prepared by Illinois State Water Survey for U.S. Geological Survey, Environmental Management Technical Center, Onalaska, Wisconsin, July 1998. LTRMP 98-S001A. Appendices I-XXII

Additional copies of this report may be obtained from the National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161 (1-800-553-6847 or 703-487-4650). Also available to registered users from the Defense Technical Information Center, Attn: Help Desk, 8725 Kingman Road, Suite 0944, Fort Belvoir, VA 22060-6218 (1-800-225-3842 or 703-767-9050).

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<sup>1</sup>U.S. Fish and Wildlife Service. 1993. Operating Plan for the Upper Mississippi River System Long Term Resource Monitoring Program. Environmental Management Technical Center, Onalaska, Wisconsin, Revised September 1993. EMTC 91-P002R. 179 pp. (NTIS #PB94-160199)



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**APPENDIX I.**

**WATER SURFACE SLOPES AT ALL STUDY SITES**

### McEver's Island Site

| <i>Date<br/>measured</i> | <i>Average stage at<br/>RM 54.9, ft</i> | <i>Average stage at<br/>RM 43.1, ft</i> | <i>Water surface slope,<br/>ft/mi</i> |
|--------------------------|-----------------------------------------|-----------------------------------------|---------------------------------------|
| 5/16/89                  | 420.44                                  | 420.01                                  | 0.036                                 |
| 5/17/89                  | 420.30                                  | 419.92                                  | 0.032                                 |
| 5/18/89                  | 420.59                                  | 420.20                                  | 0.033                                 |

Average slope = 0.034 ft/mile

### Kampsville Site Trip 1

| <i>Date<br/>measured</i> | <i>Average elevation<br/>at RM 43.1, ft</i> | <i>Average elevation<br/>at RM 21.6, ft</i> | <i>Water surface slope,<br/>ft/mi</i> |
|--------------------------|---------------------------------------------|---------------------------------------------|---------------------------------------|
| 10/09/90                 | 419.85                                      | 419.27                                      | 0.026                                 |
| 10/10/90                 | 420.50                                      | 419.58                                      | 0.042                                 |
| 10/11/90                 | 421.30                                      | 419.70                                      | 0.073                                 |
| 10/12/90                 | 421.80                                      | 420.05                                      | 0.080                                 |
| 10/13/90                 | 422.60                                      | 420.35                                      | 0.102                                 |
| 10/14/90                 | 422.80                                      | 420.39                                      | 0.110                                 |
| 10/15/90                 | 422.90                                      | 420.40                                      | 0.114                                 |
| 10/16/90                 | 423.00                                      | 420.50                                      | 0.114                                 |
| 10/17/90                 | 424.25                                      | 420.57                                      | 0.167                                 |
| 10/18/90                 | 423.25                                      | 420.41                                      | 0.129                                 |

Average slope = 0.096 ft/mile

### Trip 2

| <i>Date<br/>measured</i> | <i>Average elevation<br/>at RM 43.1, ft</i> | <i>Average elevation<br/>at RM 21.6, ft</i> | <i>Water surface slope,<br/>ft/mi</i> |
|--------------------------|---------------------------------------------|---------------------------------------------|---------------------------------------|
| 8/12/91                  | 420.20                                      | 419.50                                      | 0.032                                 |
| 8/13/91                  | 420.30                                      | 419.70                                      | 0.027                                 |
| 8/14/91                  | 420.40                                      | 419.70                                      | 0.032                                 |
| 8/15/91                  | 420.00                                      | 419.70                                      | 0.014                                 |
| 8/16/91                  | 419.90                                      | 419.50                                      | 0.018                                 |

Average slope = 0.025 ft/mile

### Apple River Island Site

| <i>Date<br/>measured</i> | <i>Average stage at<br/>RM 552.9, ft</i> | <i>Average stage at<br/>RM 522.5, ft</i> | <i>Water surface slope,<br/>ft/mi</i> |
|--------------------------|------------------------------------------|------------------------------------------|---------------------------------------|
| 5/15/90                  | 587.85                                   | 583.06                                   | 0.158                                 |
| 5/16/90                  | 588.28                                   | 583.13                                   | 0.169                                 |
| 5/17/90                  | 588.56                                   | 583.27                                   | 0.174                                 |
| 5/18/90                  | 588.72                                   | 583.35                                   | 0.177                                 |
| 5/19/90                  | 588.77                                   | 583.26                                   | 0.181                                 |
| 5/20/90                  | 588.85                                   | 582.11                                   | 0.222                                 |
| 5/21/90                  | 589.07                                   | 582.82                                   | 0.206                                 |
| 5/22/90                  | 589.33                                   | 582.78                                   | 0.216                                 |
| 5/23/90                  | 589.59                                   | 582.94                                   | 0.219                                 |
| 5/24/90                  | 589.87                                   | 583.03                                   | 0.225                                 |

Average slope = 0.195 ft/mile

### Goose Island Site Trip 1

| <i>Date<br/>measured</i> | <i>Average stage at<br/>RM 324.9, ft</i> | <i>Average stage at<br/>RM 301.2, ft</i> | <i>Water surface slope,<br/>ft/mi</i> |
|--------------------------|------------------------------------------|------------------------------------------|---------------------------------------|
| 8/20/90                  | 465.08                                   | 459.35                                   | 0.242                                 |
| 8/21/90                  | 466.52                                   | 459.63                                   | 0.291                                 |
| 8/22/90                  | 467.99                                   | 459.63                                   | 0.353                                 |
| 8/23/90                  | 468.59                                   | 459.70                                   | 0.375                                 |
| 8/24/90                  | 468.38                                   | 459.52                                   | 0.374                                 |
| 8/25/90                  | 468.23                                   | 459.46                                   | 0.370                                 |
| 8/26/90                  | 468.29                                   | 459.49                                   | 0.371                                 |
| 8/27/90                  | 468.92                                   | 459.72                                   | 0.388                                 |
| 8/28/90                  | 469.57                                   | 459.65                                   | 0.419                                 |
| 8/29/90                  | 470.21                                   | 459.60                                   | 0.448                                 |

Average slope = 0.363 ft/mile

**Goose Island Site  
Trip 2**

| <i>Date<br/>measured</i> | <i>Average stage at<br/>RM 324.9, ft</i> | <i>Average stage at<br/>RM 301.2, ft</i> | <i>Water surface slope,<br/>ft/mi</i> |
|--------------------------|------------------------------------------|------------------------------------------|---------------------------------------|
| 7/15/91                  | 466.78                                   | 459.47                                   | 0.308                                 |
| 7/16/91                  | 466.92                                   | 459.57                                   | 0.310                                 |
| 7/17/91                  | 466.96                                   | 459.59                                   | 0.311                                 |
| 7/18/91                  | 466.81                                   | 459.35                                   | 0.315                                 |
| 7/19/91                  | 466.39                                   | 459.29                                   | 0.300                                 |
| 7/20/91                  | 466.19                                   | 459.46                                   | 0.284                                 |
| 7/21/91                  | 465.84                                   | 459.44                                   | 0.270                                 |
| 7/22/91                  | 465.55                                   | 459.41                                   | 0.259                                 |
| 7/23/91                  | 465.52                                   | 459.49                                   | 0.254                                 |
| 7/24/91                  | 465.81                                   | 459.75                                   | 0.256                                 |
| 7/25/91                  | 466.21                                   | 459.71                                   | 0.274                                 |

Average slope = 0.286 ft/mile

**Clarks Ferry Site  
Trip 1**

| <i>Date<br/>measured</i> | <i>Average elevation<br/>at RM 473.75</i> | <i>Average elevation<br/>at RM 468.2</i> | <i>Water surface slope,<br/>ft/mi</i> |
|--------------------------|-------------------------------------------|------------------------------------------|---------------------------------------|
| 5/17/91                  | 550.69                                    | 548.83                                   | 0.335                                 |
| 5/19/91                  | 551.14                                    | 549.35                                   | 0.322                                 |
| 5/20/91                  | 551.37                                    | 549.47                                   | 0.342                                 |
| 5/21/91                  | 551.47                                    | 549.61                                   | 0.335                                 |
| 5/22/91                  | 551.47                                    | 549.64                                   | 0.329                                 |

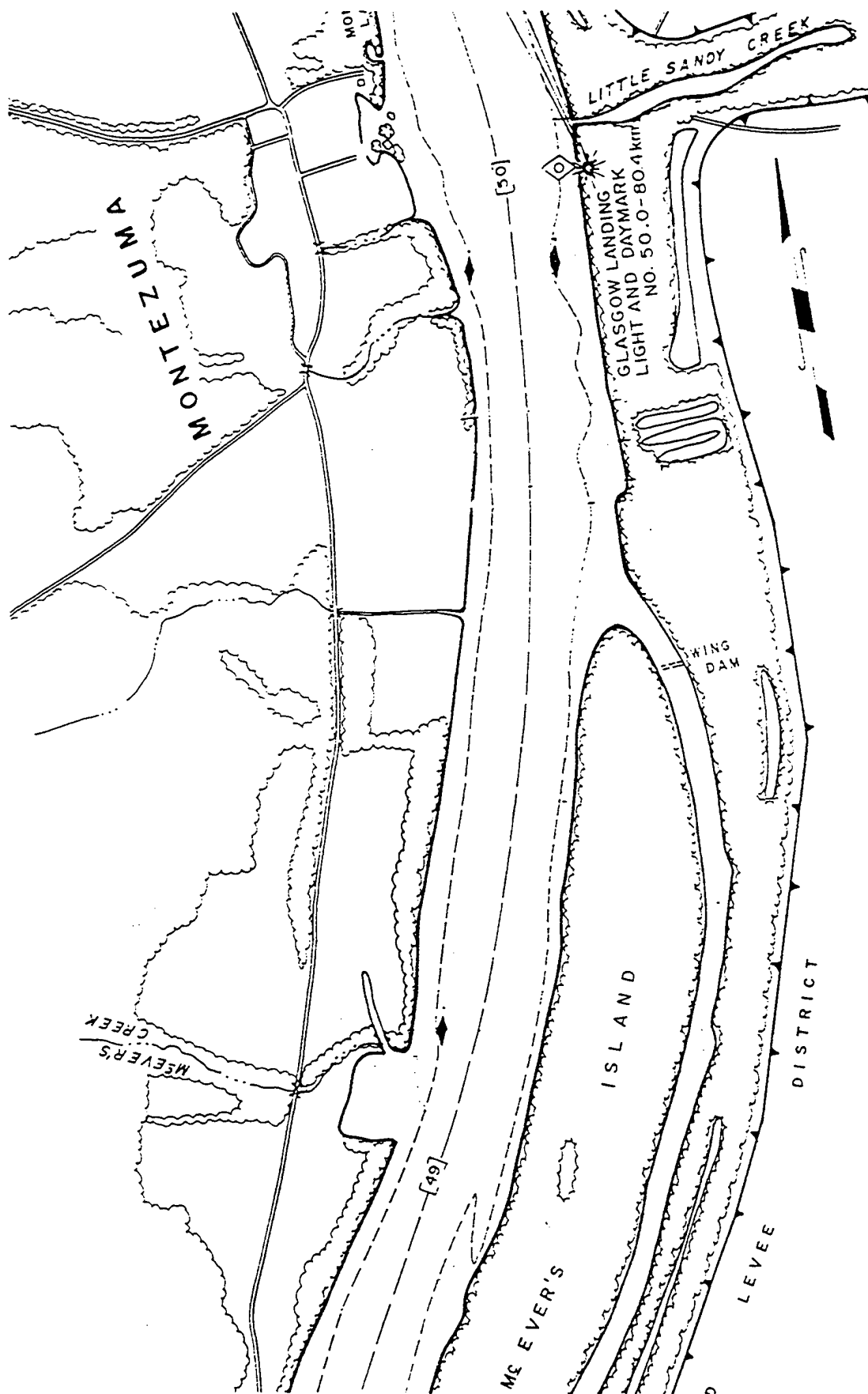
Average slope = 0.333 ft/mile

**Trip 2**

The average surface slope during this trip was 0.06 ft/mile.

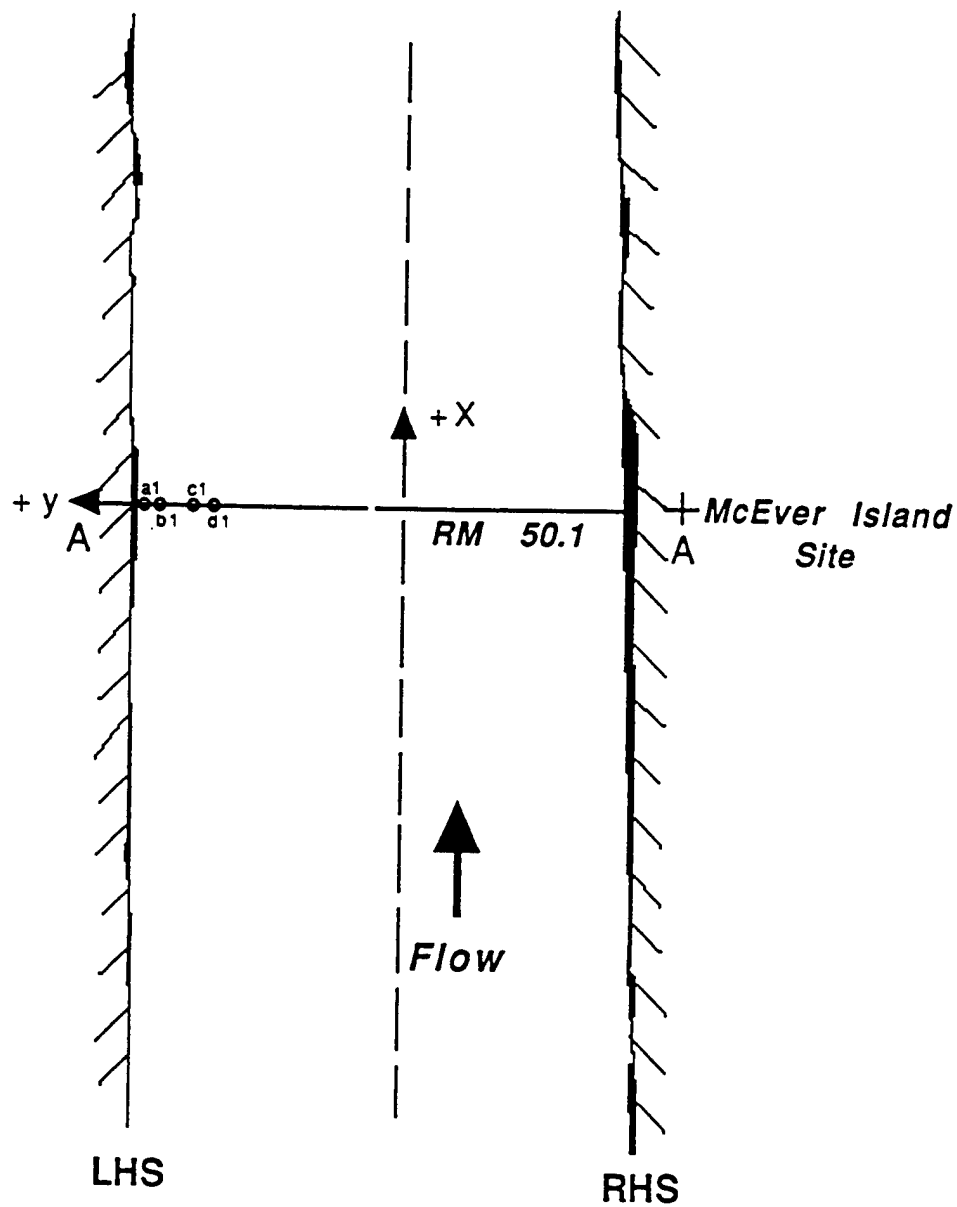
**APPENDIX II.**

**STUDY SITE LOCATIONS AND RELATIVE POSITIONS  
OF MEASURING SENSORS**



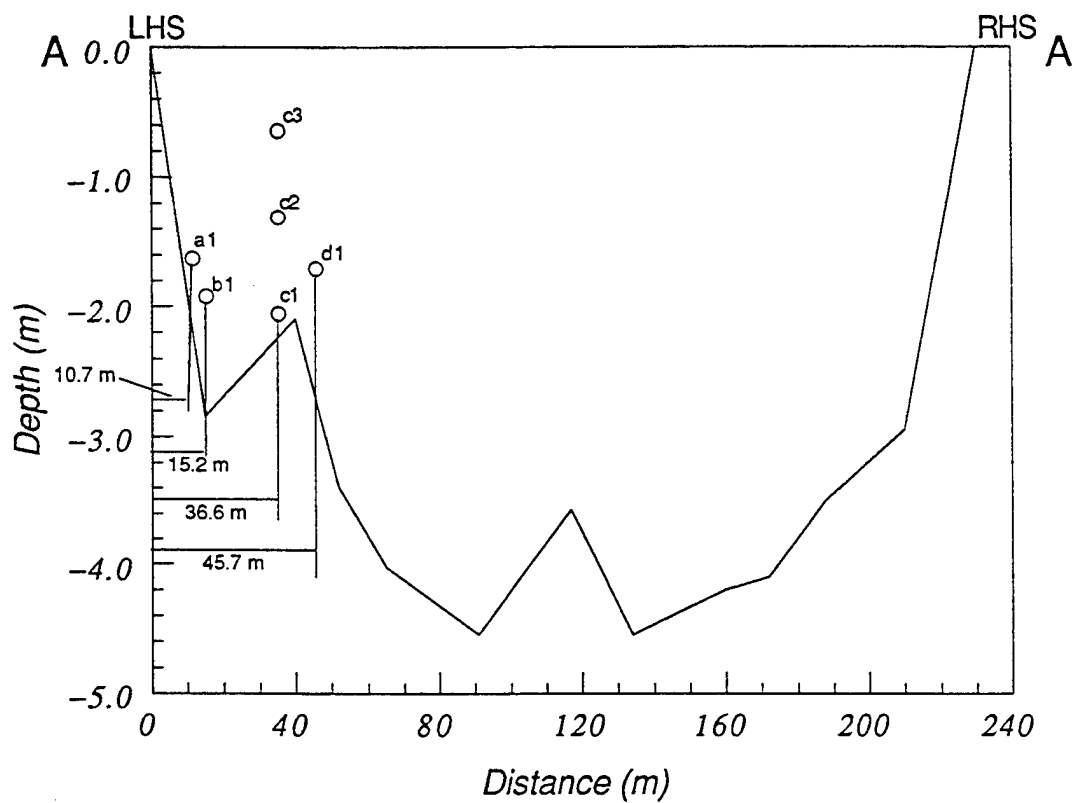
II-1. McEver's Island site on the Illinois River



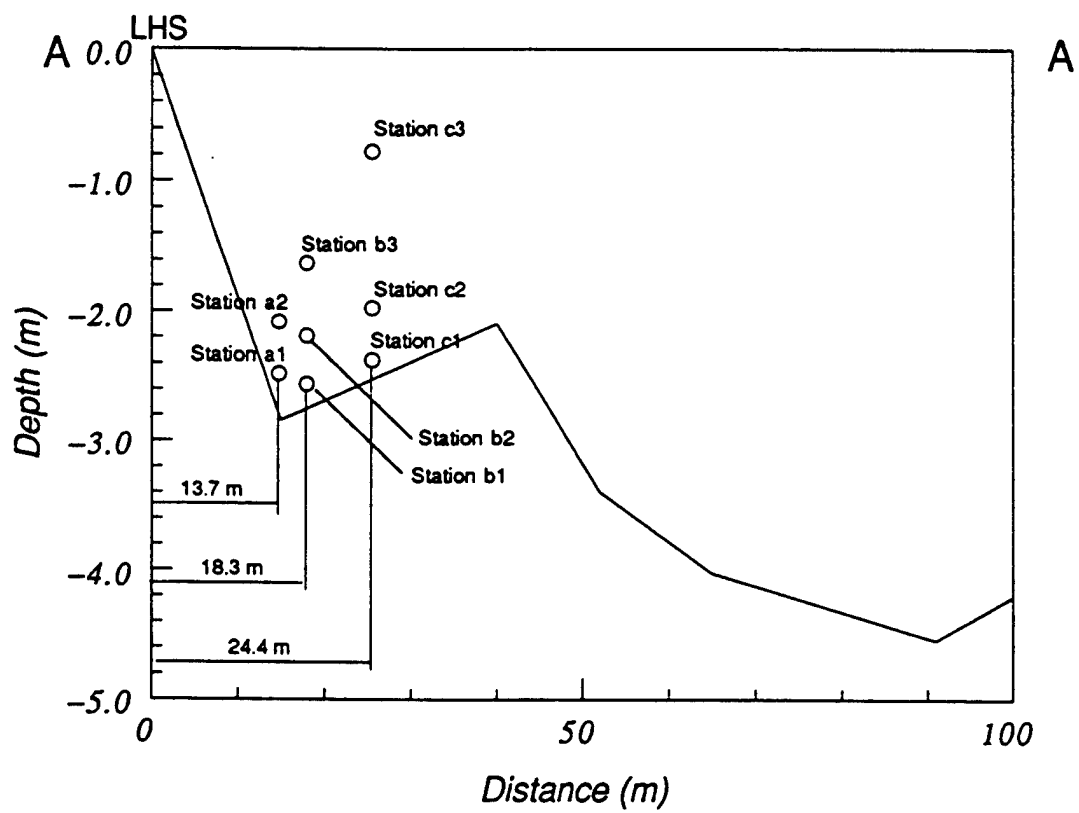


- a1 - MMB511/998, 0.15 m above river bed
- b1 - MMB527/642, 0.91 m above river bed
- c1 - MMB511/999, 0.15 m above river bed
- c2 - MMB511/1000, 0.91 m above river bed
- c3 - MMB511/1001, 2.65 m above river bed
- d1 - S4/071, 0.91 m above river bed

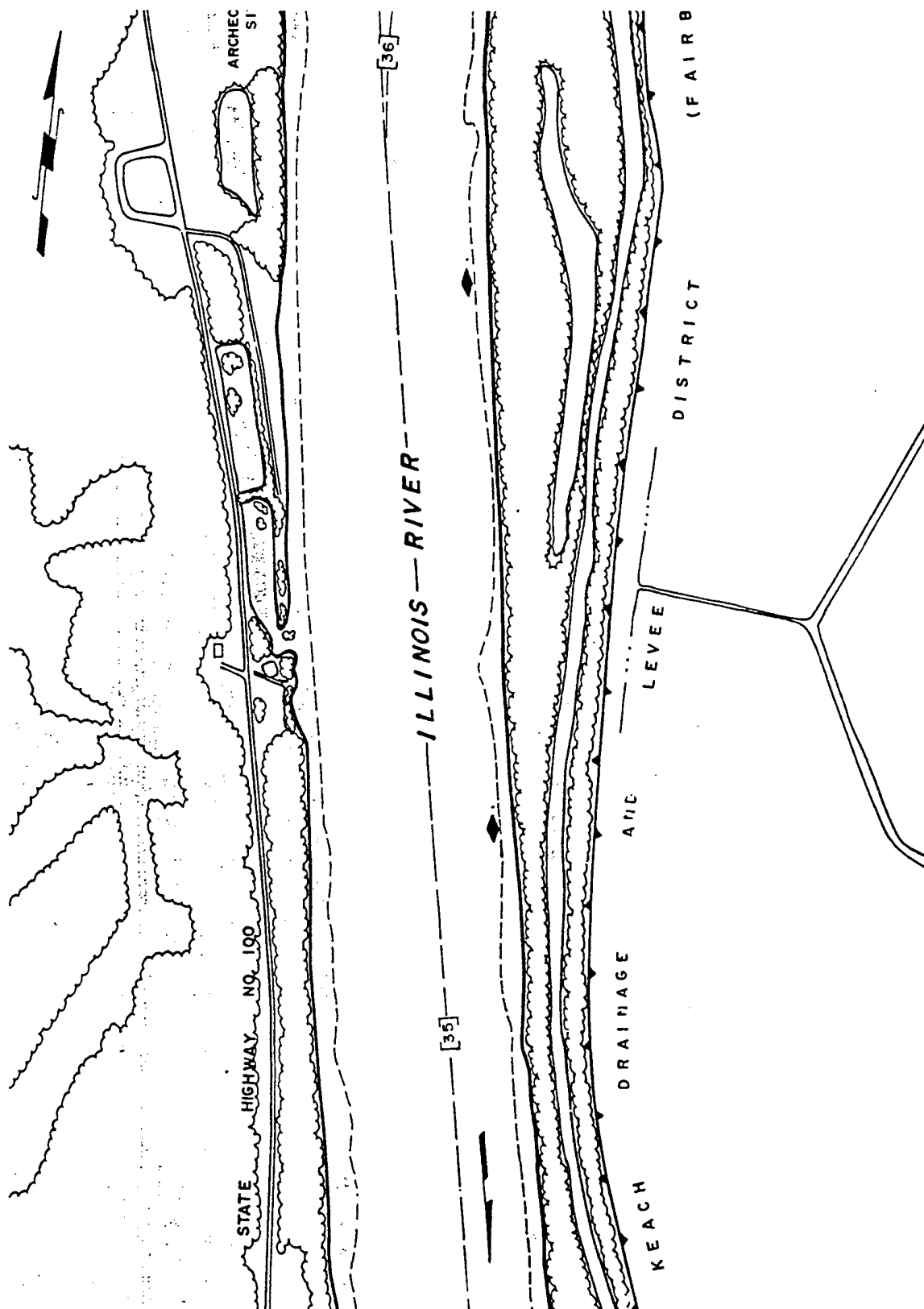
II-2. Plan view of the McEver's Island site  
and locations of current meters



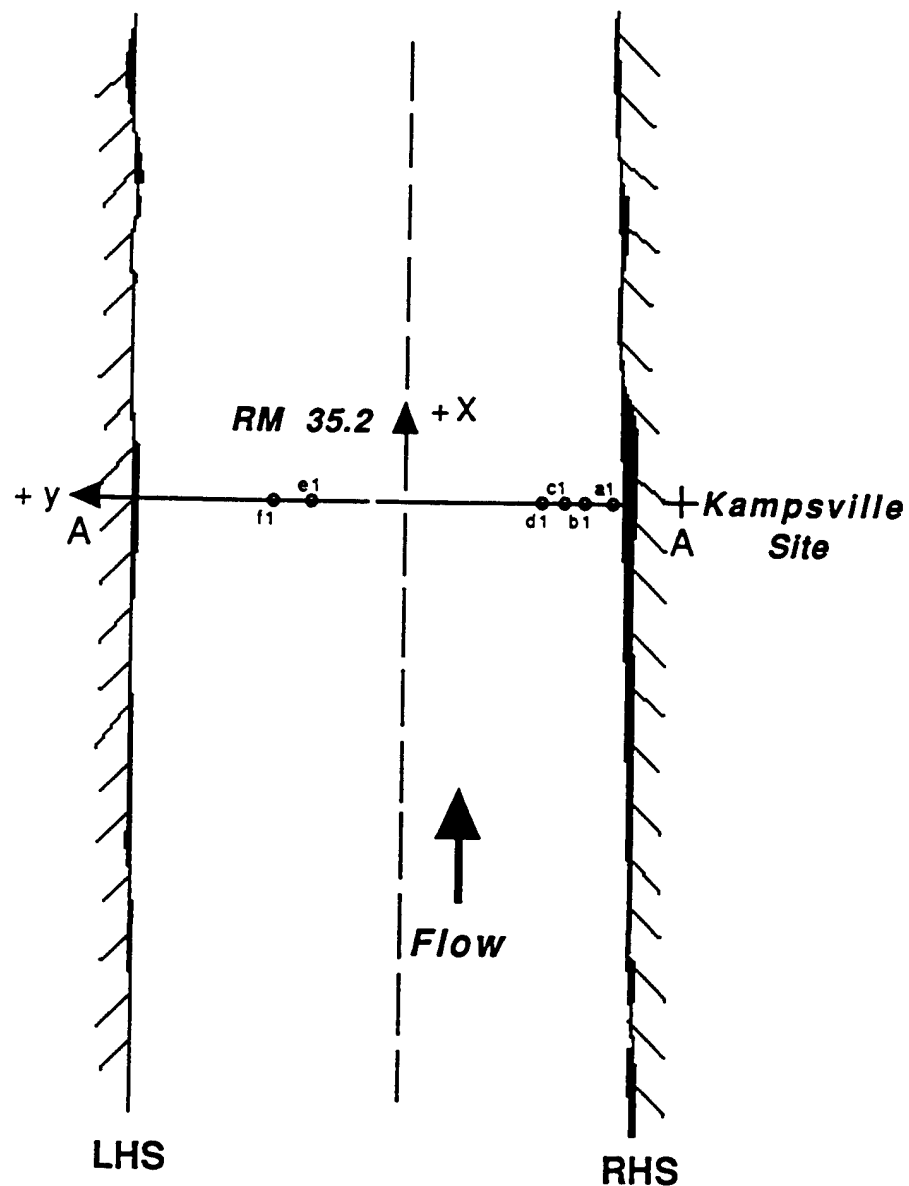
II-3. Cross section of the Illinois River at the McEver's Island site and relative position of the current meters



II-4. Location of suspended sediment sampling stations on the Illinois River near the McEver's Island site

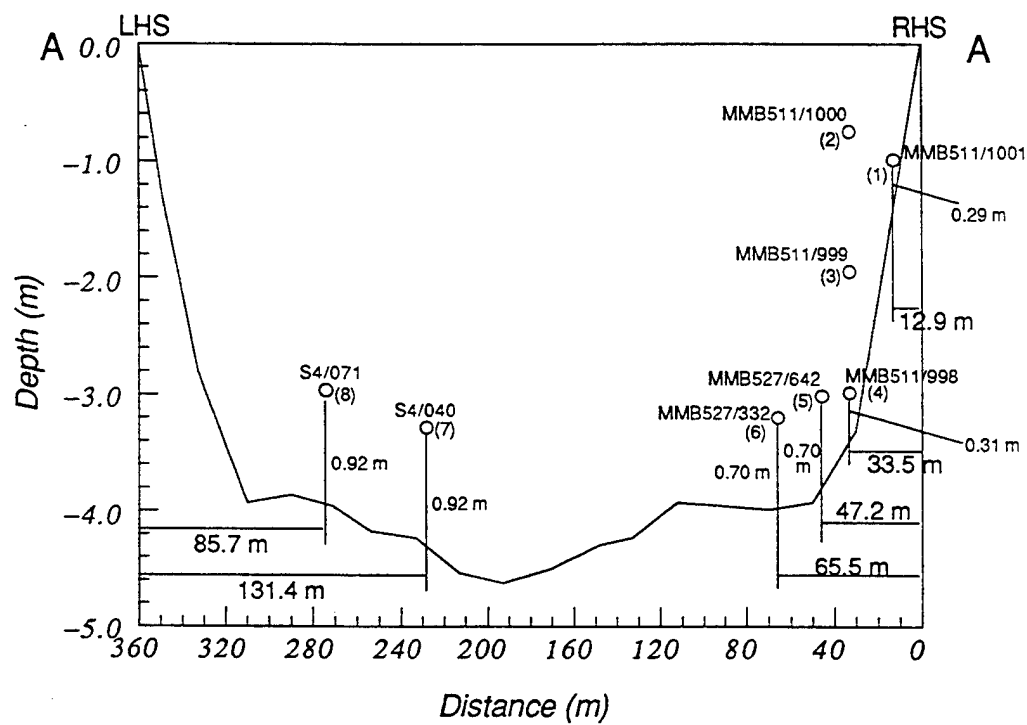


II-5. Kampsville site on the Illinois River

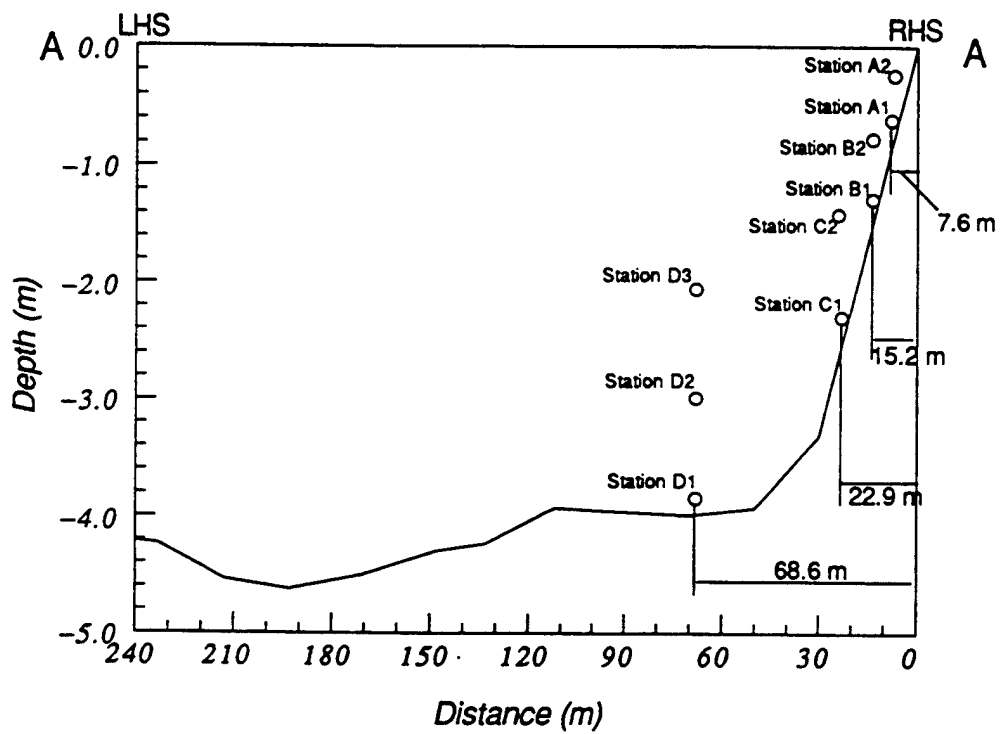


- a1 - MMB511/1001, 0.29 m above river bed
- b1 - MMB511/998, 0.31 m above river bed
- b2 - MMB511/999, 1.22 m above river bed
- b3 - MMB511/1000, 2.44 m above river bed
- c1 - MMB527/642, 0.70 m above river bed
- d1 - MMB527/332, 0.70 m above river bed
- e1 - S4/040, 0.92 m above river bed
- f1 - S4/071, 0.92 m above river bed

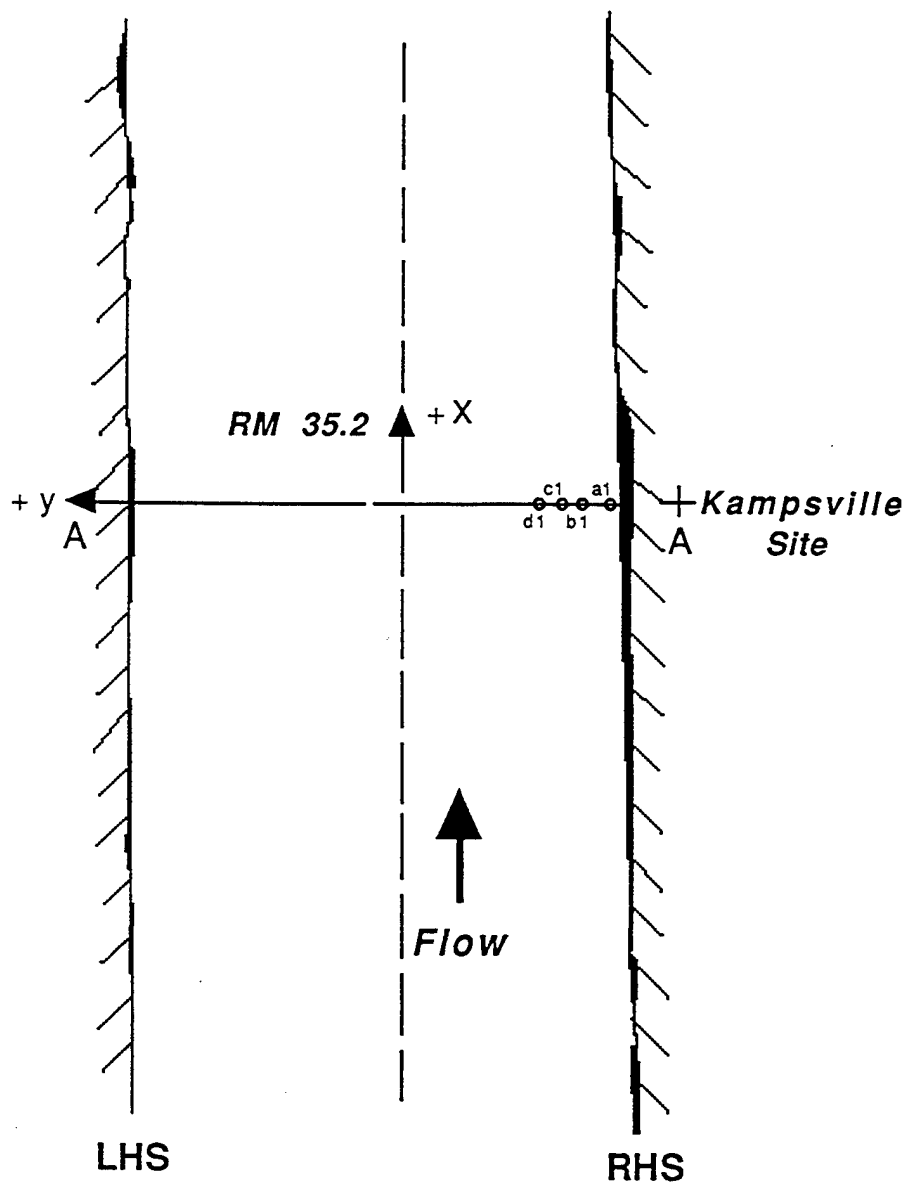
II-6. Plan view of the Kampsville site for trip 1  
and locations of current meters



II-7. Cross section of the Illinois River at the Kampsville site for trip 1



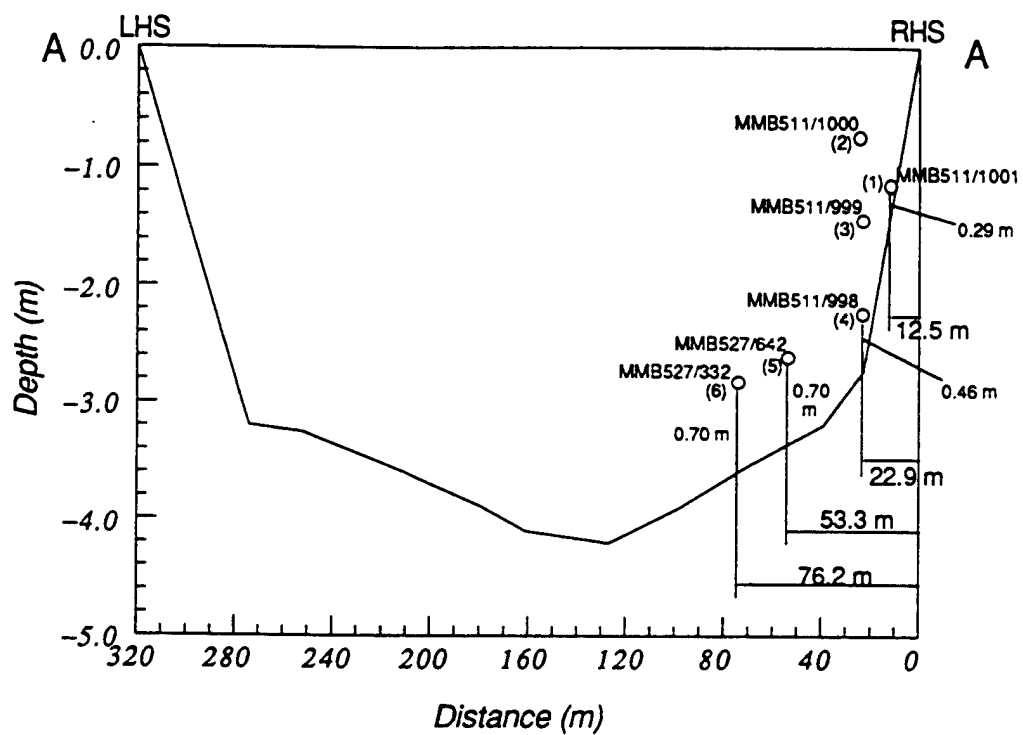
II-8. Location of suspended sediment sampling stations on the Illinois River near the Kampsville site during trip 1



- a1 - MMB511/1001, 0.29 m above river bed
- b1 - MMB511/998, 0.46 m above river bed
- b2 - MMB511/999, 1.31 m above river bed
- b3 - MMB511/1000, 2.13 m above river bed
- c1 - MMB527/642, 0.70 m above river bed
- d1 - MMB527/332, 0.70 m above river bed

II-9. Plan view of Kampsville site for trip 2  
and locations of current meters

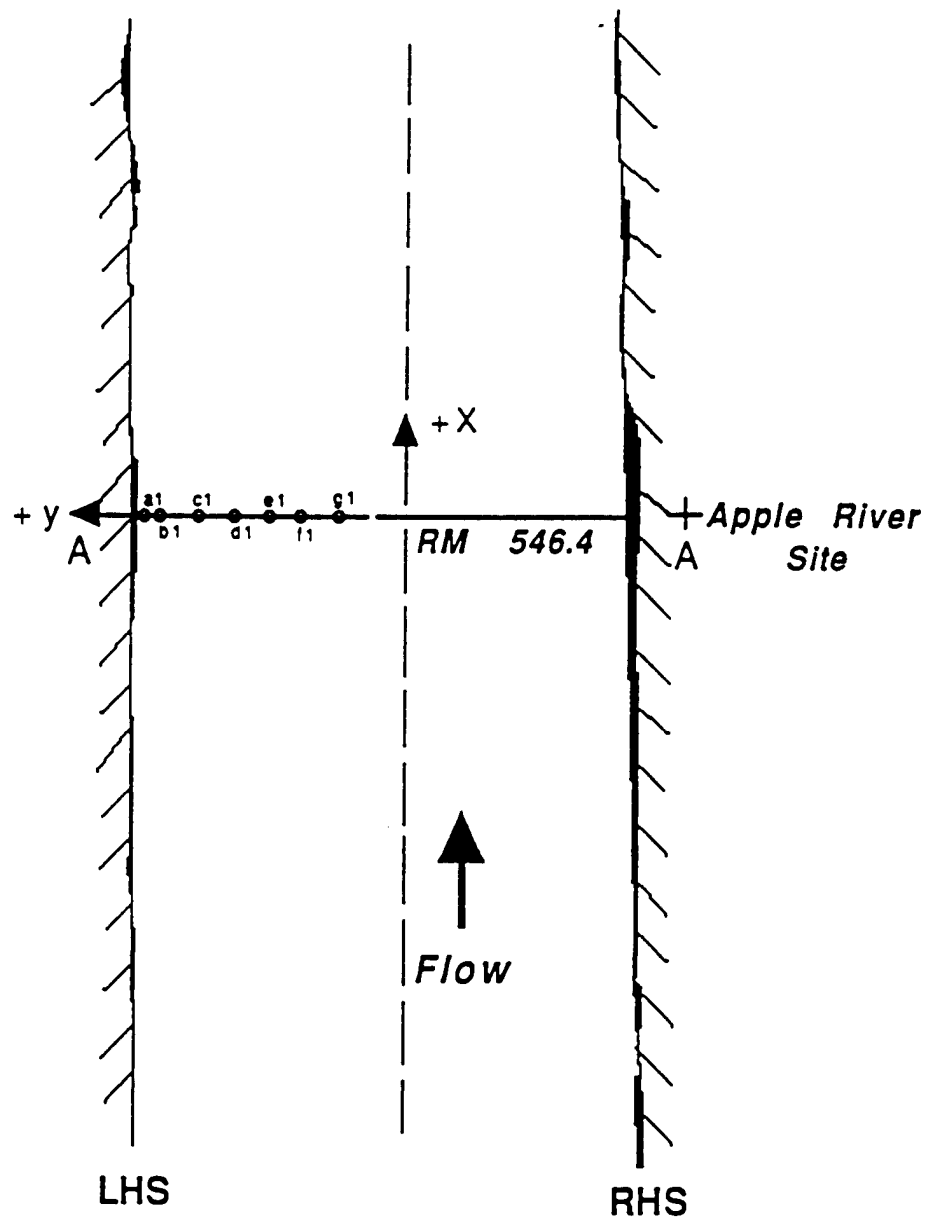




II-10. Cross section of the Illinois River at the Kampsville site for trip 2

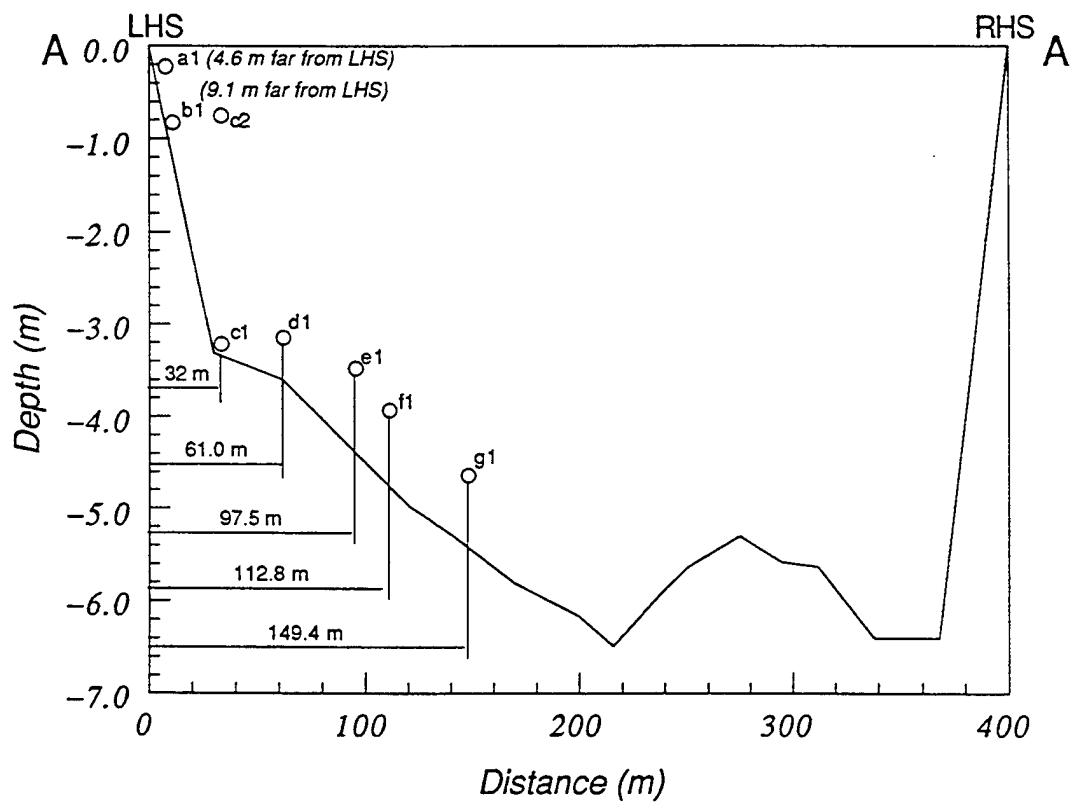


II-11. Apple River Island site on the Mississippi River

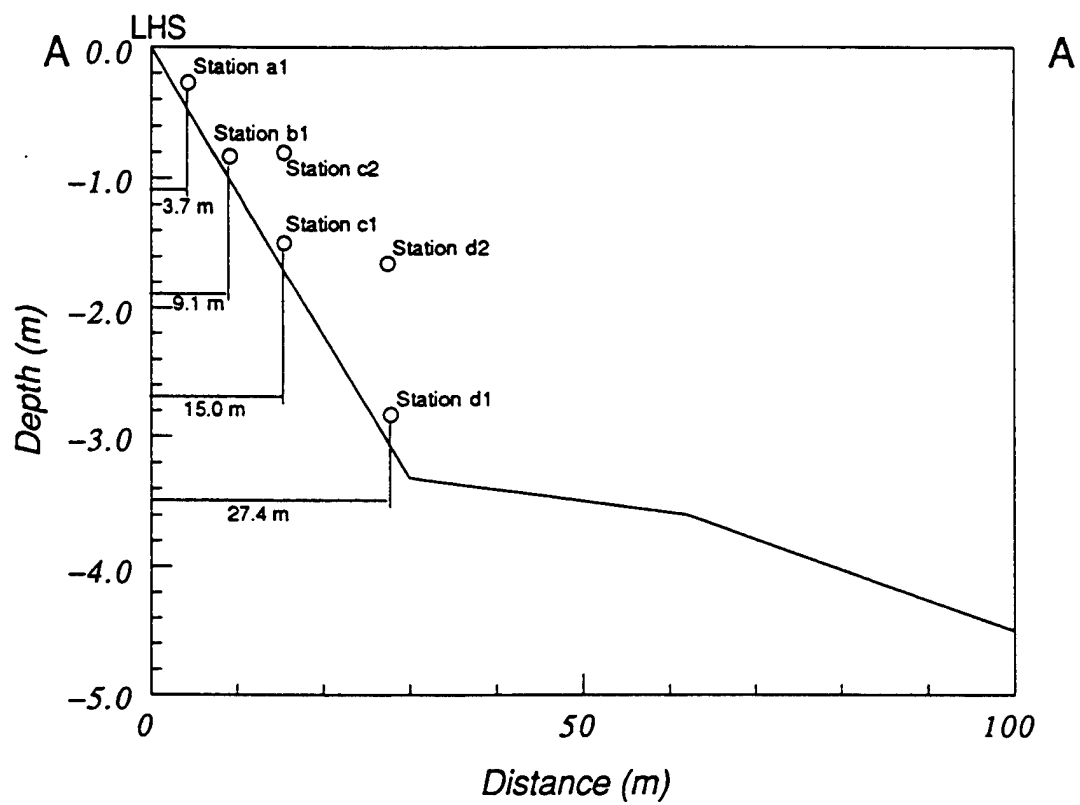


- a1 - MMB511/1001, 0.20 m above river bed
- b1 - MMB511/1000, 0.22 m above river bed
- c1 - MMB511/998, 0.15 m above river bed
- c2 - MMB511/999, 2.74 m above river bed
- d1 - MMB527/642, 0.46 m above river bed
- e1 - MMB527/332, 0.91 m above river bed
- f1 - S4/071, 0.91 m above river bed
- g1 - S4/040, 0.91 m above river bed

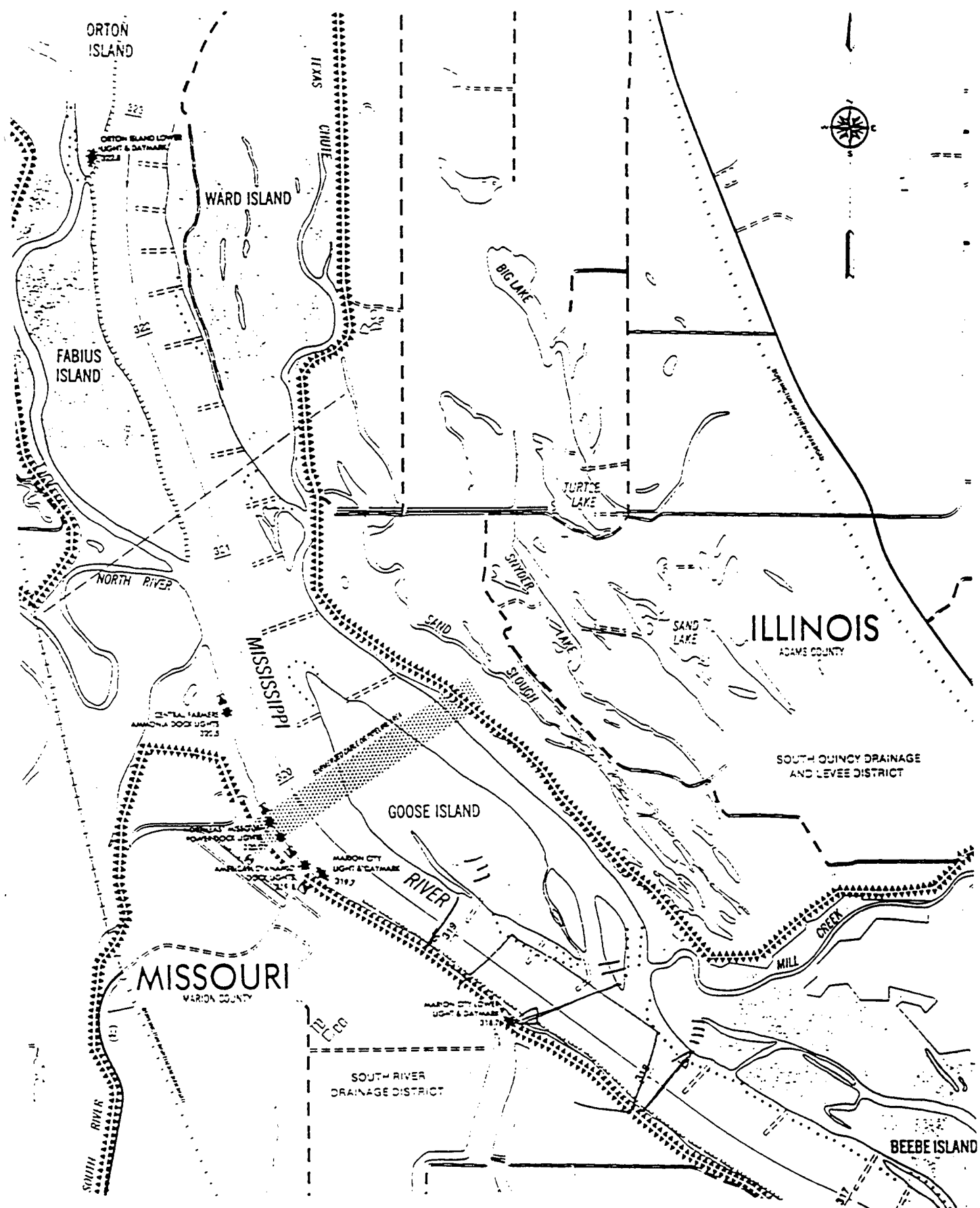
II-12. Plan view of the Apple River Island site and locations of current meters



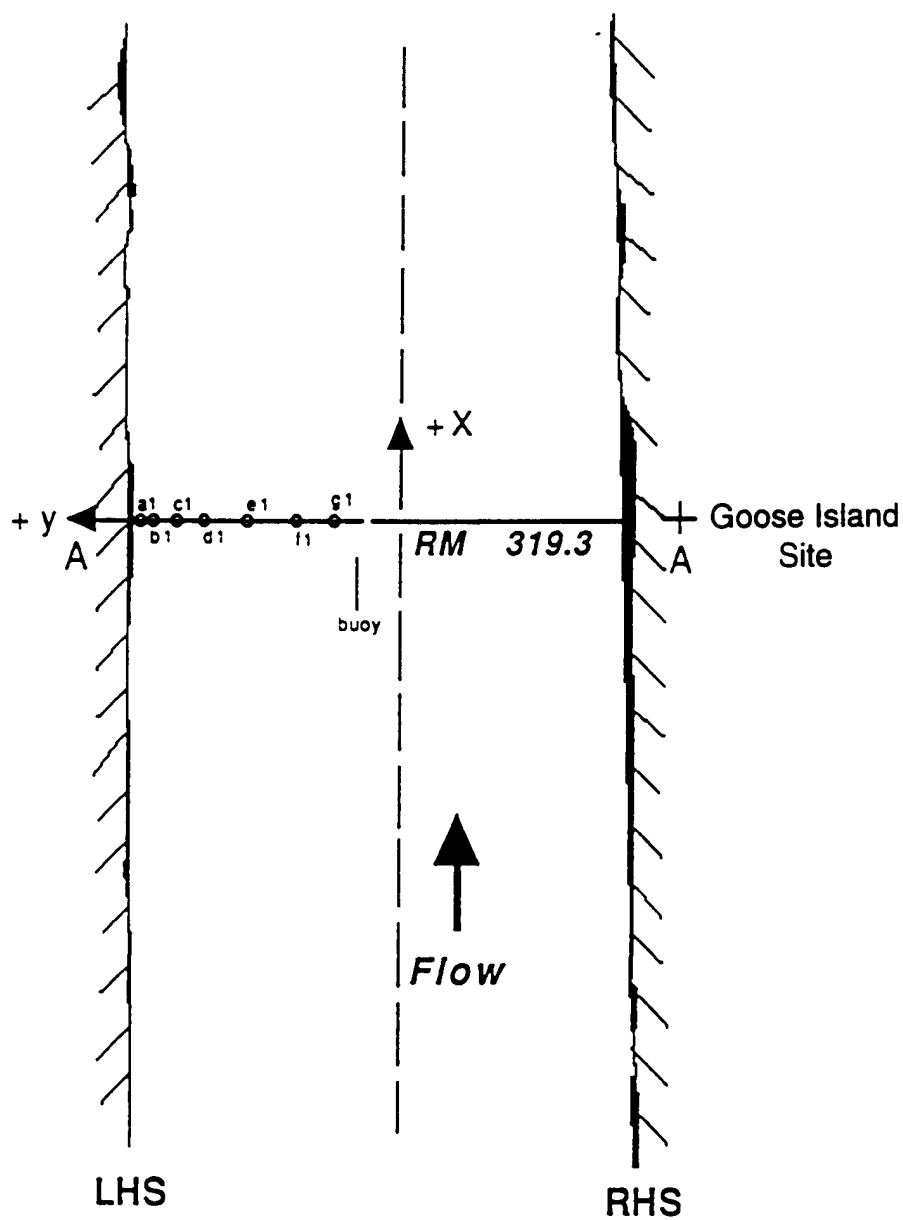
II-13. Cross section of the Mississippi River at the Apple River Island site



II-14. Location of suspended sediment sampling stations on the Mississippi River near the Apple River Island site

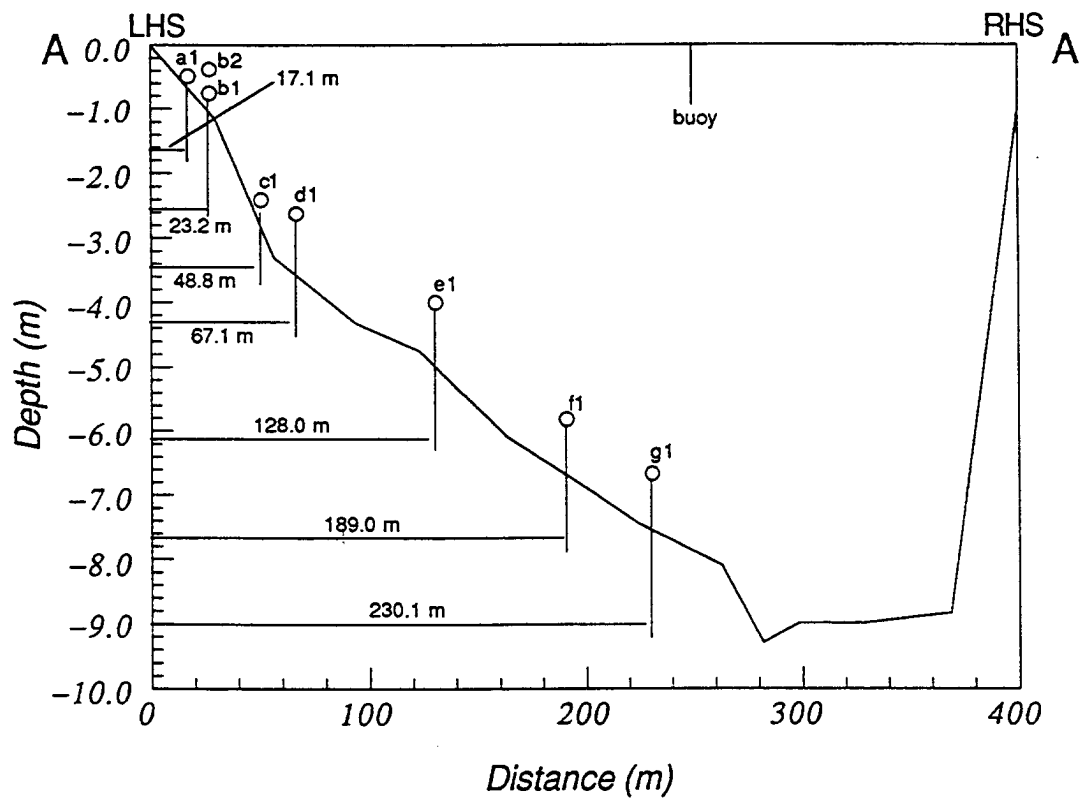


II-15. Goose Island site on the Mississippi River



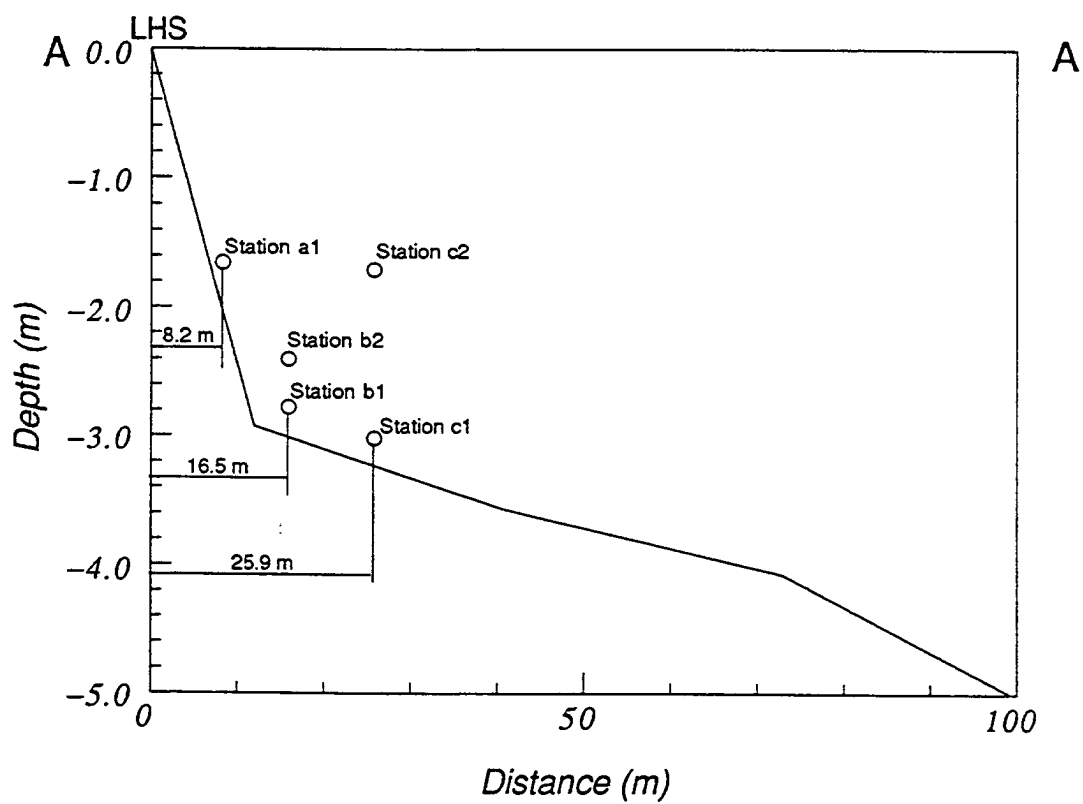
- a1 - MMB511/1000, 0.18 m above river bed
- b1 - MMB511/998, 0.25 m above river bed
- b2 - MMB511/999, 0.61 m above river bed
- c1 - MMB511/1001, 0.25 m above river bed
- d1 - MMB527/642, 0.91 m above river bed
- e1 - MMB527/332, 0.91 m above river bed
- f1 - S4/040, 0.91 m above river bed
- g1 - S4/071, 0.91 m above river bed

II-16. Plan view of the Goose Island site  
and locations of current meters for trip 1

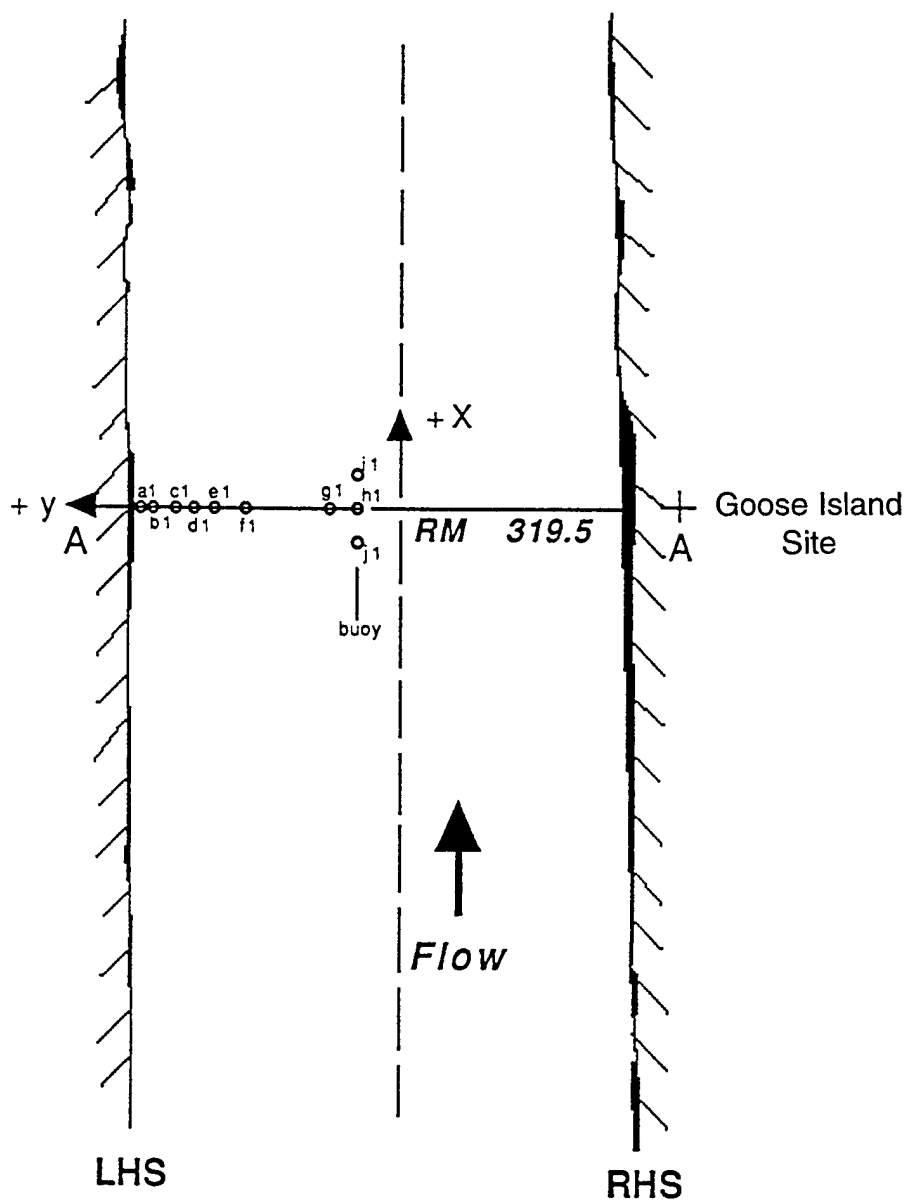


II-17. Cross section of the Mississippi River  
at the Goose Island site during trip 1

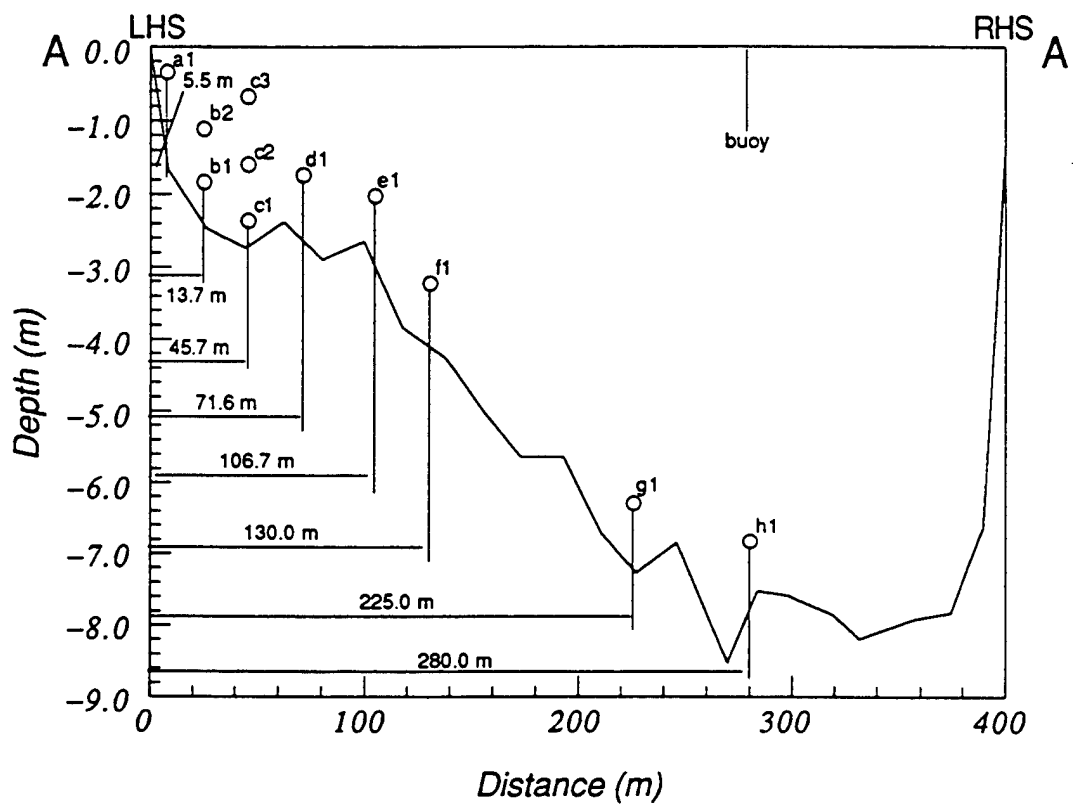




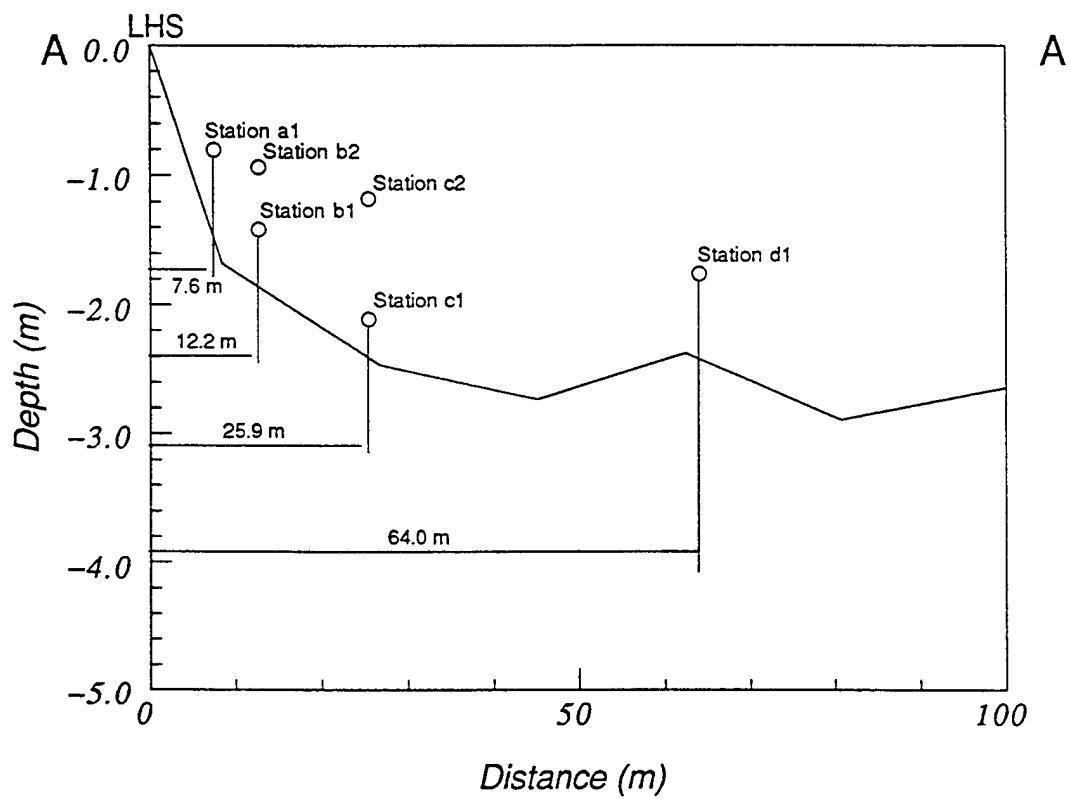
II-18. Location of suspended sediment sampling stations on the Mississippi River near the Goose Island site during trip 1



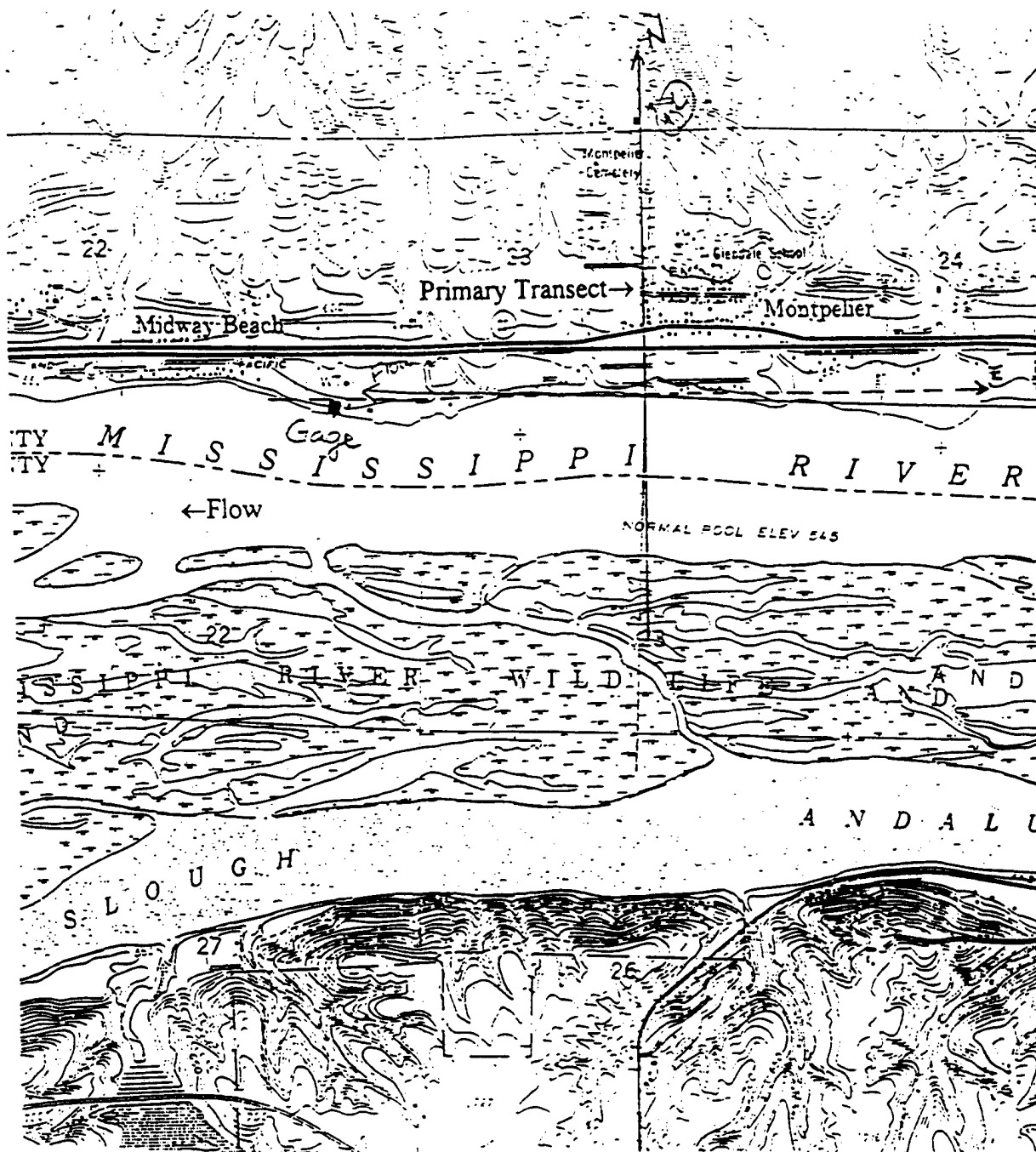
II-19. Plan view of the Goose Island site and locations of current meters for trip 2



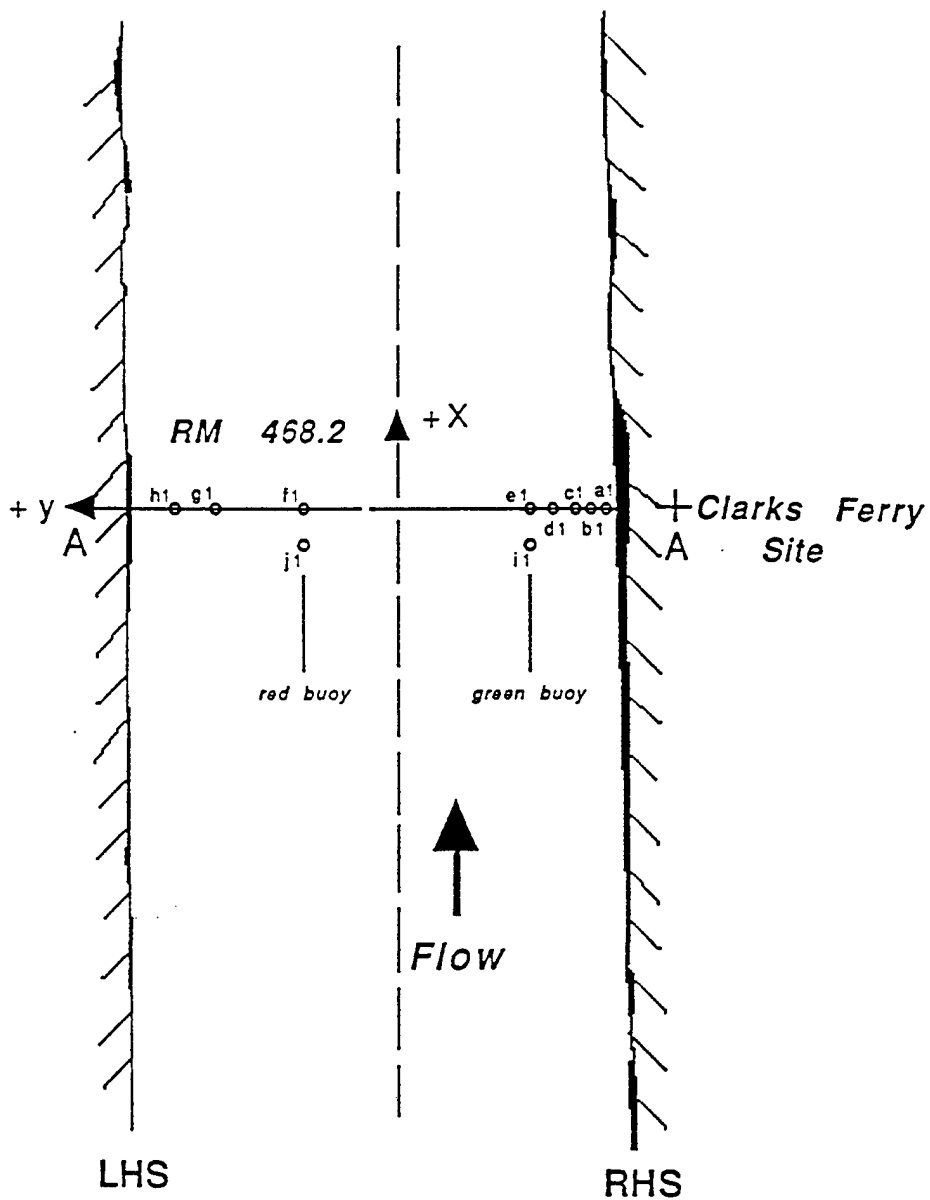
II-20. Cross section of the Mississippi River  
at the Goose Island site during trip 2



II-21. Location of suspended sampling stations  
on the Mississippi River near the Goose Island site during trip 2

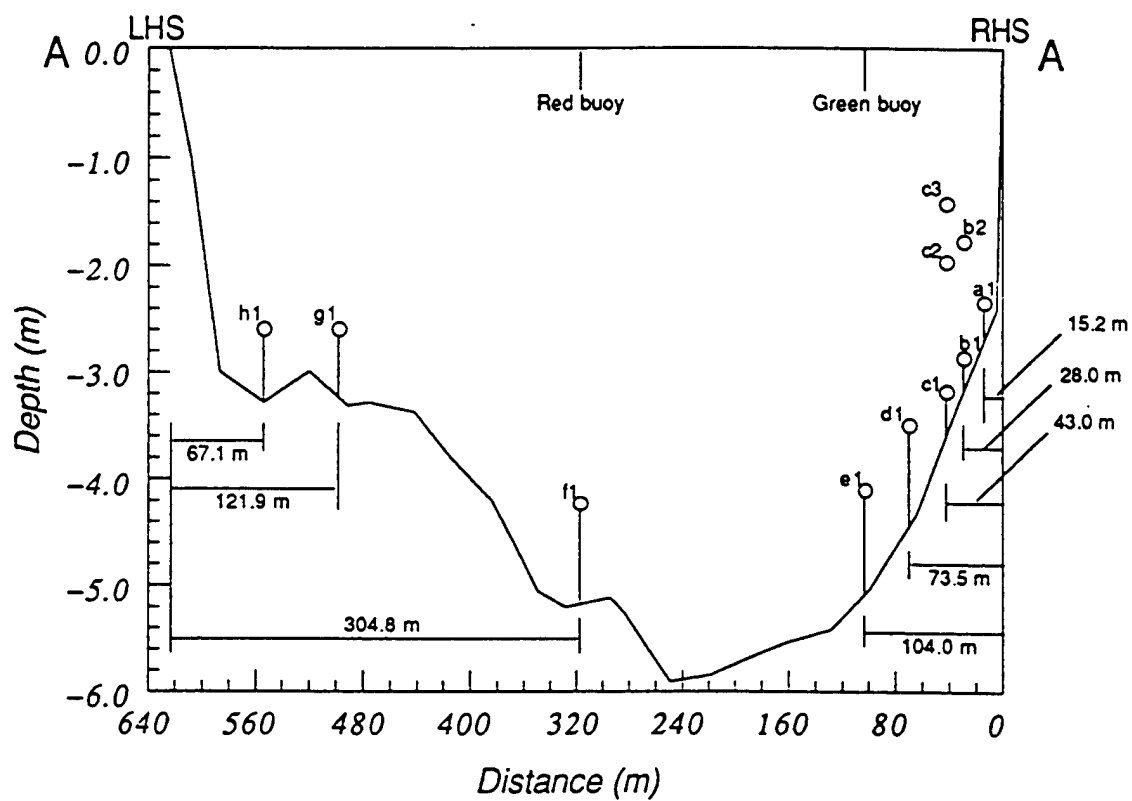


II-22. Clarks Ferry site on the Mississippi River

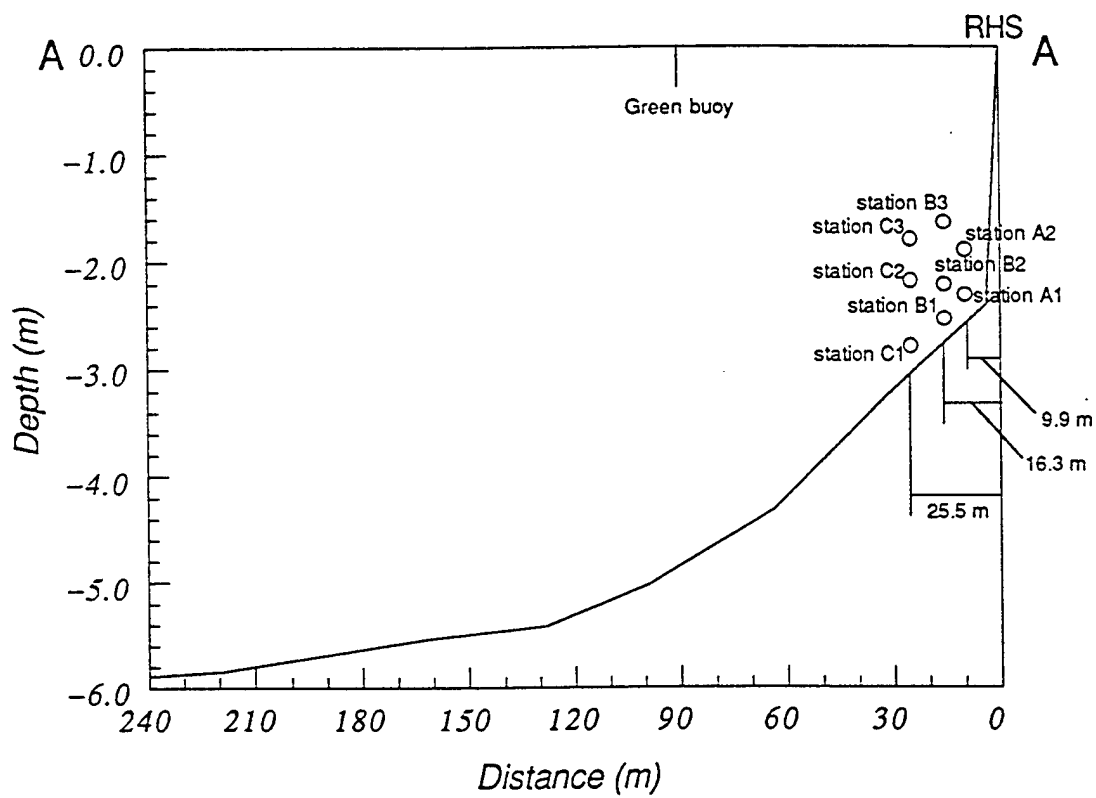


- a1 - MMB511/1001, 0.35 m above river bed
- b1 - MMB511/1330, 0.33 m above river bed
- b2 - MMB511/1331, 1.52 m above river bed
- c1 - MMB511/998, 0.36 m above river bed
- c2 - MMB511/999, 1.62 m above river bed
- c3 - MMB511/1000, 2.53 m above river bed
- d1 - S4/151, 1.0 m above river bed
- e1 - S4/834, 1.0 m above river bed
- f1 - S4/040, 1.0 m above river bed
- g1 - MMB527/332, 0.70 m above river bed
- h1 - MMB527/642, 0.70 m above river bed
- i1 - S4/832, 1.0 m above river bed
- j1 - S4/071, 1.0 m above river bed

II-23. Plan view of the Clarks Ferry site for trip 1  
and locations of current meters

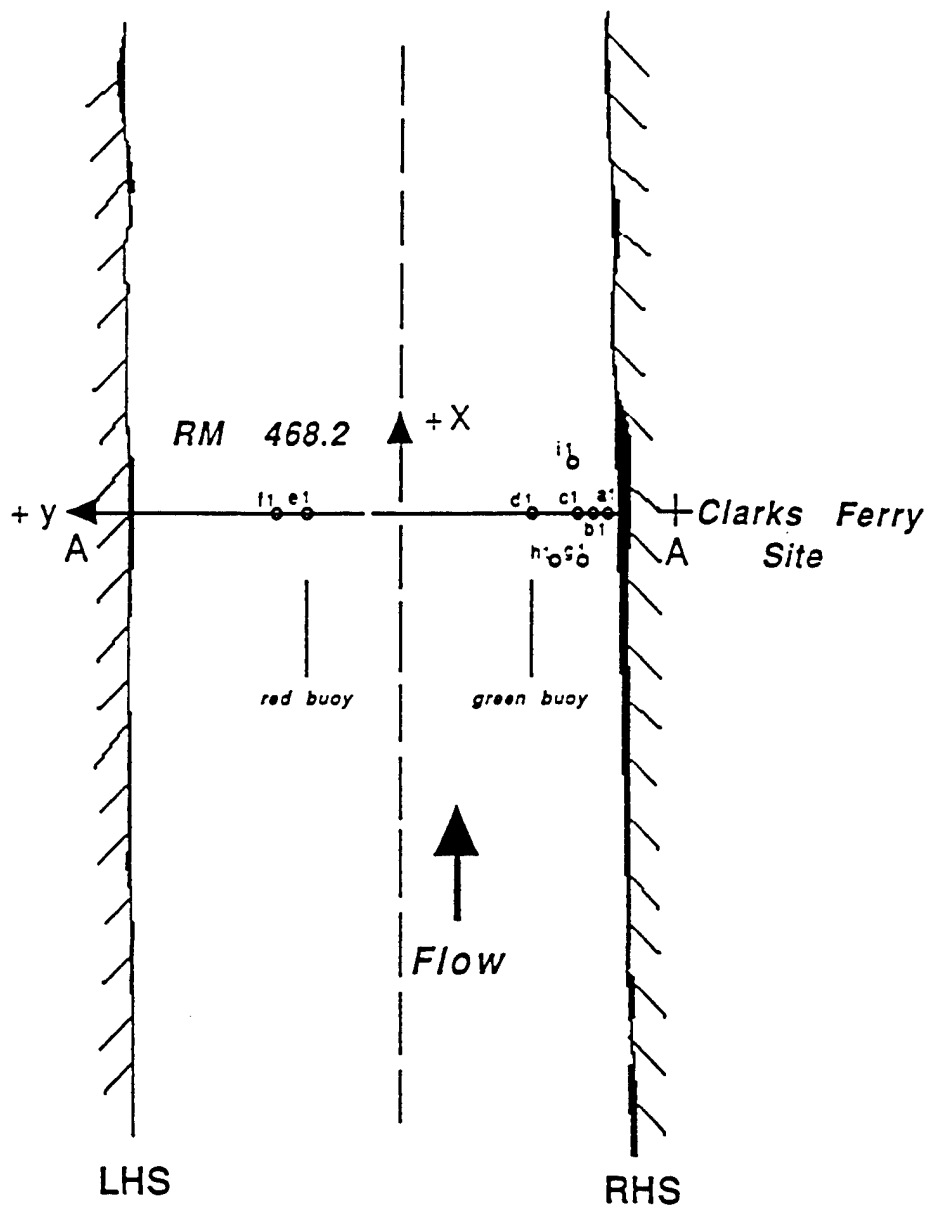


II-24. Cross section of the Mississippi River at the Clarks Ferry site for trip 1



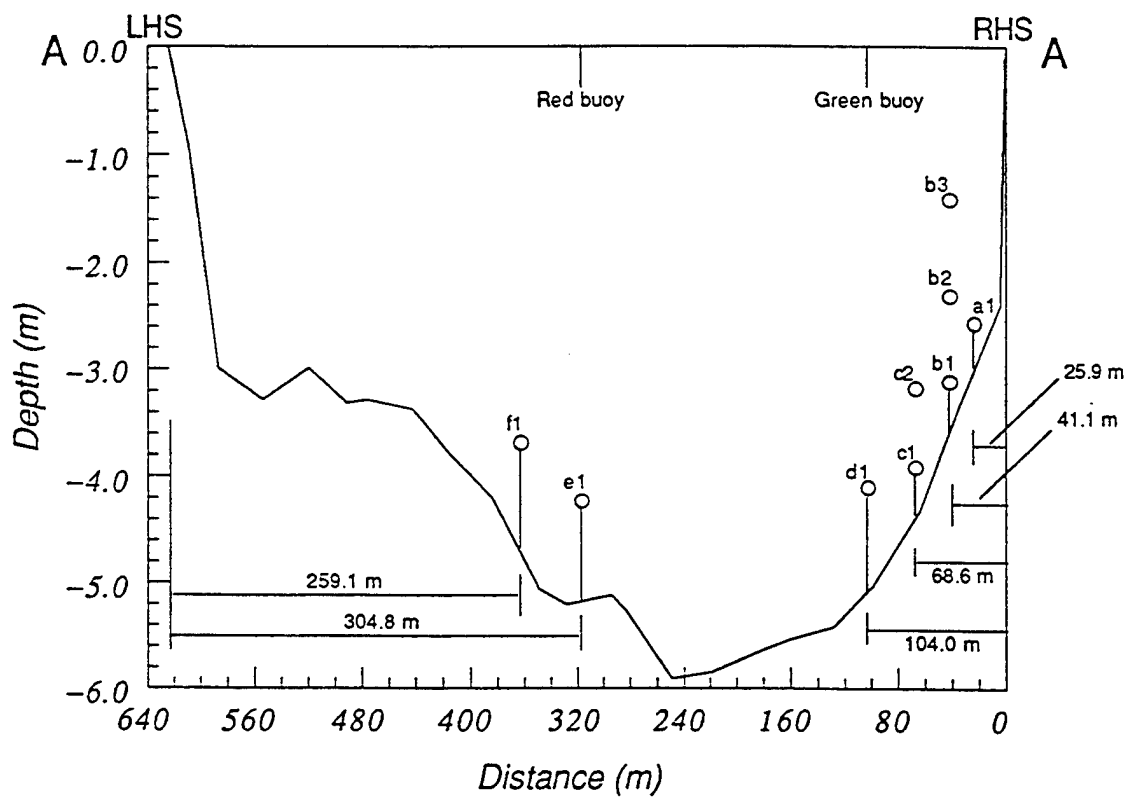
II-25. Location of suspended sediment sampling stations on the Mississippi River near the Clarks Ferry site during trip 1





- a1 - MMB511/1001, 0.45 m above river bed
- b1 - MMB511/998, 0.51 m above river bed
- b2 - MMB511/999, 1.24 m above river bed
- b3 - MMB511/1000, 2.16 m above river bed
- c1 - MMB511/1130, 0.50 m above river bed
- c2 - MMB511/1131, 1.21 m above river bed
- d1 - S4/834, 1.0 m above river bed
- e1 - S4/151, 1.0 m above river bed
- f1 - S4/832, 1.0 m above river bed
- g1 - MMB527/642, 0.94 m above river bed
- h1 - S4/040, 1.0 m above river bed
- i1 - MMB527/332, 0.94 m above river bed

II-26. Plan view of the Clarks Ferry site on the Mississippi River for trip 2



II-27. Cross section of the Mississippi River at the Clarks Ferry site for trip 2



**APPENDIX III.**

**BED MATERIAL CHARACTERISTICS AND LOCATION  
OF BED MATERIAL SAMPLING AT ALL STUDY SITES**

McEver's Island Site

| Location |     | Dist. (ft) | Characteristics of Bed Material Particle Size (mm) |          |          |          |          |          |          |      |
|----------|-----|------------|----------------------------------------------------|----------|----------|----------|----------|----------|----------|------|
|          |     |            | $d_{10}$                                           | $d_{16}$ | $d_{50}$ | $d_{60}$ | $d_{85}$ | $d_{95}$ | $\sigma$ | $U$  |
| 6/15/89  |     |            |                                                    |          |          |          |          |          |          |      |
| RM49.5   | B3* | 165        | 0.19                                               | 0.23     | 0.31     | 0.34     | 0.45     | 0.60     | 1.40     | 1.79 |
| REW-LEW  | C3  | 155        | 0.22                                               | 0.24     | 0.32     | 0.35     | 0.42     | 0.52     | 1.32     | 1.59 |
|          | D3  | 135        | 0.25                                               | 0.27     | 0.36     | 0.4      | 0.51     | 0.75     | 1.38     | 1.60 |
|          | E3  | 120        | 0.19                                               | 0.20     | 0.30     | 0.34     | 0.55     | 2.0      | 1.67     | 1.79 |
|          | F3  | 105        | 0.21                                               | 0.23     | 0.27     | 0.3      | 0.4      | 0.50     | 1.33     | 1.43 |
|          | J3  | 35         | -                                                  | -        | 0.02     | 0.028    | -        | -        | -        | -    |
|          | K3  | 20         | -                                                  | -        | 0.014    | 0.02     | -        | -        | -        | -    |
| 6/15/89  | A4  | 40         | -                                                  | -        | 0.021    | 0.03     | -        | -        | -        | -    |
| RM50.1   | B4  | 55         | -                                                  | -        | 0.19     | 0.28     | 0.45     | 0.6      | -        | -    |
| LEW-REW  | C4  | 70         | 0.013                                              | 0.026    | 0.23     | 0.26     | 0.35     | 0.5      | 5.18     | 20   |
|          | D4  | 105        | 0.28                                               | 0.31     | 0.472    | 0.46     | 0.58     | 0.75     | 1.37     | 1.64 |
|          | E4  | 125        | 0.27                                               | 0.3      | 0.4      | 0.44     | 0.57     | 0.75     | 1.38     | 1.63 |
|          | F4  | 140        | 0.3                                                | 0.34     | 0.5      | 0.56     | 1.1      | 3        | 1.84     | 1.87 |
|          | G4* | 155        | 0.25                                               | 0.27     | 0.49     | 0.59     | 1.5      | 3        | 2.44     | 2.36 |
|          | I4  | 185        | 0.21                                               | 0.22     | 0.28     | 0.31     | 0.41     | 0.5      | 1.37     | 1.48 |
|          | K4  | 215        | -                                                  | 0.007    | 0.15     | 0.2      | 0.29     | 0.35     | 11.68    | -    |
|          | L4  | 240        | -                                                  | -        | 0.03     | -        | -        | -        | -        | -    |
|          | M4  | 260        | -                                                  | 0.008    | 0.06     | 0.1      | 0.2      | 0.25     | 5.42     | -    |
|          | N4  | 280        | -                                                  | 0.004    | 0.049    | 0.075    | 0.17     | 0.25     | 7.86     | -    |
| 6/15/89  | A5  | 230        | -                                                  | 0.002    | -        | -        | -        | -        | -        | -    |
| RM50.5   | B5  | 215        | -                                                  | 0.006    | 0.2      | 0.26     | 0.39     | 0.5      | 17.64    | -    |
| REW-LEW  | C5  | 200        | 0.25                                               | 0.25     | 0.36     | 0.4      | 0.59     | 0.8      | 1.54     | 1.6  |
|          | D5* | 185        | 0.20                                               | 0.26     | 0.40     | 0.45     | 0.65     | 1.0      | 1.7      | 2.25 |
|          | E5  | 170        | 0.24                                               | 0.26     | 0.35     | 0.37     | 0.49     | 0.65     | 1.37     | 1.54 |
|          | F5  | 165        | -                                                  | -        | 0.08     | 0.17     | 0.28     | 0.35     | -        | -    |
|          | G5  | 140        | 0.002                                              | 0.01     | 0.11     | 0.13     | 0.18     | 0.25     | 6.32     | 65   |

Note: \* contained shells that cannot be separated

REW: Right edge of water

LEW: Left edge of water

Both REW and LEW are defined as we look downstream the river.

$$\sigma = \frac{1}{2} \left[ \frac{d_{85}}{d_{50}} + \frac{d_{50}}{d_{16}} \right]$$

$$U = \frac{d_{60}}{d_{10}}$$

Kampsville Site, Trip 1

|                 |      |                   | <i>Characteristics of Bed Material Particle Size (mm)</i> |                       |                       |                       |                       |                       |          |          |
|-----------------|------|-------------------|-----------------------------------------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|----------|----------|
| <i>Location</i> |      | <i>Dist. (ft)</i> | <i>d<sub>10</sub></i>                                     | <i>d<sub>16</sub></i> | <i>d<sub>50</sub></i> | <i>d<sub>60</sub></i> | <i>d<sub>85</sub></i> | <i>d<sub>95</sub></i> | <i>σ</i> | <i>U</i> |
| 10/15/90        | A1   | 349               | -                                                         | -                     | 0.024                 | 0.031                 | -                     | -                     | -        | -        |
| RM 35.2         | A3   | 310               |                                                           | 0.0023                | -                     | -                     | -                     | -                     | -        | -        |
| K13             | A4   | 290               | -                                                         | -                     | 0.014                 | 0.018                 | 0.032                 | -                     | -        | -        |
| LEW-REW         | A5   | 271               | -                                                         | -                     | 0.08                  | 0.013                 | 0.029                 | -                     | -        |          |
|                 | A6   | 254               | -                                                         | -                     | 0.012                 | 0.019                 | -                     | -                     |          |          |
|                 | A7*  | 233               | 0.19                                                      | 0.20                  | 0.30                  | 0.34                  | 0.45                  | 0.60                  | 1.50     | 1.79     |
|                 | A8*  | 213               | 0.20                                                      | 0.23                  | 0.34                  | 0.37                  | 0.49                  | 0.65                  | 1.46     | 1.85     |
|                 | A9*  | 193               | 0.20                                                      | 0.24                  | 0.35                  | 0.39                  | 0.59                  | 2                     | 1.57     | 1.95     |
|                 | A11  | 148               | -                                                         | -                     | 0.24                  | 0.27                  | 0.42                  | 0.60                  | -        | -        |
| 10/15/90        | A12  | 133               | -                                                         | 0.006                 | 0.18                  | 0.22                  | 0.35                  | 0.6                   | 2.77     | -        |
| RM 35.1         | A13  | 112               | -                                                         | 0.052                 | 0.17                  | 0.22                  | 0.45                  | 1                     | 2.96     | -        |
| LEW-REW         | A14  | 93                | 0.006                                                     | 0.018                 | 0.23                  | 0.28                  | 0.55                  | 2                     | 7.58     | 46.67    |
|                 | A15  | 70                | -                                                         | -                     | 0.032                 | 0.095                 | 0.35                  | 0.6                   | -        | -        |
|                 | A16  | 50                | -                                                         | 0.0042                | 0.07                  | 0.18                  | 0.34                  | 0.5                   | 10.76    | -        |
|                 | A17  | 30                | -                                                         | 0.004                 | 0.15                  | 0.2                   | 0.35                  | 0.45                  | 19.92    | -        |
| 10/10/90        | B1   | 374.5             | -                                                         | -                     | 0.017                 | 0.022                 | -                     | -                     | -        | -        |
| RM 35.2         | B2   | 354.3             | -                                                         | -                     | 0.014                 | 0.023                 | -                     | -                     | -        | -        |
| LEW-REW         | B3   | 330.0             | -                                                         | -                     | 0.018                 | 0.024                 | -                     | -                     | -        | -        |
|                 | B4   | 311.0             | -                                                         | -                     | 0.011                 | 0.017                 | -                     | -                     | -        | -        |
|                 | B5   | 293.0             | 0.0022                                                    | 0.012                 | 0.2                   | 0.24                  | 0.35                  | 0.45                  |          | 109.09   |
|                 | B6*  | 274.0             | 0.19                                                      | 0.22                  | 0.29                  | 0.32                  | 0.41                  | 0.48                  | 1.37     | 1.68     |
|                 | B7*  | 255.0             | 0.19                                                      | 0.22                  | 0.32                  | 0.35                  | 0.46                  | 0.65                  | 1.45     | 1.84     |
|                 | B8*  | 232.0             | 0.19                                                      | 0.22                  | 0.32                  | 0.35                  | 0.48                  | 0.70                  | 1.48     | 1.84     |
|                 | B9*  | 212.0             | 0.18                                                      | 0.19                  | 0.27                  | 0.30                  | 0.4                   | 0.5                   | 1.45     | 1.67     |
|                 | B10* | 191.0             | 0.13                                                      | 0.19                  | 0.35                  | 0.45                  | 10.4                  | -                     | 15.78    | 3.46     |
|                 | B11  | 171.0             | -                                                         | 0.006                 | 0.19                  | 0.21                  | 0.35                  | 0.55                  | 16.75    | -        |
|                 | B12  | 152.0             | -                                                         | 0.024                 | -                     | -                     | -                     | -                     |          | -        |
|                 | B14  | 112.0             | -                                                         | -                     | 0.019                 | 0.026                 | -                     | -                     |          | -        |
|                 | B15  | 91                | -                                                         | -                     | 0.013                 | 0.018                 | -                     | -                     |          | -        |
| 10/18/90        | C2   | 300               | -                                                         | -                     | -                     | -                     | -                     | -                     |          | -        |
| RM 35.2         | C4   | 259               | -                                                         | -                     | 0.016                 | 0.019                 | -                     | -                     |          | -        |
| LEW-REW         | C6   | 217               | 0.002                                                     | 0.013                 | 0.22                  | 0.25                  | 0.35                  | 0.45                  |          | -        |
|                 | C8*  | 178               | 0.20                                                      | 0.23                  | 0.33                  | 0.36                  | 0.49                  | 0.7                   | 1.46     | 1.80     |
|                 | C12  | 99                | -                                                         | -                     | 0.018                 | 0.029                 | -                     | -                     |          |          |
|                 | C14  | 57                | -                                                         | -                     | 0.0055                | 0.01                  | -                     | -                     |          |          |

Note: \* contained shells that cannot be separated

### Kampsville Site, Trip 2

#### Characteristics of Bed Material Particle Size (mm)

| Location  | Dist. (ft) | $d_{10}$ | $d_{16}$ | $d_{50}$ | $d_{60}$ | $d_{85}$ | $d_{95}$ | $\sigma$ | $U$ |
|-----------|------------|----------|----------|----------|----------|----------|----------|----------|-----|
| 8/8/91 A  | 50         | -        | -        | 0.032    | -        | -        | -        | -        | -   |
| RM 35.4 B | 100        | -        | -        | 0.018    | 0.027    | -        | -        | -        | -   |
| REW-LEW C | 260        | -        | 0.005    | 0.18     | 0.24     | 0.35     | 0.7      | 18.97    | -   |
| D         | 355        | -        | -        | 0.025    | -        | -        | -        | -        | -   |
| E         | 460        | -        | -        | 0.115    | 0.19     | 0.29     | 0.45     | -        | -   |
| F         | 540        | 0.21     | 0.23     | 0.35     | 0.39     | 0.5      | 0.65     | 1.475    | -   |
| G         | 652        | 0.2      | 0.22     | 0.3      | 0.34     | 0.45     | 0.5      | 1.432    | -   |
| H         | 752        | -        | -        | 0.01     | 0.017    | 0.026    | -        | -        | -   |
| I         | 847        | -        | -        | 0.0023   | 0.0046   | 0.015    | 0.025    | -        | -   |
| J         | 952        | -        | -        | 0.011    | 0.018    | -        | -        | -        | -   |

### Apple River Island Site

#### Characteristics of Bed Material Particle Size (mm)

| Location   | Dist. (ft) | $d_{10}$                                          | $d_{16}$ | $d_{50}$ | $d_{60}$ | $d_{85}$ | $d_{95}$ | $\sigma$ | $U$  |
|------------|------------|---------------------------------------------------|----------|----------|----------|----------|----------|----------|------|
| 5/22/90 A  | 338        | 0.28                                              | 0.31     | 0.37     | 0.39     | 0.54     | 0.7      | 1.33     | 1.39 |
| RM 546.3 B | 312        | 0.35                                              | 0.36     | 0.58     | 0.69     | 1.5      | 2.5      | 2.10     | 1.97 |
| REW-LEW C  | 295        | 0.38                                              | 0.41     | 0.55     | 0.62     | 1.16     | 2.5      | 1.73     | 1.63 |
| D          | 275        | 0.35                                              | 0.39     | 0.51     | 0.55     | 0.85     | 1.4      | 1.49     | 1.57 |
| E          | 251        | 0.35                                              | 0.39     | 0.51     | 0.55     | 0.85     | 1.4      | 1.49     | 1.57 |
| F          | 240        | 0.29                                              | 0.33     | 0.41     | 0.45     | 0.54     | 0.8      | 1.28     | 1.55 |
| G          | 216        | 0.3                                               | 0.35     | 0.48     | 0.5      | 0.65     | 1        | 1.36     | 1.67 |
| H          | 200        | 0.34                                              | 0.37     | 0.49     | 0.5      | 0.62     | 0.9      | 1.29     | 1.47 |
| I          | 170        | 0.28                                              | 0.34     | 0.5      | 0.58     | 0.97     | 1.7      | 1.71     | 2.07 |
| J          | 141        | 0.29                                              | 0.35     | 0.52     | 0.61     | 0.99     | 1.9      | 1.63     | 2.10 |
| K          | 120        | 0.29                                              | 0.34     | 0.44     | 0.5      | 0.85     | 3        | 1.61     | 1.72 |
| L          | 62         | 0.26                                              | 0.29     | 0.39     | 0.4      | 0.54     | 0.65     | 1.36     | 1.54 |
| M          | 30         | 0.25                                              | 0.27     | 0.37     | 0.39     | 0.49     | .6       | 1.35     | 1.56 |
| 5/23/96 A  | 338        | 0.46                                              | 0.52     | 0.74     | 0.85     | 1.60     | 3.00     | 1.79     | 1.85 |
| RM 546.4 B | 312        | 0.40                                              | 0.44     | 0.50     | 0.53     | 0.71     | 0.95     | 1.28     | 1.33 |
| REW-LEW C  | 295        | **small sample - just 25 grams total dry weight** |          |          |          |          |          |          |      |
| D          | 275        | 0.30                                              | 0.34     | 0.49     | 0.55     | 0.76     | 1.40     | 1.50     | 1.83 |
| E          | 251        | 0.38                                              | 0.42     | 0.56     | 0.62     | 0.95     | 1.70     | 1.51     | 1.63 |
| F          | 240        | 0.28                                              | 0.30     | 0.42     | 0.45     | 0.60     | 0.90     | 1.41     | 1.61 |
| G          | 216        | 0.28                                              | 0.30     | 0.39     | 0.42     | 0.51     | 0.63     | 1.30     | 1.50 |
| H          | 200        | 0.27                                              | 0.29     | 0.41     | 0.46     | 0.80     | 1.90     | 1.68     | 1.70 |
| I          | 170        | 0.28                                              | 0.32     | 0.48     | 0.51     | 0.83     | 1.50     | 1.61     | 1.82 |
| J          | 141        | 0.28                                              | 0.31     | 0.48     | 0.54     | 0.90     | 1.80     | 1.71     | 1.93 |
| K*         | 120        | 0.27                                              | 0.30     | 0.55     | 0.69     | 3.00     | 6.50     | 3.64     | 2.56 |
| L*         | 62         | 0.23                                              | 0.26     | 0.38     | 0.41     | 0.58     | 0.90     | 1.49     | 1.78 |
| M*         | 30         | 0.19                                              | 0.22     | 0.28     | 0.30     | 0.35     | 0.40     | 1.26     | 1.58 |
| N*         | 0          | 0.19                                              | 0.22     | 0.35     | 0.40     | 0.65     | 8.00     | 1.72     | 2.11 |

Note: \* contained shells that cannot be separated

### Apple River Island Site (Concluded)

|                 |    | <i>Characteristics of Bed Material Particle Size (mm)</i> |                       |                       |                       |                       |                       |                       |          |          |
|-----------------|----|-----------------------------------------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|----------|----------|
| <i>Location</i> |    | <i>Dist. (ft)</i>                                         | <i>d<sub>10</sub></i> | <i>d<sub>16</sub></i> | <i>d<sub>50</sub></i> | <i>d<sub>60</sub></i> | <i>d<sub>85</sub></i> | <i>d<sub>95</sub></i> | <i>σ</i> | <i>U</i> |
| 5/23/90         | A  | 304                                                       | 0.39                  | 0.4                   | 0.55                  | 0.6                   | 1.14                  | 1                     | 1.32     | 1.54     |
| RM 546.7        | C  | 255                                                       | 0.28                  | 0.33                  | 0.5                   | 0.59                  | 1.47                  | 2.3                   | 1.86     | 2.11     |
| REW-LEW         | D  | 242                                                       | 0.32                  | 0.39                  | 0.64                  | 0.72                  | 0.78                  | 2.5                   | 1.97     | 2.25     |
|                 | E  | 197                                                       | 0.24                  | 0.28                  | 0.48                  | 0.52                  | 0.65                  | 1.6                   | 1.67     | 2.17     |
|                 | F  | 150                                                       | 0.29                  | 0.28                  | 0.45                  | 0.49                  | 1.3                   | 0.9                   | 1.53     | 1.88     |
|                 | G  | 120                                                       | 0.28                  | 0.33                  | 0.55                  | 0.65                  | 0.9                   | 2                     | 2.02     | 2.32     |
|                 | H  | 90                                                        | 0.29                  | 0.34                  | 0.54                  | 0.55                  | 0.6                   | 1.5                   | 1.63     | 1.90     |
|                 | I  | 60                                                        | 0.24                  | 0.27                  | 0.37                  | 0.41                  | 5                     | 09                    | 1.50     | 1.71     |
|                 | J* | 129                                                       | 0.15                  | 0.17                  | 0.34                  | 0.41                  |                       | 8                     | 8.35     | 2.73     |

Note: \*contained shells that cannot be separated.

### Goose Island Site, Trip 1

|          |     |           | Characteristics of Bed Material Particle Size (mm) |                 |                 |                 |                 |                 |      |      |
|----------|-----|-----------|----------------------------------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|------|------|
| Location |     | Dist. (m) | d <sub>10</sub>                                    | d <sub>16</sub> | d <sub>50</sub> | d <sub>60</sub> | d <sub>85</sub> | d <sub>95</sub> | σ    | U    |
| 8/29/90  | A5  |           | 0.41                                               | 0.45            | 0.65            | 0.7             | 0.95            | 1.4             | 1.45 | 1.71 |
| RM 319.3 | A6  |           | 0.32                                               | 0.35            | 0.49            | 0.5             | 0.75            | 1.4             | 1.47 | 1.56 |
| GI12     | A7  |           | 0.3                                                | 0.35            | 0.5             | 0.54            | 0.78            | 1.2             | 1.49 | 1.80 |
|          | A8  |           | 0.28                                               | 0.3             | 0.38            | 0.4             | 0.54            | 0.7             | 1.34 | 1.43 |
|          | A9  |           | 0.27                                               | 0.31            | 0.41            | 0.46            | 0.72            | 1.7             | 1.54 | 1.70 |
|          | A10 |           | 0.29                                               | 0.34            | 0.51            | 0.6             | 1.1             | 2               | 1.83 | 2.07 |
|          | A11 |           | 0.2                                                | 0.22            | 0.29            | 0.34            | 0.54            | 0.8             | 1.59 | 1.70 |
|          | A12 |           | 0.29                                               | 0.39            | 0.69            | 0.72            | 0.99            | 1.5             | 1.60 | 2.48 |
|          |     |           |                                                    |                 |                 |                 |                 |                 |      |      |
| 8/29/90  | B5  | 282       | 0.24                                               | 0.27            | 0.4             | 0.44            | 0.6             | 0.8             | 1.49 | 1.83 |
| RM 319.3 | B6  | 263       | 0.35                                               | 0.39            | 0.59            | 0.65            | 0.93            | 1.5             | 1.54 | 1.86 |
| LEW-REW  | B7  | 224       | 0.28                                               | 0.3             | 0.45            | 0.5             | 0.7             | 1               | 1.53 | 1.79 |
|          | B8  | 200       | 0.26                                               | 0.28            | 0.4             | 0.44            | 0.6             | 0.7             | 1.46 | 1.69 |
|          | B9  | 164       | 0.23                                               | 0.26            | 0.42            | 0.48            | 0.7             | 1.4             | 1.64 | 2.09 |
|          | B10 | 123       | 0.26                                               | 0.28            | 0.43            | 0.48            | 0.67            | 0.9             | 1.55 | 1.85 |
|          | B11 | 94        | 0.19                                               | 0.22            | 0.28            | 0.3             | 0.37            | 0.5             | 1.30 | 1.58 |
|          | B12 | 57        | 0.3                                                | 0.36            | 0.54            | 0.59            | 0.74            | 0.91            | 1.44 | 1.97 |
|          | B13 | 30        | 0.39                                               | 0.45            | 0.65            | 0.7             | 0.95            | 1.5             | 1.45 | 1.79 |
|          |     |           |                                                    |                 |                 |                 |                 |                 |      |      |
| 8/29/90  | 04  | 359       | 0.55                                               | 0.66            | 1.24            | 1.47            | 2.3             | 3.5             | 1.87 | 2.67 |
| GI2-TRC  | 05  | 335       | 0.46                                               | 0.54            | 0.88            | 1               | 1.7             | 2.2             | 1.78 | 2.17 |
| LEW-REW  | 06  | 297       | 0.39                                               | 0.44            | 0.63            | 0.69            | 0.95            | 1.6             | 1.47 | 1.77 |
|          | 07  | 271       | 0.35                                               | 0.4             | 0.5             | 0.51            | 0.64            | 0.79            | 1.27 | 1.46 |
|          | 08  | 232       | 0.29                                               | 0.34            | 0.48            | 0.49            | 0.6             | 0.82            | 1.33 | 1.69 |
|          | 09  | 200       | 0.27                                               | 0.32            | 0.47            | 0.5             | 0.7             | 1.1             | 1.48 | 1.85 |



Goose Island Site, Trip 1 (Concluded)

|          |           | Characteristics of Bed Material Particle Size (mm) |          |          |          |          |          |          |      |      |
|----------|-----------|----------------------------------------------------|----------|----------|----------|----------|----------|----------|------|------|
| Location | Dist. (m) | $d_{10}$                                           | $d_{16}$ | $d_{50}$ | $d_{60}$ | $d_{85}$ | $d_{95}$ | $\sigma$ | $U$  |      |
| G12-TRC  | 10        | 164                                                | 0.31     | 0.35     | 0.5      | 0.55     | 0.85     | 1.3      | 1.56 | 1.77 |
| REW-LEW  | 11        | 140                                                | 0.3      | 0.34     | 0.48     | 0.5      | 0.65     | 0.85     | 1.38 | 1.67 |
|          | 12        | 105                                                | 0.29     | 0.32     | 0.48     | 0.52     | 0.72     | 1        | 1.50 | 1.79 |
|          | 13        | 78                                                 | 0.27     | 0.31     | 0.48     | 0.51     | 0.75     | 1.1      | 1.56 | 1.89 |
|          | 14        | 46                                                 | 0.24     | 0.27     | 0.38     | 0.41     | 0.59     | 0.8      | 1.48 | 1.71 |
|          | 15        | 17                                                 | 0.16     | 0.17     | 0.19     | 0.21     | 0.29     | 0.37     | 1.32 | 1.31 |

Goose Island Site, Trip 2

|          |         |            | Characteristics of Bed Material Particle Size (mm) |          |          |          |          |          |          |      |
|----------|---------|------------|----------------------------------------------------|----------|----------|----------|----------|----------|----------|------|
| Location |         | Dist. (ft) | $d_{10}$                                           | $d_{16}$ | $d_{50}$ | $d_{60}$ | $d_{85}$ | $d_{95}$ | $\sigma$ | $U$  |
| 7/20/91  | 820     | 820        | 0.27                                               | 0.31     | 0.45     | 0.48     | 0.62     | 0.94     | 1.42     | 1.78 |
| RM 319.5 | 702     | 702        | 0.34                                               | 0.41     | 0.66     | 0.75     | 1.2      | 1.82     | 1.71     | 2.21 |
| TR2      | 645     | 645        | 0.28                                               | 0.31     | 0.44     | 0.48     | 0.65     | 0.95     | 1.45     | 1.71 |
| REW-LEW  | 580     | 580        | 0.28                                               | 0.31     | 0.4      | 0.45     | 0.65     | 0.9      | 1.46     | 1.61 |
|          | 520     | 520        | 0.3                                                | 0.35     | 0.49     | 0.54     | 0.8      | 1.2      | 1.52     | 1.8  |
|          | 464     | 464        | 0.27                                               | 0.31     | 0.54     | 0.63     | 1.00     | 1.70     | 1.8      | 2.33 |
|          | 398     | 398        | 0.26                                               | 0.28     | 0.42     | 0.49     | 0.90     | 2.40     | 1.82     | 1.88 |
|          | 340     | 340        | 0.28                                               | 0.30     | 0.36     | 0.39     | 0.55     | 0.81     | 1.36     | 1.39 |
|          | 277     | 277        | 0.24                                               | 0.26     | 0.37     | 0.39     | 0.59     | 1        | 1.51     | 1.63 |
|          | 217     | 217        | 0.22                                               | 0.25     | 0.36     | 0.39     | 0.55     | 0.7      | 1.48     | 1.77 |
|          | 160     | 160        | 0.21                                               | 0.23     | 0.35     | 0.37     | 0.46     | 0.59     | 1.42     | 1.76 |
|          | 100     | 100        | 0.19                                               | 0.21     | 0.25     | 0.26     | 0.34     | 0.4      | 1.28     | 1.37 |
|          | 7/21/91 | 887        | 904                                                | 0.24     | 0.26     | 0.38     | 0.41     | 0.59     | 0.8      | 1.51 |
| RM 319.8 | 830     | 847        | 0.24                                               | 0.26     | 0.44     | 0.49     | 0.7      | 0.95     | 1.64     | 2.04 |
| GISC     | 768     | 785        | 0.26                                               | 0.31     | 0.70     | 0.83     | 1.5      | 2        | 2.2      | 3.19 |
| REW-LEW  | 710     | 724        | 0.28                                               | 0.31     | 0.48     | 0.51     | 0.71     | 1        | 1.51     | 1.82 |
|          | 651     | 668        | 0.28                                               | 0.34     | 0.5      | 0.54     | 0.74     | 1        | 1.48     | 1.93 |
|          | 591     | 605        | 0.34                                               | 0.39     | 0.55     | 0.59     | 0.83     | 1.22     | 1.46     | 1.74 |
|          | 529     | 546        | 0.27                                               | 0.31     | 0.46     | 0.49     | 0.6      | 0.75     | 1.39     | 1.82 |
|          | 467     | 484        | 0.35                                               | 0.39     | 0.49     | 0.51     | 0.61     | 0.81     | 1.25     | 1.46 |
|          | 407     | 424        | 0.326                                              | 0.36     | 0.49     | 0.5      | 0.65     | 0.87     | 1.37     | 1.53 |
|          | 349     | 366        | 0.31                                               | 0.36     | 0.49     | 0.51     | 0.66     | 0.9      | 1.35     | 1.65 |
|          | 290     | 307        | 0.29                                               | 0.34     | 0.46     | 0.49     | 0.61     | 0.9      | 1.34     | 1.69 |
|          | 231     | 248        | 0.27                                               | 0.31     | 0.41     | 0.45     | 0.7      | 2        | 1.52     | 1.67 |
|          | 165     | 182        | 0.29                                               | 0.33     | 0.48     | 0.51     | 0.7      | 1        | 1.46     | 1.76 |
|          | 110     | 129        | 0.29                                               | 0.31     | 0.45     | 0.49     | 0.58     | 0.8      | 1.37     | 1.69 |
|          | 50      | 69         | 0.21                                               | 0.24     | 0.35     | 0.38     | 0.5      | 0.65     | 1.44     | 1.81 |
|          | 20      | 34         | 0.15                                               | 0.18     | 0.26     | 0.32     | 0.50     | 0.68     | 1.68     | 2.13 |
|          | ?       |            | 0.19                                               | 0.21     | 0.30     | 0.35     | 0.51     | 0.8      | 1.56     | 1.84 |

Clarks Ferry Site, Trip 1

|                 |    |                  | <i>Characteristics of Bed Material Particle Size (mm)</i> |                       |                       |                       |                       |                       |          |          |
|-----------------|----|------------------|-----------------------------------------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|----------|----------|
| <i>Location</i> |    | <i>Dist. (m)</i> | <i>d<sub>10</sub></i>                                     | <i>d<sub>16</sub></i> | <i>d<sub>50</sub></i> | <i>d<sub>60</sub></i> | <i>d<sub>85</sub></i> | <i>d<sub>95</sub></i> | <i>σ</i> | <i>U</i> |
| 5/23/91         | A  | 642              | -                                                         | 0.005                 | 0.15                  | 0.2                   | 0.32                  | 0.45                  | 16.1     | -        |
| RM 468.3        | B  | 604              | 0.28                                                      | 0.35                  | 0.52                  | 0.57                  | 0.75                  | 0.95                  | 1.46     | 2.04     |
| XS3             | C  | 554              | 0.22                                                      | 0.24                  | 0.35                  | 0.38                  | 0.55                  | 0.8                   | 1.51     | 1.73     |
| LEW-REW         | D  | 497              | 0.21                                                      | 0.24                  | 0.37                  | 0.4                   | 0.75                  | 1.5                   | 1.78     | 1.90     |
|                 | E  | 444              | 0.22                                                      | 0.24                  | 0.32                  | 0.36                  | 0.51                  | 0.8                   | 1.46     | 1.64     |
|                 | F  | 408              | 0.23                                                      | 0.24                  | 0.35                  | 0.36                  | 0.45                  | 0.57                  | 1.37     | 1.57     |
|                 | G  | 343              | 0.28                                                      | 0.31                  | 0.41                  | 0.47                  | 0.65                  | 0.81                  | 1.45     | 1.68     |
|                 | H  | 298              | 0.25                                                      | 0.29                  | 0.36                  | 0.39                  | 0.5                   | 0.61                  | 1.32     | 1.56     |
|                 | I  | 248              | 0.28                                                      | 0.31                  | 0.47                  | 0.5                   | 0.75                  | 1.2                   | 1.56     | 1.79     |
|                 | J  | 192              | 0.29                                                      | 0.32                  | 0.43                  | 0.49                  | 0.8                   | 1.4                   | 1.60     | 1.69     |
|                 |    |                  |                                                           |                       |                       |                       |                       |                       |          |          |
| 5/22/91         | A  | 615              | 0.002                                                     | 0.017                 | 0.22                  | 0.27                  | 0.4                   | 0.5                   | 7.38     |          |
| RM 468.1        | B  | 575              | 0.28                                                      | 0.31                  | 0.45                  | 0.49                  | 0.59                  | 0.71                  | 1.38     | 1.75     |
| XS1             | C  | 520              | 0.22                                                      | 0.24                  | 0.38                  | 0.41                  | 0.6                   | 0.8                   | 1.58     | 1.86     |
| LEW-REW         | D  | 475              | 0.23                                                      | 0.25                  | 0.38                  | 0.39                  | 0.55                  | 0.8                   | 1.48     | 1.70     |
|                 | E  | 422              | 0.24                                                      | 0.27                  | 0.39                  | 0.44                  | 0.65                  | 1.1                   | 1.56     | 1.83     |
|                 | F  | 370              | 0.23                                                      | 0.25                  | 0.35                  | 0.38                  | 0.55                  | 0.7                   | 1.49     | 1.65     |
|                 | H  | 269              | 0.28                                                      | 0.31                  | 0.42                  | 0.46                  | 0.6                   | 0.8                   | 1.39     | 1.64     |
|                 | I  | 235              | 0.28                                                      | 0.31                  | 0.4                   | 0.44                  | 0.59                  | 0.8                   | 1.38     | 1.57     |
|                 | J  | 178              | 0.34                                                      | 0.37                  | 0.6                   | 0.7                   | 1.4                   | 2                     | 1.98     | 2.06     |
|                 | K  | 125              | 0.29                                                      | 0.34                  | 0.44                  | 0.48                  | 0.79                  | 1.23                  | 1.54     | 1.66     |
|                 |    |                  |                                                           |                       |                       |                       |                       |                       |          |          |
| 5/14/91         | 01 | 15               | -                                                         | -                     | 0.028                 | -                     | -                     | -                     | -        | -        |
| RM 468.2        | 05 | 138              | 0.28                                                      | 0.31                  | 0.46                  | 0.49                  | 0.75                  | 2                     | 1.56     | 1.75     |
| MRX2            | 06 | 172              | 0.28                                                      | 0.31                  | 0.41                  | 0.44                  | 0.65                  | 0.9                   | 1.45     | 1.57     |
| REW-LEW         | 07 | 193              | 0.27                                                      | 0.29                  | 0.38                  | 0.39                  | 0.5                   | 0.69                  | 1.31     | 1.44     |
|                 | 08 | 230              | 0.27                                                      | 0.31                  | 0.39                  | 0.41                  | 0.65                  | 1.2                   | 1.46     | 1.52     |
|                 | 09 | 260              | 0.27                                                      | 0.3                   | 0.39                  | 0.45                  | 0.7                   | 1.1                   | 1.55     | 1.67     |
|                 | 10 | 295              | 0.27                                                      | 0.3                   | 0.39                  | 0.4                   | 0.55                  | 0.7                   | 1.36     | 1.48     |
|                 | 11 | 305              | 0.28                                                      | 0.3                   | 0.38                  | 0.4                   | 0.55                  | 0.66                  | 1.36     | 1.43     |
|                 | 12 | 340              | 0.28                                                      | 0.32                  | 0.45                  | 0.49                  | 0.55                  | 0.7                   | 1.31     | 1.75     |
|                 | 13 | 361              | 0.25                                                      | 0.29                  | 0.4                   | 0.45                  | 0.6                   | 0.8                   | 1.44     | 1.80     |
|                 | 14 | 395              | 0.22                                                      | 0.24                  | 0.34                  | 0.36                  | 0.5                   | 0.67                  | 1.44     | 1.64     |
|                 | 15 | 427              | 0.23                                                      | 0.24                  | 0.36                  | 0.39                  | 0.55                  | 0.9                   | 1.51     | 1.70     |
|                 | 16 | 454              | 0.23                                                      | 0.26                  | 0.38                  | 0.39                  | 0.55                  | 0.8                   | 1.45     | 1.70     |
|                 | 17 | 487              | 0.23                                                      | 0.25                  | 0.36                  | 0.39                  | 0.55                  | 0.7                   | 1.48     | 1.70     |
|                 | 18 | 502              | 0.22                                                      | 0.24                  | 0.32                  | 0.36                  | 0.59                  | 0.9                   | 1.59     | 1.64     |
|                 | 19 | 531              | 0.19                                                      | 0.22                  | 0.28                  | 0.31                  | 0.42                  | 0.51                  | 1.39     | 1.63     |
|                 | 20 | 565              | 0.006                                                     | 0.02                  | 0.24                  | 0.29                  | 0.52                  | 0.7                   | 7.08     | 48.33    |
|                 | 21 | 598              | 0.21                                                      | 0.23                  | 0.29                  | 0.32                  | 0.48                  | 0.7                   | 1.46     | 1.52     |
|                 | 22 | 620              | -                                                         | -                     | 0.018                 | 0.024                 | -                     | -                     | -        | -        |

Clarks Ferry Site, Trip 2

| <i>Location</i> |   | <i>Dist. (ft)</i> | <i>Characteristics of Bed Material Particle Size (mm)</i> |                       |                       |                       |                       |                       |          |          |
|-----------------|---|-------------------|-----------------------------------------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|----------|----------|
|                 |   |                   | <i>d<sub>10</sub></i>                                     | <i>d<sub>16</sub></i> | <i>d<sub>50</sub></i> | <i>d<sub>60</sub></i> | <i>d<sub>85</sub></i> | <i>d<sub>95</sub></i> | <i>σ</i> | <i>U</i> |
| 10/19/91        | A | 2015              | 0.13                                                      | 0.16                  | 0.25                  | 0.28                  | 0.44                  | 0.60                  | 1.66     | 2.15     |
| RM 468.3        | B | 1921              | 0.23                                                      | 0.26                  | 0.37                  | 0.39                  | 0.5                   | 0.65                  | 1.39     | 1.70     |
| XS              | C | 1824              | 0.24                                                      | 0.26                  | 0.42                  | 0.48                  | 0.63                  | 0.8                   | 1.56     | 2.00     |
| LEW-REW         | D | 1727              | 0.23                                                      | 0.25                  | 0.36                  | 0.4                   | 0.55                  | 0.75                  | 1.48     | 1.74     |
|                 | E | 1627              | 0.22                                                      | 0.24                  | 0.35                  | 0.36                  | 0.5                   | 0.7                   | 1.44     | 1.64     |
|                 | F | 1524              | 0.23                                                      | 0.25                  | 0.37                  | 0.41                  | 0.6                   | 0.85                  | 1.55     | 1.78     |
|                 | G | 1424              | 0.19                                                      | 0.22                  | 0.38                  | 0.41                  | 0.61                  | 1                     | 1.67     | 2.16     |
|                 | H | 1322              | 0.21                                                      | 0.22                  | 0.28                  | 0.31                  | 0.45                  | 0.59                  | 1.44     | 1.48     |
|                 | J | 1128              | 0.29                                                      | 0.33                  | 0.48                  | 0.5                   | 0.63                  | 0.8                   | 1.38     | 1.72     |
|                 | K | 1023              | 0.23                                                      | 0.25                  | 0.4                   | 0.44                  | 0.65                  | 0.85                  | 1.61     | 1.91     |
|                 | L | 925               | 0.25                                                      | 0.28                  | 0.42                  | 0.46                  | 0.65                  | 0.82                  | 1.52     | 1.84     |
|                 | M | 829               | 0.25                                                      | 0.27                  | 0.38                  | 0.41                  | 0.6                   | 1                     | 1.49     | 1.64     |
|                 | N | 724               | 0.26                                                      | 0.3                   | 0.42                  | 0.49                  | 0.9                   | 2.5                   | 1.77     | 1.88     |

**APPENDIX IV.**

**AMBIENT WATER LEVELS AND AIR AND WATER TEMPERATURES  
AT ALL STUDY SITES**

**McEver's Island Site  
(NA)**

**Kamspville Site, Trip 1**

| Date     | Time  | Temperature |                    |                         |             | Water surface stage* (ft) |
|----------|-------|-------------|--------------------|-------------------------|-------------|---------------------------|
|          |       | Air (°F)    | Surface water (°C) | Under water measured by |             |                           |
|          |       |             |                    | S4/040 (°C)             | S4/071 (°C) |                           |
| 10/11/90 | 09:00 |             |                    |                         |             | 2.20                      |
|          | 10:00 |             |                    |                         |             | 2.24                      |
|          | 13:46 |             |                    |                         |             | 2.40                      |
|          | 17:47 |             |                    |                         |             | 2.54                      |
| 10/12/90 | 09:45 |             |                    |                         |             | 2.78                      |
|          | 12:39 |             |                    |                         |             | 2.98                      |
|          | 13:35 |             |                    | 14.6                    | 14.5        |                           |
|          | 13:49 |             |                    | 14.6                    | 14.5        |                           |
| 10/13/90 | 14:28 |             | 18.0               |                         |             | 3.10                      |
|          | 15:30 | 67.1        | 17.0               |                         |             | 3.14                      |
|          | 17:00 | 59.0        | 17.0               |                         |             | 3.24                      |
|          | 09:32 |             |                    |                         | 13.5        |                           |
|          | 09:45 | 58.1        | 15.5               |                         |             | 3.46                      |
|          | 09:56 |             |                    |                         | 13.4        |                           |
|          | 10:00 |             |                    |                         | 13.4        |                           |
|          | 10:53 | 61.7        | 16.0               |                         |             | 3.50                      |
|          | 11:09 |             |                    | 13.4                    | 13.4        |                           |
|          | 11:58 | 64.4        | 16.0               |                         |             | 3.48                      |
|          | 13:42 | 66.2        | 17.0               |                         |             | 3.48                      |
|          | 15:22 |             |                    | 13.5                    | 13.6        |                           |
| 10/14/90 | 15:33 | 68.9        | 16.0               |                         |             | 3.50                      |
|          | 16:25 |             |                    | 13.5                    | 13.6        |                           |
|          | 17:12 | 65.3        |                    |                         |             | 3.46                      |
|          | 07:20 | 51.8        | 14.0               |                         |             | 3.54                      |
|          | 09:30 | 60.8        | 15.0               |                         |             | 3.56                      |
|          | 10:18 |             |                    |                         | 12.4        |                           |
|          | 10:35 | 61.7        | 15.5               |                         |             | 3.60                      |
|          | 10:57 |             |                    | 12.3                    |             |                           |
|          | 11:43 |             |                    |                         | 12.4        |                           |
|          | 12:26 |             |                    | 12.4                    | 12.4        |                           |
|          | 12:51 | 73.4        | 16.0               |                         |             | 3.58                      |
|          | 13:30 |             |                    | 12.5                    | 12.6        |                           |
| 15:02    | 71.6  | 16.0        |                    |                         | 3.60        |                           |
| 15:30    |       |             | 12.6               | 12.7                    |             |                           |
| 15:45    | 67.1  | 16.0        |                    |                         |             |                           |

# Kamspville Site, Trip 1 (Concluded)

| Date     | Time  | Temperature |                    |                         |             | Water surface stage* (ft) |
|----------|-------|-------------|--------------------|-------------------------|-------------|---------------------------|
|          |       | Air (°F)    | Surface water (°C) | Under water measured by |             |                           |
|          |       |             |                    | S4/040 (°C)             | S4/071 (°C) |                           |
| 10/15/90 | 15:59 |             |                    | 12.6                    | 12.7        |                           |
|          | 16:07 | 66.2        | 16.0               |                         |             | 3.52                      |
|          | 16:38 |             |                    | 12.6                    | 12.7        |                           |
|          | 17:31 |             | 16.0               |                         |             | 3.54                      |
|          | 09:50 |             |                    | 12.9                    | 13.0        |                           |
|          | 09:53 |             | 15.0               |                         |             | 3.66                      |
|          | 10:33 | 60.0        | 15.0               |                         |             | 3.64                      |
|          | 10:50 | 58.0        | 16.0               |                         |             | 3.66                      |
|          | 12:08 |             |                    | 13.3                    | 13.2        |                           |
|          | 13:25 | 58.5        | 16.0               |                         |             | 3.68                      |
|          | 14:41 |             |                    |                         |             | 3.64                      |
|          | 14:52 |             |                    | 13.6                    |             |                           |
|          | 15:12 |             |                    | 13.7                    | 13.7        |                           |
|          | 16:02 | 67.0        | 16.0               |                         |             | 3.68                      |
|          | 17:30 | 64.0        | 15.0               |                         |             | 3.68                      |
| 10/16/90 | 09:22 | 59.0        | 15.5               |                         |             | 3.72                      |
|          | 10:28 |             |                    | 14.1                    | 14.1        |                           |
|          | 10:49 | 63.0        | 16.0               |                         |             | 3.72                      |
|          | 11:56 | 66.0        | 17.0               |                         |             | 3.74                      |
|          | 12:48 | 67.0        | 17.0               |                         |             | 3.76                      |
|          | 14:44 | 74.5        | 17.0               |                         |             | 3.76                      |
|          | 15:46 | 75.0        | 18.0               |                         |             | 3.80                      |
|          | 16:21 |             |                    | 14.6                    | 14.7        |                           |
|          | 16:56 | 73.0        | 18.0               |                         |             | 3.80                      |
|          | 18:00 | 76.0        | 18.0               |                         |             | 3.84                      |
|          | 09:15 | 73.5        | 17.5               |                         |             | 3.90                      |
|          | 10:26 |             |                    | 14.8                    | 14.8        |                           |
| 10/17/90 | 11:14 |             |                    | 14.8                    | 14.8        |                           |
|          | 11:28 | 73.5        | 17.5               |                         |             | 3.90                      |
|          | 14:06 | 73.5        | 18.0               |                         |             | 3.92                      |

\*water stage data were taken from a staff gage installed by ISWS for these field trips

### Kampsville Site, Trip 2

| <i>Date</i> | <i>Time</i> | <i>Temperature</i> |                              | <i>Water surface stage*</i><br>(ft) |
|-------------|-------------|--------------------|------------------------------|-------------------------------------|
|             |             | <i>Air</i><br>(°F) | <i>Surface water</i><br>(°C) |                                     |
| 8/12/91     | 06:20       |                    |                              | 1.90                                |
| 8/13/91     | 09:00       |                    |                              | 2.00                                |
|             | 11:40       |                    |                              | 2.00                                |
|             | 12:10       | 84.0               | 22.2                         | 2.00                                |
|             | 18:40       |                    |                              | 1.94                                |
| 8/14/91     | 07:00       |                    |                              | 2.12                                |
| 8/15/91     | 17:00       |                    |                              | 1.94                                |
|             | 18:40       |                    |                              | 1.92                                |

\*water stage data were taken from a staff gage installed by ISWS for these field trips

### Apple River Island Site

| Date    | Time  | Temperature |                       |                  |             | Water Surface stage (m) |
|---------|-------|-------------|-----------------------|------------------|-------------|-------------------------|
|         |       | Air (°C)    | Water near shore (°C) | Water in channel |             |                         |
|         |       |             |                       | S4/040 (°C)      | S4/071 (°C) |                         |
| 5/18/90 | 14:34 | 20.5        |                       |                  |             |                         |
| 5/19/90 | 9:55  |             |                       |                  | 15.3        |                         |
|         | 11:20 |             |                       |                  | 15.2        |                         |
|         | 11:40 |             |                       |                  | 15.1        |                         |
|         | 11:56 |             |                       |                  | 15.1        |                         |
|         | 14:34 | 18.0        | 16.1                  |                  |             | 0.30                    |
| 5/20/90 | 7:54  | 12.0        | 15.0                  |                  |             | 0.27                    |
|         | 10:55 | 11.0        | 15.0                  |                  |             | 0.29                    |
|         | 11:27 |             |                       | 14.9             |             |                         |
|         | 12:08 | 12.0        | 15.3                  |                  |             | 0.30                    |
|         | 12:36 |             |                       | 14.8             |             |                         |
|         | 15:33 |             |                       | 14.6             | 14.9        |                         |
|         | 17:56 | 11.5        | 15.0                  |                  |             | 0.33                    |
| 5/21/90 | 8:26  | 10.5        | 13.9                  |                  |             | 0.35                    |
|         | 10:06 |             |                       | 13.5             | 13.8        |                         |
|         | 10:20 |             |                       |                  |             |                         |
|         | 11:00 |             |                       | 13.5             | 13.8        |                         |

# Apple River Island Site (Concluded)

| Date    | Time  | Temperature |                             |                  |                | Water<br>Surface<br>stage<br>(m) |
|---------|-------|-------------|-----------------------------|------------------|----------------|----------------------------------|
|         |       | Air<br>(°C) | Water<br>near shore<br>(°C) | Water in channel |                |                                  |
|         |       |             |                             | S4/040<br>(°C)   | S4/071<br>(°C) |                                  |
| 5/22/90 | 11:10 | 13.0        | 14.4                        |                  |                |                                  |
|         | 12:40 | 15.0        | 14.4                        |                  |                | 0.35                             |
|         | 14:19 |             |                             | 13.6             |                |                                  |
|         | 14:37 |             |                             | 13.6             | 13.8           |                                  |
|         | 14:55 |             |                             | 13.6             | 13.8           |                                  |
|         | 15:30 | 15.0        | 14.4                        |                  |                | 0.37                             |
|         | 16:50 | 16.0        | 14.7                        |                  |                | 0.38                             |
|         | 9:10  | 12.0        | 13.9                        |                  |                | 0.43                             |
|         | 10:09 |             |                             | 13.6             | 13.8           |                                  |
|         | 11:00 | 15.0        | 15.3                        |                  |                | 0.43                             |
| 5/23/90 | 13:40 | 18.0        | 15.6                        |                  |                | 0.44                             |
|         | 15:01 | 20.5        | 15.6                        |                  |                | 0.45                             |
|         | 16:30 | 20.0        | 15.6                        |                  |                | 0.45                             |
|         | 17:08 |             |                             | 14.3             | 14.5           |                                  |
|         | 17:28 |             |                             | 14.4             | 14.6           |                                  |
|         | 18:06 |             |                             | 14.4             | 14.6           |                                  |
|         | 19:49 |             |                             | 14.6             | 14.8           |                                  |
|         | 6:40  | 12.0        | 15.0                        |                  |                | 0.47                             |
|         | 6:52  |             |                             | 14.0             |                |                                  |
|         | 8:45  | 14.0        | 15.0                        |                  |                | 0.48                             |
| 5/24/90 | 10:05 | 15.0        | 15.0                        |                  |                | 0.48                             |
|         | 13:05 | 16.5        | 15.0                        |                  |                | 0.49                             |
|         | 14:09 | 17.0        | 15.3                        |                  |                | 0.50                             |
|         | 15:05 | 17.0        | 15.3                        |                  |                | 0.51                             |
|         | 16:13 |             |                             | 14.4             |                |                                  |
|         | 18:00 | 17.0        | 15.0                        |                  |                | 0.52                             |
|         | 7:28  |             |                             |                  |                | 0.57                             |
|         | 8:35  |             |                             |                  |                | 0.57                             |



Goose Island Site, Trip 1

| Date    | Time  | Temperature |                       |                  |             | Water Surface stage (m) |
|---------|-------|-------------|-----------------------|------------------|-------------|-------------------------|
|         |       | Air (°C)    | Water near shore (°C) | Water in channel |             |                         |
|         |       |             |                       | S4/040 (°C)      | S4/071 (°C) |                         |
| 8/24/90 | 9:19  | 26.0        | 26.0                  |                  |             | 0.26                    |
|         | 10:16 | 28.0        | 26.0                  |                  |             | 0.24                    |
|         | 10:51 |             |                       | 25.6             | 25.7        |                         |
|         | 11:05 | 28.5        | 26.0                  |                  |             | 0.24                    |
|         | 12:08 | 29.5        | 26.0                  |                  |             | 0.21                    |
|         | 13:19 | 31.0        | 26.5                  |                  |             | 0.21                    |
|         | 13:42 |             |                       | 25.6             | 25.8        |                         |
|         | 13:54 |             |                       | 25.6             | 25.9        |                         |
|         | 14:16 |             |                       | 25.7             | 25.9        |                         |
|         | 14:33 | 31.0        | 26.5                  |                  |             | 0.21                    |
|         | 15:13 | 31.5        | 26.8                  |                  |             | 0.20                    |
|         | 16:19 | 31.5        | 27.0                  |                  |             | 0.19                    |
|         | 16:25 | 31.5        | 27.0                  |                  |             | 0.19                    |
|         | 16:39 |             |                       |                  | 26.1        |                         |
|         | 18:07 | 31.0        | 27.0                  |                  |             |                         |
|         | 18:55 | 30.0        | 26.0                  |                  |             | 0.18                    |
| 8/25/90 | 7:25  | 25.0        | 25.0                  |                  |             | 0.19                    |
|         | 9:30  | 27.0        | 25.5                  |                  |             | 0.20                    |
|         | 10:35 | 27.5        | 26.0                  |                  |             | 0.20                    |
|         | 11:19 |             |                       | 25.8             | 26.0        |                         |
|         | 11:44 | 28.0        | 26.0                  |                  |             | 0.20                    |
|         | 12:15 |             |                       | 25.8             | 27.0        |                         |
|         | 12:24 |             |                       | 25.8             | 26.0        |                         |
|         | 12:31 | 29.0        | 27.0                  |                  |             |                         |
|         | 13:51 | 29.5        | 27.0                  |                  |             | 0.19                    |
|         | 14:16 | 29.5        | 27.0                  |                  |             | 0.19                    |
|         | 15:06 | 30.5        | 27.0                  |                  |             | 0.20                    |
|         | 15:45 |             |                       | 26.0             | 26.2        |                         |
|         | 16:00 | 30.5        | 27.0                  |                  |             | 0.20                    |
| 8/26/90 | 9:08  |             | 26.0                  |                  |             |                         |
|         | 9:52  | 29.0        | 26.0                  |                  |             | 0.19                    |
|         | 11:00 | 30.5        | 26.5                  |                  |             | 0.19                    |
|         | 11:46 |             |                       | 25.8             | 26.1        |                         |
|         | 12:56 | 32.0        | 27.0                  |                  |             | 0.18                    |
|         | 13:27 |             |                       | 25.9             | 26.1        |                         |

**Goose Island Site, Trip 1 (Concluded)**

| Date    | Time  | Temperature |                       |                  |             | Water Surface stage (m) |
|---------|-------|-------------|-----------------------|------------------|-------------|-------------------------|
|         |       | Air (°C)    | Water near shore (°C) | Water in channel |             |                         |
|         |       |             |                       | S4/040 (°C)      | S4/071 (°C) |                         |
| 8/27/90 | 14:13 | 33.0        | 28.0                  | 26.0             |             | 0.20                    |
|         | 14:21 |             |                       |                  |             |                         |
|         | 15:29 | 34.0        | 28.0                  |                  |             | 0.20                    |
|         | 9:00  |             | 26.0                  |                  |             | 0.36                    |
|         | 9:37  | 30.0        | 26.0                  |                  |             | 0.36                    |
|         | 10:12 | 31.0        | 26.5                  |                  |             | 0.36                    |
|         | 11:50 | 33.0        | 27.0                  |                  |             | 0.39                    |
|         | 13:31 | 35.5        | 27.0                  |                  |             | 0.41                    |
|         | 18:05 | 35.0        | 27.0                  |                  |             | 0.43                    |
|         |       |             |                       |                  |             |                         |

**Goose Island Site, Trip 2**

| Date    | Time  | Air<br>(°C) | Temperature                    |                  |                |                |                | Water<br>surface<br>stage<br>(m) |
|---------|-------|-------------|--------------------------------|------------------|----------------|----------------|----------------|----------------------------------|
|         |       |             | Water<br>near<br>shore<br>(°C) | Water in channel |                |                |                |                                  |
|         |       |             |                                | S4/40<br>(°C)    | S4/151<br>(°C) | S4/834<br>(°C) | S4/832<br>(°C) |                                  |
| 7/16/91 | 15:30 |             |                                |                  |                |                |                | 0.55                             |
|         | 16:30 |             |                                |                  |                |                |                | 0.55                             |
|         | 17:00 |             |                                |                  |                |                |                | 0.55                             |
| 7/17/91 | 12:30 |             |                                |                  |                |                |                | 0.55                             |
|         | 15:00 | 33.3        |                                |                  |                |                |                | 0.52                             |
|         | 16:50 | 35.0        |                                |                  |                |                |                | 0.52                             |
| 7/18/91 | 7:45  | 27.8        |                                |                  |                |                |                | 0.49                             |
|         | 9:00  |             |                                |                  |                |                |                | 0.49                             |
|         | 10:42 |             |                                | 27.4             | 27.7           | 27.3           |                |                                  |
|         | 12:26 |             |                                |                  | 27.8           | 27.5           |                |                                  |
|         | 11:00 | 29.4        | 29.0                           |                  |                |                |                | 0.49                             |
|         | 12:36 | 31.7        | 29.0                           |                  |                |                |                | 0.49                             |
|         | 13:54 | 32.2        | 29.0                           |                  |                |                |                | 0.49                             |
|         | 14:17 |             |                                | 28.0             | 27.6           | 27.9           | 28.0           | 28.3                             |
|         | 15:07 | 32.8        | 30.0                           |                  |                |                |                | 0.48                             |
|         | 16:16 | 32.8        | 30.0                           |                  |                |                |                | 0.48                             |

Goose Island Site, Trip 2 (Continued)

|         |                | Temperature     |                                    |                   |                    |                    |                    |                    | Water<br>surface<br>stage<br><br>(m) |
|---------|----------------|-----------------|------------------------------------|-------------------|--------------------|--------------------|--------------------|--------------------|--------------------------------------|
|         |                | Air<br><br>(°C) | Water<br>near<br>shore<br><br>(°C) | Water in channel  |                    |                    |                    |                    |                                      |
| Date    | Time           |                 |                                    | S4/40<br><br>(°C) | S4/151<br><br>(°C) | S4/834<br><br>(°C) | S4/832<br><br>(°C) | S4/071<br><br>(°C) |                                      |
|         | 17:23<br>18:07 |                 |                                    | 28.3              | 27.9               | 28.2               |                    |                    |                                      |
| 7/19/91 | 9:20           | 27.8            | 29.0                               |                   |                    |                    |                    |                    | 0.42                                 |
|         | 10:17          | 28.9            | 29.0                               |                   |                    |                    |                    |                    | 0.41                                 |
|         | 11:03          |                 |                                    |                   |                    | 27.9               |                    |                    |                                      |
|         | 11:20          | 30.0            | 29.0                               |                   |                    |                    |                    |                    | 0.40                                 |
|         | 13:08          | 31.9            | 29.0                               |                   |                    |                    |                    |                    | 0.39                                 |
|         | 16:00          | 33.3            | 29.5                               |                   |                    |                    |                    |                    | 0.34                                 |
|         | 16:24          |                 |                                    |                   |                    | 28.4               |                    | 28.6               |                                      |
|         | 16:33          |                 |                                    |                   |                    | 28.3               |                    | 28.6               |                                      |
|         | 17:50          | 32.5            | 29.0                               |                   |                    |                    |                    |                    | 0.30                                 |
|         | 18:05          |                 |                                    |                   |                    | 28.4               |                    |                    |                                      |
| 7/20/91 | 6:15           | 25.6            | 29.0                               |                   |                    |                    |                    |                    | 0.30                                 |
|         | 7:55           | 25.8            | 29.0                               |                   |                    |                    |                    |                    | 0.32                                 |
|         | 8:09           |                 |                                    |                   | 27.8               | 28.1               |                    |                    |                                      |
|         | 8:19           |                 |                                    |                   | 27.8               | 28.1               |                    |                    |                                      |
|         | 9:06           | 27.8            | 29.0                               |                   |                    |                    |                    |                    | 0.33                                 |
|         | 10:41          | 29.4            | 29.0                               |                   |                    |                    |                    |                    | 0.34                                 |
|         | 11:39          |                 |                                    |                   | 27.9               | 27.6               | 27.8               |                    |                                      |
|         | 11:55          |                 |                                    |                   | 27.9               | 27.6               | 27.8               |                    |                                      |
|         | 13:00          | 31.7            | 31.0                               |                   |                    |                    |                    |                    | 0.35                                 |
|         | 13:31          |                 |                                    |                   | 27.9               | 27.6               | 27.8               |                    |                                      |
|         | 16:24          | 32.8            | 31.0                               |                   |                    |                    |                    |                    | 0.35                                 |
|         | 16:56          |                 |                                    |                   | 28.3               | 28.0               | 28.2               |                    |                                      |
|         | 7/21/91        | 9:30            | 30.6                               |                   |                    |                    |                    |                    |                                      |
| 12:51   |                | 32.8            | 32.0                               |                   |                    |                    |                    |                    | 0.25                                 |
| 13:08   |                |                 |                                    | 28.7              | 28.3               | 28.2               | 28.1               | 28.9               |                                      |
| 14:21   |                | 32.5            |                                    |                   |                    |                    |                    |                    | 0.22                                 |
| 14:57   |                |                 |                                    | 28.9              | 28.4               | 28.2               | 28.3               | 29.1               |                                      |
| 15:11   |                | 32.5            |                                    |                   |                    |                    |                    |                    | 0.18                                 |
| 16:22   |                | 33.6            |                                    |                   |                    |                    |                    |                    | 0.77                                 |
| 17:33   |                | 34.4            |                                    |                   |                    |                    |                    |                    | 0.76                                 |
| 7/22/91 | 8:00           | 28.9            | 29.0                               |                   |                    |                    |                    |                    | 0.79                                 |
|         | 10:12          | 31.1            | 30.0                               |                   |                    |                    |                    |                    | 0.79                                 |

**Goose Island Site, Trip 2 (Continued)**

| Date    | Time  | Air<br>(°C) | Water<br>near<br>shore<br>(°C) | Temperature      |                |                |                |                | Water<br>surface<br>stage<br>(m) |
|---------|-------|-------------|--------------------------------|------------------|----------------|----------------|----------------|----------------|----------------------------------|
|         |       |             |                                | Water in channel |                |                |                |                |                                  |
|         |       |             |                                | S4/40<br>(°C)    | S4/151<br>(°C) | S4/834<br>(°C) | S4/832<br>(°C) | S4/071<br>(°C) |                                  |
| 7/23/91 | 10:34 |             |                                | 28.8             | 28.4           | 28.1           | 28.3           |                |                                  |
|         | 12:00 | 32.8        | 32.0                           |                  |                |                |                |                | 0.80                             |
|         | 12:11 |             |                                | 28.9             | 28.5           | 28.2           | 28.3           | 29.1           |                                  |
|         | 13:00 | 33.9        | 32.0                           |                  |                |                |                |                | 0.80                             |
|         | 13:16 |             |                                | 29.0             | 28.6           | 28.3           | 28.5           | 29.2           |                                  |
|         | 13:20 |             |                                | 29.1             | 28.6           | 28.3           | 28.5           | 29.2           |                                  |
|         | 13:24 |             |                                | 29.1             | 28.6           | 28.3           | 28.5           | 29.2           |                                  |
|         | 14:00 |             |                                | 29.1             | 28.6           | 28.3           | 28.5           | 29.3           |                                  |
|         | 14:10 | 34.4        | 32.0                           |                  |                |                |                |                | 0.79                             |
|         | 15:00 | 35.0        | 32.0                           |                  |                |                |                |                | 0.77                             |
|         | 17:10 | 34.4        | 32.0                           |                  |                |                |                |                | 0.76                             |
|         | 9:45  | 25.6        | 30.0                           |                  |                |                |                |                | 0.66                             |
|         | 10:57 | 27.2        | 30.0                           |                  |                |                |                |                | 0.67                             |
|         | 12:00 |             |                                |                  |                |                |                |                | 0.73                             |
| 13:15   |       |             |                                |                  |                |                |                | 0.76           |                                  |
| 7/24/91 | 14:00 | 27.8        | 30.0                           |                  |                |                |                |                | 0.76                             |
|         | 14:12 |             |                                | 29.1             | 28.8           | 28.5           | 28.6           | 29.4           |                                  |
|         | 14:20 |             |                                | 29.2             | 28.7           | 28.5           | 28.6           | 29.4           |                                  |
|         | 15:15 | 28.9        | 30.0                           |                  |                |                |                |                | 0.79                             |
|         | 15:55 |             |                                | 29.2             | 28.8           | 28.6           | 28.7           | 29.5           |                                  |
|         | 15:59 |             |                                | 29.2             | 28.9           | 28.6           | 28.7           | 29.5           |                                  |
|         | 16:18 | 28.9        | 31.0                           |                  |                |                |                |                | 0.84                             |
|         | 16:24 |             |                                | 29.2             | 28.8           | 28.5           | 28.7           |                |                                  |
|         | 17:15 | 28.9        | 31.0                           |                  |                |                |                |                | 0.85                             |
|         | 7:00  |             |                                |                  |                |                |                |                | 0.87                             |
|         | 8:12  | 18.9        |                                |                  |                |                |                |                | 0.86                             |
|         | 8:25  |             |                                | 28.7             | 28.3           | 28.0           | 28.1           |                |                                  |
|         | 9:14  |             |                                | 28.7             | 28.2           |                | 28.1           |                |                                  |
|         | 9:58  |             |                                | 28.7             | 28.2           |                | 28.1           | 28.9           |                                  |
| 10:22   | 21.1  |             |                                |                  |                |                |                | 0.85           |                                  |
| 10:45   |       |             |                                |                  |                |                |                | 0.82           |                                  |
| 10:55   |       |             |                                |                  |                |                |                | 0.82           |                                  |
| 11:47   |       |             |                                |                  |                |                |                | 0.79           |                                  |
| 12:13   |       |             |                                | 28.6             | 28.2           |                | 28.1           | 28.8           |                                  |
| 12:29   |       |             |                                |                  |                |                |                |                | 0.79                             |
| 13:44   |       |             |                                | 28.6             | 28.2           |                | 28.1           | 28.8           |                                  |

**Goose Island Site, Trip 2 (Concluded)**

| Date | Time  | Air<br>(°C) | Water<br>near<br>shore<br>(°C) | Temperature      |                |                |                |                | Water<br>surface<br>stage<br>(m) |      |
|------|-------|-------------|--------------------------------|------------------|----------------|----------------|----------------|----------------|----------------------------------|------|
|      |       |             |                                | Water in channel |                |                |                |                |                                  |      |
|      |       |             |                                | S4/40<br>(°C)    | S4/151<br>(°C) | S4/834<br>(°C) | S4/832<br>(°C) | S4/071<br>(°C) |                                  |      |
|      | 13:57 |             |                                |                  |                |                |                |                |                                  | 0.79 |
|      | 14:48 |             |                                | 28.6             | 28.2           |                | 28.1           | 28.8           |                                  |      |
|      | 15:43 |             |                                | 28.6             | 28.2           |                | 28.1           | 28.8           |                                  |      |

**Clarks Ferry Site, Trip 1**

| Date    | Time  | Temperature |                    |                         |             |             |             |             | Water surface stage* (ft) |
|---------|-------|-------------|--------------------|-------------------------|-------------|-------------|-------------|-------------|---------------------------|
|         |       | Air (°F)    | Surface water (°C) | Under water measured by |             |             |             |             |                           |
|         |       |             |                    | S4/151 (°C)             | S4/834 (°C) | S4/832 (°C) | S4/483 (°C) | S4/071 (°C) |                           |
| 5/16/91 | 10:39 |             |                    |                         |             |             |             |             | 2.32                      |
|         | 11:59 |             |                    |                         |             |             |             |             | 2.32                      |
|         | 12:08 |             |                    | 20.9                    |             | 20.1        |             |             |                           |
|         | 12:23 |             |                    | 21.3                    |             | 20.1        |             |             | 2.36                      |
|         | 12:59 |             |                    |                         |             |             |             |             |                           |
|         | 13:27 |             |                    | 20.4                    |             | 20.2        |             |             |                           |
|         | 13:59 |             |                    |                         |             |             |             |             | 2.38                      |
|         | 14:53 |             |                    |                         |             |             |             |             | 2.38                      |
|         | 16:51 |             |                    |                         |             |             |             |             | 2:40                      |
| 5/17/91 | 10:00 |             |                    |                         |             |             |             |             | 2:48                      |
|         | 11:06 |             |                    |                         |             |             |             |             | 2:48                      |
|         | 11:58 |             |                    |                         |             |             |             |             | 2:48                      |
|         | 12:26 |             |                    | 21.0                    | 20.4        | 20.7        | 21.0        | 21.1        |                           |
|         | 13:04 | 79.5        | 25.0               |                         |             |             |             |             |                           |
|         | 15:04 |             |                    | 21.3                    | 20.8        | 21.1        | 21.4        | 21.5        |                           |
|         | 15:35 | 81.0        |                    |                         |             |             |             |             | 2.50                      |
|         | 16:32 |             | 21.5               | 20.9                    | 21.3        | 21.5        | 21.6        |             |                           |
|         | 17:45 |             | 21.4               | 20.9                    | 21.3        | 21.5        | 21.6        |             |                           |
| 5/18/91 | 11:03 | 52.5        |                    |                         |             |             |             |             | 3.00                      |
|         | 12:17 | 52.5        | 19.0               |                         |             |             |             |             | 3.02                      |
|         | 13:17 | 53.0        | 19.0               |                         |             |             |             |             | 3.02                      |
|         | 14:50 | 55.0        | 19.5               |                         |             |             |             |             | 3.04                      |
|         | 16:16 | 55.0        | 19.5               |                         |             |             |             |             | 3.08                      |

**Clarks Ferry Site, Trip 1 (Continued)**

| Date    | Time  | Temperature |                    |                         |             |             |             |             | Water surface stage* (ft) |
|---------|-------|-------------|--------------------|-------------------------|-------------|-------------|-------------|-------------|---------------------------|
|         |       | Air (°F)    | Surface water (°C) | Under water measured by |             |             |             |             |                           |
|         |       |             |                    | S4/151 (°C)             | S4/834 (°C) | S4/832 (°C) | S4/483 (°C) | S4/071 (°C) |                           |
| 5/19/91 | 08:25 | 55.0        | 19.0               |                         |             |             |             |             |                           |
|         | 10:07 |             |                    | 17.9                    | 17.3        | 17.8        | 18.4        |             |                           |
|         | 10:30 | 61.0        | 20.5               |                         |             |             |             |             | 2.98                      |
|         | 11:42 |             |                    | 18.0                    | 17.4        | 17.8        | 18.4        | 18.5        |                           |
|         | 11:45 | 64.0        | 21.0               |                         |             |             |             |             | 2.98                      |
|         | 12:53 | 66.0        | 21.0               |                         |             |             |             |             | 2.98                      |
|         | 14:21 | 68.0        | 22.0               |                         |             |             |             |             | 2.98                      |
|         | 15:14 | 69.0        | 22.0               |                         |             |             |             |             | 3.02                      |
|         | 16:29 |             |                    |                         |             |             |             |             | 3.04                      |
|         | 16:34 |             |                    | 18.3                    | 17.7        | 18.1        | 18.7        | 18.8        |                           |
|         | 17:08 | 68.0        | 21.0               |                         |             |             |             |             | 3.06                      |
| 5/20/91 | 09:10 | 61.0        | 19.0               |                         |             |             |             |             | 3.10                      |
|         | 10:57 | 67.0        | 21.0               |                         |             |             |             |             | 3.10                      |
|         | 11:35 |             |                    | 17.5                    | 17.0        | 17.4        | 17.9        | 18.0        |                           |
|         | 12:20 | 69.0        | 21.0               |                         |             |             |             |             | 3.10                      |
|         | 12:24 |             |                    | 17.6                    | 17.0        | 17.5        | 18.0        | 18.1        |                           |
|         | 13:00 | 70.5        | 22.0               |                         |             |             |             |             | 3.12                      |
|         | 14:06 | 73.5        | 22.0               |                         |             |             |             |             | 3.14                      |
|         | 15:15 | 75.0        | 22.5               |                         |             |             |             |             | 3.16                      |
|         | 15:49 |             |                    | 18.1                    | 17.5        | 18.0        | 18.7        | 18.7        |                           |
|         | 16:00 | 76.0        | 22.0               |                         |             |             |             |             | 3.16                      |
| 5/21/91 | 09:10 |             |                    | 18.3                    | 16.9        | 18.1        | 18.4        | 18.5        |                           |
|         | 09:37 |             |                    |                         | 16.9        | 18.1        | 18.4        |             |                           |
|         | 09:42 | 74.5        | 21.0               |                         |             |             |             |             | 3.25                      |
|         | 10:30 |             |                    |                         | 16.9        | 18.2        | 18.6        |             |                           |
|         | 10:46 | 75.0        | 21.0               |                         |             |             |             |             | 3.25                      |
|         | 10:49 |             |                    |                         | 16.9        | 18.2        | 18.6        |             |                           |
|         | 11:33 |             |                    |                         |             | 18.3        | 18.7        |             |                           |
|         | 11:49 | 75.0        | 21.0               |                         |             |             |             |             | 3.25                      |
|         | 12:13 |             |                    |                         |             | 18.4        | 18.8        |             |                           |
|         | 12:38 |             |                    |                         |             | 18.4        | 18.8        |             |                           |
|         | 12:45 | 76.0        | 21.5               |                         |             |             |             |             | 3.25                      |
|         | 13:31 |             |                    |                         |             | 18.6        | 19.0        |             |                           |
|         | 14:04 | 76.0        | 22.0               |                         |             |             |             |             | 3.28                      |
|         | 15:01 | 77.0        | 22.0               |                         |             |             |             |             | 3.28                      |
|         | 16:09 |             |                    |                         | 19.0        | 19.0        | 19.5        | 19.6        |                           |
|         | 16:25 | 78.0        | 22.0               |                         |             |             |             |             | 3.28                      |

### Clarks Ferry Site, Trip 1 (Concluded)

| Date    | Time  | Temperature |                    |                         |             |             |             |             | Water surface stage* (ft) |
|---------|-------|-------------|--------------------|-------------------------|-------------|-------------|-------------|-------------|---------------------------|
|         |       | Air (°F)    | Surface water (°C) | Under water measured by |             |             |             |             |                           |
|         |       |             |                    | S4/151 (°C)             | S4/834 (°C) | S4/832 (°C) | S4/483 (°C) | S4/071 (°C) |                           |
| 5/22/91 | 08:28 | 74.0        |                    |                         |             |             |             |             | 3.28                      |
|         | 09:49 | 76.0        |                    |                         |             |             |             |             |                           |
|         | 09:54 |             |                    |                         | 18.0        | 18.9        | 19.0        | 19.0        |                           |
|         | 10:30 | 75.0        | 22.0               |                         |             |             |             |             |                           |
|         | 10:55 |             |                    |                         | 18.1        | 18.9        | 19.1        | 19.1        |                           |
|         | 11:33 | 77.0        | 23.0               |                         |             |             |             |             |                           |
|         | 12:55 | 79.0        |                    |                         |             |             |             |             |                           |
|         | 13:47 |             |                    |                         | 18.5        | 19.2        | 19.4        | 19.4        |                           |
|         | 14:16 | 80.0        | 23.0               |                         |             |             |             |             |                           |
|         | 15:03 | 81.0        |                    |                         |             |             |             |             |                           |
|         | 16:03 | 82.0        | 25.0               |                         |             |             |             |             |                           |
|         | 16:58 | 82.0        | 24.0               |                         |             |             |             |             |                           |
| 5/23/91 | 08:50 |             | 22.0               |                         |             |             |             |             |                           |

\*water stage data were taken from a staff gage installed by ISWS for these field trips.

### Clarks Ferry Site, Trip 2

| Date     | Time  | Temperature |                    |                         |             |             |             | Water surface stage* (ft) |
|----------|-------|-------------|--------------------|-------------------------|-------------|-------------|-------------|---------------------------|
|          |       | Air (°F)    | Surface water (°C) | Under water measured by |             |             |             |                           |
|          |       |             |                    | S4/040 (°C)             | S4/834 (°C) | S4/151 (°C) | S4/832 (°C) |                           |
| 10/17/91 | 07:34 |             |                    | 12.0                    |             |             |             |                           |
|          | 07:50 |             | 14.0               |                         |             |             |             | 3.80                      |
|          | 09:21 | 54.0        | 18.0               |                         |             |             |             | 3.78                      |
|          | 11:22 | 54.0        | 22.0               |                         |             |             |             | 3.80                      |
|          | 11:44 |             |                    | 11.9                    | 11.9        | 11.5        | 11.4        |                           |
|          | 11:45 |             |                    | 11.9                    | 10.9        | 11.5        | 11.4        |                           |
|          | 13:22 | 60.0        | 25.0               |                         |             |             |             | 3.80                      |
|          | 17:06 |             |                    |                         | 11.6        | 12.0        | 11.9        |                           |
|          | 18:56 |             |                    | 12.7                    | 11.7        | 12.0        | 11.9        |                           |
|          | 20:14 |             |                    | 12.7                    | 11.6        | 12.0        | 11.9        |                           |
|          | 20:20 |             |                    | 12.7                    | 11.6        | 12.0        | 11.9        |                           |
|          | 20:51 |             |                    | 12.7                    | 11.7        | 11.9        | 11.8        |                           |
| 10/18/91 | 07:17 |             |                    | 12.1                    | 11.0        | 11.1        | 11.0        |                           |
|          | 07:30 | 52.0        | 5.0                |                         |             |             |             | 3.75                      |
|          | 07:43 |             |                    | 12.1                    | 11.0        | 11.1        | 11.0        |                           |

**Clarks Ferry Site, Trip 2 (Concluded)**

| Date     | Time  | Temperature |                    |                         |             |             |             |             | Water surface stage* (ft) |
|----------|-------|-------------|--------------------|-------------------------|-------------|-------------|-------------|-------------|---------------------------|
|          |       | Air (°F)    | Surface water (°C) | Under water measured by |             |             |             |             |                           |
|          |       |             |                    | S4/151 (°C)             | S4/834 (°C) | S4/832 (°C) | S4/483 (°C) | S4/071 (°C) |                           |
| 10/18/91 | 08:26 |             |                    | 12.0                    | 10.9        | 11.1        | 10.9        |             |                           |
|          | 09:20 | 52.0        | 15.0               |                         |             |             |             | 3.75        |                           |
|          | 09:57 |             |                    | 10.9                    | 10.7        | 11.1        | 10.9        |             |                           |
|          | 10:07 |             |                    | 11.8                    | 10.7        | 11.1        | 11.0        |             |                           |
|          | 11:21 | 57.0        | 20.0               |                         |             |             |             | 3.75        |                           |
|          | 11:27 |             |                    | 11.8                    | 10.7        |             |             |             |                           |
|          | 12:32 |             |                    | 11.8                    | 10.8        | 11.4        | 11.2        |             |                           |
|          | 13:18 | 59.0        | 20.0               |                         |             |             |             | 3.80        |                           |
|          | 15:30 |             |                    |                         |             |             |             | 3.80        |                           |
| 10/19/91 | 07:00 | 49.0        | 0.0                |                         |             |             |             | 3.78        |                           |
|          | 09:00 | 50.0        | 7.0                |                         |             |             |             | 3.78        |                           |
|          | 10:15 |             |                    | 10.9                    | 9.9         | 10.6        | 10.5        |             |                           |
|          | 11:00 | 52.0        | 11.0               |                         |             |             |             | 3.78        |                           |
|          | 12:08 |             |                    | 10.9                    | 10.0        | 10.8        | 11.7        |             |                           |
|          | 12:53 | 57.0        | 13.0               |                         |             |             |             | 3.78        |                           |
|          | 12:58 |             |                    | 11.0                    | 10.2        | 11.0        | 10.8        |             |                           |
|          | 13:45 |             |                    | 11.1                    | 10.2        | 11.0        | 10.9        |             |                           |
|          | 14:04 |             |                    | 11.1                    | 10.3        | 11.1        | 10.9        |             |                           |
|          | 14:54 |             |                    | 11.3                    | 10.4        | 11.2        | 11.0        |             |                           |
|          | 15:01 | 55.0        | 11.0               |                         |             |             |             | 3.80        |                           |
|          | 17:04 | 53.0        | 11.0               |                         |             |             |             | 3.84        |                           |
| 10/20/91 | 17:31 |             |                    | 11.5                    | 10.6        | 11.2        | 11.1        |             |                           |
|          | 06:55 |             |                    | 11.2                    | 10.3        | 10.7        | 10.6        |             |                           |
|          | 07:06 |             |                    | 11.2                    | 10.3        | 10.7        | 10.6        |             |                           |
|          | 07:30 | 49.0        | 4.0                |                         |             |             |             | 3.86        |                           |
|          | 09:06 | 50.0        | 7.0                |                         |             |             |             | 3.86        |                           |
|          | 09:33 |             |                    | 11.1                    | 10.2        | 10.7        | 10.6        |             |                           |
|          | 10:53 | 52.0        | 11.0               |                         |             |             |             | 3.86        |                           |
|          | 12:20 |             |                    | 11.1                    | 10.0        | 10.9        | 10.9        |             |                           |

\*water stage data were taken from a staff gage installed by ISWS for these field trips.



**APPENDIX V.**

**MEASURED WATER DISCHARGE, COMPUTED AVERAGE  
VELOCITY, AND WATER DEPTH FOR ALL STUDY SITES**

### McEver's Island Site

| <i>Date</i> | $Q_w$<br><i>cms</i> | $\bar{V}$<br><i>m/s</i> | $\bar{D}$<br><i>m</i> |
|-------------|---------------------|-------------------------|-----------------------|
| 5/17/89     | 212                 | 0.27                    | 3.37                  |

### Kampsville Site

| <i>Trip 1</i> |                     |                         |                       |
|---------------|---------------------|-------------------------|-----------------------|
| <i>Date</i>   | $Q_w$<br><i>cms</i> | $\bar{V}$<br><i>m/s</i> | $\bar{D}$<br><i>m</i> |
| 10/10/90      | 413                 | 0.36                    | 3.44                  |
| 10/15/90      | 772                 | 0.58                    | 3.64                  |
| 10/18/90      | 817                 | 0.61                    | 3.91                  |

| <i>Trip 2</i> |     |      |      |
|---------------|-----|------|------|
| 8/8/91        | 329 | 0.29 | 3.51 |

### Apple River Island Site

| <i>Date</i> | $Q_w$<br><i>cms</i> | $\bar{V}$<br><i>m/s</i> | $\bar{D}$<br><i>m</i> |
|-------------|---------------------|-------------------------|-----------------------|
| 5/22/90     | 1537.4              | 0.81                    | 5.16                  |

### Goose Island Site

| <i>Date</i> | <i>Trip 1</i>                      |                         |                       |
|-------------|------------------------------------|-------------------------|-----------------------|
|             | <i>Q<sub>w</sub></i><br><i>cms</i> | $\bar{V}$<br><i>m/s</i> | $\bar{D}$<br><i>m</i> |
| 8/29/90     | 2856                               | 1.13                    | 6.04                  |

| <i>Trip 2</i> |      |      |      |
|---------------|------|------|------|
| 7/20/91       | 1808 | 0.83 | 5.42 |
| 7/24/91       | 1880 | 0.84 | 5.56 |

### Clarks Ferry Site

| <i>Date</i> | <i>Trip 1</i>                      |                         |                       |
|-------------|------------------------------------|-------------------------|-----------------------|
|             | <i>Q<sub>w</sub></i><br><i>cms</i> | $\bar{V}$<br><i>m/s</i> | $\bar{D}$<br><i>m</i> |
| 5/14/91     | 2351                               | 0.83                    | 4.41                  |
| 5/22/91     | 2072                               | 0.78                    | 4.18                  |
| 5/23/91     | 2428                               | 0.85                    | 4.36                  |

| <i>Trip 2</i> |     |      |      |
|---------------|-----|------|------|
| 10/19/91      | 673 | 0.32 | 3.40 |

**APPENDIX VI.**

**AMBIENT SUSPENDED SEDIMENT CONCENTRATIONS**  
**AT ALL STUDY SITES**

**McEver's Island Site  
(NA)**

**Kampsville Site, Trip 1**

| <i>Sampling date</i> | <i>River mile</i> | <i>Station ID</i> | <i>Dist. (m)<br/>(REW-LEW)</i> | <i>Concentration (mg/L)</i> |
|----------------------|-------------------|-------------------|--------------------------------|-----------------------------|
| 10/18/90             | 35.2              | C1/2              | 300                            | 206.0*                      |
|                      |                   | C3                | 278                            | 470.0*                      |
|                      |                   | C4                | 259                            | 357.2*                      |
|                      |                   | C5                | 243                            | 387.4                       |
|                      |                   | C6                | 217                            | 347.5*                      |
|                      |                   | C7                | 198                            | 259.5*                      |
|                      |                   | C8                | 178                            | 263.6*                      |
|                      |                   | C9                | 160                            | 339.9                       |
|                      |                   | C10               | 137                            | 307.7                       |
|                      |                   | C11               | 124                            | 237.6*                      |
|                      |                   | C12               | 99                             | 229.7*                      |
|                      |                   | C13               | 80                             | 372.8*                      |
|                      |                   | C14               | 57                             | 320.6                       |
|                      |                   | C15               | 37                             | 329.7                       |
|                      |                   | C16               | 20                             | 318.0                       |
| 10/19/90             |                   | B13               | 139                            | 246.8*                      |
|                      |                   | B14               | 122                            | 259.2                       |
|                      |                   | B15               | 101                            | 285.3                       |
|                      |                   | B16               | 82                             | 164.5                       |

### Kampsville Site, Trip 2

| <i>Sampling date</i> | <i>River mile</i> | <i>Station ID</i> | <i>Dist. (ft)<br/>(REW-LEW)</i> | <i>Concentration (mg/L)</i> |
|----------------------|-------------------|-------------------|---------------------------------|-----------------------------|
| 8/08/91              | 35.4              | A                 | 50                              | 107.9*                      |
|                      |                   | B                 | 148                             | 158.6                       |
|                      |                   | C                 | 260                             | 132.4                       |
|                      |                   | D                 | 355                             | 84.6                        |
|                      |                   | E                 | 460                             | 88.9                        |
|                      |                   | F                 | 540                             | 122.0                       |
|                      |                   | G                 | 652                             | 128.7                       |
|                      |                   | H                 | 752                             | 78.5                        |
|                      |                   | I                 | 847                             | 73.4                        |
|                      |                   | J                 | 952                             | 171.6                       |

\*algae grown in sample bottles; therefore, results were used as a reference value only.

### Apple River Island Site (NA)

### Goose Island Site, Trip 1 (NA)

### Goose Island Site, Trip 2

| <i>Sampling date</i> | <i>River mile</i> | <i>Station ID</i> | <i>Dist. (ft)<br/>(REW-LEW)</i> | <i>Concentration (mg/L)</i> |
|----------------------|-------------------|-------------------|---------------------------------|-----------------------------|
| 07/20/91             | 319.3             | t-40              | 40                              | 146.4                       |
|                      |                   | t-100             | 100                             | 130.9                       |
|                      |                   | t-160             | 160                             | 129.7                       |
|                      |                   | t-217             | 217                             | 129.8                       |
|                      |                   | t-277             | 277                             | 137.9                       |
|                      |                   | t-340             | 340                             | 122.8                       |
|                      |                   | t-398             | 398                             | 123.4                       |
|                      |                   | t-464             | 464                             | 119.1                       |
|                      |                   | t-520             | 520                             | 127.5                       |
|                      |                   | t-580             | 580                             | 122.1                       |
|                      |                   | t-645             | 645                             | 115.6                       |
|                      |                   | t-702             | 702                             | 119.4                       |
|                      |                   | t-757             | 757                             | 104.1                       |
|                      |                   | t-820             | 820                             | 121.1                       |
|                      |                   | t-897             | 897                             | 130.5                       |
|                      |                   | t-942             | 942                             | 111.0                       |

**Goose Island Site, Trip 2 (Continued)**

| <i>Sampling date</i> | <i>River mile</i> | <i>Station ID</i> | <i>Dist. (ft)<br/>(REW-LEW)</i> | <i>Concentration (mg/L)</i> |
|----------------------|-------------------|-------------------|---------------------------------|-----------------------------|
| 07/20/91             | 319.3             | t-1061            | 1061                            | 117.1                       |
|                      |                   | t-1185            | 1185                            | 127.6                       |
|                      |                   | t-1240            | 1240                            | 129.5                       |
|                      |                   | t-1290            | 1290                            | 147.6                       |
|                      |                   | t-990             | 990                             | 116.5                       |
|                      |                   | t-1100            | 1100                            | 116.6                       |
| 07/21/91             | 319.8             | G-20              | 37                              | 89.5                        |
|                      |                   | G-50              | 67                              | 98.6                        |
|                      |                   | G-110             | 127                             | 80.4                        |
|                      |                   | G-165             | 182                             | 82.5                        |
|                      |                   | G-231             | 248                             | 72.1                        |
|                      |                   | G-290             | 307                             | 74.0                        |
|                      |                   | G-349             | 366                             | 83.9                        |
|                      |                   | G-407             | 424                             | 66.7                        |
|                      |                   | G-467             | 484                             | 67.3                        |
|                      |                   | G-529             | 546                             | 72.8                        |
|                      |                   | G-591             | 608                             | 71.1                        |
|                      |                   | G-651             | 668                             | 94.7                        |
|                      |                   | G-710             | 727                             | 69.2                        |
|                      |                   | G-768             | 785                             | 70.7                        |
|                      |                   | G-830             | 847                             | 75.5                        |
|                      |                   | G-887             | 904                             | 69.4                        |
|                      |                   | G-946             | 963                             | 73.4                        |
| 07/24/91             | 319.3             | t-17              | 17                              | 113.0                       |
|                      |                   | t-35              | 35                              | 83.9                        |
|                      |                   | t-55              | 55                              | 80.2                        |
|                      |                   | t-75              | 75                              | 69.8                        |
|                      |                   | t-96              | 96                              | 62.6                        |
|                      |                   | t-115             | 115                             | 110.7                       |
|                      |                   | t-135             | 135                             | 99.5                        |
|                      |                   | t-157             | 157                             | 101.4                       |
|                      |                   | t-175             | 175                             | 135.9                       |
|                      |                   | t-195             | 195                             | 78.5                        |

**Goose Island Site, Trip 2 (Concluded)**

| <i>Sampling date</i> | <i>River mile</i> | <i>Station ID</i> | <i>Dist. (m)</i><br><i>(REW-LEW)</i> | <i>Concentration (mg/L)</i> |
|----------------------|-------------------|-------------------|--------------------------------------|-----------------------------|
| 07/24/91             | 319.3             | t-215             | 215                                  | 116.6                       |
|                      |                   | t-233             | 233                                  | 115.3                       |
|                      |                   | t-257             | 257                                  | 113.3                       |
|                      |                   | t-274             | 274                                  | 114.7                       |
|                      |                   | t-295             | 295                                  | 116.4                       |
|                      |                   | t-314             | 314                                  | 134.2                       |
|                      |                   | t-333             | 333                                  | 133.9                       |
|                      |                   | t-355             | 355                                  | 143.3                       |
|                      |                   | t-373             | 373                                  | 134.5                       |
|                      |                   | t-391             | 391                                  | 247.8                       |

**Clarks Ferry Site, Trip 1**

| <i>Sampling date</i> | <i>River mile</i> | <i>Station ID</i> | <i>Dist. (ft)</i><br><i>(LEW-REW)</i> | <i>Concentration (mg/L)</i> |
|----------------------|-------------------|-------------------|---------------------------------------|-----------------------------|
| 05/23/91             | 468.1             | A1                | 75.46                                 | 118.4                       |
|                      |                   | B1                | 180.44                                | 130.0                       |
|                      |                   | C1                | 377.29                                | 126.1                       |
|                      |                   | D1                | 551.17                                | 121.2                       |
|                      |                   | E1                | 738.18                                | 115.6                       |
|                      |                   | F1                | 849.73                                | 120.0                       |
|                      |                   | G1                | 1020.33                               | 122.1                       |
|                      |                   | H1                | 1181.09                               | 125.1                       |
|                      |                   | I1                | 1351.69                               | 126.1                       |
|                      |                   | J1                | 1525.57                               | 126.5                       |
|                      |                   | K1                | 1673.21                               | 130.0                       |
|                      |                   | L1                | 1853.65                               | 128.7                       |
|                      |                   | M1                | 1985.11                               | 110.5                       |



**Clarks Ferry Site, Trip 1 (Concluded)**

| <i>Sampling date</i> | <i>River mile</i> | <i>Station ID</i> | <i>Dist. (ft)</i><br><i>(LEW-REW)</i> | <i>Concentration (mg/L)</i> |
|----------------------|-------------------|-------------------|---------------------------------------|-----------------------------|
| 05/14/91             | 468.2             | 1                 | 42.65                                 | 136.5                       |
|                      |                   | 2                 | 141.08                                | 136.0                       |
|                      |                   | 3                 | 239.50                                | 114.1                       |
|                      |                   | 4                 | 354.33                                | 118.1                       |
|                      |                   | 5                 | 446.19                                | 114.7                       |
|                      |                   | 6                 | 557.74                                | 129.1                       |
|                      |                   | 7                 | 626.63                                | 113.8                       |
|                      |                   | 8                 | 748.02                                | 105.4                       |
|                      |                   | 9                 | 846.45                                | 110.9                       |
|                      |                   | 10                | 961.28                                | 106.2                       |
| 05/14/91             |                   | 11                | 994.08                                | 123.2                       |
|                      |                   | 12                | 1108.91                               | 109.5                       |
|                      |                   | 13                | 1177.81                               | 104.2                       |
|                      |                   | 14                | 1289.36                               | 105.5                       |
|                      |                   | 15                | 1394.34                               | 106.3                       |
|                      |                   | 16                | 1482.92                               | 120.9                       |
|                      |                   | 17                | 1591.19                               | 122.5                       |
|                      |                   | 18                | 1640.40                               | 113.0                       |
|                      |                   | 19                | 1735.54                               | 115.8                       |
|                      |                   | 20                | 1847.09                               | 119.1                       |
|                      |                   | 21                | 1955.36                               | 141.9                       |
|                      |                   | 22                | 2027.54                               | 138.4                       |
| 05/22/91             | 468.3             | A3                | 124.67                                | 130.4                       |
|                      |                   | B3                | 239.50                                | 128.6                       |
|                      |                   | C3                | 446.19                                | 127.0                       |
|                      |                   | D3                | 580.70                                | 125.5                       |
|                      |                   | E3                | 764.43                                | 122.0                       |
|                      |                   | F3                | 928.47                                | 124.3                       |
|                      |                   | G3                | 1076.10                               | 125.4                       |
|                      |                   | H3                | 1289.36                               | 131.7                       |
|                      |                   | I3                | 1407.47                               | 136.3                       |
|                      |                   | J3                | 1581.35                               | 128.8                       |
|                      |                   | K3                | 1768.35                               | 124.3                       |
|                      |                   | L3                | 1932.39                               | 122.5                       |
|                      |                   | M3                | 2057.06                               | 98.0                        |

**APPENDIX VII.**  
**TRAFFIC CHARACTERISTICS AT ALL STUDY SITES**

# McEver's Island Site

| <i>Date</i> | <i>Name</i>          | <i>Hp</i> | <i>Screws</i> | <i>Kort</i> | <i>Length<br/>(m)</i> | <i>Width<br/>(m)</i> | <i>No. of<br/>barges</i> | <i>Config</i> | <i>Type of barge</i> | <i>Draft<br/>(m)</i> | <i>Speed<br/>(m/s)</i> | <i>Dist.<br/>(m)</i> | <i>Direction</i> |
|-------------|----------------------|-----------|---------------|-------------|-----------------------|----------------------|--------------------------|---------------|----------------------|----------------------|------------------------|----------------------|------------------|
| 5/16/89     | R.W. Naye            | 1020      | 2             | N           | 22.9                  | 7.3                  | 11                       | 3x3           |                      | 2.74                 | 2.20                   | 120                  | u                |
|             | Evelyn C.            | 2200      | 2             | N           | 25.9                  | 10.7                 | 1                        | 1x1           |                      | 0.76                 |                        | 130                  | d                |
| 5/17/89     | Mary Ellen           | 800       | 2             | Y           | 17.7                  | 6.1                  | 6                        | 2x3           |                      | 2.74                 | 1.22                   | 150                  | u                |
|             | Elaine Jones         | 5000      | 2             | Y           | 47.0                  | 12.2                 | 8                        | 2x4           |                      | 2.74                 | 2.00                   | 120                  | u                |
|             | Bill McCormick       | 3200      | 2             | Y           | 45.3                  | 10.5                 | 16                       | 3x5+1         |                      | 2.74                 | 2.55                   | 130                  | d                |
|             | Nicolas Duncan       | 1530      | 2             | N           | 39.0                  | 8.5                  | 15                       | 3x5           |                      | 2.74                 | 1.39                   | 130                  | u                |
| 5/18/89     | Mobil Leader         | 5000      | 2             | Y           | 47.0                  | 13.5                 | 6                        | 2x3           |                      | 2.74                 | 2.40                   | 140                  | u                |
|             | Reliance             | 5600      | 2             | Y           | 38.7                  | 12.2                 | 15                       | 3x5           |                      | 2.08                 | 2.27                   | 130                  | u                |
|             | Cooperative Vanguard | 3700      | 2             | N           | 51.2                  | 12.2                 | 15                       | 3x5           |                      | 2.74                 | 2.64                   | 160                  | d                |
|             | Marvin E. Norman     | 1800      | 2             | N           | 31.1                  | 10.4                 | 15                       | 3x5           |                      | 0.76                 | 2.59                   | 130                  | u                |
|             | Illini               | 1600      | 2             | N           | 24.4                  | 8.5                  | 11                       | 3x4-1         |                      | 2.74                 | 2.30                   | 160                  | d                |
|             | Thurston B. Norton   | 4200      | 2             | N           | 45.7                  | 10.7                 | 13                       | 1+3x4         |                      | 2.74                 | 2.10                   | 150                  | d                |
| 5/19/89     | Clarence G. Frame    | 4100      | 2             | Y           | 43.9                  | 10.7                 | 15                       | 3x5           |                      | 2.74                 | 2.75                   | 160                  | d                |

# Kampsville Site, Trip 1

| <i>Date</i> | <i>Name</i>     | <i>Hp</i> | <i>Screws</i> | <i>Kort</i> | <i>Length<br/>(m)</i> | <i>Width<br/>(m)</i> | <i>No. of<br/>barges</i> | <i>Config</i> | <i>Type of barge</i> | <i>Draft<br/>(m)</i> | <i>Speed<br/>(m/s)</i> | <i>Dist.<br/>(m)</i> | <i>Direction</i> |
|-------------|-----------------|-----------|---------------|-------------|-----------------------|----------------------|--------------------------|---------------|----------------------|----------------------|------------------------|----------------------|------------------|
| 10/11/90    | Mallard         | 1650      | 2             | N           | 26.8                  | 9.1                  | 2                        | 1x2           | chemical             | 0.61                 | 3.83                   | 122                  | d                |
|             | Nicolas Duncan  | 1530      | 2             | N           | 39.0                  | 8.5                  | 9                        | 3x3           | grain                | 1.32                 | 2.88                   | 155                  | d                |
|             | Bill Gee        | 2800      | 2             | Y           | 36.9                  | 10.1                 | 3                        | 2x1+1         | coal                 | 1.31                 | 4.76                   | 140                  | d                |
| 10/12/90    | Mr. Aldo        | 5600      | 2             | Y           | 44.2                  | 14.6                 | 14                       | 2x1+3x4       | grain                | 2.74                 | 2.78                   | 130                  | d                |
|             | Floyd H. Blaske | 5000      | 2             | Y           | 51.8                  | 12.2                 | 12                       | 3x4           | grain                | 1.63                 | 2.18                   | 115                  | u                |

# Kampsville Site, Trip 1 (Concluded)

| <i>Date</i> | <i>Name</i>       | <i>Hp</i> | <i>Screws</i> | <i>Kort</i> | <i>Length<br/>(m)</i> | <i>Width<br/>(m)</i> | <i>No. of<br/>barges</i> | <i>Config</i> | <i>Type of barge</i> | <i>Draft<br/>(m)</i> | <i>Speed<br/>(m/s)</i> | <i>Dist.<br/>(m)</i> | <i>Direction</i> |
|-------------|-------------------|-----------|---------------|-------------|-----------------------|----------------------|--------------------------|---------------|----------------------|----------------------|------------------------|----------------------|------------------|
| 10/13/90    | Marvin E. Norman  | 1800      | 2             | N           | 31.1                  | 10.4                 | 16                       | 3x5+1         | grain                | 0.61                 | 1.69                   | 115                  | u                |
|             | Luke Burton       | 4200      | 2             | Y           | 43.9                  | 10.7                 | 3                        | 1x3           | mixed                | 2.74                 | 2.93                   | 138                  | u                |
|             | Sugarland         | 3375      | 3             | N           | 42.1                  | 12.8                 | 12                       | 3x4           | grain                | 2.29                 | 1.88                   | 170                  | u                |
|             | William C. Norman | 1800      | 2             | N           | 33.5                  | 10.4                 | 12                       | 3x4           | grain                | 2.74                 | 2.90                   | 138                  | d                |
|             | Frank H. Peavey   | 3800      | 2             | N           | 42.7                  | 11.6                 | 23                       | 4x5+3         | grain                | 1.17                 | 1.75                   | 150                  | u                |
|             | Conti Karla       | 3060      | 2             | N           | 34.8                  | 10.5                 | 16                       | 3x5+1         | grain                | 2.34                 | 1.70                   | 145                  | u                |
| 10/14/90    | Margaret O.       | 5600      | 2             | Y           | 42.1                  | 13.4                 | 10                       | 2x5           | grain                | 2.53                 | 2.75                   | 150                  | u                |
|             | Lydia E. Campbell | 4200      | 2             | Y           | 43.9                  | 10.7                 | 3                        | 1x3           | grain                | 2.74                 | 3.24                   | 180                  | u                |
|             | Mr. Paul          | 5600      | 2             | Y           | 44.2                  | 14.6                 | 8                        | 2x4           | chemical             | 1.68                 | 2.76                   | 155                  | d                |
|             | Rambler           | 2000      | 2             | N           | 27.4                  | 9.1                  | 12                       | 3x4           | grain                | 2.74                 | 2.48                   | 138                  | d                |
|             | Mr. Lawrence      | 5600      | 2             | Y           | 44.2                  | 14.6                 | 15                       | 3x5           | grain                | 1.75                 | 2.56                   | 165                  | u                |
|             | Mallard           | 1650      | 2             | N           | 26.8                  | 9.1                  | 7                        | 3x2+1         | mixed                | 2.13                 | 2.68                   | 175                  | u                |
|             | Charles Lehman    | 5600      | 2             | Y           | 44.2                  | 14.6                 | 13                       | 1+3x4         | coal                 | 2.74                 | 1.85                   | 145                  | u                |
|             | Nicolas Duncan    | 1530      | 2             | N           | 39.0                  | 8.5                  | 9                        | 3x3           | grain                | 2.74                 | 1.52                   | 130                  | u                |
|             | Jeffboat          | 6000      | 2             | Y           | 44.2                  | 14.6                 | 15                       | 3x5           | grain                | 2.74                 | 1.84                   | 115                  | u                |
|             | Mary Ann          | 2250      | 2             | N           | 30.5                  | 9.1                  | 15                       | 3x5           | grain                | 0.61                 | 1.90                   | 105                  | u                |
| 10/15/90    | Ardyce Randall    | 5600      | 2             | Y           | 44.2                  | 14.6                 | 15                       | 3x5           | grain                | 2.74                 | 2.36                   | 155                  | d                |
|             | Mr. Paul          | 5600      | 2             | Y           | 44.2                  | 14.6                 | 15                       | 3x5           | grain                | 1.61                 | 2.25                   | 130                  | u                |
|             | Exxon St. Louis   | 3800      | 2             | N           | 42.7                  | 13.4                 | 4                        | 2x2           | petroleum            | 2.74                 | 2.25                   | 175                  | u                |
|             | Margaret O.       | 5600      | 2             | Y           | 42.1                  | 13.4                 | 12                       | 3x4           | cargo                | 2.03                 | 3.83                   | 130                  | d                |
|             | Mr. Lawrence      | 5600      | 2             | Y           | 44.2                  | 14.6                 | 15                       | 3x5           | cargo                | 2.74                 | 3.16                   | 115                  | d                |
|             | A.L. Smith        | 1800      | 2             | N           | -                     | -                    | 8                        | 2x4           | cargo                | 2.48                 | 2.80                   | 140                  | d                |
|             | Ste. Genevieve    | 1600      | 2             | N           | 23.2                  | 7.9                  | 12                       | 3x4           | cargo                | 0.61                 | 1.66                   | 150                  | u                |
| 10/17/90    | Nicole Brent      | 1400      | 2             | N           | 22.9                  | 7.9                  | 2                        | 1x2           | chemical             | 2.74                 | 2.86                   | 150                  | u                |
|             | Frank H. Peavey   | 3800      | 2             | N           | 42.7                  | 11.6                 | 5                        | 1+2x2         | cargo                | 2.74                 | 3.05                   | 170                  | d                |

# Kampsville Site, Trip 2

| Date    | Name                | Hp   | Screws | Kort | Length<br>(m) | Width<br>(m) | No. of<br>barges | Config  | Type of barge<br>hopper & chemical | Draft<br>(m) | Speed<br>(m/s) | Dist.<br>(m) | Direction |
|---------|---------------------|------|--------|------|---------------|--------------|------------------|---------|------------------------------------|--------------|----------------|--------------|-----------|
| 8/13/91 | Ranger              | 850  | 2      | Y    | 21.3          | 6.1          | 5                | 2x2+1   | hopper & chemical                  | 2.74         | 1.90           | 190          | d         |
|         | Dixie Patriot       | 3200 | 2      | N    | 33.5          | 10.4         | 3                | 1x3     |                                    | 2.74         | 2.48           | 135          | d         |
|         | Orleanian           | 4300 | 2      | N    | 42.7          | 11.6         | 13               | 3x4+1   |                                    |              | 2.02           | 120          | u         |
|         | Pat Breen           | 5600 | 2      | Y    | 44.2          | 14.6         | 15               | 3x5     |                                    | 1.52         | 2.29           | 120          | d         |
|         | Dixie Express       | 1700 | 2      | N    | 26.2          | 8.5          | 2                | 1x2     |                                    | 1.52         | 3.40           | 140          | d         |
|         | Jo Anne Stegbauer   | 3200 | 2      | N    | 36.6          | 10.7         | 2                | 1x2     | chemical                           |              |                | 110          | u         |
|         | Ste. Genevieve      | 200  | 2      | N    | 12.2          | 4.6          | 11               | 2+3x3   | empty                              |              | 2.48           | 100          | u         |
|         | Bob White           | 3600 | 2      | N    | 40.5          | 10.5         | 9                | 3x3     | closed hopper                      |              | 1.37           | 205          | d         |
|         |                     |      |        |      |               |              |                  |         |                                    |              |                |              |           |
| 8/14/91 | Night-14-01         |      |        |      |               |              | 11               | 2+3x3   |                                    |              | 1.62           | 100          | u         |
|         | Night-14-02         |      |        |      |               |              | 9                | 3x3     | chemical                           |              | 4.05           | 210          | d         |
|         | Irving Crown        | 2400 | 2      | N    | 31.4          | 9.1          | 7                | 3+2x2   |                                    | 2.74         | 1.59           | 180          | u         |
|         | Gordon Jones        | 4200 | 2      | N    | 44.8          | 11.7         | 15               | 3x5     |                                    | 2.74         |                | 130          | d         |
|         | George W. Schamblin | 1800 | 2      | N    | 26.1          | 9.1          | 2                | 2x1     |                                    | 0.61         | 3.83           | 130          | d         |
|         | Katherine L.        | 1600 | 2      | N    | 31.1          | 8.5          | 2                | 1x2     |                                    | 0.61         | 3.21           | 160          | d         |
|         | Thruston B. Morton  | 4200 | 2      | N    | 45.7          | 10.7         | 12               | 3x4     |                                    | 1.52         | 2.18           | 160          | u         |
|         | Julie White         | 1700 | 2      | N    | 26.8          | 11.6         | 12               | 3x2+2x3 |                                    |              | 2.20           | 130          | u         |
|         | Ranger              | 850  | 2      | Y    | 21.3          | 6.1          | 1                | 1x1     | empty                              |              | 3.50           | 110          | u         |
|         | Illini              | 1600 | 2      | N    | 24.4          | 8.5          | 12               | 3x4     |                                    |              | 2.18           | 170          | u         |
|         | Bronwynne Brent     | 5400 | 2      | Y    | 42.7          | 12.8         | 6                | 2x3     |                                    | 0.61         | 2.32           | 140          | d         |
|         | Sugarland           | 3375 | 3      | N    | 42.1          | 12.8         | 1                | 1x1     |                                    | 0.61         |                |              | u         |
|         | Frank Stegbauer     | 3200 | 2      | N    | 39.6          | 10.7         | 1                | 1x1     | chemical                           | 0.61         |                |              | d         |
|         |                     |      |        |      |               |              |                  |         |                                    |              |                |              |           |
|         |                     |      |        |      |               |              |                  |         |                                    |              |                |              |           |
|         |                     |      |        |      |               |              |                  |         |                                    |              |                |              |           |

### Kampsville Site, Trip 2 (Concluded)

| <i>Date</i> | <i>Name</i>      | <i>Hp</i> | <i>Screws</i> | <i>Kort</i> | <i>Length<br/>(m)</i> | <i>Width<br/>(m)</i> | <i>No. of<br/>barges</i> | <i>Config</i> | <i>Type of barge</i> | <i>Draft<br/>(m)</i> | <i>Speed<br/>(m/s)</i> | <i>Dist.<br/>(m)</i> | <i>Direction</i> |
|-------------|------------------|-----------|---------------|-------------|-----------------------|----------------------|--------------------------|---------------|----------------------|----------------------|------------------------|----------------------|------------------|
| 8/15/91     | Bill McCormick   | 3200      | 2             | Y           | 45.3                  | 10.5                 | 8                        | 2x4           |                      | 2.74                 | 2.07                   | 150                  | d                |
|             | Marvin E. Norman | 1800      | 2             | N           | 31.1                  | 10.4                 | 6                        | 2x3           |                      |                      | 1.75                   | 150                  | d                |
|             | Olmstead         | 5920      | 2             | Y           | 42.1                  | 13.4                 | 15                       | 3x5           | coal                 |                      | 2.19                   | 140                  | u                |
|             | Jack D. Wofford  | 5000      | 2             | Y           | 51.8                  | 12.2                 | 15                       | 3x5           |                      | 2.74                 | 2.22                   | 140                  | u                |
|             | Dixie Express    | 1800      | 2             | N           | 30.5                  | 8.5                  | 2                        | 1x2           |                      | 2.74                 | 2.58                   | 160                  | u                |
|             | Hal D. Miller    | 2400      | 2             | N           | 32.9                  | 9.8                  | 2                        | 1x2           | work                 |                      | 2.33                   | 150                  | d                |
|             | Jesse Brent      | 4300      | 2             | N           | 36.6                  | 12.2                 | 2                        | 2x1           | hopper               | 1.52                 | 3.72                   | 180                  | d                |
|             |                  |           |               |             |                       |                      |                          |               |                      |                      |                        |                      |                  |

### Apple River Island Site

| <i>Date</i> | <i>Name</i>            | <i>Hp</i> | <i>Screws</i> | <i>Kort</i> | <i>Length<br/>(m)</i> | <i>Width<br/>(m)</i> | <i>No. of<br/>barges</i> | <i>Config</i> | <i>Type of barge</i> | <i>Draft<br/>(m)</i> | <i>Speed<br/>(m/s)</i> | <i>Dist.<br/>(m)</i> | <i>Direction</i> |
|-------------|------------------------|-----------|---------------|-------------|-----------------------|----------------------|--------------------------|---------------|----------------------|----------------------|------------------------|----------------------|------------------|
| 5/18/90     | Mississippi Belle II   |           |               |             |                       |                      |                          |               |                      |                      |                        |                      |                  |
|             | Yazoo                  | 2550      | 3             | N           | 32.9                  | 9.2                  | 15                       | 3x5           |                      | 1.85                 | 1.43                   | 220                  | u                |
|             | Cooperative Ambassador | 3800      | 2             | Y           | 48.8                  | 12.2                 | 15                       | 3x5           |                      | 2.67                 | 2.13                   | 275                  | u                |
|             | Christine Bailey       | 5200      | 2             | N           | 42.7                  | 11.6                 | 15                       | 3x5           |                      | 2.74                 | 3.29                   | 245                  | d                |
| 5/19        | Kathy Ellen            | 3800      | 2             | N           | 46.0                  | 10.6                 | 10                       | 3x3+1         |                      | 2.32                 | 1.83                   |                      | u                |
|             | W.A. Kernan            | 5600      | 2             | Y           | 44.2                  | 14.6                 | 16                       | 3x5+1         |                      | 0.61                 | 2.00                   | 220                  | u                |
|             | Hornet                 | 4300      | 2             | N           | 44.5                  | 11.6                 | 4                        | 2x2           |                      | 2.74                 | 2.77                   | 230                  | d                |
|             | Conti Bonnie           | 6000      | 2             | Y           | 44.2                  | 14.6                 | 17                       | 3x5+2         |                      | 0.61                 | 3.43                   | 215                  | u                |
|             | Becky Lynn             | 5600      | 2             | Y           | 42.7                  | 12.8                 | 16                       | 3x5+1         |                      | 1.52                 | 2.84                   | 215                  | u                |
|             | Twilight               |           |               |             |                       |                      |                          |               |                      |                      |                        |                      |                  |
|             | Lexington              | 5600      | 2             | Y           | 51.8                  | 12.2                 | 15                       | 3x5           |                      | 2.74                 | 3.99                   | 215                  | d                |

# Apple River Island Site (Continued)

| <i>Date</i> | <i>Name</i>          | <i>Hp</i> | <i>Screws</i> | <i>Kort</i> | <i>Length<br/>(m)</i> | <i>Width<br/>(m)</i> | <i>No. of<br/>barges</i> | <i>Config</i> | <i>Type of barge</i> | <i>Draft<br/>(m)</i> | <i>Speed<br/>(m/s)</i> | <i>Dist.<br/>(m)</i> | <i>Direction</i> |
|-------------|----------------------|-----------|---------------|-------------|-----------------------|----------------------|--------------------------|---------------|----------------------|----------------------|------------------------|----------------------|------------------|
| 5/20/90     | Philip M. Pfeffer    | 6140      | 2             | Y           | 42.7                  | 12.8                 | 15                       | 3x5           |                      | 2.74                 | 3.62                   | 230                  | d                |
|             | Merlin Banta         | 2800      | 2             | N           | 38.4                  | 8.8                  | 4                        |               |                      | 0.61                 | 2.32                   | 230                  | d                |
|             | Mississippi Belle II |           |               |             |                       |                      |                          |               |                      |                      |                        |                      |                  |
|             | Rusty Flower         | 4200      | 2             | Y           | 42.7                  | 12.8                 | 16                       | 3x5+1         |                      | 1.18                 | 7.38                   | 250                  | d                |
|             | Tom Talbert          | 5600      | 2             | Y           | 51.2                  | 12.2                 | 15                       | 3x5           |                      | 0.61                 | 2.96                   | 215                  | u                |
|             | Twilight             |           |               |             |                       |                      |                          |               |                      |                      | 3.41                   | 230                  | u                |
| 5/21/90     | Julia Swain          |           |               |             |                       |                      |                          |               |                      |                      |                        |                      |                  |
|             | Herman Pott          | 5600      | 2             | Y           | 51.2                  | 12.2                 | 15                       | 3x5           |                      | 2.74                 | 2.44                   | 215                  | u                |
|             | Walter Brunson       | 4200      | 2             | N           | 45.7                  | 10.7                 | 15                       | 3x5           |                      | 0.61                 | 3.05                   | 215                  | u                |
|             | Dell Butcher         | 5000      | 2             | Y           | 51.8                  | 12.2                 | 15                       | 3x5           |                      | 2.74                 | 4.33                   | 230                  | d                |
|             | Missippi Belle II    |           |               |             |                       |                      |                          |               |                      |                      |                        |                      |                  |
|             | Mary Gail            | 1200      | 2             | N           | 19.8                  | 7.3                  | 4                        | 2x2           |                      | 0.61                 | 3.30                   | 230                  | u                |
| 5/22/90     | Julia Swain          |           |               |             |                       |                      |                          |               |                      |                      |                        |                      |                  |
|             | T.S. Kunsman         | 4200      | 2             | N           | 45.7                  | 10.7                 | 12                       | 3x4           |                      | 2.74                 | 4.15                   | 230                  | d                |
|             | Twilight             |           |               |             |                       |                      |                          |               |                      |                      |                        |                      |                  |
|             | D. Ray Miller        | 5600      | 2             | Y           | 44.2                  | 14.6                 | 11                       | 3x4-1         |                      | 2.16                 | 2.22                   | 215                  | u                |
|             | Mississippi Belle II |           |               |             |                       |                      |                          |               |                      |                      |                        |                      |                  |
|             | Mary Gail            | 1200      | 2             | N           | 19.8                  | 7.3                  | 4                        | 2x2           |                      | 2.74                 | 3.96                   | 230                  | d                |
| 5/22/90     | Trojan               | 1350      | 2             | N           | 21.3                  | 7.9                  | 9                        | 3x3           |                      | 2.74                 | 2.68                   | 215                  | d                |
|             | Melinda Brent        | 1880      | 2             | N           | 26.2                  | 8.4                  | 2                        | 2x1           | Super Jumbo          | 0.61                 | 2.38                   | 250                  | u                |
|             | Twilight             |           |               |             |                       |                      |                          |               |                      |                      |                        |                      |                  |
|             | Julia Swain          |           |               |             |                       |                      |                          |               |                      |                      |                        |                      |                  |
|             | Cooperative Mariner  | 3700      | 2             | N           | 51.2                  | 12.2                 | 12                       | 3x4           |                      | 2.74                 | 4.66                   | 230                  | d                |
|             | Ed Renshaw           | 5600      | 2             | Y           | 51.8                  | 13.7                 | 9                        | 3x3           |                      | 2.74                 | 3.05                   | 250                  | u                |

# Apple River Island Site (Concluded)

| <i>Date</i> | <i>Name</i>          | <i>Hp</i> | <i>Screws</i> | <i>Kort</i> | <i>Length<br/>(m)</i> | <i>Width<br/>(m)</i> | <i>No. of<br/>barges</i> | <i>Config</i> | <i>Type of barge</i> | <i>Draft<br/>(m)</i> | <i>Speed<br/>(m/s)</i> | <i>Dist.<br/>(m)</i> | <i>Direction</i> |
|-------------|----------------------|-----------|---------------|-------------|-----------------------|----------------------|--------------------------|---------------|----------------------|----------------------|------------------------|----------------------|------------------|
| 5/23/90     | Kevin Michael        | 5600      | 2             | N           | 54.0                  | 12.8                 | 16                       | 3x5+1         |                      | 0.61                 | 2.68                   | 215                  | u                |
|             | Mississippi Belle II |           |               |             |                       |                      |                          |               |                      |                      |                        |                      |                  |
|             | Julia Swain          |           |               |             |                       |                      |                          |               |                      |                      |                        |                      |                  |
|             | Twilight             |           |               |             |                       |                      |                          |               |                      |                      |                        |                      |                  |
|             | Jack D. Wofford      | 5000      | 2             | Y           | 51.8                  | 12.2                 | 2                        | 1x2           |                      | 2.74                 | 2.87                   | 215                  | u                |
|             | Trojan               | 1350      | 2             | N           | 21.3                  | 7.9                  | 5                        | 1+2x2         |                      | 0.61                 | 2.38                   | 215                  | u                |

## Goose Island Site, Trip 1

| <i>Date</i> | <i>Name</i>          | <i>Hp</i> | <i>Screws</i> | <i>Kort</i> | <i>Length<br/>(m)</i> | <i>Width<br/>(m)</i> | <i>No. of<br/>barges</i> | <i>Config</i> | <i>Type of barge</i> | <i>Draft<br/>(m)</i> | <i>Speed<br/>(m/s)</i> | <i>Dist.<br/>(m)</i> | <i>Direction</i> |
|-------------|----------------------|-----------|---------------|-------------|-----------------------|----------------------|--------------------------|---------------|----------------------|----------------------|------------------------|----------------------|------------------|
| 8/24/90     | Sierra Dawn          | 5000      | 2             | Y           | 50.0                  | 12.2                 | 11                       | 2+3x3         |                      | 2.74                 | 2.72                   | 320                  | d                |
|             | Dell Butcher         | 5000      | 2             | Y           | 51.8                  | 12.2                 | 13                       | 1+3x4         |                      | 2.74                 | 3.17                   | 300                  | d                |
|             | William C. Norman    | 1800      | 2             | N           | 33.5                  | 10.4                 | 16                       | 3x5+1         |                      | 0.61                 | 1.83                   | 320                  | u                |
|             | Normania             | 1800      | 2             | N           | 27.4                  | 9.1                  | 16                       | 3x5+1         |                      | 0.61                 | 1.26                   | 320                  | u                |
|             | Dave Carlton         | 6000      | 2             | Y           | 51.8                  | 13.7                 | 15                       | 3x5           |                      | 2.74                 | 3.50                   | 300                  | d                |
| 8/25/90     | Hugh C. Blaske       | 5000      | 2             | Y           | 51.8                  | 12.2                 | 15                       | 3x5           |                      | 2.60                 | 1.88                   | 310                  | u                |
|             | Teresa R. Beesber    | 4200      | 2             | Y           | 35.4                  | 10.4                 | 15                       | 3x5           |                      | 2.74                 | 3.58                   | 280                  | d                |
|             | Trojan Warrior       | 2800      | 2             | Y           | 33.5                  | 10.4                 | 4                        | 2x2           |                      | 2.74                 | 1.42                   | 320                  | u                |
|             | Hoosier State        | 4320      | 2             | Y           | 45.7                  | 14.6                 | 13                       | 1+3x4         |                      | 0.61                 | 2.83                   | 310                  | u                |
| 8/26/90     | Reliance             | 2800      | 2             | N           | 50.9                  | 11.1                 | 15                       | 3x5           |                      | 2.74                 | 3.03                   | 320                  | d                |
|             | Kevin Michael        | 5600      | 2             | N           | 54.0                  | 12.8                 | 15                       | 3x5           |                      | 2.74                 | 2.91                   | 310                  | d                |
|             | Sumac                | 1965      | 3             | N           | 34.9                  | 9.3                  | 1                        | 1x1           | Buoy Tender          | 2.74                 | 3.54                   | 300                  | d                |
|             | Twin Cities          | 4200      | 2             | Y           | 44.1                  | 11.0                 | 13                       | 1+3x4         |                      | 2.57                 | 2.19                   | 320                  | u                |
|             | Cooperative Vanguard | 3700      | 2             | N           | 51.2                  | 12.2                 | 15                       | 3x5           |                      | 0.61                 | 2.22                   | 320                  | u                |
| 8/27/90     | Superior             | 3900      | 2             | N           | 39.6                  | 11.3                 | 5                        | 1+2x2         |                      | 2.74                 | 0.98                   | 320                  | u                |
|             | Helen M. Clements    | 5100      | 3             | N           | 42.7                  | 13.7                 | 15                       | 3x5           |                      | 2.60                 | 2.36                   | 320                  | d                |



# Goose Island Site, Trip 2

| <i>Date</i> | <i>Name</i>           | <i>Hp</i> | <i>Screws</i> | <i>Kort</i> | <i>Length<br/>(m)</i> | <i>Width<br/>(m)</i> | <i>No. of<br/>barges</i> | <i>Config</i> | <i>Type of barge</i> | <i>Draft<br/>(m)</i> | <i>Speed<br/>(m/s)</i> | <i>Dist.<br/>(m)</i> | <i>Direction</i> |
|-------------|-----------------------|-----------|---------------|-------------|-----------------------|----------------------|--------------------------|---------------|----------------------|----------------------|------------------------|----------------------|------------------|
| 7/18/91     | Ardyce Randall        | 5600      | 2             | Y           | 44.2                  | 14.6                 | 15                       | 3x5           | closed hopper        | 2.74                 | 3.11                   | 305                  | d                |
|             | Scarlet Knight        | 4200      | 2             | N           | 42.7                  | 12.8                 | 15                       | 3x5           | closed hopper        | 2.74                 | 3.20                   | 305                  | d                |
|             | James F. Neal         | 6000      | 2             | Y           | 44.2                  | 14.6                 | 15                       | 3x5           | closed hopper        | 2.74                 | 4.05                   | 305                  | d                |
|             | Helen M. Clements     | 5100      | 3             | N           | 42.7                  | 13.7                 | 16                       | 3x5+1         | closed hopper        | 0.61                 | 2.44                   | 330                  | u                |
|             | Elizabeth Ann         | 1350      | 2             | N           | 21.3                  |                      | 15                       | 3x5           | closed hopper        | 2.74                 | 3.20                   | 330                  | d                |
| 7/19/91     | Frank T. Heffelfinger | 3800      | 2             | N           | 42.7                  | 11.6                 | 15                       | 3x5           | closed hopper jumbo  | 2.74                 | 2.99                   | 305                  | d                |
|             | Queen City            | 5600      | 2             | Y           | 42.7                  | 12.8                 | 15                       | 3x5           | closed hopper        | 2.74                 | 3.54                   | 350                  | d                |
|             | Helen M. Clements     | 5100      | 3             | N           | 42.7                  | 13.7                 | 15                       | 3x5           | closed hopper        | 2.74                 | 2.83                   | 310                  | d                |
|             | Frank T. Heffelfinger | 3800      | 2             | N           | 42.7                  | 11.6                 | 15                       | 3x5           | coal barge           | 2.74                 | 2.38                   | 350                  | u                |
|             | Cooperative Venture   | 3700      | 2             | N           | 51.2                  | 12.2                 | 15                       | 3x5           | closed hopper        | 0.61                 | 2.54                   | 350                  | u                |
|             | Volunteer State       | 4320      | 2             | Y           | 45.7                  | 14.6                 | 15                       | 3x5           | closed hopper        | 2.74                 | 3.00                   | 350                  | d                |
|             | No Name               |           |               |             |                       |                      | 15                       | 3x5           | closed hopper        | 2.74                 | 3.46                   |                      | d                |
|             | Night 1               |           |               |             |                       |                      | 9                        | 3x3           | chemical barge       | 0.61                 | 1.75                   |                      | u                |
|             | Night 2               |           |               |             |                       |                      | 6                        | 3x2           | barge                | 0.61                 | 2.29                   |                      | u                |
|             | G.R. Packet           | 4200      | 2             | N           | 44.8                  | 11.6                 | 15                       | 3x5           | closed hopper        | 2.74                 | 3.00                   | 300                  | d                |
| 7/20/91     | Prairie Dawn          | 5000      | 2             | Y           | 50.0                  | 12.2                 | 15                       | 3x5           | closed hopper        | 2.74                 | 2.68                   | 310                  | d                |
|             | Prosperity            | 3800      | 2             | N           | 51.2                  | 12.2                 | 15                       | 3x5           | closed hopper        | 0.61                 | 1.93                   | 310                  | u                |
|             | Clyde Butcher         | 5000      | 2             | Y           | 51.8                  | 12.2                 | 15                       | 3x5           | closed hopper        | 2.74                 | 3.62                   | 350                  | d                |
|             | Lil Charley           | 1000      | 2             | N           | 19.8                  | 7.3                  | 2                        | 1x2           | closed hopper        | 2.74                 | 4.95                   | 330                  | d                |
|             | C.W. Rushing          | 1200      | 1             | N           | 32.3                  | 10.4                 | 1                        | 1x1           | barge                | 2.13                 | 5.39                   | 305                  | d                |
|             | Conti-Nan             | 4200      | 2             | N           | 42.7                  | 13.4                 | 16                       | 3x5+1         | closed hopper        | 0.61                 | 2.30                   | 350                  | u                |
|             | Mary L.               | 4300      | 2             | N           | 44.5                  | 11.6                 | 15                       | 3x5           | closed hopper        | 2.74                 | 3.00                   | 305                  | d                |

Goose Island Site, Trip 2 (Continued)

| <i>Date</i> | <i>Name</i>          | <i>Hp</i> | <i>Screws</i> | <i>Kort</i> | <i>Length<br/>(m)</i> | <i>Width<br/>(m)</i> | <i>No. of<br/>barges</i> | <i>Config</i> | <i>Type of barge</i> | <i>Draft<br/>(m)</i> | <i>Speed<br/>(m/s)</i> | <i>Dist.<br/>(m)</i> | <i>Direction</i> |
|-------------|----------------------|-----------|---------------|-------------|-----------------------|----------------------|--------------------------|---------------|----------------------|----------------------|------------------------|----------------------|------------------|
| 7/21/91     | Cooperative Vanguard | 3700      | 2             | N           | 51.2                  | 12.2                 | 14                       | 3x4+2         |                      | 1.52                 | 2.83                   | 310                  | u                |
|             | Conti-Karla          | 3060      | 2             | N           | 34.7                  | 10.5                 | 15                       | 3x5           | closed hopper        | 2.74                 | 3.46                   | 305                  | d                |
| 7/22/91     | Cooperative Mariner  | 3700      | 2             | N           | 51.2                  | 12.2                 | 15                       | 3x5           | closed hopper        | 2.74                 | 2.89                   | 315                  | d                |
|             | Hornet               | 4300      | 2             | N           | 44.5                  | 11.6                 | 15                       | 3x5           | closed hopper        | 2.74                 | 3.14                   | 300                  | d                |
|             | Cooperative          | 3800      | 2             | Y           | 48.8                  | 12.2                 | 15                       | 3x5           | closed hopper        | 1.32                 | 2.83                   | 330                  | u                |
|             | Ambassador           |           |               |             |                       |                      |                          |               |                      |                      |                        |                      |                  |
|             | Eastern              | 3530      | 2             | Y           | 50.9                  | 11.1                 | 15                       | 3x5           | closed hopper        | 0.61                 | 1.55                   | 380                  | u                |
|             | Sam M. Fleming       | 4100      | 2             | Y           | 43.9                  | 10.7                 | 8                        | 3x5           | barge                | 2.74                 | 2.67                   | 300                  | u                |
| 7/23/91     | Kevin Michael        | 5600      | 2             | N           | 54.0                  | 12.8                 | 15                       | 3x5           | closed hopper        | 2.74                 | 2.94                   | 320                  | d                |
|             | A.M. Thompson        | 3800      | 2             | N           | 43.3                  | 10.4                 | 15                       | 3x5           | closed hopper        | 2.74                 | 2.86                   | 330                  | d                |
|             | Susan Elizabeth      | 760       | 2             | N           | 17.1                  | 5.7                  | 1                        | 3x5           | closed hopper        | 2.74                 |                        | 380                  | u                |
|             | Lil Charley          | 1000      | 2             | N           | 19.8                  | 7.3                  | 1                        | 1x1           |                      | 2.74                 | 4.95                   | 300                  | u                |
|             | Badger               | 3800      | 2             | N           | 45.7                  | 10.7                 | 15                       | 3x5           | closed hopper        | 2.74                 | 3.62                   | 310                  | d                |
|             | Kay D                | 1800      | 2             | N           | 32.9                  | 6.1                  | 2                        | 3x5           |                      | 2.74                 | 3.66                   | 330                  | d                |
|             | Every-T              | 4300      | 2             | N           | 42.7                  | 11.6                 | 16                       | 3x5+1         | closed hopper        | 0.61                 | 2.32                   | 320                  | u                |
|             | Robert Ingle         | 3600      | 2             | Y           | 48.8                  | 10.7                 | 15                       | 3x5           | closed hopper        | 2.74                 | 2.63                   | 310                  | d                |
|             | Prairie Dawn         | 5000      | 2             | Y           | 50.0                  | 12.2                 | 15                       | 3x5           | closed hopper        | 0.61                 | 3.72                   | 330                  | u                |
|             |                      |           |               |             |                       |                      |                          |               |                      |                      |                        |                      |                  |
|             |                      |           |               |             |                       |                      |                          |               |                      |                      |                        |                      |                  |

# Goose Island Site, Trip 2 (Concluded)

| <i>Date</i> | <i>Name</i>         | <i>Hp</i> | <i>Screws</i> | <i>Kort</i> | <i>Length<br/>(m)</i> | <i>Width<br/>(m)</i> | <i>No. of<br/>barges</i> | <i>Config</i> | <i>Type of barge</i> | <i>Draft<br/>(m)</i> | <i>Speed<br/>(m/s)</i> | <i>Dist.<br/>(m)</i> | <i>Direction</i> |
|-------------|---------------------|-----------|---------------|-------------|-----------------------|----------------------|--------------------------|---------------|----------------------|----------------------|------------------------|----------------------|------------------|
| 7/24/91     | G.R. Packet         | 4200      | 2             | N           | 44.8                  | 11.6                 | 16                       | 3x5+1         |                      | 1.41                 | 2.91                   | 305                  | u                |
|             | Mary L              | 4300      | 2             | N           | 44.5                  | 11.6                 | 16                       | 3x5+1         | closed hopper        | 0.61                 | 2.34                   | 320                  | u                |
|             | Dub Hollinger       | 2880      | 2             | N           | 39.2                  | 8.5                  | 14                       | 2x5+4         | closed hopper        | 0.61                 | 2.65                   | 310                  | u                |
|             | C.W. Rushing        | 1200      | 1             | N           | 32.3                  | 10.4                 | 1                        | 1x1           | closed hopper        | 2.74                 | 2.68                   | 320                  | u                |
|             | Dell Butcher        | 5000      | 2             | Y           | 51.8                  | 12.2                 | 15                       | 3x5           | closed hopper        | 2.74                 | 3.19                   | 330                  | d                |
|             | Coral Dawn          | 5000      | 2             | Y           | 50.0                  | 12.2                 | 15                       | 3x5           | closed hopper        | 0.61                 | 2.23                   | 320                  | u                |
|             | Teresa R. Beesecker | 4200      | 2             | Y           | 35.4                  | 10.4                 | 15                       | 3x5           | closed hopper        | 0.61                 | 2.80                   | 305                  | u                |
|             | Sirene              | 800       | 2             | N           | 16.5                  | 7.3                  | 6                        | 2x3           | closed hopper        | 2.74                 | 2.97                   | 320                  | d                |
|             | Rusty Flavors       | 4200      | 2             | Y           | 42.7                  | 12.8                 | 15                       | 3x5           | closed hopper        | 0.61                 | 2.27                   | 320                  | u                |

# Clarks Ferry Site, Trip 1

| <i>Date</i> | <i>Name</i>        | <i>Hp</i> | <i>Screws</i> | <i>Kort</i> | <i>Length<br/>(m)</i> | <i>Width<br/>(m)</i> | <i>No. of<br/>barges</i> | <i>Config</i> | <i>Type of barge</i> | <i>Draft<br/>(m)</i> | <i>Speed<br/>(m/s)</i> | <i>Dist.<br/>(m)</i> | <i>Direction</i> |
|-------------|--------------------|-----------|---------------|-------------|-----------------------|----------------------|--------------------------|---------------|----------------------|----------------------|------------------------|----------------------|------------------|
| 5/16/91     | C.W. Rushing (1)   | 1200      | 1             | N           | 32.3                  | 10.4                 | 2                        | 1x2           | cargo                | 2.74                 | 2.02                   | 325                  | u                |
|             | Donnie Ray Jr. (1) | 5600      | 2             | Y           | 53.7                  | 12.2                 | 15                       | 3x5           | cargo                | 2.66                 | 3.35                   | 250                  | d                |
|             | Samantha (1)       | 1000      | 2             | N           | 18.2                  | 6.7                  | 1                        | 1x1           | coal                 | 2.74                 | 3.66                   | 270                  | d                |
|             | Samantha (2)       | 1000      | 2             | N           | 18.2                  | 6.7                  | 0                        |               |                      | 2.74                 | 2.61                   | 270                  | u                |
| 5/17/91     | Quad City Queen    |           |               |             |                       |                      |                          |               |                      |                      |                        | 250                  | d                |
|             | C.W. Rushing (2)   | 1200      | 1             | N           | 32.3                  | 10.4                 | 1                        | 1x1           | cargo                | 1.52                 | 2.02                   | 270                  | d                |
|             | Jemco Towing       |           |               |             |                       |                      | 4                        | 2x2           | cargo                | 2.74                 | 2.97                   | 275                  | u                |
|             | T.S. Kunsman       | 4200      | 2             | N           | 45.7                  | 10.7                 | 12                       | 3x4           | cargo                | 2.74                 | 2.54                   | 370                  | d                |
|             | Dell Butcher (1)   | 5000      | 2             | Y           | 51.8                  | 12.2                 | 10                       | 2x5           | cargo                | 2.74                 | 2.16                   | 270                  | u                |

Clarks Ferry Site, Trip 1 (Continued)

| <i>Date</i> | <i>Name</i>        | <i>Hp</i> | <i>Screws</i> | <i>Kort</i> | <i>Length<br/>(m)</i> | <i>Width<br/>(m)</i> | <i>No. of<br/>barges</i> | <i>Config</i> | <i>Type of barge</i> | <i>Draft<br/>(m)</i> | <i>Speed<br/>(m/s)</i> | <i>Dist.<br/>(m)</i> | <i>Direction</i> |
|-------------|--------------------|-----------|---------------|-------------|-----------------------|----------------------|--------------------------|---------------|----------------------|----------------------|------------------------|----------------------|------------------|
| 5/18/91     | William Earthman   | 4100      | 2             | Y           | 43.9                  | 10.7                 | 4                        | 2x2           | chemical             | 1.52                 | 2.54                   | 250                  | u                |
|             | Lady Lone Star     | 760       | 2             | N           | 23.8                  | 7.3                  | 0                        |               |                      | 2.74                 | 2.98                   |                      | u                |
| 5/19/91     | Pearl B.           | 4400      | 2             | N           | 42.7                  | 9.1                  | 12                       | 3x4           | cargo                | 2.74                 | 2.87                   | 250                  | d                |
|             | Conti-Afton        | 4200      | 2             | N           | 42.7                  | 13.4                 | 15                       | 3x5           | cargo                | 2.74                 | 3.88                   | 300                  | d                |
|             | Jack D. Wofford    | 5000      | 2             | Y           | 51.8                  | 12.2                 | 12                       | 3x4           | cargo                | 2.74                 | 3.7                    | 300                  | d                |
|             | Creole Belle       | 3900      | 2             | N           | 39.6                  | 11.3                 | 16                       | 3x5+1         | empty                | 0.61                 | 2.03                   | 225                  | u                |
| 5/20/91     | Donnie Ray Jr. (2) | 5600      | 2             | Y           | 53.7                  | 12.2                 | 15                       | 3x5           | cargo                | 2.74                 | 3.00                   | 225                  | u                |
|             | Sunflower (1)      | 825       | 3             | N           | 16.8                  | 6.71                 | 1                        | 1x1           | cargo                | 0.61                 | 5.59                   | 250                  | d                |
|             | American Beauty(1) | 5000      | 2             | Y           | 51.8                  | 13.7                 | 15                       | 3x5           | cargo                | 0.61                 | 3.23                   | 275                  | u                |
| 5/21/91     | Sierra Dawn        | 5000      | 2             | Y           | 50                    | 12.2                 | 12                       | 3x4           | cargo                | 2.64                 | 3.33                   | 270                  | d                |
|             | Coop. Vanguard     | 3700      | 2             | N           | 51.2                  | 12.2                 | 6                        | 3x2           | cargo                | 2.74                 | 2.69                   | 250                  | d                |
|             | Cindy J. Erickson  | 3900      | 2             | N           | 36.6                  | 11.6                 | 15                       | 3x5           | cargo                | 0.61                 | 2.37                   | 250                  | u                |
|             | Frank H. Peavey    | 3800      | 2             | N           | 42.7                  | 11.6                 | 12                       | 3x4           | cargo                | 2.74                 | 3.28                   | 275                  | d                |
|             | Helen M. Clements  | 5100      | 3             | N           | 42.7                  | 13.7                 | 12                       | 3x4           | cargo                | 0.61                 | 2.51                   | 260                  | u                |
|             | Sunflowers (2)     | 825       | 3             | N           | 16.8                  | 6.71                 | 1                        | 1x1           | cargo                | 1.52                 | 5.6                    | 225                  | d                |
|             | Dell Butcher (2)   | 5000      | 2             | Y           | 51.8                  | 12.2                 | 12                       | 3x4           | cargo                | 2.74                 | 3.24                   | 300                  | d                |
|             | Hornet             | 4300      | 2             | N           | 44.5                  | 11.6                 | 12                       | 3x4           | cargo                | 0.61                 | 2.97                   | 280                  | u                |
|             | Volunteer State    | 4320      | 2             | N           | 45.7                  | 14.6                 | 15                       | 3x5           | cargo                | 0.61                 | 3.51                   | 250                  | u                |
|             | Enterprise Star    |           |               |             |                       |                      | 15                       | 3x5           | cargo                | 2.74                 | 5.31                   | 275                  | d                |

### Clarks Ferry Site, Trip 1 (Concluded)

| Date    | Name               | Hp   | Screws | Kort | Length<br>(m) | Width<br>(m) | No. of<br>barges | Config | Type of barge | Draft<br>(m) | Speed<br>(m/s) | Dist.<br>(m) | Direction |
|---------|--------------------|------|--------|------|---------------|--------------|------------------|--------|---------------|--------------|----------------|--------------|-----------|
| 5/22/91 | Edward J. Hancock  | 4320 | 2      | Y    | 45.1          | 10.4         | 13               | 3x4+1  | cargo         | .61          | 1.83           | 250          | u         |
|         | Joe/Nut            | 5600 | 4      | N    | 49.3          | 13.7         | 1                |        |               | 2.74         | 2.74           | 300          | u         |
|         | Starfire           | 3200 | 2      | N    | 47.6          | 10.7         | 10               | 1+3x3  | cargo         | 1.89         | 1.98           | 250          | u         |
|         | Conti-Karla        | 3060 | 2      | N    | 34.7          | 10.5         | 16               | 3x5+1  | cargo         | 0.74         | 2.00           | 275          | u         |
|         | American Beauty(2) | 5000 | 2      | Y    | 51.8          | 13.7         | 3                | 1+2x1  | cargo         | 1.52         | 5.18           | 300          | d         |

### Clarks Ferry Site, Trip 2

| Date     | Name              | Hp   | Screws | Kort | Length<br>(m) | Width<br>(m) | No. of<br>barges | Config | Type of barge           | Draft<br>(m) | Speed<br>(m/s) | Dist.<br>(m) | Direction |
|----------|-------------------|------|--------|------|---------------|--------------|------------------|--------|-------------------------|--------------|----------------|--------------|-----------|
| 10/17/91 | C.W. Rushing      | 1200 | 1      | N    | 32.3          | 10.4         | 2                | 2x1    | hopper                  | 1.52         | 3.98           | 220          | d         |
|          | Evey-T            | 4300 | 2      | N    | 42.7          | 11.6         | 13               | 1+3x4  | empty                   | .61          | 2.41           | 260          | u         |
|          | Sunflower (1)     | 825  | 3      | N    | 16.8          | 6.7          | 1                | 1x1    | empty                   | .61          | 4.25           | 185          | d         |
|          | Evelyn C.         | 2200 | 2      | N    | 25.9          | 10.7         | 5                | 1+2x2  | Corp of Eng. work barge | 2.74         | 1.92           | 220          | d         |
|          | Sunflower (2)     | 825  | 3      | N    | 16.8          | 6.7          | 1                | 1x1    | hopper                  | 2.74         | 3.13           | 210          | u         |
|          | Conti-Nan (1)     |      |        | N    |               |              | 15               | 3x5    | hopper                  | 2.74         | 2.41           | 260          | d         |
|          | Night 1           |      |        | N    |               |              | 1                | 1x1    | work                    | 2.74         |                | 250          | u         |
|          | Night 2           |      |        | N    |               |              | 1                | 1x1    | hopper                  | 1.52         | 4.25           | 230          | u         |
|          | Night 3           |      |        | N    |               |              | 6                | 3x2    | work                    | 2.74         |                | 230          | d         |
| 10/18/91 | Lady Lone Star    | 760  | 2      | N    | 23.8          | 7.3          | 1                | 1x1    | coal                    | 2.74         | 2.38           | 200          | d         |
|          | Lady Lone Star    | 760  | 2      | N    | 23.8          | 7.3          | 0                |        |                         | 2.74         | 3.4            | 260          | u         |
|          | Kevin Michael     | 5600 | 2      | N    | 54            | 12.8         | 12               | 3x4    | closed hopper           | 2.74         | 2.31           | 245          | d         |
|          | Deborah Valentine | 4300 | 2      | Y    | 47            | 12.2         | 15               | 3x5    | closed hopper           | 2.74         | 2.14           | 210          | d         |
|          | Volunteer State   | 4320 | 2      | Y    | 45.7          | 14.6         | 4                | 2x2    | closed hopper           | 2.74         | 4.25           | 185          | d         |
|          | Sunflower (3)     | 825  | 3      | N    | 16.8          | 6.7          | 1                | 1x1    | closed hopper           | .61          | 4.25           | 230          | d         |
|          | Frank Stegbauer   | 3200 | 2      | N    | 39.6          | 10.7         | 3                | 1+2x1  | empty chemical          | .61          | 2.57           | 185          | d         |
|          | Joshua            | 1000 | 2      | N    | 18.3          | 6.7          | 1                | 1x1    | coal                    | 2.74         | 2.48           | 240          | d         |

**Clarks Ferry Site, Trip 2 (Concluded)**

| <i>Date</i> | <i>Name</i>       | <i>Hp</i> | <i>Screws</i> | <i>Kort</i> | <i>Length<br/>(m)</i> | <i>Width<br/>(m)</i> | <i>No. of<br/>barges</i> | <i>Config</i> | <i>Type of barge</i>   | <i>Draft<br/>(m)</i> | <i>Speed<br/>(m/s)</i> | <i>Dist.<br/>(m)</i> | <i>Direction</i> |
|-------------|-------------------|-----------|---------------|-------------|-----------------------|----------------------|--------------------------|---------------|------------------------|----------------------|------------------------|----------------------|------------------|
| 10/19/91    | Kathy Ellen       | 3800      | 2             | N           | 46                    | 10.7                 | 15                       | 3x5           | closed hopper          | 2.74                 | 1.92                   | 195                  | d                |
|             | Jack Bullard      | 5600      | 2             | Y           | 44.2                  | 14.6                 | 14                       | 2x1+3x4       | hopper                 | 2.74                 | 2.38                   | 215                  | u                |
|             | Marc              | 1000      | 2             | N           | 18.3                  | 6.7                  | 4                        | 2x2           | coal                   | 2.74                 | 2.7                    | 205                  | d                |
|             | Conti-Nan (2)     | 4200      | 2             | N           | 42.7                  | 13.4                 | 6                        | 3x2           | empty chemical         | .61                  | 2.84                   | 185                  | u                |
|             | Cristina Ecstein  | 3200      | 2             | N           | 35.4                  | 10.5                 | 8                        | 3x2+2x1       | empty                  | .61                  | 2.88                   | 215                  | u                |
|             | Coast Guard 65504 | 600       | 2             | N           | 19.8                  | 6.4                  | 1                        | 1x1           | buoy tender/work barge | 2.74                 | 4.95                   | 225                  | d                |
|             | Prairie Dawn      | 5000      | 2             | Y           | 50                    | 12.2                 | 11                       | 3x3+2         | empty                  | .61                  | 3.4                    | 190                  | u                |
|             | Noname            |           |               |             |                       |                      | 2                        | 2x1           | chemical               | 2.74                 | 2.63                   | 230                  | d                |
|             | Coop. Ambassador  | 3800      | 2             | Y           | 48.8                  | 12.2                 | 15                       | 3x5           | closed hopper          | 2.74                 | 2.22                   | 190                  | d                |
| 10/20/91    | Yazoo City        | 4300      | 2             | N           | 44.8                  | 10.7                 | 14                       | 2+3x4         | closed hopper          |                      | 2.09                   | 230                  | u                |
|             | George W. Banta   | 2400      | 2             | N           | 30.2                  | 9.1                  | 3                        | 1x3           | petroleum              | 2.74                 | 2.0                    | 200                  | u                |

**APPENDIX VIII.**  
**RECREATIONAL TRAFFIC CHARACTERISTICS**  
**AT ALL STUDY SITES**

**McEver's Island Site  
(NA)**

**Kampsville Site, Trip 1**

| <i>Type</i> | <i>Date</i> | <i>Time</i> | <i>Approx.<br/>Speed</i> | <i>Approx.<br/>Distance<br/>(m)</i> | <i>Approx.<br/>Length<br/>(m)</i> | <i>Direction</i> |
|-------------|-------------|-------------|--------------------------|-------------------------------------|-----------------------------------|------------------|
| Houseboat   | 10/14/90    | 12:41       | Medium                   | 168                                 | N/A                               | d/s              |

**Kampsville Site, Trip 2  
(N/A)**

**Apple River Island Site**

| <i>Type</i>          | <i>Date</i> | <i>Time</i> | <i>Approx.<br/>Speed</i> | <i>Approx.<br/>Distance<br/>(m)</i> | <i>Approx.<br/>Length<br/>(m)</i> | <i>Direction</i> |
|----------------------|-------------|-------------|--------------------------|-------------------------------------|-----------------------------------|------------------|
| Cabin Cruiser        | 5/21/90     | 12:09       | N/A                      | 244                                 | 9                                 | u/s              |
| Mississippi Belle II | 5/22/90     | 9:57        | N/A                      | 229                                 | 45                                | d/s              |

**Goose Island Site, Trip 1**

| <i>Type</i> | <i>Date</i> | <i>Time</i> | <i>Approx.<br/>Speed</i> | <i>Approx.<br/>Distance<br/>(m)</i> | <i>Approx.<br/>Length<br/>(m)</i> | <i>Direction</i> |
|-------------|-------------|-------------|--------------------------|-------------------------------------|-----------------------------------|------------------|
| Houseboat   | 8/25/90     | 12:23       | High                     | 350                                 | N/A                               | u/s              |
| Houseboat   | 8/25/90     | 13:05       | N/A                      | 350                                 | N/A                               | u/s              |

Notes: N/A = not applicable  
u/s = upstream  
d/s = downstream



### Goose Island Site, Trip 2

| <i>Type</i> | <i>Date</i> | <i>Time</i> | <i>Approx.<br/>Speed</i> | <i>Approx.<br/>Distance<br/>(m)</i> | <i>Approx.<br/>Length<br/>(m)</i> | <i>Direction</i> |
|-------------|-------------|-------------|--------------------------|-------------------------------------|-----------------------------------|------------------|
| Houseboat   | 7/21/91     | 13:40       | Medium                   | N/A                                 | 13.72                             | u/s              |
| Houseboat   | 7/21/91     | 15:31       | Slow                     | N/A                                 | 10.50                             | u/s              |

### Clarks Ferry Site, Trip 1

| <i>Type</i> | <i>Date</i> | <i>Time</i> | <i>Approx.<br/>Speed</i> | <i>Approx.<br/>Distance<br/>(m)</i> | <i>Approx.<br/>Length<br/>(m)</i> | <i>Direction</i> |
|-------------|-------------|-------------|--------------------------|-------------------------------------|-----------------------------------|------------------|
| Houseboat   | 5/18/91     | 15:14       | N/A                      | N/A                                 | 12.19                             | d/s              |
| Houseboat   | 5/19/91     | 12:44       | N/A                      | 250                                 | N/A                               | d/s              |
| Houseboat   | 5/19/91     | 14:17       | N/A                      | 270                                 | N/A                               | u/s              |
| Houseboat   | 5/19/91     | 15:40       | N/A                      | 220                                 | N/A                               | d/s              |
| Houseboat   | 5/19/91     | 17:17       | Slow                     | 250                                 | N/A                               | u/s              |
| Houseboat   | 5/20/91     | 14:13       | N/A                      | 250                                 | N/A                               | u/s              |
| Cruiser     | 5/21/91     | 10:22       | Medium                   | 300                                 | N/A                               | u/s              |

### Clarks Ferry Site, Trip 2

| <i>Type</i> | <i>Date</i> | <i>Time</i> | <i>Approx.<br/>Speed</i> | <i>Approx.<br/>Distance<br/>(m)</i> | <i>Approx.<br/>Length<br/>(m)</i> | <i>Direction</i> |
|-------------|-------------|-------------|--------------------------|-------------------------------------|-----------------------------------|------------------|
| Cruiser     | 10/18/91    | 7:39        | Medium                   | 220                                 | N/A                               | d/s              |
| Houseboat   | 10/18/91    | 11:01       | Slow-medium              | 280                                 | N/A                               | d/s              |
| Cruiser     | 10/19/91    | 14:47       | Medium                   | 220                                 | N/A                               | d/s              |
| Cruiser     | 10/19/91    | 17:15       | Medium                   | N/A                                 | N/A                               | u/s              |
| Houseboat   | 10/20/91    | 9:38        | Slow                     | 150                                 | N/A                               | d/s              |

Notes: N/A = not applicable  
u/s = upstream  
d/s = downstream

**APPENDIX IX.**  
**WIND SPEED AND DIRECTION AT ALL STUDY SITES**

**McEver's Island Site  
(NA)**

**Kampsville Site, Trip 1**

| <i>Date</i> | <i>Time</i> | <i>Wind</i>            |                  |
|-------------|-------------|------------------------|------------------|
|             |             | <i>Speed (mile/hr)</i> | <i>Direction</i> |
| 10/12/90    | 10:30       | 1.2                    | 58               |
|             | 11:00       | 0.9                    | 66               |
| 10/13/90    | 10:00       | 2.5                    | 152              |
|             | 10:30       | 2.6                    | 152              |
| 10/14/90    | 9:30        | 5.3                    | 161              |
|             | 10:00       | 5.9                    | 164              |
|             | 10:30       | 5.9                    | 165              |
|             | 11:00       | 3.3                    | 164              |
|             | 11:30       | 3.6                    | 147              |
|             | 12:00       | 5.3                    | 160              |
|             | 12:30       | 5.8                    | 154              |
|             | 13:00       | 5.1                    | 147              |
|             | 13:30       | 4.5                    | 112              |
|             |             |                        |                  |
| 10/15/90    | 10:00       | 0.4                    | 64               |
|             | 10:30       | 0.9                    | 86               |
|             | 11:00       | 0.6                    | 53               |
|             | 11:30       | 1.1                    | 88               |
|             | 12:00       | 1.0                    | 108              |
|             | 12:30       | 2.0                    | 115              |
|             | 13:00       | 2.0                    | 55               |
|             | 13:30       | 1.4                    | 53               |
|             | 14:00       | 1.2                    | 101              |
|             | 14:30       | 1.6                    | 105              |
|             | 15:00       | 1.0                    | 124              |
|             | 15:30       | 1.1                    | 228              |
|             | 16:00       | 1.3                    | 224              |
|             | 16:30       | 2.8                    | 155              |
|             | 17:00       | 4.2                    | 120              |

### Kampsville Site, Trip 1 (Concluded)

| <i>Date</i> | <i>Time</i> | <i>Wind</i>            |                  |
|-------------|-------------|------------------------|------------------|
|             |             | <i>Speed (mile/hr)</i> | <i>Direction</i> |
| 10/16/90    | 9:00        | 3.7                    | 169              |
|             | 9:30        | 4.6                    | 166              |
|             | 10:00       | 4.7                    | 169              |
|             | 10:30       | 5.8                    | 162              |
|             | 11:00       | 6.3                    | 162              |
|             | 11:30       | 5.4                    | 162              |
|             | 12:00       | 6.7                    | 160              |
|             | 12:30       | 5.6                    | 163              |
|             | 13:00       | 5.3                    | 161              |
|             | 13:30       | 4.7                    | 165              |
|             | 14:00       | 3.5                    | 165              |
|             | 14:30       | 2.9                    | 164              |
|             | 15:00       | 3.9                    | 165              |
|             | 15:30       | 4.4                    | 168              |
|             | 16:00       | 3.4                    | 173              |
|             | 16:30       | 2.8                    | 184              |
|             | 17:00       | 1.3                    | 241              |
|             | 17:30       | 1.1                    | 216              |
|             | 18:00       | 1.8                    | 204              |
| 10/17/90    | 10:00       | 8.8                    | 166              |
|             | 10:30       | 7.2                    | 165              |
|             | 11:00       | 7.2                    | 165              |
|             | 11:30       | 5.5                    | 166              |
|             | 12:00       | 6.2                    | 169              |
|             | 12:30       | 5.7                    | 168              |
|             | 13:00       | 5.3                    | 166              |

### Kampsville Site, Trip 2 (NA)

# Apple River Island Site

| <i>Date</i> | <i>Time</i> | <i>Wind</i>            |                  |
|-------------|-------------|------------------------|------------------|
|             |             | <i>Speed (mile/hr)</i> | <i>Direction</i> |
| 5/19/90     | 17:30       | 4.1                    | 196              |
| 5/20/90     | 10:30       | 0.5                    | 52               |
|             | 11:00       | 0.7                    | 220              |
|             | 11:30       | 0.8                    | 219              |
|             | 12:00       | 0.6                    | 176              |
|             | 12:30       | 1.3                    | 116              |
|             | 15:00       | 1.5                    | 35               |
|             | 15:30       | 0.6                    | 42               |
|             | 16:00       | 1.4                    | 51               |
|             | 16:30       | 0.2                    | 49               |
|             | 17:00       | 0.4                    | 84               |
|             | 17:30       | 0.2                    | 62               |
| 5/21/90     | 10:30       | 1.0                    | 173              |
|             | 12:00       | 1.4                    | 120              |
|             | 12:30       | 1.6                    | 39               |
|             | 13:00       | 1.0                    | 131              |
|             | 13:30       | 1.3                    | 103              |
|             | 14:00       | 1.3                    | 180              |
|             | 14:30       | 0.5                    | 125              |
|             | 15:00       | 1.1                    | 108              |
|             | 15:30       | 0.4                    | 93               |
|             | 16:30       | 1.2                    | 72               |
|             | 17:30       | 0.5                    | 149              |

# **Apple River Island Site (Concluded)**

| <i>Date</i> | <i>Time</i> | <i>Wind</i>            |                  |
|-------------|-------------|------------------------|------------------|
|             |             | <i>Speed (mile/hr)</i> | <i>Direction</i> |
| 5/22/90     | 10:00       | 2.6                    | 282              |
|             | 10:30       | 2.4                    | 289              |
|             | 11:00       | 2.8                    | 272              |
|             | 11:30       | 1.9                    | 262              |
|             | 12:00       | 1.5                    | 266              |
|             | 12:30       | 1.6                    | 252              |
|             | 13:00       | 1.6                    | 276              |
|             | 13:30       | 2.2                    | 258              |
|             | 14:00       | 1.6                    | 261              |
|             | 14:30       | 1.2                    | 188              |
|             | 15:00       | 0.9                    | 239              |
|             | 15:30       | 2.4                    | 272              |
|             | 16:00       | 0.9                    | 77               |
|             | 16:30       | 1.2                    | 184              |
|             | 17:00       | 2.0                    | 279              |
| 5/23/90     | 9:30        | 2.9                    | 205              |
|             | 10:00       | 4.1                    | 254              |
|             | 10:30       | 6.5                    | 276              |
|             | 11:00       | 5.3                    | 273              |
|             | 11:30       | 6.4                    | 238              |
|             | 12:00       | 5.3                    | 235              |
|             | 12:30       | 5.5                    | 288              |
|             | 13:00       | 4.7                    | 311              |
|             | 13:30       | 2.0                    | 293              |
|             | 14:00       | 4.5                    | 279              |
|             | 14:30       | 2.9                    | 239              |
|             | 15:00       | 4.2                    | 278              |
|             | 15:30       | 4.8                    | 262              |
|             | 16:00       | 4.1                    | 285              |
|             | 16:30       | 3.8                    | 254              |
|             | 17:00       | 4.9                    | 245              |
|             | 17:30       | 3.2                    | 247              |
|             | 18:00       | 2.8                    | 226              |

# Goose Island Site, Trip 1

| <i>Date</i> | <i>Time</i> | <i>Wind</i>            |                  |
|-------------|-------------|------------------------|------------------|
|             |             | <i>Speed (mile/hr)</i> | <i>Direction</i> |
| 8/24/90     | 10:30       | 4.3                    | 121              |
|             | 11:00       | 6.9                    | 135              |
|             | 11:30       | 6.8                    | 134              |
|             | 12:00       | 7.3                    | 136              |
|             | 12:30       | 7.9                    | 127              |
|             | 13:00       | 7.1                    | 125              |
|             | 13:30       | 6.4                    | 135              |
|             | 14:00       | 7.1                    | 134              |
|             | 14:30       | 7.6                    | 127              |
|             | 15:00       | 5.8                    | 139              |
|             | 15:30       | 6.5                    | 117              |
|             | 16:00       | 5.7                    | 113              |
|             | 16:30       | 6.7                    | 125              |
|             | 17:00       | 6.7                    | 132              |
|             | 17:30       | 6.7                    | 122              |
| 8/25/90     | 10:30       | 0.4                    | 137              |
|             | 11:00       | 3.5                    | 136              |
|             | 11:30       | 4.6                    | 128              |
|             | 12:00       | 4.2                    | 115              |
|             | 12:30       | 6.4                    | 130              |
|             | 13:00       | 8.3                    | 119              |
|             | 13:30       | 7.6                    | 139              |
|             | 14:00       | 7.0                    | 126              |
|             | 14:30       | 8.4                    | 131              |
|             | 15:00       | 9.5                    | 135              |
|             | 15:30       | 7.2                    | 105              |
|             | 16:00       | 11.3                   | 149              |
|             | 16:30       | 10.7                   | 134              |
|             | 17:00       | 9.5                    | 128              |
| 8/26/90     | 10:00       | 3.1                    | 154              |
|             | 10:30       | 3.3                    | 139              |
|             | 11:00       | 3.8                    | 129              |
|             | 11:30       | 3.1                    | 139              |
|             | 12:00       | 2.5                    | 131              |
|             | 12:30       | 3.4                    | 136              |
|             | 13:00       | 2.2                    | 137              |
|             | 13:30       | 3.0                    | 122              |
|             | 14:00       | 2.7                    | 139              |

### Goose Island Site, Trip 1 (Concluded)

| <i>Date</i> | <i>Time</i> | <i>Wind</i>            |                  |
|-------------|-------------|------------------------|------------------|
|             |             | <i>Speed (mile/hr)</i> | <i>Direction</i> |
| 8/27/90     | 14:30       | 3.6                    | 128              |
|             | 15:00       | 3.3                    | 111              |
|             | 15:30       | 3.3                    | 131              |
|             | 16:00       | 4.2                    | 131              |
|             | 16:30       | 5.1                    | 127              |
|             | 10:00       | 2.2                    | 196              |
|             | 10:30       | 2.8                    | 124              |
|             | 11:00       | 4.6                    | 133              |
|             | 11:30       | 4.2                    | 125              |
|             | 12:00       | 5.1                    | 129              |
|             | 12:30       | 4.9                    | 123              |
|             | 13:00       | 4.1                    | 154              |
|             | 13:30       | 4.8                    | 183              |
|             | 14:00       | 5.3                    | 183              |
|             | 14:30       | 3.7                    | 206              |
|             | 15:00       | 3.5                    | 183              |
|             | 15:30       | 4.1                    | 265              |

### Goose Island Site, Trip 2

| <i>Date</i> | <i>Time</i> | <i>Wind</i>            |                  |
|-------------|-------------|------------------------|------------------|
|             |             | <i>Speed (mile/hr)</i> | <i>Direction</i> |
| 7/18/91     | 10:00       | 2.1                    | 180              |
|             | 10:30       | 2.5                    | 171              |
|             | 11:00       | 2.5                    | 183              |
|             | 11:30       | 4.6                    | 154              |
|             | 12:00       | 2.6                    | 176              |
|             | 12:30       | 4.6                    | 135              |
|             | 13:00       | 5.9                    | 133              |
|             | 13:30       | 6.8                    | 122              |
|             | 14:00       | 3.9                    | 177              |
|             | 14:30       | 4.9                    | 179              |
|             | 15:00       | 3.6                    | 191              |
|             | 15:30       | 5.9                    | 152              |
|             | 16:00       | 6.4                    | 136              |
|             | 16:30       | 6.0                    | 141              |



**Goose Island Site, Trip 2 (Continued)**

| <i>Date</i> | <i>Time</i> | <i>Wind</i>            |                  |
|-------------|-------------|------------------------|------------------|
|             |             | <i>Speed (mile/hr)</i> | <i>Direction</i> |
| 7/19/91     | 17:00       | 6.6                    | 156              |
|             | 17:30       | 7.8                    | 151              |
|             | 18:00       | 5.0                    | 161              |
|             | 10:30       | 8.4                    | 142              |
|             | 11:00       | 6.9                    | 151              |
|             | 11:30       | 7.5                    | 159              |
|             | 12:00       | 4.0                    | 163              |
|             | 12:30       | 10.4                   | 141              |
|             | 13:00       | 7.3                    | 154              |
|             | 13:30       | 4.0                    | 167              |
|             | 14:00       | 8.8                    | 135              |
|             | 14:30       | 7.7                    | 160              |
|             | 15:00       | 8.9                    | 152              |
|             | 15:30       | 7.7                    | 146              |
|             | 16:00       | 7.7                    | 143              |
|             | 16:30       | 8.4                    | 144              |
|             | 17:00       | 6.3                    | 152              |
|             | 17:30       | 8.2                    | 139              |
|             | 18:00       | 7.7                    | 151              |
|             | 18:30       | 5.6                    | 171              |
|             | 19:00       | 4.9                    | 142              |
|             | 19:30       | 5.5                    | 128              |
| 7/22/91     | 9:30        | 5.1                    | 251              |
|             | 10:00       | 7.7                    | 263              |
|             | 10:30       | 8.2                    | 281              |
|             | 11:00       | 8.1                    | 272              |
|             | 11:30       | 9.0                    | 89               |
|             | 12:00       | 9.9                    | 109              |
|             | 12:30       | 7.8                    | 263              |
|             | 13:00       | 5.0                    | 175              |
|             | 13:30       | 5.3                    | 265              |
|             | 14:00       | 3.8                    | 250              |
|             | 14:30       | 2.9                    | 249              |
|             | 15:00       | 1.3                    | 249              |
|             | 15:30       | 1.3                    | 192              |
|             | 16:00       | 3.0                    | 193              |
|             | 16:30       | 3.6                    | 163              |
|             | 17:00       | 3.1                    | 207              |

**Goose Island Site, Trip 2 (Concluded)**

| <i>Date</i> | <i>Time</i> | <i>Wind</i>            |                  |
|-------------|-------------|------------------------|------------------|
|             |             | <i>Speed (mile/hr)</i> | <i>Direction</i> |
| 7/23/91     | 17:30       | 2.1                    | 166              |
|             | 18:00       | 3.7                    | 153              |
|             | 9:30        | 10.2                   | 240              |
|             | 10:00       | 4.7                    | 239              |
|             | 10:30       | 4.1                    | 218              |
|             | 11:00       | 9.2                    | 260              |
|             | 11:30       | 5.7                    | 231              |
|             | 12:00       | 6.2                    | 240              |
|             | 12:30       | 7.9                    | 253              |
|             | 13:00       | 3.3                    | 219              |
|             | 13:30       | 5.4                    | 244              |
|             | 14:00       | 5.2                    | 231              |
|             | 14:30       | 6.2                    | 192              |
|             | 15:00       | 6.2                    | 208              |
|             | 15:30       | 6.5                    | 193              |
|             | 16:00       | 4.4                    | 217              |
|             | 16:30       | 6.6                    | 202              |
|             | 17:00       | 9.9                    | 141              |
| 7/24/91     | 10:30       | 1.5                    | 245              |
|             | 11:00       | 1.6                    | 251              |
|             | 11:30       | 3.5                    | 290              |
|             | 12:00       | 2.3                    | 126              |
|             | 12:30       | 3.0                    | 300              |
|             | 13:00       | 3.0                    | 252              |
|             | 13:30       | 2.2                    | 316              |
|             | 14:00       | 2.4                    | 283              |
|             | 14:30       | 2.7                    | 298              |
|             | 15:00       | 8.8                    | 292              |
|             | 15:30       | 4.2                    | 277              |
|             | 16:00       | 1.9                    | 213              |
|             | 16:30       | 1.1                    | 282              |
|             | 17:00       | 1.4                    | 274              |
|             | 17:30       | 0.9                    | 160              |

### Clarks Ferry Site, Trip 1

| <i>Date</i> | <i>Time</i> | <i>Wind</i>            |                  |
|-------------|-------------|------------------------|------------------|
|             |             | <i>Speed (mile/hr)</i> | <i>Direction</i> |
| 5/17/91     | 11:00       | 4.5                    | 101              |
|             | 11:30       | 2.3                    | 80               |
|             | 12:00       | 2.5                    | 83               |
|             | 12:30       | 3.3                    | 89               |
|             | 13:00       | 2.2                    | 82               |
|             | 13:30       | 3.1                    | 88               |
|             | 14:00       | 2.6                    | 76               |
|             | 15:00       | 2.2                    | 81               |
|             | 15:30       | 2.4                    | 79               |
|             | 16:00       | 2.4                    | 75               |
| 5/18/91     | 10:00       | 3.4                    | 91               |
|             | 10:30       | 3.5                    | 39               |
|             | 11:00       | 3.3                    | 60               |
|             | 11:30       | 2.9                    | 71               |
|             | 12:00       | 3.2                    | 39               |
|             | 12:30       | 4.9                    | 39               |
|             | 13:00       | 4.3                    | 70               |
|             | 13:30       | 4.0                    | 171              |
| 5/19/91     | 9:00        | 4.9                    | 113              |
|             | 9:30        | 3.2                    | 146              |
|             | 10:00       | 2.7                    | 185              |
|             | 10:30       | 3.4                    | 168              |
|             | 11:00       | 3                      | 170              |
|             | 11:30       | 2.6                    | 176              |
|             | 12:00       | 2.7                    | 185              |
|             | 12:30       | 2.4                    | 169              |
|             | 13:00       | 2.8                    | 106              |
|             | 13:30       | 3.0                    | 96               |
|             | 14:00       | 3.3                    | 91               |
|             | 14:30       | 3.0                    | 101              |
|             | 15:00       | 2.9                    | 86               |
|             | 15:30       | 3.9                    | 79               |
|             | 16:00       | 2.6                    | 84               |
|             | 16:30       | 3.1                    | 102              |
|             | 17:00       | 2.5                    | 76               |
|             | 17:30       | 4.1                    | 69               |

# Clarks Ferry Site, Trip 1 (Concluded)

| <i>Date</i> | <i>Time</i> | <i>Wind</i>            |                  |
|-------------|-------------|------------------------|------------------|
|             |             | <i>Speed (mile/hr)</i> | <i>Direction</i> |
| 5/20/91     | 9:30        | 1.9                    | 116              |
|             | 10:00       | 1.4                    | 90               |
|             | 10:30       | 1.4                    | 100              |
|             | 11:00       | 1.3                    | 83               |
|             | 11:30       | 1.5                    | 89               |
|             | 12:00       | 1.1                    | 65               |
|             | 12:30       | 1.2                    | 88               |
|             | 13:00       | 1.5                    | 122              |
|             | 13:30       | 1.6                    | 84               |
|             | 14:00       | 1.5                    | 64               |
|             | 14:30       | 1.5                    | 61               |
|             | 15:00       | 1.7                    | 71               |
|             | 15:30       | 1.7                    | 79               |
|             | 16:00       | 1.8                    | 64               |
|             | 16:30       | 1.5                    | 78               |
|             | 17:00       | 1.2                    | 79               |
|             | 17:30       | 1.1                    | 78               |
|             | 18:00       | 1.0                    | 62               |
| 5/21/91     | 8:30        | 1.0                    | 87               |
|             | 9:30        | 1.0                    | 77               |
|             | 10:00       | 2.0                    | 116              |
|             | 10:30       | 5.2                    | 143              |
|             | 11:00       | 4.7                    | 140              |
|             | 11:30       | 5.0                    | 127              |
|             | 12:00       | 5.1                    | 131              |
|             | 12:30       | 2.7                    | 132              |
|             | 13:00       | 1.3                    | 120              |
|             | 13:30       | 3.8                    | 163              |
|             | 14:00       | 5.5                    | 170              |
|             | 14:30       | 2.9                    | 167              |
|             | 15:00       | 3.9                    | 156              |
|             | 15:30       | 4.9                    | 150              |
|             | 16:00       | 4.4                    | 170              |
|             | 16:30       | 4.6                    | 169              |
|             | 17:00       | 4.9                    | 154              |
|             | 17:30       | 2.2                    | 180              |
|             | 18:00       | 3.1                    | 179              |

# Wind Wave Event

Kampsville, Illinois River

Date: 10/17/90

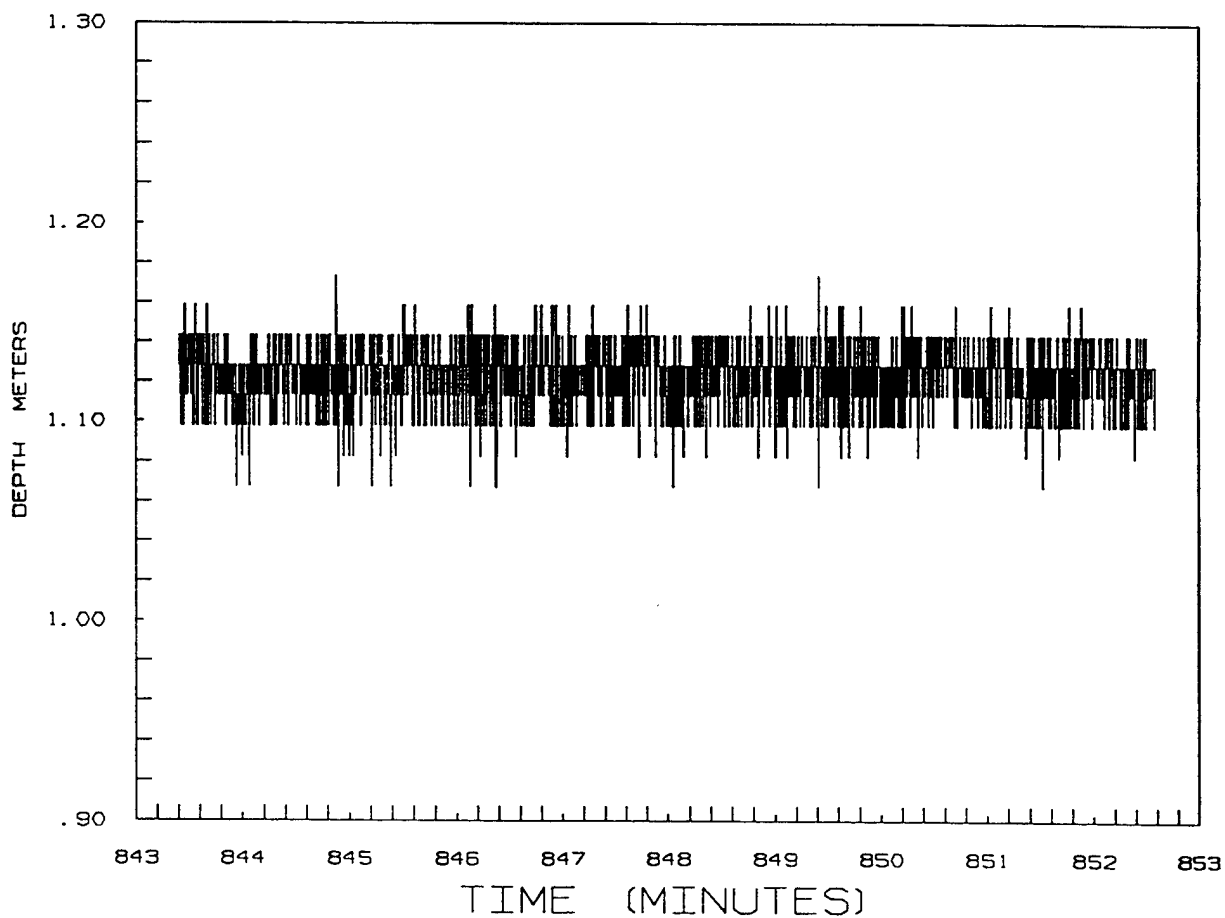
Max. wave height = 0.107 m

Significant wave height = 0.05 m

Sampling rate = 10

Starting time = 14: 12: 34

Mean wave height = 0.04 m



**APPENDIX X.**

**DATE AND TIME OF PASSAGE OF BARGE-TOWS AND MEAN AMBIENT  
VELOCITY BEFORE BARGE-TOW PASSAGE FOR ALL STUDY SITES**

# McEver's Island Site

| Tow name             | Date    | Passing Time |          | Mean ambient velocity m/s |          |               |          |               |          |             |          |
|----------------------|---------|--------------|----------|---------------------------|----------|---------------|----------|---------------|----------|-------------|----------|
|                      |         | Beginning    | Ending   | MMB511/1998               |          | MMB511/1999   |          | MMB511/1000   |          | MMB511/1001 |          |
|                      |         |              |          | $U_{ma}$                  | $V_{ma}$ | $U_{ma}$      | $V_{ma}$ | $U_{ma}$      | $V_{ma}$ | $U_{ma}$    | $V_{ma}$ |
| R.W. Naye            | 5/16/89 | 14:23:30     | 14:26:32 | 0.070, 0.008              |          | -             | -        | -             | -        | -           | -        |
| Evelyn C.            |         | 14:46:35     | 14:46:45 | *                         |          | -             | -        | -             | -        | -           | -        |
| Mary Ellen           | 5/17/89 | 7:57:10      | 7:59:50  | 0.045, -0.003             |          | -             | -        | -             | -        | -           | -        |
| Elaine Jones         |         | 8:07:00      | 8:09:22  | *                         |          | -             | -        | -             | -        | -           | -        |
| Nicholas Duncan      |         | 15:29:38     | 15:33:40 | 0.320, 0.000              |          | -             | -        | -             | -        | -           | -        |
| Mobil Leader         | 5/18/89 | 9:39:47      | 9:41:21  | -                         |          | 0.090, 0.000  |          | 0.060, -0.006 |          | *           | *        |
| Reliance             |         | 12:16:45     | 12:19:13 | -0.005, -0.018            |          | 0.115, -0.003 |          | 0.055, -0.008 |          | *           | *        |
| Cooperative Vanguard |         | 12:41:49     | 12:44:03 | -0.019, -0.008            |          | 0.080, 0.002  |          | 0.040, -0.007 |          | *           | *        |
| Marvin Norman        |         | 13:09:20     | 13:11:27 | 0.005, -0.002             |          | 0.100, 0.000  |          | 0.074, -0.008 |          | *           | *        |
| Illini               |         | 14:31:36     | 14:33:34 | -0.020, -0.015            |          | 0.092, 0.008  |          | 0.053, -0.003 |          | *           | *        |
| Thurston B. Morton   | 5/19/89 | 10:37:56     | 10:40:40 | -                         |          | 0.099, 0.000  |          | 0.065, -0.005 |          | *           | *        |
| Clarence G. Frame    |         | 10:45:36     | 10:47:40 | -                         |          | 0.098, 0.005  |          | 0.068, 0.000  |          | *           | *        |

- Meter was not available

\* Meter did not work

# McEver's Island Site (Concluded)

| Tow name                                                                    | Date    | Passing Time |          | Mean ambient velocity m/s |          |               |          |
|-----------------------------------------------------------------------------|---------|--------------|----------|---------------------------|----------|---------------|----------|
|                                                                             |         | Beginning    | Ending   | MMBS27/642                |          | S4/071        |          |
| R.W. Naye<br>Evelyn C.                                                      | 5/16/89 | 14:23:30     | 14:26:32 | $U_{ma}$                  | $V_{ma}$ | $U_{ma}$      | $V_{ma}$ |
|                                                                             |         | 14:46:35     | 14:46:45 | 0.170, -0.005             | *        | 0.070, -0.003 | *        |
| Mary Ellen<br>Elaine Jones<br>Nicholas Duncan                               | 5/17/89 | 7:57:10      | 7:59:50  | 0.195, -0.050             | *        | 0.053, -0.018 | *        |
|                                                                             |         | 8:07:00      | 8:09:22  | *                         |          | *             |          |
|                                                                             |         | 15:29:38     | 15:33:40 | 0.140, 0.000              |          | -             |          |
| Mobil Leader<br>Reliance<br>Cooperative Vanguard<br>Marvin Norman<br>Illini | 5/18/89 | 9:39:47      | 9:41:21  | -                         |          | 0.030, 0.004  |          |
|                                                                             |         | 12:16:45     | 12:19:13 | 0.110, -0.003             |          | 0.010, -0.020 |          |
|                                                                             |         | 12:41:49     | 12:44:03 | 0.070, -0.004             |          | 0.018, -0.035 |          |
|                                                                             |         | 13:09:20     | 13:11:27 | 0.117, 0.003              |          | 0.080, 0.013  |          |
|                                                                             |         | 14:31:36     | 14:33:34 | 0.095, -0.006             |          | -             |          |
| Thurston B. Morton<br>Clarence G. Frame                                     | 5/19/89 | 10:37:56     | 10:40:40 | -                         |          | *             |          |
|                                                                             |         | 10:45:36     | 10:47:40 | -                         |          | 0.093, -0.038 |          |

- Meter was not available

\* Meter did not work



# Kampsville Site, Trip 1

| Tow name          | Date     | Passing Time |          | Mean ambient velocity m/s |                                 |                                 |                                 |                                 |  |  |  |  |  |  |  |
|-------------------|----------|--------------|----------|---------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|--|--|--|--|--|--|--|
|                   |          | Beginning    | Ending   | MMB511/1001               | MMB511/998                      | MMB511/999                      | MMB511/1000                     | MMB511/642                      |  |  |  |  |  |  |  |
| Mr. Aldo          | 10/12/90 | 13:34:46     | 13:36:48 | U <sub>ma</sub> *         | U <sub>ma</sub> V <sub>ma</sub> | U <sub>ma</sub> V <sub>ma</sub> | U <sub>ma</sub> V <sub>ma</sub> | U <sub>ma</sub> V <sub>ma</sub> |  |  |  |  |  |  |  |
| Floyd Blaske      |          | 13:47:57     | 13:50:10 | *                         | 0.253,-0.005                    | 0.318,-0.011                    | 0.456,-0.008                    | 0.445-0.017                     |  |  |  |  |  |  |  |
| Marvin Norman     | 10/13/90 | 09:31:13     | 09:34:45 | 0.190,-0.007              | 0.333,-0.015                    | 0.327,-0.020                    | *                               | 0.435, 0.010                    |  |  |  |  |  |  |  |
| Luke Burton       |          | 09:55:32     | 09:56:38 | 0.196,-0.005              | 0.334, 0.004                    | 0.330,-0.016                    | 0.466, 0.024                    | 0.433, 0.017                    |  |  |  |  |  |  |  |
| Sugarland         |          | 09:58:35     | 10:01:18 | 0.196,-0.006              | 0.334, 0.004                    | 0.330,-0.016                    | 0.466, 0.024                    | 0.433, 0.017                    |  |  |  |  |  |  |  |
| William C. Norman |          | 11:08:41     | 11:10:15 | 0.204,-0.006              | 0.289, 0.007                    | 0.341,-0.018                    | 0.420,0.041                     | 0.438, 0.014                    |  |  |  |  |  |  |  |
| Frank H. Peavey   |          | 15:20:29     | 15:24:20 | 0.191,-0.006              | 0.295, 0.010                    | 0.362, 0.003                    | 0.397, 0.013                    | 0.420, 0.015                    |  |  |  |  |  |  |  |
| Conti Karla       |          | 16:23:56     | 16:27:38 | 0.204,-0.007              | 0.295, 0.011                    | 0.356, 0.002                    | 0.410, 0.018                    | 0.424, 0.017                    |  |  |  |  |  |  |  |
| Mr. Paul          | 10/14/90 | 10:17:12     | 10:18:58 | 0.211,-0.005              | 0.257, 0.024                    | 0.397, 0.002                    | 0.500, 0.040                    | 0.443, -0.013                   |  |  |  |  |  |  |  |
| Rambler           |          | 10:56:37     | 10:58:25 | 0.226,-0.002              | 0.290, 0.027                    | 0.381, N/A                      | 0.470, 0.030                    | 0.438, 0.016                    |  |  |  |  |  |  |  |
| Mr. Lawrence      |          | 11:42:09     | 11:44:22 | 0.216,-0.005              | 0.292, 0.025                    | 0.385, 0.020                    | 0.470, 0.032                    | 0.445, 0.018                    |  |  |  |  |  |  |  |
| Mallard           |          | 12:25:38     | 12:26:51 | 0.211,-0.002              | 0.290, 0.020                    | 0.378, N/A                      | 0.470, 0.032                    | 0.441, -0.022                   |  |  |  |  |  |  |  |
| Charles Lehman    |          | 13:28:18     | 13:31:24 | 0.215,-0.001              | 0.298, 0.032                    | 0.397, 0.032                    | 0.504, 0.038                    | 0.446, 0.016                    |  |  |  |  |  |  |  |
| Nicholas Duncan   |          | 15:29:11     | 15:31:36 | 0.230,-0.002              | 0.250, 0.026                    | 0.395, 0.029                    | 0.485, 0.035                    | 0.467, 0.018                    |  |  |  |  |  |  |  |
| Jeff Boat         |          | 15:57:43     | 16:00:46 | 0.235,-0.005              | 0.241, 0.025                    | 0.380, 0.025                    | 0.480, 0.035                    | 0.461, 0.015                    |  |  |  |  |  |  |  |
| Mary Ann          |          | 16:36:20     | 16:39:11 | 0.217, 0.000              | 0.245, 0.029                    | 0.390, 0.032                    | 0.515, 0.018                    | 0.450, -0.020                   |  |  |  |  |  |  |  |
| Ardyce Randall    | 10/15/90 | 09:49:07     | 09:51:32 | 0.235,-0.002              | *                               | *                               | *                               | 0.470, 0.011                    |  |  |  |  |  |  |  |
| Mr. Paul          |          | 12:07:21     | 12:09:53 | 0.227,-0.006              | 0.351, 0.039                    | 0.411, 0.032                    | *                               | 0.459, 0.017                    |  |  |  |  |  |  |  |
| Exxon St. Louis   |          | 14:51:40     | 14:53:18 | 0.240,-0.005              | 0.357, 0.034                    | 0.411, 0.027                    | 0.620, 0.000                    | 0.477, 0.015                    |  |  |  |  |  |  |  |
| Margaret O.       |          | 15:11:17     | 15:12:29 | 0.220,-0.005              | 0.350, 0.036                    | 0.405, 0.030                    | 0.422, 0.015                    | 0.455, 0.020                    |  |  |  |  |  |  |  |
| Mr. Lawrence      |          | 18:10:53     | 18:12:36 | 0.225,-0.005              | 0.374, 0.034                    | 0.432, 0.028                    | 0.390, 0.015                    | 0.485, 0.017                    |  |  |  |  |  |  |  |
| A.L. Smith        | 10/16/90 | 10:27:27     | 10:29:00 | 0.240,-0.002              | 0.375, 0.010                    | 0.460,-0.007                    | 0.780, 0.005                    | 0.460, 0.016                    |  |  |  |  |  |  |  |
| Ste. Genevieve    |          | 16:19:41     | 16:22:00 | 0.230,-0.005              | 0.378, 0.000                    | 0.445,-0.022                    | 0.720, 0.007                    | 0.475, 0.018                    |  |  |  |  |  |  |  |
| Nicole Brent      | 10/17/90 | 10:25:21     | 10:26:31 | 0.234, 0.000              | 0.410, 0.037                    | 0.335, 0.030                    | *                               | 0.470, 0.014                    |  |  |  |  |  |  |  |
| Frank H. Peavey   |          | 11:14:06     | 11:15:20 | 0.240,-0.002              | 0.435, 0.028                    | 0.330, 0.075                    | *                               | 0.480, 0.013                    |  |  |  |  |  |  |  |

\* Meter did not work

# Kampsville Site, Trip 1 (Concluded)

| Tow name          | Date     | Passing Time |          | Mean ambient velocity m/s |          |               |          |               |          |
|-------------------|----------|--------------|----------|---------------------------|----------|---------------|----------|---------------|----------|
|                   |          | Beginning    | Ending   | MMB511/332                |          | MMB527/040    |          | MMB527/071    |          |
|                   |          |              |          | $U_{ma}$                  | $V_{ma}$ | $U_{ma}$      | $V_{ma}$ | $U_{ma}$      | $V_{ma}$ |
| Mr. Aldo          | 10/12/90 | 13:34:46     | 13:36:48 | 0.520, -0.018             |          | 0.443, -0.020 |          | 0.468, 0.010  |          |
| Floyd Blaske      |          | 13:47:57     | 13:50:10 | 0.560, -0.020             |          | 0.460, -0.018 |          | 0.470, -0.002 |          |
| Marvin Norman     | 10/13/90 | 09:31:13     | 09:34:45 | 0.531, 0.005              |          | *             |          | 0.445, 0.010  |          |
| Luke Burton       |          | 09:55:32     | 09:56:38 | 0.528, -0.005             |          | *             |          | 0.440, 0.002  |          |
| Sugarland         |          | 09:58:35     | 10:01:18 | 0.528, -0.005             |          | *             |          | 0.440, 0.005  |          |
| William C. Norman |          | 11:08:41     | 11:10:15 | 0.546, -0.004             |          | 0.455, 0.010  |          | 0.445, 0.004  |          |
| Frank H. Peavey   |          | 15:20:29     | 15:24:20 | 0.498, 0.005              |          | 0.430, 0.007  |          | 0.455, -0.001 |          |
| Conti Karla       |          | 16:23:56     | 16:27:38 | 0.505, 0.000              |          | 0.432, 0.010  |          | 0.480, -0.008 |          |
| Mr. Paul          | 10/14/90 | 10:17:12     | 10:18:58 | 0.525, -0.025             |          | *             |          | 0.455, 0.006  |          |
| Rambler           |          | 10:56:37     | 10:58:25 | 0.540, -0.024             |          | 0.461, 0.031  |          | *             |          |
| Mr. Lawrence      |          | 11:42:09     | 11:44:22 | 0.525, -0.019             |          | 0.444, 0.025  |          | 0.470, -0.002 |          |
| Mallard           |          | 12:25:38     | 12:26:51 | 0.520, -0.025             |          | 0.455, 0.021  |          | 0.478, 0.006  |          |
| Charles Lehman    |          | 13:28:18     | 13:31:24 | 0.535, -0.021             |          | 0.440, 0.026  |          | 0.460, 0.001  |          |
| Nicholas Duncan   |          | 15:29:11     | 15:31:36 | 0.560, -0.024             |          | 0.450, 0.021  |          | 0.477, 0.006  |          |
| Jeff Boat         |          | 15:57:43     | 16:00:46 | 0.550, -0.020             |          | 0.470, 0.019  |          | 0.480, 0.015  |          |
| Mary Ann          |          | 16:36:20     | 16:39:11 | 0.550, 0.028              |          | 0.490, 0.021  |          | 0.490, 0.008  |          |
| Ardyce Randall    | 10/15/90 | 09:49:07     | 09:51:32 | 0.541, -0.007             |          | 0.440, 0.021  |          | 0.465, 0.004  |          |
| Mr. Paul          |          | 12:07:21     | 12:09:53 | 0.535, -0.006             |          | 0.440, 0.020  |          | 0.470, -0.010 |          |
| Exxon St. Louis   |          | 14:51:40     | 14:53:18 | 0.558, -0.005             |          | 0.450, 0.020  |          | *             |          |
| Margaret O.       |          | 15:11:17     | 15:12:29 | 0.550, 0.000              |          | 0.480, 0.021  |          | 0.485, 0.000  |          |
| Mr. Lawrence      |          | 18:10:53     | 18:12:36 | 0.540, -0.012             |          | *             |          | *             |          |
| A.L. Smith        | 10/16/90 | 10:27:27     | 10:29:00 | 0.530, -0.005             |          | 0.452, 0.020  |          | 0.490, 0.004  |          |
| Ste. Genevieve    |          | 16:19:41     | 16:22:00 | 0.525, -0.014             |          | 0.449, 0.029  |          | 0.470, 0.000  |          |
| Nicole Brent      | 10/17/90 | 10:25:21     | 10:26:31 | 0.510, -0.025             |          | 0.465, 0.015  |          | 0.450, 0.005  |          |
| Frank H. Peavey   |          | 11:14:06     | 11:15:20 | 0.515, -0.020             |          | 0.475, 0.005  |          | 0.460, 0.009  |          |

\* Meter did not work

# Kampsville Site, Trip 2

| Tow name           | Date    | Passing Time |          | Mean ambient velocity m/s |          |               |          |               |          |
|--------------------|---------|--------------|----------|---------------------------|----------|---------------|----------|---------------|----------|
|                    |         | Beginning    | Ending   | MMB511/1001               |          | MMB511/998    |          | MMB511/999    |          |
| Ranger             | 8/13/91 | 10:08:48     | 10:10:32 | $U_{ma}$                  | $V_{ma}$ | $U_{ma}$      | $V_{ma}$ | $U_{ma}$      | $V_{ma}$ |
| Dixie Patriot      |         | 10:48:40     | 10:50:01 | *                         | *        | 0.151, 0.018  |          | 0.139, 0.002  |          |
| Orleanian          |         | 16:39:53     | 16:42:40 | 0.073, 0.006              |          | *             |          | 0.148, 0.006  |          |
| Pat Breen          |         | 17:45:36     | 17:47:58 | 0.052, 0.005              |          | *             |          | 0.155, 0.000  |          |
| Dixie Express      |         | 18:15:23     | 18:16:04 | 0.091, 0.000              |          | *             |          | 0.116, 0.002  |          |
| Night-14-01        | 8/14/91 | 04:21:06     | 04:23:57 | 0.122, -0.001             |          | *             |          | 0.139, 0.001  |          |
| Night-14-02        |         | 07:15:57     | 07:16:51 | 0.106, 0.001              |          | *             |          | 0.128, 0.005  |          |
| Irving Crown       |         | 10:08:34     | 10:10:45 | 0.073, 0.006              |          | 0.070, N/A    |          | 0.147, 0.004  |          |
| George W. Shamblin |         | 13:16:16     | 13:16:56 | 0.096, 0.001              |          | *             |          | 0.212, 0.009  |          |
| Katherine L.       |         | 13:26:36     | 13:27:20 | 0.092, 0.001              |          | 0.311, -0.002 |          | 0.123, -0.011 |          |
| Thruston B. Morton |         | 14:21:58     | 14:23:57 | 0.063, 0.004              |          | *             |          | 0.151, -0.016 |          |
| Julie White        |         | 14:32:12     | 14:35:45 | 0.031, 0.002              |          | *             |          | 0.121, -0.016 |          |
| Ranger             |         | 17:07:52     | 17:08:16 | 0.071, 0.006              |          | *             |          | 0.119, -0.024 |          |
| Illini             |         | 19:12:43     | 19:14:43 | 0.051, 0.007              |          | *             |          | 0.125, -0.016 |          |
| Bronwynne Brent    |         | 19:23:50     | 19:25:19 | 0.046, 0.007              |          | *             |          | 0.092, -0.015 |          |
| Bill McCormick     | 8/15/91 | 00:02:15     | 00:04:28 | 0.109, 0.005              |          | *             |          | 0.083, -0.011 |          |
| Marvin E. Norman   |         | 03:27:22     | 03:29:18 | 0.108, 0.002              |          | *             |          | *             |          |
| Olmstead           |         | 13:02:42     | 13:05:16 | 0.067, 0.003              |          | 0.072, -0.028 |          | *             |          |
| Jack D. Wofford    |         | 13:39:18     | 13:41:57 | 0.064, 0.010              |          | 0.073, -0.025 |          | 0.129, -0.010 |          |
| Dixie Express      |         | 15:09:12     | 15:10:08 | 0.067, 0.011              |          | 0.056, -0.021 |          | 0.121, -0.019 |          |
| Hal D. Miller      |         | 17:45:56     | 17:46:56 | 0.072, 0.009              |          | 0.071, -0.024 |          | 0.110, -0.015 |          |
| Jesse Brent        |         | 18:10:31     | 18:10:55 | 0.071, 0.010              |          | 0.074, -0.027 |          | 0.118, -0.012 |          |

\* Meter did not work

# Kampsville Site, Trip 2 (Concluded)

| Tow name           | Date    | Passing Time |          | Mean ambient velocity m/s |            |               |            |               |            |
|--------------------|---------|--------------|----------|---------------------------|------------|---------------|------------|---------------|------------|
|                    |         | Beginning    | Ending   | MMB511/1000               | MMB527/642 | MMB527/332    | MMB527/642 | MMB527/332    | MMB527/642 |
| Ranger             | 8/13/91 | 10:08:48     | 10:10:32 | $U_{ma}$ *                | $V_{ma}$   | $U_{ma}$      | $V_{ma}$   | $U_{ma}$      | $V_{ma}$   |
| Dixie Patriot      |         | 10:48:40     | 10:50:01 | 0.391, 0.000              |            | 0.020, N/A    |            | 0.166, 0.012  |            |
| Orleanian          |         | 16:39:53     | 16:42:40 | *                         |            | 0.029, -0.003 |            | 0.170, 0.010  |            |
| Pat Breen          |         | 17:45:36     | 17:47:58 | *                         |            | 0.140, -0.004 |            | 0.159, 0.006  |            |
| Dixie Express      |         | 18:15:23     | 18:16:04 | *                         |            | 0.119, -0.001 |            | 0.151, 0.018  |            |
|                    |         |              |          |                           |            | 0.138, -0.006 |            | 0.174, 0.012  |            |
| Night-14-01        | 8/14/91 | 04:21:06     | 04:23:57 | *                         |            | 0.132, -0.010 |            | 0.175, 0.008  |            |
| Night-14-02        |         | 07:15:57     | 07:16:51 | *                         |            | 0.138, -0.010 |            | 0.162, 0.004  |            |
| Irving Crown       |         | 10:08:34     | 10:10:45 | *                         |            | 0.129, -0.015 |            | 0.142, -0.016 |            |
| George W. Shamblyn |         | 13:16:16     | 13:16:56 | *                         |            | *             |            | 0.136, 0.010  |            |
| Katherine L.       |         | 13:26:36     | 13:27:20 | 0.319, 0.018              |            | *             |            | 0.149, 0.008  |            |
| Thruston B. Morton |         | 14:21:58     | 14:23:57 | *                         |            | *             |            | 0.156, 0.013  |            |
| Julie White        |         | 14:32:12     | 14:35:45 | *                         |            | *             |            | 0.160, 0.026  |            |
| Ranger             |         | 17:07:52     | 17:08:16 | *                         |            | *             |            | 0.160, 0.009  |            |
| Illini             |         | 19:12:43     | 19:14:43 | *                         |            | *             |            | 0.127, 0.012  |            |
| Bronwynne Brent    |         | 19:23:50     | 19:25:19 | *                         |            | *             |            | 0.118, 0.010  |            |
| Bill McCormick     | 8/15/91 | 00:02:15     | 00:04:28 | *                         |            | *             |            | 0.150, 0.008  |            |
| Marvin E. Norman   |         | 03:27:22     | 03:29:18 | *                         |            | *             |            | 0.170, 0.006  |            |
| Olmstead           |         | 13:02:42     | 13:05:16 | 0.023, 0.004              |            | *             |            | 0.180, 0.012  |            |
| Jack D. Wofford    |         | 13:39:18     | 13:41:57 | *                         |            | *             |            | 0.141, 0.013  |            |
| Dixie Express      |         | 15:09:12     | 15:10:08 | *                         |            | 0.095, 0.000  |            | 0.159, 0.010  |            |
| Hal D. Miller      |         | 17:45:56     | 17:46:56 | *                         |            | 0.142, -0.006 |            | 0.142, 0.006  |            |
| Jesse Brent        |         | 18:10:31     | 18:10:55 | *                         |            | 0.123, -0.004 |            | 0.141, 0.008  |            |

\* Meter did not work

# Apple River Island Site

| Tow name               | Date    | Passing Time |          | Mean ambient velocity m/s |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |
|------------------------|---------|--------------|----------|---------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
|                        |         |              |          | MMB511/1001               |                 |                 |                 | MMB511/1000     |                 |                 |                 | MMB511/998      |                 |                 |                 |
|                        |         | Beginning    | Ending   | U <sub>ma</sub>           | V <sub>ma</sub> | U <sub>ma</sub> | V <sub>ma</sub> | U <sub>ma</sub> | V <sub>ma</sub> | U <sub>ma</sub> | V <sub>ma</sub> | U <sub>ma</sub> | V <sub>ma</sub> | U <sub>ma</sub> | V <sub>ma</sub> |
| Yazoo                  | 5/18/90 | 16:20:16     | 16:23:41 | 0.228                     | -0.009          | 0.253           | -0.021          | 0.358           | -0.024          | 0.297           | -0.001          | 0.297           | -0.001          | 0.118           | -0.001          |
| Cooperative Ambassador |         | 16:46:42     | 16:48:55 | 0.212                     | -0.005          | 0.252           | -0.025          | *               |                 | 0.288           | -0.003          | 0.288           | -0.003          | 0.143           | 0.001           |
| Christine Bailey       |         | 17:21:24     | 17:23:17 | 0.227                     | -0.008          | 0.241           | -0.018          | *               |                 | 0.265           | -0.001          | 0.265           | -0.001          | 0.129           | 0.000           |
| Kathy Ellen            |         | 20:07:30     | 20:09:39 | 0.219                     | -0.004          | 0.241           | -0.018          | *               |                 | 0.256           | 0.001           | 0.256           | 0.001           | 0.117           | -0.002          |
| W.A. Kernan            | 5/19/90 | 10:04:10     | 10:07:04 | 0.221                     | -0.006          | 0.228           | -0.023          | 0.317           | 0.013           | 0.158           | -0.009          | 0.158           | -0.009          | -0.005          | -0.009          |
| Hornet                 |         | 11:20:37     | 11:21:31 | 0.221                     | 0.001           | 0.229           | -0.021          | 0.351           | -0.016          | 0.151           | -0.001          | 0.151           | -0.001          | 0.091           | -0.010          |
| Conti-Bonnie           |         | 11:40:41     | 11:42:25 | 0.229                     | 0.001           | 0.245           | -0.021          | 0.371           | -0.004          | 0.149           | -0.009          | 0.149           | -0.009          | 0.101           | -0.010          |
| Becky Lynn             |         | 11:56:12     | 11:58:03 | 0.211                     | -0.001          | 0.229           | -0.022          | 0.382           | 0.011           | 0.152           | -0.010          | 0.152           | -0.010          | 0.110           | -0.009          |
| Merlin Banta           | 5/20/90 | 09:09:21     | 09:10:12 | 0.211                     | 0.001           | 0.241           | -0.015          | *               |                 | 0.132           | 0.013           | 0.132           | 0.013           | 0.053           | -0.007          |
| Rusty Flowers          |         | 11:27:57     | 11:29:38 | 0.209                     | -0.001          | 0.241           | -0.006          | 0.383           | -0.050          | 0.110           | 0.012           | 0.110           | 0.012           | *               |                 |
| Tom Talbert            |         | 12:36:12     | 12:37:48 | 0.219                     | -0.001          | 0.228           | -0.019          | 0.377           | -0.039          | 0.091           | 0.027           | 0.091           | 0.027           | *               |                 |
| Herman Pott            |         | 15:33:19     | 15:35:31 | 0.222                     | -0.003          | 0.221           | -0.016          | 0.389           | -0.024          | 0.072           | 0.022           | 0.072           | 0.022           | *               |                 |
| Walter Brunson         | 5/21/90 | 10:06:14     | 10:08:09 | 0.226                     | 0.000           | 0.261           | -0.014          | *               |                 | 0.493           | 0.005           | 0.493           | 0.005           | 0.378           | -0.025          |
| Dell Butcher           |         | 11:00:40     | 11:02:30 | 0.220                     | 0.001           | 0.251           | -0.015          | 0.353           | -0.018          | 0.521           | 0.015           | 0.521           | 0.015           | 0.380           | -0.020          |
| Mary Gail              |         | 14:19:17     | 14:20:01 | 0.248                     | -0.009          | 0.228           | -0.018          | 0.455           | -0.010          | 0.488           | 0.001           | 0.488           | 0.001           | 0.357           | 0.001           |
| T.S. Kunsman           |         | 14:37:15     | 14:38:33 | 0.247                     | -0.001          | 0.239           | -0.014          | 0.453           | 0.007           | 0.490           | 0.003           | 0.490           | 0.003           | 0.378           | -0.001          |
| D. Ray Miller          |         | 14:55:21     | 14:57:23 | 0.242                     | -0.009          | 0.250           | -0.014          | 0.469           | 0.041           | 0.482           | 0.001           | 0.482           | 0.001           | 0.391           | -0.011          |
| Mary Gail              | 5/22/90 | 10:09:50     | 10:10:25 | 0.238                     | -0.010          | 0.258           | -0.012          | *               |                 | 0.520           | -0.017          | 0.520           | -0.017          | 0.358           | -0.016          |
| Trojan                 |         | 17:08:42     | 17:09:52 | 0.249                     | -0.003          | 0.242           | -0.014          | 0.500           | -0.031          | 0.554           | -0.024          | 0.554           | -0.024          | 0.354           | -0.006          |
| Melinda Brent          |         | 17:28:40     | 17:29:27 | 0.240                     | -0.001          | 0.249           | -0.012          | 0.502           | -0.031          | 0.498           | -0.026          | 0.498           | -0.026          | 0.351           | -0.002          |
| Corporate Mariner      |         | 18:06:22     | 18:07:30 | 0.239                     | -0.001          | 0.246           | -0.010          | *               |                 | 0.518           | -0.020          | 0.518           | -0.020          | 0.353           | -0.016          |
| Ed Renshaw             |         | 19:49:48     |          | -                         | -               | -               | -               | -               | -               | -               | -               | -               | -               | -               | -               |
| Kevin Michael          | 5/23/90 | 06:52:42     | 06:55:13 | -                         | -               | -               | -               | -               | -               | -               | -               | -               | -               | -               | -               |
| Jack D. Wofford        |         | 16:13:23     | 16:14:20 | 0.241                     | -0.001          | 0.228           | -0.011          | 0.502           | 0.012           | 0.506           | -0.001          | 0.506           | -0.001          | 0.312           | -0.001          |
| Trojan                 |         | 16:23:20     | 16:24:42 | 0.238                     | -0.001          | 0.231           | -0.010          | 0.503           | 0.012           | 0.529           | -0.001          | 0.529           | -0.001          | 0.309           | 0.009           |

- Meter was not available  
\* Meter did not work

# Apple River Island Site (Concluded)

| Tow name               | Date    | Passing Time |          | Mean ambient velocity m/s |                 |                 |                 |                 |                 |
|------------------------|---------|--------------|----------|---------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|
|                        |         | Beginning    | Ending   | MMB511/999                |                 | S4/071          |                 | S4/040          |                 |
|                        |         |              |          | U <sub>ma</sub>           | V <sub>ma</sub> | U <sub>ma</sub> | V <sub>ma</sub> | U <sub>ma</sub> | V <sub>ma</sub> |
| Yazoo                  | 5/18/90 | 16:20:16     | 16:23:41 | *                         |                 |                 |                 |                 |                 |
| Cooperative Ambassador |         | 16:46:42     | 16:48:55 | *                         |                 |                 |                 |                 |                 |
| Christine Bailey       |         | 17:21:24     | 17:23:17 | *                         |                 |                 |                 |                 |                 |
| Kathy Ellen            |         | 20:07:30     | 20:09:39 | *                         |                 |                 |                 |                 |                 |
| W.A. Kernan            | 5/19/90 | 10:04:10     | 10:07:04 | *                         |                 | 0.624, -0.048   |                 |                 |                 |
| Hornet                 |         | 11:20:37     | 11:21:31 | *                         |                 | 0.647, -0.049   |                 |                 |                 |
| Conti-Bonnie           |         | 11:40:41     | 11:42:25 | *                         |                 | 0.640, -0.055   |                 |                 |                 |
| Becky Lynn             |         | 11:56:12     | 11:58:03 | *                         |                 | 0.648, -0.061   |                 |                 |                 |
| Merlin Banta           | 5/20/90 | 09:09:21     | 09:10:12 | *                         |                 |                 |                 | 0.561, 0.004    |                 |
| Rusty Flowers          |         | 11:27:57     | 11:29:38 | *                         |                 |                 |                 | *               |                 |
| Tom Talbert            |         | 12:36:12     | 12:37:48 | *                         |                 |                 |                 | 0.627, 0.014    |                 |
| Herman Pott            |         | 15:33:19     | 15:35:31 | *                         |                 | 0.670, -0.051   |                 | *               |                 |
| Walter Brunson         | 5/21/90 | 10:06:14     | 10:08:09 | *                         |                 | 0.597, -0.087   |                 | *               |                 |
| Dell Butcher           |         | 11:00:40     | 11:02:30 | *                         |                 | 0.578, -0.091   |                 | *               |                 |
| Mary Gail              |         | 14:19:17     | 14:20:01 | *                         |                 |                 |                 | 0.520, -0.082   |                 |
| T.S. Kunsman           |         | 14:37:15     | 14:38:33 | *                         |                 | 0.559, -0.070   |                 | 0.588, -0.090   |                 |
| D. Ray Miller          |         | 14:55:21     | 14:57:23 | *                         |                 | 0.567, -0.079   |                 | 0.591, -0.093   |                 |
| Mary Gail              | 5/22/90 | 10:09:50     | 10:10:25 | *                         |                 | 0.583, -0.102   |                 | 0.579, -0.090   |                 |
| Trojan                 |         | 17:08:42     | 17:09:52 | *                         |                 | 0.568, -0.104   |                 | 0.558, -0.091   |                 |
| Melinda Brent          |         | 17:28:40     | 17:29:27 | *                         |                 | 0.588, -0.109   |                 | *               |                 |
| Corporate Mariner      |         | 18:06:22     | 18:07:30 | *                         |                 | 0.561, -0.101   |                 | *               |                 |
| Ed Renshaw             |         | 19:49:48     | 19:49:48 | *                         |                 | *               |                 | 0.570, -0.090   |                 |
| Kevin Michael          | 5/23/90 | 06:52:42     | 06:55:13 | *                         |                 |                 |                 | 0.592, -0.090   |                 |
| Jack D. Wofford        |         | 16:13:23     | 16:14:20 | *                         |                 |                 |                 | 0.609, -0.081   |                 |
| Trojan                 |         | 16:23:20     | 16:24:42 | *                         |                 |                 |                 |                 |                 |

- Meter was not available

\* Meter did not work

# Goose Island Site, Trip 1

| Tow name             | Date    | Passing Time |          | Mean ambient velocity m/s |                 |  |                 |                 |  |                 |                 |  |                 |                 |               |
|----------------------|---------|--------------|----------|---------------------------|-----------------|--|-----------------|-----------------|--|-----------------|-----------------|--|-----------------|-----------------|---------------|
|                      |         | Beginning    | Ending   | MMB511/1001               |                 |  | MMB511/998      |                 |  | MMB511/999      |                 |  | MMB511/1000     |                 |               |
|                      |         |              |          | U <sub>ma</sub>           | V <sub>ma</sub> |  | U <sub>ma</sub> | V <sub>ma</sub> |  | U <sub>ma</sub> | V <sub>ma</sub> |  | U <sub>ma</sub> | V <sub>ma</sub> |               |
| Sierra Dawn          | 8/24/90 | 10:51:08     | 10:52:54 | 0.428                     | -0.008          |  | 0.409           | -0.004          |  | 0.443           | -0.003          |  | 0.294           | 0.003           | 0.350, -0.018 |
| Dell Butcher         |         | 13:42:01     | 13:43:52 | 0.409                     | -0.011          |  | 0.391           | 0.020           |  | 0.429           | -0.014          |  | 0.281           | 0.001           | 0.366, -0.019 |
| William C. Norman    |         | 13:54:34     | 13:57:35 | 0.294                     | -0.006          |  | 0.397           | 0.020           |  | 0.428           | -0.019          |  | 0.295           | 0.001           | 0.353, -0.011 |
| Normania             |         | 14:16:33     | 14:20:50 | 0.408                     | 0.012           |  | 0.381           | 0.019           |  | 0.419           | -0.019          |  | 0.285           | 0.001           | 0.353, -0.015 |
| Dare Carlton         |         | 16:39:17     | 16:40:57 | 0.417                     | 0.003           |  | 0.377           | 0.019           |  | 0.406           | -0.025          |  | 0.259           | 0.006           | *             |
| Hugh C. Blaske       | 8/25/90 | 11:19:46     | 11:22:52 | 0.394                     | 0.030           |  | 0.371           | 0.020           |  | 0.459           | -0.016          |  | 0.287           | -0.001          | 0.493, -0.001 |
| Teresa Renee B.      |         | 12:15:45     | 12:17:17 | 0.358                     | 0.020           |  | 0.373           | 0.020           |  | 0.467           | -0.014          |  | 0.296           | 0.001           | 0.492, 0.001  |
| Trojan Warrior       |         | 12:24:48     | 12:26:28 | 0.349                     | 0.020           |  | 0.364           | 0.020           |  | 0.457           | -0.015          |  | 0.291           | 0.001           | 0.491, 0.002  |
| Hoosier State        |         | 15:45:01     | 15:47:01 | 0.324                     | 0.012           |  | 0.352           | 0.020           |  | 0.408           | -0.022          |  | 0.279           | -0.001          | 0.458, 0.001  |
| Kevin Michael        | 8/26/90 | 11:46:36     | 11:48:36 | -                         | -               |  | 0.373           | 0.020           |  | 0.448           | 0.020           |  | 0.270           | 0.009           | -             |
| Sumac                |         | 13:27:02     | 13:27:21 | -                         | -               |  | 0.341           | -0.007          |  | 0.447           | 0.030           |  | 0.266           | 0.011           | -             |
| Twin City            |         | 14:21:22     | 14:24:00 | -                         | -               |  | 0.346           | 0.020           |  | 0.443           | 0.012           |  | 0.258           | 0.015           | -             |
| Cooperative Vanguard |         | 14:58:35     | 15:01:11 | -                         | -               |  | 0.358           | 0.020           |  | 0.451           | 0.011           |  | 0.260           | 0.012           | -             |
| Superior             | 8/27/90 | 09:54:38     | 09:58:22 | -                         | -               |  | 0.457           | -0.020          |  | 0.547           | 0.025           |  | *               | *               | -             |
| Helen M. Clements    |         | 12:36:11     | 12:38:32 | -                         | -               |  | 0.428           | 0.030           |  | 0.512           | 0.013           |  | 0.358           | 0.020           | -             |

- Meter was not available

\* Meter did not work

# Goose Island Site, Trip 1 (Concluded)

| Tow name             | Date    | Passing Time |          | Mean ambient velocity m/s |               |              |          |          |          |
|----------------------|---------|--------------|----------|---------------------------|---------------|--------------|----------|----------|----------|
|                      |         | Beginning    | Ending   | MMB527/B332               |               | S4/071       |          | S4/040   |          |
| Sierra Dawn          | 8/24/90 | 10:51:08     | 10:52:54 | $U_{ma}$                  | $V_{ma}$      | $U_{ma}$     | $V_{ma}$ | $U_{ma}$ | $V_{ma}$ |
| Dell Butcher         |         | 13:42:01     | 13:43:52 | 0.393, -0.001             | 0.504, -0.012 | 0.478, 0.084 |          |          |          |
| William C. Norman    |         | 13:54:34     | 13:57:35 | 0.389, 0.002              | 0.378, -0.034 | 0.472, 0.870 |          |          |          |
| Normania             |         | 14:16:33     | 14:20:50 | 0.381, 0.027              | 0.358, -0.037 | 0.462, 0.094 |          |          |          |
| Dare Carlton         |         | 16:39:17     | 16:40:57 | 0.319, -0.009             | *             | 0.481, 0.097 |          |          |          |
|                      |         |              |          | 0.223, 0.032              | 0.458, 0.013  | -            |          |          |          |
| Hugh C. Blaske       | 8/25/90 | 11:19:46     | 11:22:52 | 0.152, -0.001             | 0.383, -0.012 | 0.469, 0.072 |          |          |          |
| Teresa Renee B.      |         | 12:15:45     | 12:17:17 | 0.117, -0.002             | *             | 0.432, 0.051 |          |          |          |
| Trojan Warrior       |         | 12:24:48     | 12:26:28 | 0.109, -0.010             | 0.422, -0.070 | 0.416, 0.048 |          |          |          |
| Hoosier State        |         | 15:45:01     | 15:47:01 | 0.242, 0.011              | 0.327, 0.002  | 0.482, 0.062 |          |          |          |
| Kevin Michael        | 8/26/90 | 11:46:36     | 11:48:36 | -                         | *             | 0.451, 0.129 |          |          |          |
| Sumac                |         | 13:27:02     | 13:27:21 | -                         | *             | 0.465, 0.041 |          |          |          |
| Twin City            |         | 14:21:22     | 14:24:00 | -                         | -             | 0.455, 0.038 |          |          |          |
| Cooperative Vanguard |         | 14:58:35     | 15:01:11 | -                         | -             | 0.432, 0.052 |          |          |          |
| Superior             | 8/27/90 | 09:54:38     | 09:58:22 | -                         | -             | -            |          |          |          |
| Helen M. Clements    |         | 12:36:11     | 12:38:32 | -                         | -             | -            |          |          |          |

- Meter was not available

\* Meter did not work



# Goose Island Site, Trip 2

| Tow name               | Date    | Passing Time |          | Mean ambient velocity m/s |               |               |                |                |          |          |          |          |          |          |          |
|------------------------|---------|--------------|----------|---------------------------|---------------|---------------|----------------|----------------|----------|----------|----------|----------|----------|----------|----------|
|                        |         |              |          | MMBS11/1001               | MMBS11/1130   | MMBS11/1131   | MMBS11/998     | MMBS11/999     |          |          |          |          |          |          |          |
|                        |         | Beginning    | Ending   | $U_{ma}$                  | $V_{ma}$      | $U_{ma}$      | $V_{ma}$       | $U_{ma}$       | $V_{ma}$ | $U_{ma}$ | $V_{ma}$ | $U_{ma}$ | $V_{ma}$ | $U_{ma}$ | $V_{ma}$ |
| Ardyce Randall         | 7/18/91 | 10:42:18     | 10:44:10 | 0.054, -0.009             | 0.091, -0.001 | 0.062, 0.001  | 0.024, 0.010   | 0.038, -0.016  |          |          |          |          |          |          |          |
| Scarlet Knight         |         | 12:26:59     | 12:28:46 | 0.306, 0.009              | 0.232, 0.014  | 0.261, 0.003  | -0.017, 0.010  | 0.048, -0.020  |          |          |          |          |          |          |          |
| James F. Neal          |         | 14:17:04     | 14:18:34 | 0.301, 0.010              | 0.158, 0.006  | 0.267, 0.002  | -0.001, 0.009  | 0.036, -0.018  |          |          |          |          |          |          |          |
| Helen M. Clements      |         | 17:23:03     | 17:25:22 | 0.288, 0.010              | 0.166, 0.010  | 0.259, 0.010  | 0.010, 0.007   | 0.036, -0.020  |          |          |          |          |          |          |          |
| Elizabeth Ann          |         | 18:00:59     | 18:02:46 | -                         | -             | -             | -              | -              |          |          |          |          |          |          |          |
| Frank T. Heffelfinger  | 7/19/91 | 11:03:32     | 11:05:24 | 0.298, 0.011              | 0.142, 0.014  | 0.218, 0.006  | 0.029, 0.011   | 0.005, -0.003  |          |          |          |          |          |          |          |
| Queen City             |         | 14:33:45     | 14:35:21 | 0.259, 0.010              | 0.132, 0.011  | 0.197, 0.002  | 0.018, 0.011   | *              |          |          |          |          |          |          |          |
| Helen M. Clements      |         | 16:24:27     | 16:26:12 | 0.251, 0.009              | 0.121, 0.014  | 0.185, 0.001  | *              | 0.012, 0.001   |          |          |          |          |          |          |          |
| Frank T. Heffelfinger  |         | 16:33:21     | 16:36:52 | 0.252, 0.009              | 0.124, 0.014  | 0.183, 0.001  | *              | 0.006, -0.001  |          |          |          |          |          |          |          |
| Cooperative Venture    |         | 18:05:37     | 18:08:27 | 0.272, -0.010             | 0.138, 0.003  | 0.195, 0.004  | *              | *              |          |          |          |          |          |          |          |
| Volunteer State        |         | 18:55:16     | 18:56:45 | 0.262, 0.010              | 0.140, 0.007  | 0.192, 0.001  | -              | -              |          |          |          |          |          |          |          |
| Prairie Dawn           | 7/20/91 | 8:09:31      | 8:11:39  | -                         | -             | -             | -              | -0.001, -0.006 |          |          |          |          |          |          |          |
| Prosperity             |         | 8:19:27      | 8:22:28  | -                         | -             | -             | -              | 0.011, 0.006   |          |          |          |          |          |          |          |
| Clyde Butcher          |         | 11:39:19     | 11:40:55 | -                         | -             | -             | -              | -              |          |          |          |          |          |          |          |
| Lil Charley            |         | 11:55:54     | 11:56:27 | -                         | -             | -             | -              | -              |          |          |          |          |          |          |          |
| C.W. Rushing           |         | 13:31:19     | 13:31:38 | *                         | 0.142, 0.009  | 0.214, 0.003  | -              | 0.011, 0.001   |          |          |          |          |          |          |          |
| Conti-Nan              |         | 16:56:41     | 16:59:16 | 0.261, 0.011              | 0.218, 0.013  | 0.206, 0.010  | *              | *              |          |          |          |          |          |          |          |
| Cooperative Vanguard   | 7/21/91 | 13:08:36     | 13:11:50 | 0.280, 0.006              | 0.202, -0.001 | 0.241, 0.002  | 0.009, 0.009   | 0.009, -0.006  |          |          |          |          |          |          |          |
| Conti-Karla            |         | 14:57:38     | 14:59:13 | 0.259, 0.004              | 0.206, 0.005  | 0.239, 0.009  | -0.011, -0.002 | 0.047, -0.011  |          |          |          |          |          |          |          |
| Cooperative Mariner    | 7/22/91 | 10:34:47     | 10:36:47 | 0.254, 0.015              | 0.129, 0.011  | 0.240, 0.004  | 0.041, -0.004  | 0.071, -0.008  |          |          |          |          |          |          |          |
| Hornet                 |         | 12:11:57     | 12:13:47 | 0.249, 0.016              | 0.189, 0.011  | 0.230, 0.006  | 0.024, -0.006  | 0.056, -0.010  |          |          |          |          |          |          |          |
| Cooperative Ambassador |         | 13:16:41     | 13:18:43 | 0.248, 0.012              | 0.201, 0.003  | 0.229, 0.003  | 0.012, -0.004  | 0.080, 0.010   |          |          |          |          |          |          |          |
| Eastern                |         | 13:20:30     | 13:23:42 | 0.251, 0.011              | 0.198, 0.003  | 0.230, -0.001 | 0.011, -0.003  | 0.079, 0.011   |          |          |          |          |          |          |          |
| Sam M. Fleming         |         | 13:24:11     | 13:25:52 | 0.254, 0.011              | 0.197, 0.003  | 0.238, 0.001  | 0.028, -0.003  | 0.088, 0.010   |          |          |          |          |          |          |          |
| Kevin Michael          |         | 14:00:12     | 14:02:12 | 0.241, 0.011              | 0.206, 0.004  | 0.232, 0.004  | *              | *              |          |          |          |          |          |          |          |
| A.M. Thompson          | 7/23/91 | 14:12:24     | 14:14:23 | 0.265, 0.014              | 0.209, 0.003  | 0.239, 0.006  | *              | 0.084, 0.014   |          |          |          |          |          |          |          |
| Lil Charley            |         | 14:20:30     | 14:20:55 | 0.249, 0.016              | 0.193, 0.004  | 0.221, 0.006  | *              | 0.088, 0.021   |          |          |          |          |          |          |          |
| Badger                 |         | 15:55:55     | 15:57:30 | 0.266, 0.016              | 0.190, 0.001  | 0.244, 0.007  | *              | 0.075, 0.015   |          |          |          |          |          |          |          |
| Kay D                  |         | 15:59:29     | 16:00:13 | 0.263, 0.015              | 0.197, 0.001  | 0.245, 0.009  | *              | 0.092, 0.021   |          |          |          |          |          |          |          |

Goose Island Site, Trip 2 (Continued)

| Tow name            | Date    | Passing Time |          | Mean ambient velocity m/s |                          |                          |               |               |               |               |               |
|---------------------|---------|--------------|----------|---------------------------|--------------------------|--------------------------|---------------|---------------|---------------|---------------|---------------|
|                     |         | Beginning    | Ending   | MMBS11/1001               | MMBS11/1130              | MMBS11/1131              | MMBS11/998    | MMBS11/999    |               |               |               |
| Evey-T              |         | 16:24:21     | 16:26:55 | $U_{ma}$<br>0.260, 0.016  | $U_{ma}$<br>0.185, 0.001 | $U_{ma}$<br>0.232, 0.003 | $U_{ma}$<br>* | $U_{ma}$<br>* | $U_{ma}$<br>* | $V_{ma}$<br>* | $V_{ma}$<br>* |
| G.R. Packet         | 7/24/91 | 8:25:25      | 8:28:39  | 0.432, -0.209             | 0.235, -0.009            | 0.209, 0.007             | -0.005, 0.006 | 0.073, 0.024  |               |               |               |
| Mary L.             |         | 9:14:50      | 9:17:21  | 0.423, -0.209             | 0.237, -0.019            | 0.210, 0.002             | 0.048, -0.006 | 0.147, 0.033  |               |               |               |
| Dud Hollinger       |         | 9:58:51      | 10:02:05 | 0.412, -0.200             | 0.240, -0.016            | 0.209, 0.006             | 0.036, 0.001  | 0.135, 0.034  |               |               |               |
| C.W. Rushing        |         | 12:13:19     | 12:13:57 | 0.409, -0.201             | 0.230, -0.016            | 0.219, 0.008             | 0.021, 0.005  | 0.084, 0.021  |               |               |               |
| Dell Butcher        |         | 13:44:39     | 13:46:27 | 0.426, -0.206             | 0.227, -0.009            | 0.206, 0.001             | 0.008, 0.000  | 0.071, 0.026  |               |               |               |
| Coral Dawn          |         | 14:48:44     | 14:51:19 | 0.411, -0.203             | 0.227, -0.015            | 0.199, 0.002             | 0.003, 0.006  | 0.062, 0.021  |               |               |               |
| Teresa R. Beesecker |         | 15:43:33     | 15:45:33 | 0.411, -0.205             | 0.245, -0.019            | 0.215, 0.006             | 0.036, 0.001  | 0.107, 0.037  |               |               |               |

# Goose Island Site, Trip 2 (Continued)

| Tow name              | Date    | Passing Time |          | Induced velocity m/s |          |               |          |               |          |              |          |                |          |  |  |
|-----------------------|---------|--------------|----------|----------------------|----------|---------------|----------|---------------|----------|--------------|----------|----------------|----------|--|--|
|                       |         | Beginning    | Ending   | MMB511/1000          |          | MMB527/642    |          | MMB527/332    |          | S4/071       |          | S4/151         |          |  |  |
|                       |         |              |          | $U_{im}$             | $V_{im}$ | $U_{im}$      | $V_{im}$ | $U_{im}$      | $V_{im}$ | $U_{im}$     | $V_{im}$ | $U_{im}$       | $V_{im}$ |  |  |
| Ardyce Randall        | 7/18/91 | 10:42:18     | 10:44:10 | 0.031, -0.009        |          | 0.443, 0.001  |          | 0.527, -0.001 |          | -            |          | -0.086, -0.006 |          |  |  |
| Scarlet Knight        |         | 12:26:59     | 12:28:46 | 0.051, -0.019        |          | 0.482, 0.001  |          | 0.481, 0.002  |          | -            |          | -              |          |  |  |
| James F. Neal         |         | 14:17:04     | 14:18:34 | 0.029, -0.019        |          | 0.489, 0.001  |          | 0.497, -0.001 |          | 0.611, 0.043 |          | 0.649, 0.111   |          |  |  |
| Helen M. Clements     |         | 17:23:03     | 17:25:22 | 0.035, -0.018        |          | 0.489, 0.003  |          | 0.482, -0.011 |          | -            |          | *              |          |  |  |
| Elizabeth Ann         |         | 18:00:59     | 18:02:46 | -                    |          | 0.525, -0.001 |          | *             |          | -            |          | -              |          |  |  |
| Frank T. Heffelfinger | 7/19/91 | 11:03:32     | 11:05:24 | 0.011, 0.000         |          | 0.450, -0.001 |          | 0.631, -0.011 |          | -            |          | -              |          |  |  |
| Queen City            |         | 14:33:45     | 14:35:21 | 0.140, -0.010        |          | 0.428, -0.011 |          | 0.581, -0.011 |          | *            |          | -              |          |  |  |
| Helen M. Clements     |         | 16:24:27     | 16:26:12 | 0.027, -0.006        |          | 0.432, -0.014 |          | 0.589, -0.009 |          | 0.556, 0.016 |          | -              |          |  |  |
| Frank T. Heffelfinger |         | 16:33:21     | 16:36:52 | 0.019, 0.001         |          | 0.418, -0.010 |          | 0.583, -0.004 |          | 0.542, 0.018 |          | -              |          |  |  |
| Cooperative Venture   |         | 18:05:37     | 18:08:27 | 0.017, 0.010         |          | -             |          | -             |          | -            |          | -              |          |  |  |
| Volunteer State       |         | 18:55:16     | 18:56:45 | -                    |          | -             |          | -             |          | -            |          | -              |          |  |  |
| Prairie Dawn          | 7/20/91 | 8:09:31      | 8:11:39  | 0.032, 0.011         |          | -             |          | -             |          | -            |          | 0.620, 0.121   |          |  |  |
| Prosperity            |         | 8:19:27      | 8:22:28  | 0.028, 0.011         |          | 0.436, -0.022 |          | 0.559, -0.016 |          | -            |          | 0.603, 0.122   |          |  |  |
| Clyde Butcher         |         | 11:39:19     | 11:40:55 | -                    |          | 0.391, -0.016 |          | 0.547, -0.024 |          | -            |          | 0.676, 0.131   |          |  |  |
| Lil Charley           |         | 11:55:54     | 11:56:27 | -                    |          | 0.398, -0.010 |          | 0.533, -0.021 |          | -            |          | 0.646, 0.119   |          |  |  |
| C. W. Rushing         |         | 13:31:19     | 13:31:38 | 0.049, -0.006        |          | 0.411, -0.022 |          | 0.543, -0.010 |          | -            |          | 0.621, 0.119   |          |  |  |
| Conti-Nan             |         | 16:56:41     | 16:59:16 | 0.019, 0.000         |          | 0.423, -0.015 |          | 0.479, -0.030 |          | -            |          | 0.598, 0.119   |          |  |  |
| Cooperative Vanguard  | 7/21/91 | 13:08:36     | 13:11:50 | 0.011, -0.001        |          | 0.451, -0.015 |          | 0.499, -0.010 |          | 0.497, 0.021 |          | 0.611, 0.111   |          |  |  |
| Conti-Karla           |         | 14:57:38     | 14:59:13 | *                    |          | 0.411, -0.014 |          | 0.478, -0.015 |          | 0.482, 0.025 |          | 0.562, 0.091   |          |  |  |

Goose Island Site, Trip 2 (Continued)

| Tow name               | Date    | Passing Time |          | Induced velocity m/s |          |               |          |               |          |               |          |              |          |          |          |
|------------------------|---------|--------------|----------|----------------------|----------|---------------|----------|---------------|----------|---------------|----------|--------------|----------|----------|----------|
|                        |         | Beginning    | Ending   | MMB511/1000          |          |               |          | MMB527/642    |          |               |          | MMB527/332   |          |          |          |
|                        |         |              |          | $U_{im}$             | $V_{im}$ | $U_{im}$      | $V_{im}$ | $U_{im}$      | $V_{im}$ | $U_{im}$      | $V_{im}$ | $U_{im}$     | $V_{im}$ | $U_{im}$ | $V_{im}$ |
| Cooperative Mariner    | 7/22/91 | 10:34:47     | 10:36:47 | 0.093, -0.015        |          | 0.421, -0.011 |          | 0.382, -0.031 |          | -             |          | 0.591, 0.109 |          |          |          |
| Hornet                 |         | 12:11:57     | 12:13:47 | 0.079, -0.011        |          | 0.411, -0.011 |          | 0.497, -0.009 |          | 0.473, 0.031  |          | 0.582, 0.110 |          |          |          |
| Cooperative Ambassador |         | 13:16:41     | 13:18:43 | 0.061, -0.009        |          | 0.361, -0.001 |          | 0.462, -0.012 |          | 0.477, 0.030  |          | 0.568, 0.101 |          |          |          |
| Eastern                |         | 13:20:30     | 13:23:42 | 0.062, -0.011        |          | 0.360, -0.001 |          | 0.455, -0.011 |          | 0.476, 0.033  |          | 0.546, 0.102 |          |          |          |
| Sam M. Fleming         |         | 13:24:11     | 13:25:52 | 0.082, -0.013        |          | 0.379, -0.008 |          | 0.449, -0.011 |          | 0.491, 0.025  |          | 0.549, 0.111 |          |          |          |
| Kevin Michael          |         | 14:00:12     | 14:02:12 | *                    |          | 0.413, -0.010 |          | 0.447, -0.021 |          | 0.461, 0.026  |          | 0.581, 0.110 |          |          |          |
| A.M. Thompson          | 7/23/91 | 14:12:24     | 14:14:23 | 0.067, -0.010        |          | 0.421, -0.019 |          | 0.468, -0.024 |          | 0.512, 0.065  |          | 0.555, 0.099 |          |          |          |
| Lil Charley            |         | 14:20:30     | 14:20:55 | 0.077, -0.003        |          | 0.403, -0.018 |          | 0.447, -0.021 |          | 0.518, 0.063  |          | 0.561, 0.102 |          |          |          |
| Badger                 |         | 15:55:55     | 15:57:30 | 0.060, -0.010        |          | 0.437, -0.011 |          | 0.484, -0.020 |          | 0.548, -0.060 |          | 0.572, 0.102 |          |          |          |
| Kay D                  |         | 15:59:29     | 16:00:13 | 0.070, -0.013        |          | 0.448, 0.015  |          | 0.467, -0.021 |          | 0.522, 0.061  |          | 0.571, 0.117 |          |          |          |
| Evey-T                 |         | 16:24:21     | 16:26:55 | *                    |          | 0.445, -0.016 |          | 0.492, -0.019 |          | 0.531, 0.055  |          | 0.579, 0.106 |          |          |          |
| G.R. Packet            |         | 8:25:25      | 8:28:39  | 0.060, -0.001        |          | 0.331, 0.011  |          | 0.142, 0.009  |          | -             |          | 0.547, 0.095 |          |          |          |
| Mary L.                | 7/24/91 | 9:14:50      | 9:17:21  | 0.131, -0.021        |          | 0.325, 0.011  |          | 0.141, 0.011  |          | -             |          | 0.566, 0.100 |          |          |          |
| Dud Hollinger          |         | 9:58:51      | 10:02:05 | 0.112, -0.010        |          | *             |          | 0.141, 0.010  |          | 0.498, 0.053  |          | 0.557, 0.083 |          |          |          |
| C.W. Rushing           |         | 12:13:19     | 12:13:57 | 0.091, -0.006        |          | 0.309, 0.011  |          | 0.142, 0.001  |          | 0.468, 0.051  |          | 0.534, 0.086 |          |          |          |
| Dell Butcher           |         | 13:44:39     | 13:46:27 | 0.051, 0.001         |          | 0.301, 0.011  |          | 0.157, -0.001 |          | 0.477, 0.055  |          | 0.498, 0.079 |          |          |          |
| Coral Dawn             |         | 14:48:44     | 14:51:19 | *                    |          | 0.297, 0.009  |          | 0.157, 0.000  |          | 0.483, 0.060  |          | 0.530, 0.092 |          |          |          |
| Teresa R. Beecker      |         | 15:43:33     | 15:45:33 | 0.116, 0.000         |          | 0.311, 0.011  |          | 0.162, -0.001 |          | 0.490, 0.069  |          | 0.540, 0.067 |          |          |          |

Goose Island Site, Trip 2 (Continued)

| Tow name                                                                                                                    | Date    | Passing Time |          | Induced velocity m/s |          |              |          |              |          |
|-----------------------------------------------------------------------------------------------------------------------------|---------|--------------|----------|----------------------|----------|--------------|----------|--------------|----------|
|                                                                                                                             |         | Beginning    | Ending   | S4/040               |          | S4/832       |          | S4/834       |          |
|                                                                                                                             |         |              |          | $U_{im}$             | $V_{im}$ | $U_{im}$     | $V_{im}$ | $U_{im}$     | $V_{im}$ |
| Ardyce Randall<br>Scarlet Knight<br>James F. Neal<br>Helen M. Clements<br>Elizabeth Ann                                     | 7/18/91 | 10:42:18     | 10:44:10 | -                    | -        | 0.072, 0.074 | -        | 0.741, 0.019 | -        |
|                                                                                                                             |         | 12:26:59     | 12:28:46 | -                    | -        | 0.031, 0.048 | -        | 0.717, 0.001 | -        |
|                                                                                                                             |         | 14:17:04     | 14:18:34 | 0.623, 0.070         | -        | -            | -        | 0.437, 0.617 | -        |
|                                                                                                                             |         | 17:23:03     | 17:25:22 | 0.678, 0.142         | -        | -            | -        | 0.404, 0.572 | -        |
|                                                                                                                             |         | 18:00:59     | 18:02:46 | -                    | -        | -            | -        | -            | -        |
| Frank T. Heffelfinger<br>Queen City<br>Helen M. Clements<br>Frank T. Heffelfinger<br>Cooperative Venture<br>Volunteer State | 7/19/91 | 11:03:32     | 11:05:24 | -                    | -        | -            | -        | 0.691, 0.029 | -        |
|                                                                                                                             |         | 14:33:45     | 14:35:21 | -                    | -        | -            | -        | 0.686, 0.021 | -        |
|                                                                                                                             |         | 16:24:27     | 16:26:12 | -                    | -        | -            | -        | 0.687, 0.011 | -        |
|                                                                                                                             |         | 16:33:21     | 16:36:52 | -                    | -        | -            | -        | 0.693, 0.015 | -        |
|                                                                                                                             |         | 18:05:37     | 18:08:27 | -                    | -        | -            | -        | 0.693, 0.019 | -        |
|                                                                                                                             |         | 18:55:16     | 18:56:45 | -                    | -        | -            | -        | -            | -        |
|                                                                                                                             |         | -            | -        | -                    | -        | -            | -        | -            | -        |
| Prairie Dawn<br>Prosperity<br>Clyde Butcher<br>Lil Charley<br>C.W. Rushing<br>Conti-Nan                                     | 7/20/91 | 8:09:31      | 8:11:39  | -                    | -        | -            | -        | 0.657, 0.020 | -        |
|                                                                                                                             |         | 8:19:27      | 8:22:28  | -                    | -        | -            | -        | 0.671, 0.028 | -        |
|                                                                                                                             |         | 11:39:19     | 11:40:55 | -                    | -        | 0.659, 0.030 | -        | 0.681, 0.021 | -        |
|                                                                                                                             |         | 11:55:54     | 11:56:27 | -                    | -        | 0.673, 0.022 | -        | 0.698, 0.012 | -        |
|                                                                                                                             |         | 13:31:19     | 13:31:38 | -                    | -        | 0.670, 0.020 | -        | 0.672, 0.010 | -        |
|                                                                                                                             |         | 16:56:41     | 16:59:16 | -                    | -        | 0.680, 0.010 | -        | 0.679, 0.018 | -        |
| Cooperative Vanguard<br>Conti-Karla                                                                                         | 7/21/91 | 13:08:36     | 13:11:50 | 0.619, 0.180         | -        | 0.609, 0.010 | -        | 0.647, 0.027 | -        |
|                                                                                                                             |         | 14:57:38     | 14:59:13 | 0.590, 0.151         | -        | 0.643, 0.010 | -        | 0.647, 0.014 | -        |

# Goose Island Site, Trip 2 (Concluded)

| Tow name                                                                       | Date    | Passing Time |          | Induced velocity m/s |          |               |              |
|--------------------------------------------------------------------------------|---------|--------------|----------|----------------------|----------|---------------|--------------|
|                                                                                |         | Beginning    | Ending   | S4/040               |          | S4/832        |              |
|                                                                                |         |              |          | $U_{im}$             | $V_{im}$ | $U_{im}$      | $V_{im}$     |
| Cooperative Mariner<br>Hornet<br>Cooperative Ambassador<br>Eastern             | 7/22/91 | 10:34:47     | 10:36:47 | 0.581, 0.152         |          | 0.598, -0.001 | 0.617, 0.019 |
|                                                                                |         | 12:11:57     | 12:13:47 | 0.597, 0.160         |          | 0.618, 0.010  | 0.626, 0.019 |
|                                                                                |         | 13:16:41     | 13:18:43 | 0.550, 0.131         |          | 0.595, 0.012  | 0.599, 0.022 |
|                                                                                |         | 13:20:30     | 13:23:42 | 0.550, 0.139         |          | 0.604, 0.003  | 0.590, 0.021 |
|                                                                                |         | 13:24:11     | 13:25:52 | 0.584, 0.151         |          | 0.640, 0.009  | 0.616, 0.029 |
| Sam M. Fleming                                                                 |         | 14:00:12     | 14:02:12 | 0.569, 0.126         |          | 0.632, -0.010 | 0.611, 0.019 |
| Kevin Michael<br><br>A.M. Thompson<br>Lil Charley<br>Badger<br>Kay D<br>Evey-T | 7/23/91 | 14:12:24     | 14:14:23 | 0.653, 0.090         |          | 0.648, 0.042  | 0.582, 0.033 |
|                                                                                |         | 14:20:30     | 14:20:55 | 0.588, 0.072         |          | 0.628, 0.039  | 0.592, 0.031 |
|                                                                                |         | 15:55:55     | 15:57:30 | 0.641, 0.100         |          | 0.622, 0.050  | 0.626, 0.030 |
|                                                                                |         | 15:59:29     | 16:00:13 | 0.611, 0.102         |          | 0.600, 0.047  | 0.631, 0.029 |
|                                                                                |         | 16:24:21     | 16:26:55 | 0.609, 0.102         |          | 0.631, 0.042  | 0.641, 0.026 |
| G.R. Packet<br>Mary L.<br>Dud Hollinger                                        | 7/24/91 | 8:25:25      | 8:28:39  | 0.590, 0.095         |          | 0.600, 0.039  | 0.591, 0.032 |
|                                                                                |         | 9:14:50      | 9:17:21  | 0.561, 0.100         |          | 0.582, 0.039  | -            |

# Clarks Ferry Site, Trip 1

| Tow name             | Date    | Passing Time |          | Mean ambient velocity m/s |               |               |               |               |          |               |          |
|----------------------|---------|--------------|----------|---------------------------|---------------|---------------|---------------|---------------|----------|---------------|----------|
|                      |         | Beginning    | Ending   | MMBS11/1001               | MMBS11/1130   | MMBS11/1131   | MMBS11/998    | MMBS11/999    |          |               |          |
|                      |         |              |          | $U_{ma}$                  | $V_{ma}$      | $U_{ma}$      | $V_{ma}$      | $U_{ma}$      | $V_{ma}$ | $U_{ma}$      | $V_{ma}$ |
| C.W. Rushing 1       | 5/16/91 | 12:07:44     | 12:08:56 |                           | 0.198, -0.001 | 0.248, -0.009 | 0.483, -0.006 |               |          |               |          |
| Donnie Ray Jr. 1     |         | 12:22:50     | 12:24:30 | *                         | 0.386, -0.003 | 0.479, -0.017 | 0.481, 0.007  | *             |          |               |          |
| Samantha             |         | 13:26:43     | 13:27:06 | *                         | 0.204, -0.002 | 0.257, -0.006 | 0.253, -0.008 |               |          | 0.308, -0.004 |          |
| C.W. Rushing 2       | 5/17/91 | 12:26:16     | 12:26:36 | 0.109, 0.016              | 0.199, 0.008  | 0.241, 0.011  | 0.257, 0.010  | 0.314, -0.001 |          |               |          |
| Jenco Towing         |         | 15:03:40     | 15:04:39 | 0.121, 0.014              | 0.197, 0.006  | 0.247, 0.010  | 0.278, -0.012 | 0.317, -0.014 |          |               |          |
| T.S. Kunsman         |         | 16:31:55     | 16:33:22 | *                         | 0.206, 0.008  | 0.264, 0.010  | 0.271, -0.010 | 0.337, -0.012 |          |               |          |
| Dell Butcher 1       |         | 17:43:27     | 17:46:12 | 0.110, 0.018              | 0.207, -0.020 | 0.249, -0.016 | 0.278, -0.012 | 0.324, -0.011 |          |               |          |
| Pearl B.             | 5/19/91 | 10:06:30     | 10:07:53 | -                         | -             | -             | -             | -             |          |               |          |
| Conti-Afton          |         | 11:41:08     | 11:42:35 | -                         | -             | -             | -             | -             |          |               |          |
| Jack D. Wofford      |         | 16:33:57     | 16:35:16 | 0.106, 0.002              | 0.213, 0.010  | 0.259, 0.011  | 0.205, -0.011 | 0.318, -0.010 |          |               |          |
| Donnie Ray Jr. 2     | 5/20/91 | 11:33:41     | 11:36:31 | 0.108, 0.005              | 0.210, 0.004  | 0.252, 0.012  | 0.199, 0.010  | 0.311, -0.012 |          |               |          |
| Sunflower 1          |         | 12:24:22     | 12:24:37 | 0.099, 0.005              | 0.209, 0.001  | 0.248, 0.012  | 0.202, 0.015  | 0.312, -0.007 |          |               |          |
| American Beauty 1    |         | 15:48:23     | 15:50:13 | 0.101, 0.009              | 0.209, 0.005  | 0.256, 0.013  | 0.202, 0.009  | 0.319, -0.010 |          |               |          |
| Sierra Dawn          | 5/21/91 | 09:09:28     | 09:11:00 | 0.113, 0.005              | 0.210, 0.011  | 0.246, 0.015  | 0.221, -0.009 | 0.319, 0.002  |          |               |          |
| Cooperative Vanguard |         | 09:36:54     | 09:37:56 | 0.136, 0.001              | 0.212, 0.005  | 0.252, 0.011  | 0.203, -0.013 | 0.306, -0.004 |          |               |          |
| Cindy J. Erickson    |         | 10:29:26     | 10:31:47 | 0.134, 0.000              | 0.211, 0.010  | 0.249, 0.011  | 0.218, -0.011 | 0.314, -0.004 |          |               |          |
| Frank H. Peavy       |         | 10:49:16     | 10:50:37 | 0.129, -0.001             | 0.218, 0.010  | 0.257, 0.011  | 0.216, -0.009 | 0.311, -0.001 |          |               |          |
| Helen M. Clements    |         | 11:32:51     | 11:34:43 | 0.129, -0.001             | 0.209, 0.005  | 0.246, 0.012  | 0.209, -0.015 | 0.317, -0.009 |          |               |          |
| Sunflower 2          |         | 12:13:06     | 12:13:22 | 0.130, 0.001              | 0.206, 0.002  | .246, 0.014   | 0.214, -0.016 | 0.324, -0.002 |          |               |          |
| Dell Butcher 2       |         | 12:37:20     | 12:38:44 | 0.132, -0.001             | 0.209, 0.004  | 0.248, 0.014  | 0.208, -0.014 | 0.307, -0.004 |          |               |          |
| Hornet               |         | 13:30:54     | 13:32:27 | 0.131, 0.001              | 0.211, 0.006  | 0.250, 0.013  | 0.209, -0.011 | 0.321, -0.003 |          |               |          |
| Volunteer State      |         | 16:08:16     | 16:09:56 | 0.128, 0.003              | 0.211, 0.004  | 0.247, 0.011  | 0.217, -0.012 | 0.323, -0.003 |          |               |          |
| Edward J. Hancock    | 5/22/91 | 09:52:51     | 09:55:33 | *                         | 0.205, 0.005  | 0.248, 0.011  | *             | 0.312, -0.008 |          |               |          |
| Starfire             |         | 10:54:32     | 10:56:51 | 0.129, 0.004              | 0.211, 0.007  | 0.245, 0.009  | *             | 0.313, -0.010 |          |               |          |
| American Beauty 2    |         | 13:46:39     | 13:47:10 | 0.139, 0.001              | 0.209, 0.010  | 0.243, 0.009  | 0.221, -0.017 | 0.317, -0.009 |          |               |          |

- Meter was not available

\* Meter did not work

# Clarks Ferry Site, Trip 1 (Continued)

| Tow name             | Date    | Passing Time |          | Mean ambient velocity m/s |                 |                 |                 |                 |                 |                 |                 |                 |                 |  |  |
|----------------------|---------|--------------|----------|---------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|--|--|
|                      |         | Beginning    | Ending   | MMB511/1000               |                 | MMB527/332      |                 | MMB527/642      |                 | S4/151          |                 | S4/1834         |                 |  |  |
|                      |         |              |          | U <sub>ma</sub>           | V <sub>ma</sub> | U <sub>ma</sub> | V <sub>ma</sub> | U <sub>ma</sub> | V <sub>ma</sub> | U <sub>ma</sub> | V <sub>ma</sub> | U <sub>ma</sub> | V <sub>ma</sub> |  |  |
| C.W. Rushing 1       | 5/16/91 | 12:07:44     | 12:08:56 | 0.698,-0.013              |                 | 0.688,0.001     |                 | 0.618,-0.011    |                 | *               |                 | -               |                 |  |  |
| Donnie Ray Jr. 1     |         | 12:22:50     | 12:24:30 | 0.692,-0.010              |                 | 0.613,0.003     |                 | 0.637,-0.007    |                 | *               |                 | -               |                 |  |  |
| Samantha             |         | 13:26:43     | 13:27:06 | 0.368,-0.002              |                 | 0.687,-0.006    |                 | 0.613,-0.011    |                 | *               |                 | -               |                 |  |  |
| C.W. Rushing 2       | 5/17/91 | 12:26:16     | 12:26:36 | 0.344,0.011               |                 | 0.495,0.002     |                 | *               |                 | *               |                 | 0.287,0.143     |                 |  |  |
| Jemco Towing         |         | 15:03:40     | 15:04:39 | 0.359,-0.011              |                 | 0.498,-0.009    |                 | 0.692,0.017     |                 | 0.211,-0.066    |                 | 0.166,0.092     |                 |  |  |
| T.S. Kunsman         |         | 16:31:55     | 16:33:22 | 0.361,-0.010              |                 | 0.489,0.011     |                 | 0.646,-0.006    |                 | *               |                 | 0.185,0.074     |                 |  |  |
| Dell Butcher 1       |         | 17:43:27     | 17:46:12 | 0.341,-0.011              |                 | *               |                 | *               |                 | 0.229,-0.054    |                 | 0.254,0.133     |                 |  |  |
| Pearl B.             | 5/19/91 | 10:06:30     | 10:07:53 | -                         |                 | 0.497,0.001     |                 | 0.508,-0.010    |                 | 0.168,0.019     |                 | 0.257,0.121     |                 |  |  |
| Conti-Afton          |         | 11:41:08     | 11:42:35 | -                         |                 | 0.524,-0.008    |                 | 0.523,-0.011    |                 | 0.178,0.017     |                 | 0.271,0.126     |                 |  |  |
| Jack D. Wofford      |         | 16:33:57     | 16:35:16 | 0.352,-0.013              |                 | 0.515,0.000     |                 | 0.507,-0.011    |                 | 0.242,-0.014    |                 | 0.388,0.168     |                 |  |  |
| Donnie Ray Jr. 2     | 5/20/91 | 11:33:41     | 11:36:31 | 0.339,-0.014              |                 | 0.474,0.016     |                 | 0.493,-0.019    |                 | *               |                 | *               |                 |  |  |
| Sunflower 1          |         | 12:24:22     | 12:24:37 | 0.344,-0.009              |                 | 0.451,0.013     |                 | 0.482,-0.008    |                 | *               |                 | *               |                 |  |  |
| American Beauty 1    |         | 15:48:23     | 15:50:13 | 0.349,-0.010              |                 | 0.481,0.017     |                 | 0.473,-0.013    |                 | *               |                 | 0.331,0.158     |                 |  |  |
| Sierra Dawn          | 5/21/91 | 09:09:28     | 09:11:00 | 0.359,-0.006              |                 | -               |                 | -               |                 | *               |                 | *               |                 |  |  |
| Cooperative Vanguard |         | 09:36:54     | 09:37:56 | 0.343,-0.006              |                 | -               |                 | -               |                 | -               |                 | *               |                 |  |  |
| Cindy J. Erickson    |         | 10:29:26     | 10:31:47 | 0.348,-0.009              |                 | -               |                 | -               |                 | -               |                 | *               |                 |  |  |
| Frank H. Peavy       |         | 10:49:16     | 10:50:37 | 0.352,-0.010              |                 | -               |                 | -               |                 | -               |                 | *               |                 |  |  |
| Helen M. Clements    |         | 11:32:51     | 11:34:43 | 0.361,-0.010              |                 | -               |                 | -               |                 | -               |                 | -               |                 |  |  |
| Sunflower 2          |         | 12:13:06     | 12:13:22 | 0.363,-0.007              |                 | -               |                 | -               |                 | -               |                 | -               |                 |  |  |
| Dell Butcher 2       |         | 12:37:20     | 12:38:44 | 0.348,-0.009              |                 | -               |                 | -               |                 | -               |                 | -               |                 |  |  |
| Hornet               |         | 13:30:54     | 13:32:27 | 0.352,-0.009              |                 | -               |                 | -               |                 | -               |                 | -               |                 |  |  |
| Volunteer State      |         | 16:08:16     | 16:09:56 | 0.371,-0.010              |                 | -               |                 | -               |                 | -               |                 | 0.583,0.029     |                 |  |  |
| Edward J. Hancock    | 5/22/91 | 09:52:51     | 09:55:33 | 0.349,-0.010              |                 | -               |                 | -               |                 | -               |                 | 0.625,0.056     |                 |  |  |
| Starfire             |         | 10:54:32     | 10:56:51 | 0.361,-0.015              |                 | -               |                 | -               |                 | -               |                 | 0.623,0.043     |                 |  |  |
| American Beauty 2    |         | 13:46:39     | 13:47:10 | 0.377,-0.017              |                 | -               |                 | -               |                 | -               |                 | 0.615,0.021     |                 |  |  |

- Meter was not available

\* Meter did not work



# Clarks Ferry Site, Trip 1 (Concluded)

| Tow name             | Date    | Passing Time |          | Mean ambient velocity m/s |                 |                 |                 |                 |                 |
|----------------------|---------|--------------|----------|---------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|
|                      |         | Beginning    | Ending   | S4/040                    |                 | S4/832          |                 | S4/071          |                 |
|                      |         |              |          | U <sub>ma</sub>           | V <sub>ma</sub> | U <sub>ma</sub> | V <sub>ma</sub> | U <sub>ma</sub> | V <sub>ma</sub> |
| C.W. Rushing 1       | 5/16/91 | 12:07:44     | 12:08:56 | -                         | -               | 0.746, 0.029    | -               | -               | -               |
| Donnie Ray Jr. 1     |         | 12:22:50     | 12:24:30 | -                         | -               | 0.798, 0.017    | -               | -               | -               |
| Samantha             |         | 13:26:43     | 13:27:06 | -                         | -               | 0.754, 0.028    | -               | -               | -               |
| C.W. Rushing 2       | 5/17/91 | 12:26:16     | 12:26:36 | *                         | *               | 0.321, 0.031    | 0.591, 0.058    |                 |                 |
| Jemco Towing         |         | 15:03:40     | 15:04:39 | *                         | *               | 0.158, 0.021    | 0.645, 0.062    |                 |                 |
| T.S. Kunsman         |         | 16:31:55     | 16:33:22 | *                         | *               | *               | 0.584, 0.063    |                 |                 |
| Dell Butcher 1       |         | 17:43:27     | 17:46:12 | *                         | *               | 0.210, 0.023    | 0.643, 0.067    |                 |                 |
| Pearl B.             | 5/19/91 | 10:06:30     | 10:07:53 | *                         | *               | 0.209, 0.021    | -               |                 |                 |
| Conti-Afton          |         | 11:41:08     | 11:42:35 | *                         | *               | 0.216, 0.021    | 0.556, 0.063    |                 |                 |
| Jack D. Wofford      |         | 16:33:57     | 16:35:16 | *                         | *               | 0.294, 0.027    | 0.547, 0.061    |                 |                 |
| Donnie Ray Jr. 2     | 5/20/91 | 11:33:41     | 11:36:31 | 0.639--0.007              | *               | *               | *               |                 |                 |
| Sunflower 1          |         | 12:24:22     | 12:24:37 | 0.652, 0.014              | *               | *               | *               |                 |                 |
| American Beauty 1    |         | 15:48:23     | 15:50:13 | 0.658, 0.003              | 0.252, 0.021    | *               | *               |                 |                 |
| Sierra Dawn          | 5/21/91 | 09:09:28     | 09:11:00 | 0.616, 0.017              | 0.268, 0.023    | *               | *               |                 |                 |
| Cooperative Vanguard |         | 09:36:54     | 09:37:56 | 0.638, 0.016              | *               | *               | -               |                 |                 |
| Cindy J. Erickson    |         | 10:29:26     | 10:31:47 | 0.627, 0.022              | 0.278, 0.023    | -               | -               |                 |                 |
| Frank H. Peavy       |         | 10:49:16     | 10:50:37 | 0.627, 0.016              | *               | *               | -               |                 |                 |
| Helen M. Clements    |         | 11:32:51     | 11:34:43 | 0.643, 0.017              | *               | *               | -               |                 |                 |
| Sunflower 2          |         | 12:13:06     | 12:13:22 | 0.619, 0.010              | *               | *               | -               |                 |                 |
| Dell Butcher 2       |         | 12:37:20     | 12:38:44 | 0.621, 0.016              | *               | *               | -               |                 |                 |
| Hornet               |         | 13:30:54     | 13:32:27 | 0.594, 0.012              | *               | *               | -               |                 |                 |
| Volunteer State      |         | 16:08:16     | 16:09:56 | 0.603, 0.009              | *               | *               | 0.588, 0.064    |                 |                 |
| Edward J. Hancock    | 5/22/91 | 09:52:51     | 09:55:33 | 0.635, 0.019              | 0.237,-0.015    | 0.607, 0.066    |                 |                 |                 |
| Starfire             |         | 10:54:32     | 10:56:51 | 0.603, 0.019              | *               | 0.595, 0.061    |                 |                 |                 |
| American Beauty 2    |         | 13:46:39     | 13:47:10 | 0.632, 0.021              | 0.199,-0.054    | 0.603, 0.058    |                 |                 |                 |

- Meter was not available  
 \* Meter did not work

# Clarks Ferry Site, Trip 2

| Tow name          | Date     | Passing Time |          | Mean ambient velocity m/s                        |                                                  |                                                  |                                                 |                                                 |                                                  |                                                 |                                                 |
|-------------------|----------|--------------|----------|--------------------------------------------------|--------------------------------------------------|--------------------------------------------------|-------------------------------------------------|-------------------------------------------------|--------------------------------------------------|-------------------------------------------------|-------------------------------------------------|
|                   |          | Beginning    | Ending   | MMBS11/1001                                      | MMBS11/998                                       | MMBS11/999                                       | MMBS11/1000                                     | MMBS11/1000                                     | MMBS11/1000                                      | MMBS11/1000                                     | MMBS11/1130                                     |
| C.W. Rushing      | 10/17/91 | 07:33:54     | 07:34:17 | U <sub>ma</sub> 0.062, -0.005<br>V <sub>ma</sub> | U <sub>ma</sub> 0.091, -0.009<br>V <sub>ma</sub> | U <sub>ma</sub> 0.119, -0.006<br>V <sub>ma</sub> | U <sub>ma</sub> 0.129, 0.003<br>V <sub>ma</sub> | U <sub>ma</sub> 0.119, 0.005<br>V <sub>ma</sub> | U <sub>ma</sub> 0.131, -0.003<br>V <sub>ma</sub> | U <sub>ma</sub> 0.105, 0.015<br>V <sub>ma</sub> | U <sub>ma</sub> 0.132, 0.001<br>V <sub>ma</sub> |
| Evey-T            |          | 08:43:43     | 08:45:34 | 0.061, -0.001<br>0.055, -0.002                   | 0.088, -0.008<br>0.081, -0.003                   | 0.110, -0.006<br>0.110, -0.004                   | 0.129, 0.003<br>0.133, -0.001                   | 0.119, 0.005<br>0.131, -0.003                   | 0.111, 0.100<br>0.106, 0.014                     | 0.116, 0.010<br>0.106, 0.015                    | 0.117, -0.004<br>0.113, -0.002                  |
| Sunflower 1       |          | 11:43:54     | 11:44:12 | 0.053, -0.000                                    | 0.079, -0.002                                    | 0.111, -0.002                                    | 0.133, 0.008                                    | 0.119, 0.005                                    | 0.106, 0.014                                     | 0.105, 0.015                                    | 0.132, 0.001                                    |
| Evelyn C.         |          | 11:45:01     | 11:45:36 | 0.053, N/A                                       | 0.099, 0.008                                     | 0.116, 0.008                                     | 0.133, 0.008                                    | 0.119, 0.005                                    | 0.106, 0.014                                     | 0.105, 0.015                                    | 0.132, 0.001                                    |
| Sunflower 2       |          | 17:06:09     | 17:06:35 | 0.063, N/A                                       | 0.095, 0.004                                     | 0.116, 0.006                                     | 0.125, 0.009                                    | 0.119, 0.005                                    | 0.106, 0.014                                     | 0.105, 0.015                                    | 0.132, 0.001                                    |
| Conti-Nan 1       |          | 18:54:59     | 18:57:14 | 0.061, N/A                                       | 0.095, 0.007                                     | 0.112, 0.005                                     | 0.125, 0.009                                    | 0.119, 0.005                                    | 0.106, 0.014                                     | 0.105, 0.015                                    | 0.132, 0.001                                    |
| Night 1           |          | 20:14:14     | 20:14:33 | 0.058, N/A                                       | 0.091, 0.006                                     | 0.109, 0.005                                     | 0.126, 0.010                                    | 0.119, 0.012                                    | 0.113, -0.002                                    | 0.113, -0.002                                   | 0.113, -0.002                                   |
| Night 2           |          | 20:19:50     | 20:20:12 | 0.060, N/A                                       | 0.096, 0.006                                     | 0.116, 0.006                                     | 0.124, 0.009                                    | 0.117, 0.013                                    | 0.113, -0.002                                    | 0.113, -0.002                                   | 0.113, -0.002                                   |
| Night 3           |          | 20:50:43     | 20:51:25 |                                                  |                                                  |                                                  |                                                 |                                                 |                                                  |                                                 |                                                 |
| Lady Lone Star 1  | 10/18/91 | 07:16:51     | 07:17:25 | 0.049, N/A                                       | 0.085, 0.006                                     | 0.107, 0.002                                     | 0.116, 0.008                                    | 0.116, 0.008                                    | 0.113, -0.002                                    | 0.113, -0.002                                   | 0.113, -0.002                                   |
| Lady Lone Star 2  |          | 07:43:37     | 07:43:44 | 0.049, N/A                                       | 0.081, 0.004                                     | 0.111, 0.004                                     | 0.121, 0.009                                    | 0.117, -0.004                                   | 0.117, -0.004                                    | 0.117, -0.004                                   | 0.117, -0.004                                   |
| Kevin Michael     |          | 08:24:59     | 08:27:08 | 0.048, N/A                                       | 0.083, 0.004                                     | 0.110, 0.003                                     | 0.123, 0.006                                    | 0.111, -0.002                                   | 0.111, -0.002                                    | 0.111, -0.002                                   | 0.111, -0.002                                   |
| Deborah Valentine |          | 09:55:28     | 09:58:08 | 0.049, N/A                                       | 0.062, 0.002                                     | 0.109, 0.005                                     | 0.116, 0.009                                    | 0.116, -0.002                                   | 0.116, -0.002                                    | 0.116, -0.002                                   | 0.116, -0.002                                   |
| Volunteer State   |          | 10:06:34     | 10:07:14 | 0.051, N/A                                       | 0.067, 0.001                                     | 0.116, 0.005                                     | 0.130, 0.011                                    | 0.130, 0.011                                    | 0.126, -0.001                                    | 0.126, -0.001                                   | 0.126, -0.001                                   |
| Sunflower 3       |          | 11:26:47     | 11:27:04 | 0.047, N/A                                       | 0.055, 0.001                                     | 0.106, 0.006                                     | 0.119, 0.012                                    | 0.119, 0.012                                    | 0.116, -0.004                                    | 0.116, -0.004                                   | 0.116, -0.004                                   |
| Frank Stegbauer   |          | 12:32:08     | 12:32:52 | 0.050, N/A                                       | 0.057, 0.000                                     | 0.109, 0.004                                     | 0.117, 0.013                                    | 0.117, 0.013                                    | 0.113, -0.002                                    | 0.113, -0.002                                   | 0.113, -0.002                                   |
| Kathy Ellen       | 10/19/91 | 10:13:44     | 10:16:43 | 0.054, -0.016                                    | 0.085, N/A                                       | 0.116, 0.005                                     | 0.130, 0.009                                    | 0.130, 0.009                                    | 0.124, -0.001                                    | 0.124, -0.001                                   | 0.124, -0.001                                   |
| Jack Bullard      |          | 12:07:14     | 12:09:42 | 0.072, -0.006                                    | 0.093, 0.005                                     | 0.108, 0.002                                     | 0.121, 0.009                                    | 0.121, 0.009                                    | 0.124, 0.000                                     | 0.124, 0.000                                    | 0.124, 0.000                                    |
| Marc              |          | 12:57:38     | 12:58:29 | 0.069, -0.005                                    | 0.101, 0.005                                     | 0.115, 0.005                                     | 0.123, 0.010                                    | 0.123, 0.010                                    | 0.119, 0.001                                     | 0.119, 0.001                                    | 0.119, 0.001                                    |
| Conti-Nan 2       |          | 13:44:23     | 13:45:17 | 0.064, -0.004                                    | 0.091, 0.007                                     | 0.106, 0.004                                     | 0.119, 0.010                                    | 0.119, 0.010                                    | 0.126, -0.001                                    | 0.126, -0.001                                   | 0.126, -0.001                                   |
| Cristina Ecstein  |          | 14:03:17     | 14:04:18 | 0.069, -0.007                                    | 0.099, 0.006                                     | 0.106, 0.004                                     | 0.125, 0.007                                    | 0.125, 0.007                                    | 0.118, -0.001                                    | 0.118, -0.001                                   | 0.118, -0.001                                   |
| Coast Guard 65504 |          | 14:54:46     | 14:54:57 | 0.070, -0.004                                    | 0.099, 0.005                                     | 0.111, 0.004                                     | 0.129, 0.006                                    | 0.129, 0.006                                    | 0.125, -0.001                                    | 0.125, -0.001                                   | 0.125, -0.001                                   |
| Prairie Dawn      |          | 17:30:03     | 17:31:27 | 0.061, 0.001                                     | 0.101, 0.005                                     | 0.109, 0.005                                     | 0.120, 0.008                                    | 0.120, 0.008                                    | 0.120, 0.001                                     | 0.120, 0.001                                    | 0.120, 0.001                                    |
| Noname            | 10/20/91 | 06:54:14     | 06:55:25 | *                                                | 0.094, 0.003                                     | 0.104, 0.001                                     | 0.123, 0.006                                    | 0.123, 0.006                                    | *                                                | *                                               | *                                               |
| Coop. Ambassador  |          | 07:05:14     | 07:07:29 | 0.049, 0.003                                     | 0.096, 0.004                                     | 0.114, 0.000                                     | 0.124, 0.006                                    | 0.124, 0.006                                    | 0.121, -0.003                                    | 0.121, -0.003                                   | 0.121, -0.003                                   |
| Yazoo City        |          | 09:31:48     | 09:34:30 | 0.056, 0.001                                     | 0.091, 0.005                                     | 0.109, 0.001                                     | 0.130, 0.006                                    | 0.130, 0.006                                    | 0.116, 0.002                                     | 0.116, 0.002                                    | 0.116, 0.002                                    |
| George W. Banta   |          | 12:19:36     | 12:21:59 | 0.054, 0.001                                     | 0.092, 0.005                                     | 0.109, 0.004                                     | 0.122, 0.006                                    | 0.122, 0.006                                    | 0.119, 0.000                                     | 0.119, 0.000                                    | 0.119, 0.000                                    |

- Meter was not available  
\* Meter did not work

# Clarks Ferry Site, Trip 2 (Continued)

| Tow name          | Date     | Passing Time |          | Mean ambient velocity m/s |                 |                 |                 |                 |                 | S4/834          |                 |
|-------------------|----------|--------------|----------|---------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
|                   |          | Beginning    | Ending   | U <sub>ma</sub>           | V <sub>ma</sub> | U <sub>ma</sub> | V <sub>ma</sub> | U <sub>ma</sub> | V <sub>ma</sub> | U <sub>ma</sub> | V <sub>ma</sub> |
| C.W. Rushing      | 10/17/91 | 07:33:54     | 07:34:17 | 0.137, 0.009              | 0.233, 0.002    | 0.233, 0.001    | 0.245, -0.002   | 0.238, -0.001   | -               | -               | -               |
| Evey-T            |          | 08:43:43     | 08:45:34 | 0.138, 0.007              | 0.233, 0.001    | 0.218, 0.010    | 0.232, 0.001    | 0.238, 0.004    | *               | *               | *               |
| Sunflower 1       |          | 11:43:54     | 11:44:12 | 0.124, 0.015              | 0.218, 0.007    | 0.253, -0.011   | 0.261, -0.001   | 0.263, -0.011   | *               | *               | *               |
| Evelyn C.         |          | 11:45:01     | 11:45:36 | 0.124, 0.010              | 0.253, -0.011   | 0.254, -0.003   | 0.238, -0.006   | 0.235, -0.010   | *               | *               | *               |
| Sunflower 2       |          | 17:06:09     | 17:06:35 | 0.145, -0.000             | 0.238, -0.006   | 0.241, 0.001    | 0.242, 0.009    | 0.331, 0.049    | *               | *               | *               |
| Conti-Nan 1       |          | 18:54:59     | 18:57:14 | 0.146, -0.003             | 0.231, -0.002   | 0.227, -0.002   | 0.238, -0.010   | 0.409, 0.003    | *               | *               | *               |
| Night 1           |          | 20:14:14     | 20:14:33 | 0.131, -0.004             | 0.223, -0.003   | 0.229, -0.002   | 0.229, -0.140   | 0.418, 0.004    | *               | *               | *               |
| Night 2           |          | 20:19:50     | 20:20:12 | 0.133, -0.004             | 0.229, -0.002   | 0.241, -0.000   | 0.238, -0.010   | 0.417, -0.001   | *               | *               | *               |
| Night 3           |          | 20:50:43     | 20:51:25 | 0.140, -0.003             | 0.230, -0.006   | 0.227, -0.005   | 0.236, -0.011   | 0.401, -0.001   | *               | *               | *               |
| Lady Lone Star 1  | 10/18/91 | 07:16:51     | 07:17:25 | 0.129, -0.005             | 0.241, -0.001   | 0.241, -0.004   | 0.233, -0.004   | 0.408, 0.016    | *               | *               | *               |
| Lady Lone Star 2  |          | 07:43:37     | 07:43:44 | 0.133, -0.004             | 0.241, -0.004   | 0.241, 0.001    | 0.246, -0.009   | 0.391, 0.016    | *               | *               | *               |
| Kevin Michael     |          | 08:24:59     | 08:27:08 | 0.126, -0.003             | 0.241, 0.001    | 0.241, 0.006    | 0.248, -0.008   | 0.409, 0.004    | *               | *               | *               |
| Deborah Valentine |          | 09:55:28     | 09:58:08 | 0.131, -0.005             | 0.241, 0.006    | 0.238, 0.010    | 0.253, -0.006   | 0.381, 0.018    | *               | *               | *               |
| Volunteer State   |          | 10:06:34     | 10:07:14 | 0.140, -0.004             | 0.238, 0.010    | 0.243, 0.001    | 0.249, -0.010   | 0.378, 0.024    | *               | *               | *               |
| Sunflower 3       |          | 11:26:47     | 11:27:04 | 0.131, -0.006             | 0.243, 0.001    | 0.231, 0.002    | 0.249, -0.005   | 0.384, 0.016    | *               | *               | *               |
| Frank Stegbauer   |          | 12:32:08     | 12:32:52 | 0.131, -0.005             | 0.231, -0.005   | 0.238, -0.010   | 0.259, -0.011   | 0.402, 0.002    | *               | *               | *               |
| Kathy Ellen       | 10/19/91 | 10:13:44     | 10:16:43 | 0.142, -0.004             | 0.241, -0.001   | 0.241, -0.004   | 0.246, -0.009   | 0.408, 0.016    | *               | *               | *               |
| Jack Bullard      |          | 12:07:14     | 12:09:42 | 0.133, -0.004             | 0.241, -0.004   | 0.241, 0.001    | 0.248, -0.008   | 0.391, 0.016    | *               | *               | *               |
| Marc              |          | 12:57:38     | 12:58:29 | 0.135, -0.004             | 0.241, 0.001    | 0.241, 0.006    | 0.253, -0.006   | 0.409, 0.004    | *               | *               | *               |
| Conti-Nan 2       |          | 13:44:23     | 13:45:17 | 0.136, -0.004             | 0.241, 0.006    | 0.238, 0.010    | 0.249, -0.010   | 0.381, 0.018    | *               | *               | *               |
| Cristina Ecstein  |          | 14:03:17     | 14:04:18 | 0.135, -0.004             | 0.238, 0.010    | 0.243, 0.001    | 0.249, -0.005   | 0.378, 0.024    | *               | *               | *               |
| Coast Guard 65504 |          | 14:54:46     | 14:54:57 | 0.144, -0.003             | 0.243, 0.001    | 0.231, 0.002    | 0.249, -0.005   | 0.384, 0.016    | *               | *               | *               |
| Prairie Dawn      |          | 17:30:03     | 17:31:27 | 0.134, -0.005             | 0.231, 0.002    | 0.238, 0.002    | 0.259, -0.011   | 0.402, 0.002    | *               | *               | *               |
| Noname            | 10/20/91 | 06:54:14     | 06:55:25 | *                         | 0.238, 0.002    | 0.233, -0.001   | *               | 0.408, 0.005    | *               | *               | *               |
| Coop. Ambassador  |          | 07:05:14     | 07:07:29 | 0.140, -0.002             | 0.233, -0.001   | 0.238, 0.001    | 0.247, -0.010   | 0.388, 0.012    | *               | *               | *               |
| Yazoo City        |          | 09:31:48     | 09:34:30 | 0.128, -0.006             | 0.238, 0.001    | 0.242, 0.001    | 0.241, 0.001    |                 |                 |                 |                 |
| George W. Banta   |          | 12:19:36     | 12:21:59 | 0.135, -0.004             | 0.242, 0.001    |                 |                 |                 |                 |                 |                 |

- Meter was not available  
\* Meter did not work

# Clarks Ferry Site, Trip 2 (Concluded)

| Tow name          | Date     | Passing Time |          | Mean ambient velocity m/s |                 |                 |                 |                 |                 |
|-------------------|----------|--------------|----------|---------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|
|                   |          | Beginning    | Ending   | S4/151                    |                 | S4/832          |                 | S4/040          |                 |
|                   |          |              |          | U <sub>ma</sub>           | V <sub>ma</sub> | U <sub>ma</sub> | V <sub>ma</sub> | U <sub>ma</sub> | V <sub>ma</sub> |
| C.W. Rushing      | 10/17/91 | 07:33:54     | 07:34:17 | -                         | -               | -               | -               | -               | -               |
| Evey-T            |          | 08:43:43     | 08:45:34 |                           |                 |                 |                 |                 | *               |
| Sunflower 1       |          | 11:43:54     | 11:44:12 | 0.299, 0.056              |                 | 0.237, 0.011    |                 |                 | *               |
| Evelyn C.         |          | 11:45:01     | 11:45:36 | 0.300, 0.057              |                 | 0.243, 0.011    |                 |                 | *               |
| Sunflower 2       |          | 17:06:09     | 17:06:35 | 0.342, 0.068              |                 | 0.293, 0.006    |                 |                 | -               |
| Conti-Nan 1       |          | 18:54:59     | 18:57:14 | 0.328, 0.060              |                 | 0.298, 0.014    |                 | 0.131, -0.002   |                 |
| Night 1           |          | 20:14:14     | 20:14:33 | 0.308, 0.052              |                 | 0.280, 0.006    |                 | 0.151, -0.000   |                 |
| Night 2           |          | 20:19:50     | 20:20:12 | 0.319, 0.053              |                 | 0.288, 0.005    |                 | *               |                 |
| Night 3           |          | 20:50:43     | 20:51:25 | 0.313, 0.054              |                 | 0.279, 0.010    |                 | 0.131, 0.002    |                 |
| Lady Lone Star 1  | 10/18/91 | 07:16:51     | 07:17:25 | 0.306, 0.054              |                 | 0.258, 0.010    |                 | *               |                 |
| Lady Lone Star 2  |          | 07:43:37     | 07:43:44 | 0.303, 0.054              |                 | 0.262, 0.011    |                 | *               |                 |
| Kevin Michael     |          | 08:24:59     | 08:27:08 | 0.301, 0.051              |                 | 0.269, 0.011    |                 | *               |                 |
| Deborah Valentine |          | 09:55:28     | 09:58:08 | 0.298, 0.048              |                 | 0.267, 0.008    |                 | *               |                 |
| Volunteer State   |          | 10:06:34     | 10:07:14 | 0.312, 0.048              |                 | 0.278, -0.002   |                 | *               |                 |
| Sunflower 3       |          | 11:26:47     | 11:27:04 | -                         | -               | -               | -               | *               |                 |
| Frank Stegbauer   |          | 12:32:08     | 12:32:52 | 0.308, 0.043              |                 | 0.256, 0.000    |                 | *               |                 |
| Kathy Ellen       | 10/19/91 | 10:13:44     | 10:16:43 | 0.319, 0.060              |                 | 0.273, 0.014    |                 | *               |                 |
| Jack Bullard      |          | 12:07:14     | 12:09:42 | 0.303, 0.059              |                 | *               |                 | 0.196, 0.012    |                 |
| Marc              |          | 12:57:38     | 12:58:29 | 0.310, 0.061              |                 | 0.292, 0.012    |                 | *               |                 |
| Conti-Nan 2       |          | 13:44:23     | 13:45:17 | 0.308, 0.059              |                 | 0.281, 0.009    |                 | *               |                 |
| Cristina Ecstein  |          | 14:03:17     | 14:04:18 | 0.296, 0.041              |                 | 0.258, 0.006    |                 | *               |                 |
| Coast Guard 65504 |          | 14:54:46     | 14:54:57 | 0.302, 0.058              |                 | 0.271, 0.006    |                 | 0.173, 0.010    |                 |
| Prairie Dawn      |          | 17:30:03     | 17:31:27 | 0.298, 0.061              |                 | 0.277, 0.011    |                 | 0.143, 0.005    |                 |
| Noname            | 10/20/91 | 06:54:14     | 06:55:25 | 0.298, 0.051              |                 | 0.287, 0.011    |                 | *               |                 |
| Coop. Ambassador  |          | 07:05:14     | 07:07:29 | 0.301, 0.060              |                 | 0.294, 0.016    |                 | *               |                 |
| Yazoo City        |          | 09:31:48     | 09:34:30 | 0.301, 0.053              |                 | 0.260, 0.015    |                 | *               |                 |
| George W. Banta   |          | 12:19:36     | 12:21:59 | 0.300, 0.057              |                 | 0.283, 0.014    |                 | *               |                 |

- Meter was not available

\* Meter did not work

**APPENDIX XI.**

**INDUCED VELOCITY AT ALL SITES AND ALL METERING LOCATIONS  
DURING BARGE-TOW PASSAGE**

# McEver's Island Site

| Tow name             | Date    | Passing Time |          | Induced velocity m/s |                |                |          |             |          |             |          |
|----------------------|---------|--------------|----------|----------------------|----------------|----------------|----------|-------------|----------|-------------|----------|
|                      |         | Beginning    | Ending   | MMBS11/998           |                | MMBS11/999     |          | MMBS11/1000 |          | MMBS11/1001 |          |
|                      |         |              |          | $U_{im}$             | $V_{im}$       | $U_{im}$       | $V_{im}$ | $U_{im}$    | $V_{im}$ | $U_{im}$    | $V_{im}$ |
| R. W. Naye           | 5/16/89 | 14:23:30     | 14:26:32 | 0.440, 0.038         | -              | -              | -        | -           | -        | -           | -        |
| Evelyn C.            |         | 14:46:35     | 14:46:45 | *                    | -              | -              | -        | -           | -        | -           | -        |
| Mary Ellen           | 5/17/89 | 7:57:10      | 7:59:50  | 0.485, 0.058         | -              | -              | -        | -           | -        | -           | -        |
| Elaine Jones         |         | 8:07:00      | 8:09:22  | *                    | -              | -              | -        | -           | -        | -           | -        |
| Nicholas Duncan      |         | 15:29:38     | 15:33:40 | 0.550, **            | -              | -              | -        | -           | -        | -           | -        |
| Mobil Leader         | 5/18/89 | 9:39:47      | 9:41:21  | -                    | 0.385, 0.036   | 0.325, 0.025   | -        | -           | -        | *           | *        |
| Reliance             |         | 12:16:45     | 12:19:13 | 0.400, 0.055         | 0.310, 0.032   | 0.243, 0.021   | -        | -           | -        | *           | *        |
| Cooperative Vanguard |         | 12:41:49     | 12:44:03 | -0.355, -0.127       | -0.135, -0.046 | -0.120, -0.043 | -        | -           | -        | *           | *        |
| Marvin Norman        |         | 13:09:20     | 13:11:27 | 0.170, 0.030         | 0.190, 0.024   | 0.138, 0.020   | -        | -           | -        | *           | *        |
| Illini               |         | 14:31:36     | 14:33:34 | -0.270, -0.055       | -0.062, -0.030 | -0.080, -0.032 | -        | -           | -        | *           | *        |
| Thurston B. Morton   | 5/19/89 | 10:37:56     | 10:40:40 | -                    | -0.025, -0.035 | -0.050, -0.028 | -        | -           | -        | *           | *        |
| Clarence G. Frame    |         | 10:45:36     | 10:47:40 | -                    | -0.120, -0.045 | -0.110, -0.035 | -        | -           | -        | *           | *        |

| Tow name             | Date    | Passing Time |          | Induced velocity m/s |          |                |          |
|----------------------|---------|--------------|----------|----------------------|----------|----------------|----------|
|                      |         |              |          | MMBS27/642           |          | S4/071         |          |
|                      |         | Beginning    | Ending   | $U_{im}$             | $V_{im}$ | $U_{im}$       | $V_{im}$ |
| R. W. Naye           | 5/16/89 | 14:23:30     | 14:26:32 | 0.640, 0.028         | -        | 0.210, 0.040   | -        |
| Evelyn C.            |         | 14:46:35     | 14:46:45 | *                    | -        | *              | -        |
| Mary Ellen           | 5/17/89 | 7:57:10      | 7:59:50  | 0.885, **            | -        | 0.223, 0.008   | -        |
| Elaine Jones         |         | 8:07:00      | 8:09:22  | *                    | -        | *              | -        |
| Nicholas Duncan      |         | 15:29:38     | 15:33:40 | **                   | -        | -              | -        |
| Mobil Leader         | 5/18/89 | 9:39:47      | 9:41:21  | -                    | -        | 0.135, 0.050   | -        |
| Reliance             |         | 12:16:45     | 12:19:13 | 0.555, 0.054         | -        | 0.120, **      | -        |
| Cooperative Vanguard |         | 12:41:49     | 12:44:03 | -0.429, -0.104       | -        | -0.062, -0.051 | -        |
| Marvin Norman        |         | 13:09:20     | 13:11:27 | 0.265, 0.030         | -        | 0.127, 0.040   | -        |
| Illini               |         | 14:31:36     | 14:33:34 | -0.235, -0.065       | -        | -              | -        |
| Thurston B. Morton   | 5/19/89 | 10:37:56     | 10:40:40 | -                    | -        | *              | -        |
| Clarence G. Frame    |         | 10:45:36     | 10:47:40 | -                    | -        | -0.028, 0.000  | -        |

- Meter was not available  
\* Meter did not work

# Kampsville Site, Trip 1

| Tow name          | Date     | Passing time |          | Induced velocity m/s |            |            |             |            |          |          |          |          |          |          |          |
|-------------------|----------|--------------|----------|----------------------|------------|------------|-------------|------------|----------|----------|----------|----------|----------|----------|----------|
|                   |          | Beginning    | Ending   | MMB511/1001          | MMB511/998 | MMB511/999 | MMB511/1000 | MMB511/642 |          |          |          |          |          |          |          |
|                   |          |              |          | $U_{im}$             | $V_{im}$   | $U_{im}$   | $V_{im}$    | $U_{im}$   | $V_{im}$ | $U_{im}$ | $V_{im}$ | $U_{im}$ | $V_{im}$ | $U_{im}$ | $V_{im}$ |
| Mr. Aldo          | 10/12/90 | 13:34:46     | 13:36:48 | *                    |            |            |             |            |          |          |          |          |          |          |          |
| Floyd Blaske      |          | 13:47:57     | 13:50:10 | *                    |            |            |             |            |          |          |          |          |          |          |          |
| Marvin Norman     | 10/13/90 | 09:31:13     | 09:34:45 | 0.281, **            |            |            |             |            |          |          |          |          |          |          |          |
| Luke Burton       |          | 09:55:32     | 09:56:38 | 0.432, **            |            |            |             |            |          |          |          |          |          |          |          |
| Sugarland         |          | 09:58:35     | 10:01:18 | 0.381, **            |            |            |             |            |          |          |          |          |          |          |          |
| William C. Norman |          | 11:08:41     | 11:10:15 | 0.033, 0.014         |            |            |             |            |          |          |          |          |          |          |          |
| Frank H. Peavey   |          | 15:20:29     | 15:24:20 | 0.380, 0.025         |            |            |             |            |          |          |          |          |          |          |          |
| Conti Karla       |          | 16:23:56     | 16:27:38 | 0.435, -0.029        |            |            |             |            |          |          |          |          |          |          |          |
| Mr. Paul          | 10/14/90 | 10:17:12     | 10:18:58 | 0.080, **            |            |            |             |            |          |          |          |          |          |          |          |
| Rambler           |          | 10:56:37     | 10:58:25 | 0.075, **            |            |            |             |            |          |          |          |          |          |          |          |
| Mr. Lawrence      |          | 11:42:09     | 11:44:22 | 0.490, **            |            |            |             |            |          |          |          |          |          |          |          |
| Mallard           |          | 12:25:38     | 12:26:51 | 0.352, **            |            |            |             |            |          |          |          |          |          |          |          |
| Charles Lehman    |          | 13:28:18     | 13:31:24 | 0.438, -0.030        |            |            |             |            |          |          |          |          |          |          |          |
| Nicholas Duncan   |          | 15:29:11     | 15:31:36 | 0.430, **            |            |            |             |            |          |          |          |          |          |          |          |
| Jeff Boat         |          | 15:57:43     | 16:00:46 | 0.476, -0.033        |            |            |             |            |          |          |          |          |          |          |          |
| Mary Ann          |          | 16:36:20     | 16:39:11 | 0.292, **            |            |            |             |            |          |          |          |          |          |          |          |
| Ardyce Randall    | 10/15/90 | 09:49:07     | 09:51:32 | 0.120, **            |            |            |             |            |          |          |          |          |          |          |          |
| Mr. Paul          |          | 12:07:21     | 12:09:53 | 0.441, -0.024        |            |            |             |            |          |          |          |          |          |          |          |
| Exxon St. Louis   |          | 14:51:40     | 14:53:18 | 0.441, **            |            |            |             |            |          |          |          |          |          |          |          |
| Margaret O.       |          | 15:11:17     | 15:12:29 | -0.070, **           |            |            |             |            |          |          |          |          |          |          |          |
| Mr. Lawrence      |          | 18:10:53     | 18:12:36 | -0.007, **           |            |            |             |            |          |          |          |          |          |          |          |
| A.L. Smith        | 10/16/90 | 10:27:27     | 10:29:00 | 0.178, **            |            |            |             |            |          |          |          |          |          |          |          |
| Ste. Genevieve    |          | 16:19:41     | 16:22:00 | 0.348, -0.025        |            |            |             |            |          |          |          |          |          |          |          |
| Nicole Brent      | 10/17/90 | 10:25:21     | 10:26:31 | 0.355, **            |            |            |             |            |          |          |          |          |          |          |          |
| Frank H. Peavey   |          | 11:14:06     | 11:15:20 | 0.090, 0.025         |            |            |             |            |          |          |          |          |          |          |          |

\* Meter did not work

\*\*No obvious impact

# Kampsville Site, Trip 1 (Concluded)

| Tow name          | Date     | Passing time |          | Induced velocity m/s |               |              |          |
|-------------------|----------|--------------|----------|----------------------|---------------|--------------|----------|
|                   |          | Beginning    | Ending   | MMB511/332           | MMB527/040    | MMB527/071   |          |
|                   |          |              |          | $U_{im}$             | $V_{im}$      | $U_{im}$     | $V_{im}$ |
| Mr. Aldo          | 10/12/90 | 13:34:46     | 13:36:48 | 0.180, 0.070         | 0.209, 0.101  | 0.240, 0.034 |          |
| Floyd Blaske      |          | 13:47:57     | 13:50:10 | 0.847, 0.046         | 0.760, 0.089  | 0.750, 0.060 |          |
| Marvin Norman     | 10/13/90 | 09:31:13     | 09:34:45 | 0.665, **            | *             | 0.497, **    |          |
| Luke Burton       |          | 09:55:32     | 09:56:38 | 0.803, 0.065         | *             | 0.612, **    |          |
| Sugarland         |          | 09:58:35     | 10:01:18 | 0.837, 0.065         | *             | 0.631, **    |          |
| William C. Norman |          | 11:08:41     | 11:10:15 | 0.263, 0.072         | 0.235, 0.165  | 0.229, 0.070 |          |
| Frank H. Peavey   |          | 15:20:29     | 15:24:20 | 0.782, 0.064         | 0.793, 0.187  | 0.697, 0.054 |          |
| Conti Karla       |          | 16:23:56     | 16:27:38 | 0.810, 0.071         | 0.720, 0.160  | 0.708, 0.047 |          |
| Mr. Paul          | 10/14/90 | 10:17:12     | 10:18:58 | 0.310, 0.025         | *             | 0.303, 0.038 |          |
| Rambler           |          | 10:56:37     | 10:58:25 | 0.320, 0.450         | 0.278, 0.140  | *            |          |
| Mr. Lawrence      |          | 11:42:09     | 11:44:22 | 0.900, 0.050         | 0.740, 0.145  | 0.690, 0.037 |          |
| Mallard           |          | 12:25:38     | 12:26:51 | 0.704, 0.026         | 0.687, 0.159  | 0.577, 0.052 |          |
| Charles Lehman    |          | 13:28:18     | 13:31:24 | 0.870, 0.050         | 0.800, 0.161  | 0.700, 0.061 |          |
| Nicholas Duncan   |          | 15:29:11     | 15:31:36 | 0.830, 0.044         | 0.741, 0.163  | 0.640, 0.068 |          |
| Jeff Boat         |          | 15:57:43     | 16:00:46 | 0.895, 0.074         | 0.765, 0.155  | 0.735, 0.067 |          |
| Mary Ann          |          | 16:36:20     | 16:39:11 | 0.663, **            | 0.568, 0.081  | 0.585, 0.040 |          |
| Ardyce Randall    | 10/15/90 | 09:49:07     | 09:51:32 | 0.380, 0.067         | 0.298, 0.158  | 0.345, 0.024 |          |
| Mr. Paul          |          | 12:07:21     | 12:09:53 | 0.845, 0.099         | 0.728, 0.118  | 0.659, 0.034 |          |
| Exxon St. Louis   |          | 14:51:40     | 14:53:18 | 0.924, 0.092         | 0.817, 0.258  | *            |          |
| Margaret O.       |          | 15:11:17     | 15:12:29 | 0.113, -0.170        | -0.031, 0.180 | 0.180, 0.058 |          |
| Mr. Lawrence      |          | 18:10:53     | 18:12:36 | 0.201, 0.070         | *             | *            |          |
| A.L. Smith        | 10/16/90 | 10:27:27     | 10:29:00 | 0.455, **            | 0.338, **     | 0.421, **    |          |
| Ste. Genevieve    |          | 16:19:41     | 16:22:00 | 0.680, 0.022         | 0.590, 0.060  | 0.538, **    |          |
| Nicole Brent      | 10/17/90 | 10:25:21     | 10:26:31 | 0.681, 0.030         | 0.690, 0.093  | 0.605, 0.040 |          |
| Frank H. Peavey   |          | 11:14:06     | 11:15:20 | 0.240, 0.035         | 0.158, 0.144  | 0.277, 0.052 |          |

\* Meter did not work

\*\* No obvious impact



# Kampsville Site, Trip 2

| Tow name           | Date    | Passing Time |          | Induced velocity m/s |          |               |          |                |          |
|--------------------|---------|--------------|----------|----------------------|----------|---------------|----------|----------------|----------|
|                    |         | Beginning    | Ending   | MMB511/1001          |          | MMB511/998    |          | MMB511/999     |          |
|                    |         |              |          | $U_{im}$             | $V_{im}$ | $U_{im}$      | $V_{im}$ | $U_{im}$       | $V_{im}$ |
| Ranger             | 8/13/91 | 10:08:48     | 10:10:32 | *                    | *        | *             | *        | 0.047, -0.012  |          |
| Dixie Patriot      |         | 10:48:40     | 10:50:01 | *                    | *        | 0.002, **     |          | -0.120, **     |          |
| Orleanian          |         | 16:39:53     | 16:42:40 | 0.261, **            |          | *             |          | 0.361, **      |          |
| Pat Breen          |         | 17:45:36     | 17:47:58 | -0.107, **           |          | *             |          | -0.109, -0.006 |          |
| Dixie Express      |         | 18:15:23     | 18:16:04 | -0.059, 0.085        |          | *             |          | -0.031, -0.020 |          |
| Night-14-01        | 8/14/91 | 04:21:06     | 04:23:57 | 0.329, **            |          | *             |          | 0.342, **      |          |
| Night-14-02        |         | 07:15:57     | 07:16:51 | -0.005, 0.029        |          | *             |          | 0.035, -0.009  |          |
| Irving Crown       |         | 10:08:34     | 10:10:45 | 0.236, **            |          | 0.185, N/A    |          | 0.389, **      |          |
| George W. Shamblyn |         | 13:16:16     | 13:16:56 | 0.039, **            |          | *             |          | 0.058, **      |          |
| Katherine L.       |         | 13:26:36     | 13:27:20 | 0.008, 0.026         |          | 0.121, **     |          | 0.075, **      |          |
| Thruston B. Morton |         | 14:21:58     | 14:23:57 | 0.306, **            |          | *             |          | 0.393, **      |          |
| Julie White        |         | 14:32:12     | 14:35:45 | 0.182, 0.016         |          | *             |          | 0.272, **      |          |
| Ranger             |         | 17:07:52     | 17:08:16 | 0.156, 0.011         |          | *             |          | **             |          |
| Illini             |         | 19:12:43     | 19:14:43 | 0.165, **            |          | *             |          | 0.197, **      |          |
| Bronwynne Brent    |         | 19:23:50     | 19:25:19 | -0.051, **           |          | *             |          | -0.008, 0.004  |          |
| Bill McCormick     | 8/15/91 | 00:02:15     | 00:04:28 | -0.151, 0.021        |          | *             |          | *              |          |
| Marvin E. Norman   |         | 03:27:22     | 03:29:18 | -0.082, 0.018        |          | *             |          | *              |          |
| Olmstead           |         | 13:02:42     | 13:05:16 | 0.362, **            |          | 0.273, -0.100 |          | 0.478, **      |          |
| Jack D. Wofford    |         | 13:39:18     | 13:41:57 | 0.375, **            |          | 0.286, **     |          | 0.461, -0.065  |          |
| Dixie Express      |         | 15:09:12     | 15:10:08 | 0.251, **            |          | 0.200, **     |          | 0.291, **      |          |
| Hal D. Miller      |         | 17:45:56     | 17:46:56 | -0.129, 0.081        |          | -0.100, **    |          | -0.086, **     |          |
| Jesse Brent        |         | 18:10:31     | 18:10:55 | -0.029, 0.080        |          | 0.001, -0.015 |          | 0.027, -0.044  |          |

\* Meter did not work

\*\*No obvious impact

# Kampsville Site, Trip 2 (Concluded)

| Tow name           | Date    | Passing Time |          | Induced velocity m/s |          |               |          |               |          |
|--------------------|---------|--------------|----------|----------------------|----------|---------------|----------|---------------|----------|
|                    |         | Beginning    | Ending   | MMBS11/1000          |          | MMBS27/642    |          | MMBS27/332    |          |
|                    |         |              |          | $U_{im}$             | $V_{im}$ | $U_{im}$      | $V_{im}$ | $U_{im}$      | $V_{im}$ |
| Ranger             | 8/13/91 | 10:08:48     | 10:10:32 | *                    |          | 0.002, N/A    |          | 0.051, 0.030  |          |
| Dixie Patriot      |         | 10:48:40     | 10:50:01 | 0.293, **            |          | -0.071, 0.036 |          | -0.128, 0.029 |          |
| Orleanian          |         | 16:39:53     | 16:42:40 | *                    |          | 0.362, 0.015  |          | 0.393, 0.081  |          |
| Pat Breen          |         | 17:45:36     | 17:47:58 | *                    |          | -0.113, **    |          | -0.090, 0.051 |          |
| Dixie Express      |         | 18:15:23     | 18:16:04 | *                    |          | -0.027, 0.022 |          | -0.009, 0.020 |          |
| Night-14-01        | 8/14/91 | 04:21:06     | 04:23:57 | *                    |          | 0.375, **     |          | 0.407, 0.091  |          |
| Night-14-02        |         | 07:15:57     | 07:16:51 | *                    |          | 0.032, **     |          | 0.061, 0.017  |          |
| Irving Crown       |         | 10:08:34     | 10:10:45 | *                    |          | 0.338, 0.073  |          | 0.340, 0.047  |          |
| George W. Shamblin |         | 13:16:16     | 13:16:56 | *                    |          | *             |          | 0.066, 0.024  |          |
| Katherine L.       |         | 13:26:36     | 13:27:20 | **, **               |          | *             |          | 0.075, 0.023  |          |
| Thruston B. Morton |         | 14:21:58     | 14:23:57 | *                    |          | *             |          | 0.450, 0.101  |          |
| Julie White        |         | 14:32:12     | 14:35:45 | *                    |          | *             |          | 0.336, 0.050  |          |
| Ranger             |         | 17:07:52     | 17:08:16 | *                    |          | *             |          | **, **        |          |
| Illini             |         | 19:12:43     | 19:14:43 | **, **               |          | *             |          | 0.251, 0.051  |          |
| Bronwynne Brent    |         | 19:23:50     | 19:25:19 | **, **               |          | *             |          | -0.002, 0.029 |          |
| Bill McCormick     | 8/15/91 | 02:12:55     | 04:28:20 | *                    |          | *             |          | -0.125, 0.046 |          |
| Marvin E. Norman   |         | 03:27:22     | 03:29:18 | *                    |          | *             |          | -0.039, 0.063 |          |
| Olmstead           |         | 13:02:42     | 13:05:16 | 0.085, **            |          | *             |          | 0.503, 0.123  |          |
| Jack D. Wofford    |         | 13:39:18     | 13:41:57 | *                    |          | *             |          | 0.500, 0.108  |          |
| Dixie Express      |         | 15:09:12     | 15:10:08 | *                    |          | 0.301, 0.010  |          | 0.371, 0.069  |          |
| Hal D. Miller      |         | 17:45:56     | 17:46:56 | *                    |          | -0.076, 0.020 |          | -0.088, 0.045 |          |
| Jesse Brent        |         | 18:10:31     | 18:10:55 | *                    |          | 0.021, 0.037  |          | 0.030, 0.029  |          |

\* Meter did not work

\*\*No obvious impact

# Apple River Island Site

| Tow name                                                                     | Date    | Passing Time |          | Induced velocity m/s |               |               |               |               |              |              |           |
|------------------------------------------------------------------------------|---------|--------------|----------|----------------------|---------------|---------------|---------------|---------------|--------------|--------------|-----------|
|                                                                              |         | Beginning    | Ending   | MMB511/1001          | MMB511/1000   | MMB511/998    | MMB527/642    | MMB527/332    |              |              |           |
| Yazoo<br>Cooperative Ambassador<br>Christine Bailey<br>Kathy Ellen           | 5/18/90 | 16:20:16     | 16:23:41 | $U_{im}$             | $V_{im}$      | $U_{im}$      | $V_{im}$      | $U_{im}$      | $V_{im}$     | $U_{im}$     | $V_{im}$  |
|                                                                              |         | 16:46:42     | 16:48:55 | 0.307, 0.005         | 0.343, -0.037 | 0.523, 0.089  | **            | 0.464, 0.011  | 0.193, 0.011 | 0.267, 0.012 | 0.071, ** |
|                                                                              |         | 17:21:24     | 17:23:17 | 0.451, -0.040        | 0.412, -0.056 | *             |               | 0.185, -0.016 | 0.241, 0.010 |              |           |
|                                                                              |         | 20:07:30     | 20:09:39 | 0.123, -0.025        | 0.168, -0.030 | *             |               | 0.329, 0.011  |              |              |           |
| W.A. Kernan<br>Hornet<br>Conti-Bonnie<br>Becky Lynn                          | 5/19/90 | 10:04:10     | 10:07:04 | 0.317, 0.006         | 0.330, -0.014 | *             |               |               |              |              |           |
|                                                                              |         | 11:20:37     | 11:21:31 | 0.332, 0.008         | 0.342, -0.035 | 0.379, 0.092  | 0.291, 0.040  | **            |              |              |           |
|                                                                              |         | 11:40:41     | 11:42:25 | 0.156, -0.015        | 0.193, -0.030 | 0.337, -0.051 | **            | 0.046, -0.021 |              |              |           |
|                                                                              |         | 11:56:12     | 11:58:03 | 0.312, 0.020         | 0.304, -0.002 | 0.417, 0.054  | **            | 0.156, **     |              |              |           |
| Merlin Banta<br>Rusty Flowers<br>Tom Talbert<br>Herman Pott                  | 5/20/90 | 09:09:21     | 09:10:12 | 0.301, 0.012         | 0.300, -0.012 | 0.428, 0.076  | 0.268, 0.006  | **            |              |              |           |
|                                                                              |         | 11:27:57     | 11:29:38 | 0.189, -0.006        | 0.192, -0.005 | *             | 0.090, 0.052  | 0.007, -0.026 |              |              |           |
|                                                                              |         | 12:36:12     | 12:37:48 | 0.299, 0.030         | 0.328, -0.011 | 0.441, 0.051  | 0.173, 0.069  | *             |              |              |           |
|                                                                              |         | 15:33:19     | 15:35:31 | 0.320, 0.016         | 0.338, -0.041 | **            | **            | *             |              |              |           |
| Walter Brunson<br>Dell Butcher<br>Mary Gail<br>T.S. Kunsman<br>D. Ray Miller | 5/21/90 | 10:06:14     | 10:08:09 | 0.453, **            | 0.391, -0.014 | 0.462, 0.149  | 0.113, 0.193  | *             |              |              |           |
|                                                                              |         | 11:00:40     | 11:02:30 | 0.308, 0.008         | 0.323, -0.011 | *             | **            | 0.529, 0.053  |              |              |           |
|                                                                              |         | 14:19:17     | 14:20:01 | 0.131, 0.019         | 0.182, **     | **            | 0.349, -0.051 | 0.298, -0.046 |              |              |           |
|                                                                              |         | 14:37:15     | 14:38:33 | 0.306, 0.019         | 0.288, -0.010 | **            | **            | 0.421, 0.016  |              |              |           |
| Mary Gail<br>Trojan<br>Melinda Brent<br>Corporate Mariner<br>Ed Renshaw      | 5/22/90 | 14:55:21     | 14:57:23 | 0.151, -0.016        | 0.152, -0.026 | **            | 0.357, -0.061 | 0.314, -0.055 |              |              |           |
|                                                                              |         | 10:09:50     | 10:10:25 | 0.400, 0.002         | 0.352, **     | 0.528, 0.149  | 0.718, 0.085  | 0.570, **     |              |              |           |
|                                                                              |         | 17:08:42     | 17:09:52 | 0.153, **            | 0.221, -0.029 | *             | 0.386, -0.046 | 0.266, -0.036 |              |              |           |
|                                                                              |         | 17:28:40     | 17:29:27 | 0.180, -0.019        | 0.191, -0.002 | **            | 0.381, -0.050 | 0.269, -0.060 |              |              |           |
| Kevin Michael<br>Jack D. Wofford<br>Trojan                                   | 5/23/90 | 18:06:22     | 18:07:30 | **                   | **            | **            | **            | 0.431, -0.053 |              |              |           |
|                                                                              |         | 06:52:42     | 06:55:13 | 0.141, -0.045        | 0.130, -0.035 | *             | 0.316, 0.019  | 0.182, -0.051 |              |              |           |
|                                                                              |         | 16:13:23     | 16:14:20 | -                    | -             | -             | -             | -             |              |              |           |
|                                                                              |         | 16:23:20     | 16:24:42 | 0.320, 0.026         | 0.263, **     | **            | **            | 0.359, 0.021  |              |              |           |

- Meter was not available  
 \* Meter did not work  
 \*\*No obvious impact

# Apple River Island Site (Concluded)

| Tow name               | Date    | Passing Time |          | Induced velocity m/s |                 |  |                 |                 |               |
|------------------------|---------|--------------|----------|----------------------|-----------------|--|-----------------|-----------------|---------------|
|                        |         |              |          | MMBS11/999           |                 |  | S4/071          |                 |               |
|                        |         | Beginning    | Ending   | U <sub>im</sub>      | V <sub>im</sub> |  | U <sub>im</sub> | V <sub>im</sub> | S4/040        |
| Yazoo                  | 5/18/90 | 16:20:16     | 16:23:41 | *                    |                 |  | -               |                 | -             |
| Cooperative Ambassador |         | 16:46:42     | 16:48:55 | *                    |                 |  | -               |                 | -             |
| Christine Bailey       |         | 17:21:24     | 17:23:17 | *                    |                 |  | -               |                 | -             |
| Kathy Ellen            |         | 20:07:30     | 20:09:39 | *                    |                 |  | -               |                 | -             |
| W.A. Kernan            | 5/19/90 | 10:04:10     | 10:07:04 | *                    |                 |  | **              |                 | -             |
| Hornet                 |         | 11:20:37     | 11:21:31 | *                    |                 |  | **              |                 | -             |
| Conti-Bonnie           |         | 11:40:41     | 11:42:25 | *                    |                 |  | 0.754, -0.029   |                 | -             |
| Becky Lynn             |         | 11:56:12     | 11:58:03 | *                    |                 |  | **              |                 | -             |
| Merlin Banta           | 5/20/90 | 09:09:21     | 09:10:12 | *                    |                 |  | -               |                 | **            |
| Rusty Flowers          |         | 11:27:57     | 11:29:38 | *                    |                 |  | -               |                 | *             |
| Tom Talbert            |         | 12:36:12     | 12:37:48 | *                    |                 |  | -               |                 | 0.751, 0.080  |
| Herman Pott            |         | 15:33:19     | 15:35:31 | *                    |                 |  | 0.964, 0.100    |                 | *             |
| Walter Brunson         | 5/21/90 | 10:06:14     | 10:08:09 | *                    |                 |  | 0.698, -0.046   |                 | *             |
| Dell Butcher           |         | 11:00:40     | 11:02:30 | *                    |                 |  | 0.372, -0.010   |                 | *             |
| Mary Gail              |         | 14:19:17     | 14:20:01 | *                    |                 |  | -               |                 | **            |
| T.S. Kunsman           |         | 14:37:15     | 14:38:33 | *                    |                 |  | 0.392, -0.036   |                 | 0.267, 0.039  |
| D. Ray Miller          |         | 14:55:21     | 14:57:23 | *                    |                 |  | 0.726, -0.009   |                 | 0.775, -0.004 |
| Mary Gail              | 5/22/90 | 10:09:50     | 10:10:25 | *                    |                 |  | 0.458, -0.140   |                 | **            |
| Trojan                 |         | 17:08:42     | 17:09:52 | *                    |                 |  | 0.494, -0.021   |                 | 0.481, -0.016 |
| Merlinda Brent         |         | 17:28:40     | 17:29:27 | *                    |                 |  | **              |                 | *             |
| Corporate Mariner      |         | 18:06:22     | 18:07:30 | *                    |                 |  | 0.401, -0.046   |                 | *             |
| Ed Renshaw             |         | 19:49:48     |          | *                    |                 |  | *               |                 | 0.804, -0.020 |
| Kevin Michael          | 5/23/90 | 06:52:42     | 06:55:13 | *                    |                 |  | -               |                 | **            |
| Jack D. Wofford        |         | 16:13:23     | 16:14:20 | *                    |                 |  | -               |                 | **            |
| Trojan                 |         | 16:23:20     | 16:24:42 | *                    |                 |  | -               |                 | -             |

- Meter was not available

\* Meter did not work

\*\*No obvious impact

# Goose Island Site, Trip 1

| Tow name             | Date    | Passing Time |          | Induced velocity m/s |               |               |               |               |             |             |             |
|----------------------|---------|--------------|----------|----------------------|---------------|---------------|---------------|---------------|-------------|-------------|-------------|
|                      |         | Beginning    | Ending   | MMB511/1001          | MMB511/998    | MMB511/999    | MMB511/1000   | MMB511/1000   | MMB511/1000 | MMB511/1000 | MMB511/1000 |
| Sierra Dawn          | 8/24/90 | 10:51:08     | 10:52:54 | $U_{im}$             | $V_{im}$      | $U_{im}$      | $V_{im}$      | $U_{im}$      | $V_{im}$    | $U_{im}$    | $V_{im}$    |
| Dell Butcher         |         | 13:42:01     | 13:43:52 | 0.297, 0.050         | 0.353, -0.015 | 0.397, -0.021 | 0.241, -0.006 | 0.289, -0.055 |             |             |             |
| William C. Norman    |         | 13:54:34     | 13:57:35 | 0.317, **            | 0.321, **     | 0.362, **     | 0.242, **     | 0.292, -0.056 |             |             |             |
| Normania             |         | 14:16:33     | 14:20:50 | **                   | 0.446, **     | 0.478, -0.010 | 0.314, 0.010  | 0.468, 0.013  |             |             |             |
| Dave Carlton         |         | 16:39:17     | 16:40:57 | 0.532, 0.081         | 0.425, **     | 0.468, -0.010 | 0.320, **     | 0.451, 0.046  |             |             |             |
|                      |         |              |          | 0.316, **            | 0.318, **     | 0.346, -0.036 | 0.204, -0.025 | *             |             |             |             |
| Hugh C. Blaske       | 8/25/90 | 11:19:46     | 11:22:52 | 0.657, 0.200         | 0.488, **     | 0.578, -0.010 | 0.371, 0.006  | 0.679, 0.034  |             |             |             |
| Teresa Renee B.      |         | 12:15:45     | 12:17:17 | 0.248, -0.070        | 0.271, **     | 0.334, -0.036 | 0.198, -0.029 | 0.328, -0.035 |             |             |             |
| Trojan Warrior       |         | 12:24:48     | 12:26:28 | 0.578, 0.150         | 0.457, **     | 0.568, -0.009 | 0.372, -0.030 | 0.681, **     |             |             |             |
| Hoosier State        |         | 15:45:01     | 15:47:01 | 0.522, 0.142         | 0.416, **     | 0.469, -0.010 | 0.316, 0.025  | 0.614, 0.045  |             |             |             |
| Kevin Michael        | 8/26/90 | 11:46:36     | 11:48:36 | -                    | 0.331, **     | 0.412, **     | 0.229, -0.014 | -             |             |             |             |
| Sumac                |         | 13:27:02     | 13:27:21 | -                    | 0.317, -0.024 | 0.370, 0.001  | 0.212, -0.038 | -             |             |             |             |
| Twin City            |         | 14:21:22     | 14:24:00 | -                    | 0.428, **     | 0.528, **     | 0.343, 0.020  | -             |             |             |             |
| Cooperative Vanguard |         | 14:58:35     | 15:01:11 | -                    | **            | 0.501, 0.020  | 0.305, 0.020  | -             |             |             |             |
| Superior             | 8/27/90 | 9:54:38      | 9:58:22  | -                    | 0.474, -0.009 | **            | *             | -             |             |             |             |
| Helen M. Clements    |         | 12:36:11     | 12:38:32 | -                    | **            | **            | 0.325, **     | -             |             |             |             |

- Meter was not available

\* Meter did not work

\*\* No obvious impact

# Goose Island Site, Trip 1 (Concluded)

| Tow name             | Date    | Passing Time |          | Induced velocity m/s |               |               |               |               |               |
|----------------------|---------|--------------|----------|----------------------|---------------|---------------|---------------|---------------|---------------|
|                      |         | Beginning    | Ending   | MMB527/332           |               | S4/071        |               | S4/040        |               |
|                      |         |              |          | $U_{im}$             | $V_{im}$      | $U_{im}$      | $V_{im}$      | $U_{im}$      | $V_{im}$      |
| Sierra Dawn          | 8/24/90 | 10:51:08     | 10:52:54 | 0.291, -0.034        | 0.348, -0.058 | 0.348, -0.058 | 0.348, -0.058 | 0.261, 0.011  | 0.651, 0.178  |
| Dell Butcher         |         | 13:42:01     | 13:43:52 | 0.341, -0.056        | 0.100, -0.100 | 0.100, -0.100 | 0.100, -0.100 | 0.673, 0.201  | -             |
| William C. Norman    |         | 13:54:34     | 13:57:35 | 0.447, 0.090         | 0.589, 0.008  | 0.589, 0.008  | 0.589, 0.008  | 0.767, 0.218  | 0.714, 0.218  |
| Normania             |         | 14:16:33     | 14:20:50 | 0.381, 0.056         | *             | *             | *             | 0.681, 0.112  | 0.681, 0.112  |
| Dave Carlton         |         | 16:39:17     | 16:40:57 | 0.150, **            | 0.294, -0.052 | 0.294, -0.052 | 0.294, -0.052 | -             | -             |
| Hugh C. Blaske       | 8/25/90 | 11:19:46     | 11:22:52 | 0.248, 0.024         | 0.627, 0.079  | 0.627, 0.079  | 0.627, 0.079  | 0.767, 0.218  | 0.767, 0.218  |
| Teresa Renee B.      |         | 12:15:45     | 12:17:17 | 0.056, **            | *             | *             | *             | 0.714, 0.218  | 0.714, 0.218  |
| Trojan Warrior       |         | 12:24:48     | 12:26:28 | 0.163, 0.006         | 0.707, -0.007 | 0.707, -0.007 | 0.707, -0.007 | 0.681, 0.112  | 0.681, 0.112  |
| Hoosier State        |         | 15:45:01     | 15:47:01 | 0.307, 0.024         | **            | **            | **            | 0.714, 0.218  | 0.714, 0.218  |
| Kevin Michael        | 8/26/90 | 11:46:36     | 11:48:36 | -                    | *             | *             | *             | 0.218, -0.019 | 0.218, -0.019 |
| Sumac                |         | 13:27:02     | 13:27:21 | -                    | *             | *             | *             | 0.218, -0.019 | 0.218, -0.019 |
| Twin City            |         | 14:21:22     | 14:24:00 | -                    | -             | -             | -             | 0.218, -0.019 | 0.218, -0.019 |
| Cooperative Vanguard |         | 14:58:35     | 15:01:11 | -                    | -             | -             | -             | 0.218, -0.019 | 0.218, -0.019 |
| Superior             | 8/27/90 | 9:54:38      | 9:58:22  | -                    | -             | -             | -             | -             | -             |
| Helen M. Clements    |         | 12:36:11     | 12:38:32 | -                    | -             | -             | -             | -             | -             |

- Meter was not available

\* Meter did not work

\*\* No obvious impact

Goose Island Site, Trip 2

| Tow name               | Date    | Passing Time |          | Induced velocity m/s |               |               |                |                |          |          |          |          |          |          |          |
|------------------------|---------|--------------|----------|----------------------|---------------|---------------|----------------|----------------|----------|----------|----------|----------|----------|----------|----------|
|                        |         | Beginning    | Ending   | MMBS11/1001          | MMBS11/1130   | MMBS11/1131   | MMBS11/998     | MMBS11/999     |          |          |          |          |          |          |          |
|                        |         |              |          | $U_{im}$             | $V_{im}$      | $U_{im}$      | $V_{im}$       | $U_{im}$       | $V_{im}$ | $U_{im}$ | $V_{im}$ | $U_{im}$ | $V_{im}$ | $U_{im}$ | $V_{im}$ |
| Ardyce Randall         | 7/18/91 | 10:42:18     | 10:44:10 |                      | 0.036, -0.017 | 0.010, -0.014 |                | -0.041, 0.036  |          |          |          |          |          |          |          |
| Scarlet Knight         |         | 12:26:59     | 12:28:46 | 0.245, -0.026        | **            | **            | **             | -0.007, -0.10  |          |          |          |          |          |          |          |
| James F. Neal          |         | 14:17:04     | 14:18:34 | 0.208, -0.027        | 0.104, **     | 0.181, -0.011 | **             | -0.008, 0.002  |          |          |          |          |          |          |          |
| Helen M. Clements      |         | 17:23:03     | 17:25:22 | **                   | **            | **            | **             | 0.069, -0.007  |          |          |          |          |          |          |          |
| Elizabeth Ann          |         | 18:00:59     | 18:02:46 | -                    | -             | -             | -              | -              |          |          |          |          |          |          |          |
| Frank T. Heffelfinger  | 7/19/91 | 11:03:32     | 11:05:24 | **                   | 0.094, 0.001  | 0.157, -0.005 | **             | -0.030, 0.011  |          |          |          |          |          |          |          |
| Queen City             |         | 14:33:45     | 14:35:21 | 0.202, **            | 0.078, -0.003 | 0.129, 0.014  | **             | *              |          |          |          |          |          |          |          |
| Helen M. Clements      |         | 16:24:27     | 16:26:12 | 0.194, -0.010        | 0.081, 0.001  | 0.133, **     | *              | **             |          |          |          |          |          |          |          |
| Frank T. Heffelfinger  |         | 16:33:21     | 16:36:52 | 0.327, 0.005         | **            | **            | *              | 0.036, **      |          |          |          |          |          |          |          |
| Cooperative Venture    |         | 18:05:37     | 18:56:45 | **                   | **            | **            | *              | *              |          |          |          |          |          |          |          |
| Volunteer State        |         | 08:09:31     | 08:11:39 | 0.195, **            | 0.061, 0.013  | 0.094, -0.006 | -              | -              |          |          |          |          |          |          |          |
| Prairie Dawn           | 7/20/91 | 08:19:27     | 08:22:28 | -                    | -             | -             | -              | -0.02, -0.020  |          |          |          |          |          |          |          |
| Prosperity             |         | 11:39:19     | 11:40:55 | -                    | -             | -             | -              | **             |          |          |          |          |          |          |          |
| Clyde Butcher          |         | 11:55:54     | 11:56:27 | -                    | -             | -             | -              | -              |          |          |          |          |          |          |          |
| Lil Charley            |         | 13:31:19     | 13:31:38 | -                    | -             | -             | -              | -              |          |          |          |          |          |          |          |
| C.W. Rushing           |         | 16:56:41     | 16:59:16 | *                    | 0.099, 0.001  | 0.186, -0.001 | -              | -0.007, 0.041  |          |          |          |          |          |          |          |
| Conti-Nan              |         | 16:56:41     | 16:59:16 | 0.331, 0.021         | 0.297, 0.025  | 0.256, 0.011  | *              | *              |          |          |          |          |          |          |          |
| Cooperative Vanguard   | 7/21/91 | 13:08:36     | 13:11:50 | 0.338, 0.016         | 0.274, 0.006  | 0.303, 0.010  | **             | **             |          |          |          |          |          |          |          |
| Conti-Karla            |         | 14:57:38     | 14:59:13 | 0.188, -0.016        | 0.140, **     | 0.168, 0.025  | **             | -0.028, -0.034 |          |          |          |          |          |          |          |
| Cooperative Mariner    | 7/22/91 | 10:34:47     | 10:36:47 | **                   | **            | **            | **             | 0.020, -0.000  |          |          |          |          |          |          |          |
| Hornet                 |         | 12:11:57     | 12:13:47 | 0.181, 0.025         | **            | 0.165, 0.024  | -0.034, -0.011 | **             |          |          |          |          |          |          |          |
| Cooperative Ambassador |         | 13:16:41     | 13:18:43 | 0.318, 0.035         | 0.283, -0.030 | 0.312, 0.016  | -0.046, 0.020  | **             |          |          |          |          |          |          |          |
| Eastern                |         | 13:20:30     | 13:23:42 | **                   | **            | **            | **             | 0.161, 0.041   |          |          |          |          |          |          |          |
| Sam M. Fleming         |         | 13:24:11     | 13:25:52 | 0.319, 0.044         | 0.311, 0.041  | 0.322, -0.025 | 0.108, 0.002   | 0.211, **      |          |          |          |          |          |          |          |
| Kevin Michael          |         | 14:00:12     | 14:02:12 | 0.203, 0.028         | 0.146, -0.005 | 0.170, 0.026  | *              | *              |          |          |          |          |          |          |          |
| A.M. Thompson          | 7/23/91 | 14:12:24     | 14:14:23 | **                   | 0.130, 0.021  | 0.140, -0.011 | *              | **             |          |          |          |          |          |          |          |
| Lil Charley            |         | 14:20:30     | 14:20:55 | 0.311, **            | 0.265, -0.019 | 0.289, 0.031  | *              | *              |          |          |          |          |          |          |          |
| Badger                 |         | 15:55:55     | 15:57:30 | 0.203, -0.006        | 0.136, -0.015 | 0.171, -0.020 | *              | 0.221, 0.004   |          |          |          |          |          |          |          |
| Kay D                  |         | 15:59:29     | 16:00:13 | 0.226, 0.036         | 0.141, 0.012  | 0.188, -0.005 | *              | 0.011, -0.017  |          |          |          |          |          |          |          |
| Evey-T                 |         | 16:24:21     | 16:26:55 | 0.308, 0.002         | **            | 0.293, 0.031  | *              | *              |          |          |          |          |          |          |          |
| G.R. Packet            | 7/24/91 | 8:25:25      | 8:28:39  | 0.591, -0.200        | 0.303, 0.002  | 0.270, 0.021  | 0.106, -0.031  | **             |          |          |          |          |          |          |          |
| Mary L.                |         | 9:14:50      | 9:17:21  | **                   | **            | **            | **             | 0.220, -0.010  |          |          |          |          |          |          |          |
| Dud Hollinger          |         | 9:58:51      | 10:02:05 | **                   | **            | **            | **             | **             |          |          |          |          |          |          |          |
| C.W. Rushing           |         | 12:13:19     | 12:13:57 | **                   | **            | **            | **             | **             |          |          |          |          |          |          |          |
| Dell Butcher           |         | 13:44:39     | 13:46:27 | 0.312, -0.157        | 0.169, -0.025 | **            | **             | **             |          |          |          |          |          |          |          |
| Coral Dawn             |         | 14:48:44     | 14:51:19 | 0.524, -0.200        | 0.291, **     | **            | 0.073, -0.023  | **             |          |          |          |          |          |          |          |
| Teresa R. Beesacker    |         | 15:43:33     | 15:45:33 | **                   | **            | 0.282, 0.021  | **             | **             |          |          |          |          |          |          |          |

Goose Island Site, Trip 2 (Continued)

| Tow name               | Date    | Passing Time |          | Induced velocity m/s   |                        |                        |               |                         |  |
|------------------------|---------|--------------|----------|------------------------|------------------------|------------------------|---------------|-------------------------|--|
|                        |         | Beginning    | Ending   | MMB511/1000            | MMB527/642             | MMB527/332             | S4/071        | S4/151                  |  |
| Ardyce Randall         | 7/18/91 | 10:42:18     | 10:44:10 | $U_{im}$ 0.000, -0.021 | $U_{im}$ 0.347, -0.040 | $U_{im}$ 0.363, -0.045 | $U_{im}$ -    | $U_{im}$ -0.184, -0.021 |  |
| Scarlet Knight         |         | 12:26:59     | 12:28:46 | -0.021, **             | 0.348, -0.034          | 0.367, -0.020          | -             | -                       |  |
| James F. Neal          |         | 14:17:04     | 14:18:34 | -0.027, **             | 0.319, -0.025          | 0.302, **              | 0.501, -0.028 | **                      |  |
| Helen M. Clements      |         | 17:23:03     | 17:25:22 | 0.074, -0.006          | 0.642, 0.040           | 0.665, -0.045          | -             | *                       |  |
| Elizabeth Ann          |         | 18:00:59     | 18:02:46 | -                      | **                     | **                     | -             | -                       |  |
| Frank T. Heffelfinger  | 7/19/91 | 11:03:32     | 11:05:24 | -0.021, 0.025          | 0.292, -0.041          | 0.517, -0.051          | -             | -                       |  |
| Queen City             |         | 14:33:45     | 14:35:21 | -0.019, **             | 0.290, 0.012           | 0.421, -0.065          | *             | -                       |  |
| Helen M. Clements      |         | 16:24:27     | 16:26:12 | **                     | 0.239, -0.036          | **                     | 0.462, -0.032 | -                       |  |
| Frank T. Heffelfinger  |         | 16:33:21     | 16:36:52 | 0.130, -0.049          | 0.553, 0.010           | 0.793, 0.000           | 0.745, 0.495  | -                       |  |
| Cooperative Venture    |         | 18:05:37     | 18:56:45 | 0.102, -0.026          | -                      | -                      | -             | -                       |  |
| Volunteer State        |         | 08:09:31     | 08:11:39 | -                      | -                      | -                      | -             | -                       |  |
| Prairie Dawn           | 7/20/91 | 08:19:27     | 08:22:28 | -0.040, **             | -                      | -                      | -             | 0.419, 0.001            |  |
| Prosperity             |         | 11:39:19     | 11:40:55 | 0.082, -0.019          | 0.569, -0.014          | **                     | -             | 0.846, 0.238            |  |
| Clyde Butcher          |         | 11:55:54     | 11:56:27 | -                      | 0.279, -0.050          | **                     | -             | 0.541, 0.192            |  |
| Lil Charley            |         | 13:31:19     | 13:31:38 | -                      | **                     | 0.422, -0.066          | -             | 0.552, 0.091            |  |
| C.W. Rushing           |         | 16:56:41     | 16:59:16 | -0.019, 0.029          | 0.292, -0.051          | **                     | -             | **                      |  |
| Conti-Nan              |         | 16:56:41     | 16:59:16 | 0.078, -0.030          | 0.580, 0.001           | 0.589, -0.009          | -             | 0.837, 0.271            |  |
| Cooperative Vanguard   | 7/21/91 | 13:08:36     | 13:11:50 | **                     | **                     | **                     | -             | **                      |  |
| Conti-Karla            |         | 14:57:38     | 14:59:13 | *                      | 0.228, **              | 0.401, -0.040          | 0.631, 0.046  | **                      |  |
| Cooperative Mariner    | 7/22/91 | 10:34:47     | 10:36:47 | 0.022, 0.021           | 0.283, -0.051          | **                     | -             | **                      |  |
| Hornet                 |         | 12:11:57     | 12:13:47 | 0.010, -0.056          | 0.313, **              | 0.316, -0.065          | 0.396, **     | 0.429, -0.015           |  |
| Cooperative Ambassador |         | 13:16:41     | 13:18:43 | 0.169, -0.046          | **                     | 0.587, **              | 0.597, 0.037  | **                      |  |
| Eastern                |         | 13:20:30     | 13:23:42 | **                     | 0.501, 0.081           | 0.572, **              | **            | 0.690, **               |  |
| Sam M. Fleming         |         | 13:24:11     | 13:25:52 | 0.213, **              | 0.587, 0.046           | 0.659, 0.090           | 0.671, 0.066  | 0.820, 0.230            |  |
| Kevin Michael          |         | 14:00:12     | 14:02:12 | *                      | 0.291, -0.040          | 0.291, **              | 0.398, 0.001  | 0.450, -0.002           |  |
| A.M. Thompson          | 7/23/91 | 14:12:24     | 14:14:23 | **                     | 0.296, **              | **                     | 0.410, 0.090  | **                      |  |
| Lil Charley            |         | 14:20:30     | 14:20:55 | 0.209, -0.050          | 0.559, 0.003           | 0.618, -0.011          | 0.631, 0.095  | 0.764, 0.228            |  |
| Badger                 |         | 15:55:55     | 15:57:30 | 0.001, -0.033          | 0.342, -0.056          | 0.320, 0.015           | 0.388, 0.101  | 0.355, 0.019            |  |
| Kay D                  |         | 15:59:29     | 16:00:13 | **                     | **                     | **                     | **            | **                      |  |
| Evey-T                 |         | 16:24:21     | 16:26:55 | *                      | 0.562, 0.012           | **                     | **            | **                      |  |
| G.R. Packet            | 7/24/91 | 8:25:25      | 8:28:39  | **                     | **                     | **                     | -             | 0.792, -0.051           |  |
| Mary L.                |         | 9:14:50      | 9:17:21  | **                     | **                     | **                     | -             | 0.699, 0.154            |  |
| Dud Hollinger          |         | 9:58:51      | 10:02:05 | 0.189, -0.050          | *                      | **                     | **            | **                      |  |
| C.W. Rushing           |         | 12:13:19     | 12:13:57 | **                     | **                     | **                     | 0.552, 0.071  | **                      |  |
| Dell Butcher           |         | 13:44:39     | 13:46:27 | **                     | **                     | 0.107, -0.019          | 0.420, 0.101  | **                      |  |
| Coral Dawn             |         | 14:48:44     | 14:51:19 | *                      | 0.191, -0.010          | **                     | **            | **                      |  |
| Teresa R. Beesecker    |         | 15:43:33     | 15:45:33 | **                     | 0.386, -0.006          | **                     | 0.635, 0.090  | **                      |  |



# Goose Island Site, Trip 2 (Concluded)

| Tow name               | Date    | Passing Time |          | Induced velocity m/s |          |                |          |               |          |
|------------------------|---------|--------------|----------|----------------------|----------|----------------|----------|---------------|----------|
|                        |         | Beginning    | Ending   | S4/040               |          | S4/832         |          | S4/834        |          |
|                        |         |              |          | $U_{im}$             | $V_{im}$ | $U_{im}$       | $V_{im}$ | $U_{im}$      | $V_{im}$ |
| Ardyce Randall         | 7/18/91 | 10:42:18     | 10:44:10 | -                    | -        | **             | -        | 0.508, 0.093  | **       |
| Scarlet Knight         |         | 12:26:59     | 12:28:46 | -                    | -        | -0.037, -0.043 | -        | -             | -        |
| James F. Neal          |         | 14:17:04     | 14:18:34 | 0.435, -0.008        | -        | -              | -        | 0.259, 0.400  | **       |
| Helen M. Clements      |         | 17:23:03     | 17:25:22 | **                   | -        | -              | -        | **            | -        |
| Elizabeth Ann          |         | 18:00:59     | 18:02:46 | -                    | -        | -              | -        | -             | -        |
| Frank T. Heffelfinger  | 7/19/91 | 11:03:32     | 11:05:24 | -                    | -        | -              | -        | **            | -        |
| Queen City             |         | 14:33:45     | 14:35:21 | -                    | -        | -              | -        | 0.440, -0.059 | -        |
| Helen M. Clements      |         | 16:24:27     | 16:26:12 | -                    | -        | -              | -        | 0.512, -0.068 | -        |
| Frank T. Heffelfinger  |         | 16:33:21     | 16:36:52 | -                    | -        | -              | -        | 0.899, 0.139  | -        |
| Cooperative Venture    |         | 18:05:37     | 18:56:45 | -                    | -        | -              | -        | 0.857, 0.055  | -        |
| Volunteer State        |         | 08:09:31     | 08:11:39 | -                    | -        | -              | -        | -             | -        |
| Prairie Dawn           | 7/20/91 | 08:19:27     | 08:22:28 | -                    | -        | -              | -        | **            | -        |
| Prosperity             |         | 11:39:19     | 11:40:55 | -                    | -        | -              | -        | 0.809, 0.103  | -        |
| Clyde Butcher          |         | 11:55:54     | 11:56:27 | -                    | -        | 0.470, -0.039  | -        | 0.573, 0.056  | -        |
| Lil Charley            |         | 13:31:19     | 13:31:38 | -                    | -        | **             | -        | **            | -        |
| C.W. Rushing           |         | 16:56:41     | 16:59:16 | -                    | -        | **             | -        | 0.558, 0.040  | -        |
| Conti-Nan              |         | 16:56:41     | 16:59:16 | -                    | -        | 0.900, 0.139   | -        | 0.849, 0.100  | -        |
| Cooperative Vanguard   | 7/21/91 | 13:08:36     | 13:11:50 | 0.912, 0.318         | -        | **             | -        | 0.797, 0.102  | -        |
| Conti-Karla            |         | 14:57:38     | 14:59:13 | 0.393, 0.000         | -        | 0.391, 0.103   | -        | 0.481, -0.060 | -        |
| Cooperative Mariner    | 7/22/91 | 10:34:47     | 10:36:47 | 0.436, 0.080         | -        | **             | -        | 0.440, 0.102  | -        |
| Hornet                 |         | 12:11:57     | 12:13:47 | 0.450, 0.261         | -        | **             | -        | 0.449, 0.102  | -        |
| Cooperative Ambassador |         | 13:16:41     | 13:18:43 | 0.779, 0.219         | -        | 0.808, 0.142   | -        | 0.726, **     | -        |
| Eastern                |         | 13:20:30     | 13:23:42 | **                   | -        | 0.771, 0.089   | -        | **            | -        |
| Sam M. Fleming         |         | 13:24:11     | 13:25:52 | 0.790, 0.169         | -        | 0.838, 0.110   | -        | 0.818, 0.109  | -        |
| Kevin Michael          | 7/23/91 | 14:00:12     | 14:02:12 | **                   | -        | **             | -        | **            | -        |
| A.M. Thompson          |         | 14:12:24     | 14:14:23 | **                   | -        | **             | -        | 0.501, 0.081  | -        |
| Lil Charley            |         | 14:20:30     | 14:20:55 | **                   | -        | **             | -        | 0.791, 0.091  | -        |
| Badger                 |         | 15:55:55     | 15:57:30 | 0.468, 0.011         | -        | 0.411, 0.009   | -        | 0.470, -0.035 | -        |
| Kay D                  |         | 15:59:29     | 16:00:13 | 0.514, 0.129         | -        | **             | -        | 0.541, 0.002  | -        |
| Evey-T                 |         | 16:24:21     | 16:26:55 | 0.882, 0.160         | -        | **             | -        | 0.702, 0.056  | -        |
| G.R. Packet            | 7/24/91 | 8:25:25      | 8:28:39  | **                   | -        | 0.803, 0.062   | -        | 0.740, 0.068  | -        |
| Mary L.                |         | 9:14:50      | 9:17:21  | 0.682, 0.136         | -        | **             | -        | -             | -        |
| Dud Hollinger          |         | 9:58:51      | 10:02:05 | 0.718, 0.030         | -        | 0.747, **      | -        | -             | -        |
| C.W. Rushing           |         | 12:13:19     | 12:13:57 | 0.711, 0.269         | -        | **             | -        | -             | -        |
| Dell Butcher           |         | 13:44:39     | 13:46:27 | **                   | -        | **             | -        | -             | -        |
| Coral Dawn             |         | 14:48:44     | 14:51:19 | 0.760, 0.112         | -        | **             | -        | -             | -        |
| Teresa R. Beesacker    |         | 15:43:33     | 15:45:33 | **                   | -        | **             | -        | -             | -        |

# Clarks Ferry Site, Trip 1

| Tow name             | Date    | Passing time |          | Induced velocity m/s  |                       |                       |                       |                       |                       |                       |                       |                       |                       |                       |                       |
|----------------------|---------|--------------|----------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
|                      |         | Beginning    | Ending   | MMBS11/1001           | MMBS11/1130           | MMBS11/1131           | MMBS11/998            | MMBS11/999            |                       |                       |                       |                       |                       |                       |                       |
| C.W. Rushing 1       | 5/16/91 | 12:07:44     | 12:08:56 | <i>U<sub>im</sub></i> | <i>V<sub>im</sub></i> | <i>U<sub>im</sub></i> | <i>V<sub>im</sub></i> | <i>U<sub>im</sub></i> | <i>V<sub>im</sub></i> | <i>U<sub>im</sub></i> | <i>V<sub>im</sub></i> | <i>U<sub>im</sub></i> | <i>V<sub>im</sub></i> | <i>U<sub>im</sub></i> | <i>V<sub>im</sub></i> |
| Donnie Ray Jr. 1     |         | 12:22:50     | 12:24:30 | *                     | **                    |                       |                       | 0.646, 0.046          | *                     |                       |                       |                       |                       | *                     |                       |
| Samantha             |         | 13:26:43     | 13:27:06 | *                     | 0.250, -0.031         | 0.280, -0.037         |                       | 0.261, 0.042          | *                     |                       |                       |                       |                       | *                     |                       |
|                      |         |              |          | *                     | 0.136, -0.016         | **                    |                       | **                    | **                    |                       |                       |                       |                       | **                    |                       |
| C.W. Rushing 2       | 5/17/91 | 12:26:16     | 12:26:36 | 0.027, -0.001         | **                    | **                    |                       | **                    | 0.248, -0.015         |                       |                       |                       |                       |                       |                       |
| Jemco Towing         |         | 15:03:40     | 15:04:39 | 0.180, 0.029          | 0.291, 0.022          | 0.312, 0.013          |                       | 0.387, -0.002         | 0.401, -0.006         |                       |                       |                       |                       |                       |                       |
| T.S. Kunsman         |         | 16:31:55     | 16:33:22 | *                     | 0.130, -0.009         | 0.178, -0.006         |                       | 0.183, -0.037         | 0.224, -0.031         |                       |                       |                       |                       |                       |                       |
| Dell Butcher 1       |         | 17:43:27     | 17:46:12 | 0.206, 0.039          | 0.276, N/A            | 0.331, N/A            |                       | 0.398, -0.017         | 0.431, 0.045          |                       |                       |                       |                       |                       |                       |
| Pearl B.             | 5/19/91 | 10:06:30     | 10:07:53 | -                     | -                     | -                     |                       | -                     | -                     |                       |                       |                       |                       | -                     |                       |
| Conti-Afton          |         | 11:41:08     | 11:42:35 | -                     | -                     | -                     |                       | -                     | -                     |                       |                       |                       |                       | -                     |                       |
| Jack D. Wofford      |         | 16:33:57     | 16:35:16 | **                    | **                    | **                    |                       | **                    | **                    |                       |                       |                       |                       | **                    |                       |
| Donnie Ray Jr. 2     | 5/20/91 | 11:33:41     | 11:36:31 | **                    | **                    | **                    |                       | **                    | **                    |                       |                       |                       |                       | **                    |                       |
| Sunflower 1          |         | 12:24:22     | 12:24:37 | **                    | 0.159, -0.011         | **                    |                       | **                    | 0.251, -0.037         |                       |                       |                       |                       | **                    |                       |
| American Beauty 1    |         | 15:48:23     | 15:50:13 | **                    | **                    | **                    |                       | **                    | **                    |                       |                       |                       |                       | **                    |                       |
| Sierra Dawn          | 5/21/91 | 09:09:28     | 09:11:00 | **                    | **                    | **                    |                       | **                    | **                    |                       |                       |                       |                       | **                    |                       |
| Cooperative Vanguard |         | 09:36:54     | 09:37:56 | **                    | **                    | **                    |                       | **                    | **                    |                       |                       |                       |                       | **                    |                       |
| Cindy J. Erickson    |         | 10:29:26     | 10:31:47 | **                    | **                    | **                    |                       | **                    | **                    |                       |                       |                       |                       | **                    |                       |
| Frank H. Peavy       |         | 10:49:16     | 10:50:37 | **                    | **                    | **                    |                       | **                    | 0.368, 0.005          |                       |                       |                       |                       | **                    |                       |
| Helen M. Clements    |         | 11:32:51     | 11:34:43 | 0.202, 0.018          | 0.318, 0.036          | 0.348, 0.036          |                       | 0.140, -0.031         | **                    |                       |                       |                       |                       | **                    |                       |
| Sunflower 2          |         | 12:13:06     | 12:13:22 | **                    | **                    | **                    |                       | **                    | **                    |                       |                       |                       |                       | **                    |                       |
| Dell Butcher 2       |         | 12:37:20     | 12:38:44 | **                    | **                    | **                    |                       | **                    | 0.426, 0.039          |                       |                       |                       |                       | **                    |                       |
| Hornet               |         | 13:30:54     | 13:32:27 | **                    | **                    | **                    |                       | **                    | 0.242, -0.034         |                       |                       |                       |                       | **                    |                       |
| Volunteer State      |         | 16:08:16     | 16:09:56 | **                    | **                    | **                    |                       | **                    | **                    |                       |                       |                       |                       | **                    |                       |
| Edward J. Hancock    | 5/22/91 | 09:52:51     | 09:55:33 | *                     | 0.278, 0.031          | **                    |                       | *                     | **                    |                       |                       |                       |                       | **                    |                       |
| Starfire             |         | 10:54:32     | 10:56:51 | 0.178, 0.016          | **                    | **                    |                       | *                     | 0.386, 0.009          |                       |                       |                       |                       | *                     |                       |
| American Beauty 2    |         | 13:46:39     | 13:47:10 | **                    | **                    | **                    |                       | **                    | 0.258, -0.027         |                       |                       |                       |                       | **                    |                       |

- Meter was not available

\* Meter did not work

\*\* No obvious impact

# Clarks Ferry Site, Trip 1 (Continued)

| Tow name             | Date    | Passing time |          | Induced velocity m/s |          |               |          |               |          |               |          |              |          |   |  |
|----------------------|---------|--------------|----------|----------------------|----------|---------------|----------|---------------|----------|---------------|----------|--------------|----------|---|--|
|                      |         | Beginning    | Ending   | MMB511/1000          |          | MMB527/332    |          | MMB527/642    |          | S4/151        |          | S4/834       |          |   |  |
|                      |         |              |          | $U_{im}$             | $V_{im}$ | $U_{im}$      | $V_{im}$ | $U_{im}$      | $V_{im}$ | $U_{im}$      | $V_{im}$ | $U_{im}$     | $V_{im}$ |   |  |
| C.W. Rushing 1       | 5/16/91 | 12:07:44     | 12:08:56 |                      |          | **            |          |               | **       | *             |          |              |          | - |  |
| Donnie Ray Jr. 1     |         | 12:22:50     | 12:24:30 | 0.824, 0.008         |          | **            |          |               | **       | *             |          |              |          | - |  |
| Samantha             |         | 13:26:43     | 13:27:06 | 0.469, 0.044         |          | **            |          | 0.493, -0.064 | **       | *             |          |              |          | - |  |
|                      |         |              |          | **                   |          | 0.453, -0.052 |          | **            |          | *             |          |              |          | - |  |
| C.W. Rushing 2       | 5/17/91 | 12:26:16     | 12:26:36 |                      |          |               |          | *             |          | *             |          | 0.125, 0.023 |          |   |  |
| Jemco Towing         |         | 15:03:40     | 15:04:39 | 0.444, 0.001         |          | **            |          | **            |          | **            |          | 0.253, 0.145 |          |   |  |
| T.S. Kunsman         |         | 16:31:55     | 16:33:22 | 0.271, -0.028        |          | **            |          | 0.549, -0.027 | *        | *             |          | **           |          |   |  |
| Dell Butcher 1       |         | 17:43:27     | 17:46:12 | 0.449, 0.020         |          | *             |          | *             |          | 0.441, -0.085 |          | **           |          |   |  |
| Pearl B.             | 5/19/91 | 10:06:30     | 10:07:53 | -                    |          | **            |          | **            |          | **            |          | 0.143, 0.068 |          |   |  |
| Conti-Aflon          |         | 11:41:08     | 11:42:35 | -                    |          | **            |          | **            |          | **            |          | 0.143, 0.054 |          |   |  |
| Jack D. Wofford      |         | 16:33:57     | 16:35:16 | **                   |          | **            |          | **            |          | 0.132, -0.059 |          | **           |          |   |  |
| Donnie Ray Jr. 2     | 5/20/91 | 11:33:41     | 11:36:31 | **                   |          |               |          | **            |          | *             |          | *            |          |   |  |
| Sunflower 1          |         | 12:24:22     | 12:24:37 | **                   |          | **            |          | **            |          | *             |          | *            |          |   |  |
| American Beauty 1    |         | 15:48:23     | 15:50:13 | **                   |          | **            |          | **            |          | *             |          | 0.434, 0.198 |          |   |  |
| Sierra Dawn          | 5/21/91 | 09:09:28     | 09:11:00 | **                   |          |               |          | -             |          | *             |          | *            |          |   |  |
| Cooperative Vanguard |         | 09:36:54     | 09:37:56 | **                   |          | -             |          | -             |          | -             |          | *            |          |   |  |
| Cindy J. Erickson    |         | 10:29:26     | 10:31:47 | 0.399, 0.014         |          | -             |          | -             |          | -             |          | *            |          |   |  |
| Frank H. Peavy       |         | 10:49:16     | 10:50:37 | **                   |          | -             |          | -             |          | -             |          | *            |          |   |  |
| Helen M. Clements    |         | 11:32:51     | 11:34:43 | 0.439, 0.059         |          | -             |          | -             |          | -             |          | -            |          |   |  |
| Sunflower 2          |         | 12:13:06     | 12:13:22 | **                   |          | -             |          | -             |          | -             |          | -            |          |   |  |
| Dell Butcher 2       |         | 12:37:20     | 12:38:44 | 0.291, -0.034        |          | -             |          | -             |          | -             |          | -            |          |   |  |
| Hornet               |         | 13:30:54     | 13:32:27 | **                   |          | -             |          | -             |          | -             |          | -            |          |   |  |
| Volunteer State      |         | 16:08:16     | 16:09:56 | 0.406, -0.004        |          | -             |          | -             |          | -             |          | 0.721, 0.077 |          |   |  |
| Edward J. Hancock    | 5/22/91 | 09:52:51     | 09:55:33 | **                   |          | -             |          | -             |          | -             |          | 0.737, 0.098 |          |   |  |
| Starfire             |         | 10:54:32     | 10:56:51 | **                   |          | -             |          | -             |          | -             |          | 0.799, 0.113 |          |   |  |
| American Beauty 2    |         | 13:46:39     | 13:47:10 | **                   |          | -             |          | -             |          | -             |          | **           |          |   |  |

- Meter was not available  
 \* Meter did not work  
 \*\* No obvious impact

# Clarks Ferry Site, Trip 1 (Concluded)

| Tow name             | Date    | Passing time |          | Induced velocity m/s |          |              |          |              |          |
|----------------------|---------|--------------|----------|----------------------|----------|--------------|----------|--------------|----------|
|                      |         | Beginning    | Ending   | S4/040               |          | S4/832       |          | S4/071       |          |
|                      |         |              |          | $U_{im}$             | $V_{im}$ | $U_{im}$     | $V_{im}$ | $U_{im}$     | $V_{im}$ |
| C.W. Rushing 1       | 5/16/91 | 12:07:44     | 12:08:56 | -                    |          | **           |          | -            |          |
| Donnie Ray Jr. 1     |         | 12:22:50     | 12:24:30 | -                    |          | **           |          | -            |          |
| Samantha             |         | 13:26:43     | 13:27:06 | -                    |          | 0.434,-0.042 |          | -            |          |
| C.W. Rushing 2       | 5/17/91 | 12:26:16     | 12:26:36 | *                    |          | **           |          | **           |          |
| Jemco Towing         |         | 15:03:40     | 15:04:39 | *                    |          | **           |          | **           |          |
| T.S. Kunsman         |         | 16:31:55     | 16:33:22 | *                    |          | *            |          | 0.346,-0.084 |          |
| Dell Butcher 1       |         | 17:43:27     | 17:46:12 | *                    |          | 0.314, 0.065 |          | 0.819, 0.151 |          |
| Pearl B.             | 5/19/91 | 10:06:30     | 10:07:53 | *                    |          | 0.091,-0.085 |          | -            |          |
| Conti-Afton          |         | 11:41:08     | 11:42:35 | *                    |          | 0.107,-0.043 |          | 0.433, 0.010 |          |
| Jack D. Wofford      |         | 16:33:57     | 16:35:16 | **                   |          | 0.192, 0.001 |          | 0.414,-0.041 |          |
| Donnie Ray Jr. 2     | 5/20/91 | 11:33:41     | 11:36:31 | 0.887, 0.121         |          | *            |          | *            |          |
| Sunflower 1          |         | 12:24:22     | 12:24:37 | **                   |          | *            |          | *            |          |
| American Beauty 1    |         | 15:48:23     | 15:50:13 | 0.801, 0.081         |          | **           |          | *            |          |
| Sierra Dawn          | 5/21/91 | 09:09:28     | 09:11:00 | **                   |          | **           |          | *            |          |
| Cooperative Vanguard |         | 09:36:54     | 09:37:56 | 0.484,-0.017         |          | *            |          | -            |          |
| Cindy J. Erickson    |         | 10:29:26     | 10:31:47 | **                   |          | 0.385, 0.088 |          | -            |          |
| Frank H. Peavy       |         | 10:49:16     | 10:50:37 | **                   |          | *            |          | -            |          |
| Helen M. Clements    |         | 11:32:51     | 11:34:43 | 0.758, 0.059         |          | *            |          | -            |          |
| Sunflower 2          |         | 12:13:06     | 12:13:22 | **                   |          | *            |          | -            |          |
| Dell Butcher 2       |         | 12:37:20     | 12:38:44 | 0.474,-0.008         |          | *            |          | -            |          |
| Hornet               |         | 13:30:54     | 13:32:27 | 0.718, 0.044         |          | *            |          | -            |          |
| Volunteer State      |         | 16:08:16     | 16:09:56 | 0.749, 0.067         |          | *            |          | **           |          |
| Edward J. Hancock    | 5/22/91 | 09:52:51     | 09:55:33 | 0.708, 0.064         |          | 0.349, 0.009 |          | **           |          |
| Starfire             |         | 10:54:32     | 10:56:51 | **                   |          | *            |          | **           |          |
| American Beauty 2    |         | 13:46:39     | 13:47:10 | 0.431,-0.064         |          | **           |          | **           |          |

- Meter was not available

\* Meter did not work

\*\* No obvious impact

# Clarks Ferry Site, Trip 2

| Tow name                                                                                                                        | Date     | Passing time |          | Induced velocity m/s |                 |                 |                 |                 |                 |                 |                 |                 |                 |  |  |
|---------------------------------------------------------------------------------------------------------------------------------|----------|--------------|----------|----------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|--|--|
|                                                                                                                                 |          | Beginning    | Ending   | MMBS11/1001          |                 | MMBS11/998      |                 | MMBS11/999      |                 | MMBS11/1000     |                 | MMBS11/1130     |                 |  |  |
|                                                                                                                                 |          |              |          | U <sub>im</sub>      | V <sub>im</sub> | U <sub>im</sub> | V <sub>im</sub> | U <sub>im</sub> | V <sub>im</sub> | U <sub>im</sub> | V <sub>im</sub> | U <sub>im</sub> | V <sub>im</sub> |  |  |
| C. W. Rushing<br>Evey-T<br>Sunflower 1<br>Evelyn C.<br>Sunflower 2<br>Conti-Nan 1<br>Night 1<br>Night 2<br>Night 3              | 10/17/91 | 07:33:54     | 07:34:17 | **                   |                 | 0.062, -0.025   |                 | 0.084, -0.022   |                 | 0.104, -0.016   |                 | 0.072, 0.000    |                 |  |  |
|                                                                                                                                 |          | 08:43:43     | 08:45:34 | 0.095, 0.005         |                 | 0.145, 0.002    |                 | 0.171, -0.004   |                 | 0.170, 0.011    |                 | 0.182, 0.020    |                 |  |  |
|                                                                                                                                 |          | 11:43:54     | 11:44:12 | 0.030, -0.011        |                 | 0.064, -0.009   |                 | 0.089, -0.014   |                 | 0.118, -0.009   |                 | 0.061, 0.001    |                 |  |  |
|                                                                                                                                 |          | 11:45:01     | 11:45:36 | 0.033, -0.026        |                 | 0.058, -0.011   |                 | 0.095, -0.017   | **              |                 |                 | 0.074, 0.008    |                 |  |  |
|                                                                                                                                 |          | 17:06:09     | 17:06:35 | 0.070, N/A           |                 | 0.121, 0.015    |                 | 0.148, 0.015    |                 | 0.158, 0.014    |                 | 0.167, 0.016    |                 |  |  |
|                                                                                                                                 |          | 18:54:59     | 18:57:14 | 0.011, N/A           |                 | 0.034, -0.008   |                 | 0.044, -0.005   |                 | 0.064, -0.007   |                 | 0.054, -0.019   |                 |  |  |
|                                                                                                                                 |          | 20:14:14     | 20:14:33 | 0.074, N/A           |                 | 0.106, 0.013    |                 | 0.125, 0.013    | **              |                 |                 | 0.150, 0.007    |                 |  |  |
|                                                                                                                                 |          | 20:19:50     | 20:20:12 | 0.077, N/A           |                 | **              | **              | **              | **              |                 |                 | **              | **              |  |  |
|                                                                                                                                 |          | 20:50:43     | 20:51:25 | 0.036, N/A           |                 | **              | **              | **              | **              | 0.097, 0.002    |                 | 0.089, -0.016   |                 |  |  |
| Lady Lone Star 1<br>Lady Lone Star 2<br>Kevin Michael<br>Deborah Valentine<br>Volunteer State<br>Sunflower 3<br>Frank Stegbauer | 10/18/91 | 07:16:51     | 07:17:25 | 0.029, N/A           |                 | 0.060, -0.001   |                 | 0.091, -0.002   | **              |                 |                 | 0.079, -0.014   |                 |  |  |
|                                                                                                                                 |          | 07:43:37     | 07:43:44 | 0.063, N/A           |                 | **              | **              | **              | **              |                 |                 | **              | **              |  |  |
|                                                                                                                                 |          | 08:24:59     | 08:27:08 | 0.018, N/A           |                 | 0.029, -0.006   |                 | 0.061, -0.011   |                 | 0.070, -0.009   |                 | 0.053, -0.019   |                 |  |  |
|                                                                                                                                 |          | 09:55:28     | 09:58:08 | 0.011, N/A           |                 | 0.030, -0.012   |                 | 0.046, -0.006   |                 | 0.069, 0.000    |                 | 0.060, -0.015   |                 |  |  |
|                                                                                                                                 |          | 10:06:34     | 10:07:14 | -0.035, N/A          |                 | 0.008, -0.011   |                 | 0.026, -0.016   |                 | 0.019, -0.011   |                 | 0.043, -0.006   |                 |  |  |
|                                                                                                                                 |          | 11:26:47     | 11:27:04 | **                   |                 | **              | **              | 0.076, -0.002   | **              |                 |                 | **              | **              |  |  |
|                                                                                                                                 |          | 12:32:08     | 12:32:52 | -0.002, N/A          |                 | 0.028, -0.016   |                 | 0.059, -0.004   |                 | 0.065, 0.006    |                 | 0.055, -0.019   |                 |  |  |
| Kathy Ellen<br>Jack Bullard<br>Marc<br>Conti-Nan 2<br>Cristina Ecstein<br>Coast Guard 65504<br>Prairie Dawn                     | 10/19/91 | 10:13:44     | 10:16:43 | 0.009, N/A           |                 | 0.035, N/A      |                 | 0.041, -0.005   |                 | 0.075, -0.000   |                 | 0.066, -0.014   |                 |  |  |
|                                                                                                                                 |          | 12:07:14     | 12:09:42 | 0.169, 0.003         |                 | 0.201, 0.016    |                 | 0.208, N/A      |                 | 0.228, N/A      |                 | 0.228, 0.005    |                 |  |  |
|                                                                                                                                 |          | 12:57:38     | 12:58:29 | 0.039, -0.012        |                 | 0.040, -0.006   |                 | 0.074, -0.016   |                 | 0.083, -0.001   |                 | **              |                 |  |  |
|                                                                                                                                 |          | 13:44:23     | 13:45:17 | 0.104, 0.001         |                 | 0.131, 0.014    |                 | 0.141, 0.009    |                 | 0.151, 0.015    |                 | 0.169, 0.007    |                 |  |  |
|                                                                                                                                 |          | 14:03:17     | 14:04:18 | 0.094, -0.001        |                 | **              | **              | 0.139, 0.010    | **              | 0.140, 0.011    |                 | 0.148, 0.006    |                 |  |  |
|                                                                                                                                 |          | 14:54:46     | 14:54:57 | 0.055, -0.011        |                 | 0.079, -0.001   |                 | **              | **              | 0.101, 0.000    |                 | **              | **              |  |  |
|                                                                                                                                 |          | 17:30:03     | 17:31:27 | 0.118, 0.011         |                 | 0.151, 0.016    |                 | 0.166, 0.014    |                 | 0.183, 0.016    |                 | 0.191, 0.010    |                 |  |  |
| Noname<br>Cooperative<br>Ambassador<br>Yazoo City<br>George W. Banta                                                            | 10/20/91 | 06:54:14     | 06:55:25 | *                    |                 | 0.146, 0.014    |                 | 0.164, N/A      |                 | 0.169, 0.019    | *               |                 |                 |  |  |
|                                                                                                                                 |          | 07:05:14     | 07:07:29 | 0.002, -0.007        |                 | 0.041, N/A      |                 | 0.055, -0.010   |                 | 0.076, -0.004   |                 | 0.066, -0.012   |                 |  |  |
|                                                                                                                                 |          | 09:31:48     | 09:34:30 | 0.121, 0.015         |                 | 0.146, 0.016    |                 | 0.174, 0.026    |                 | 0.183, N/A      |                 | 0.191, 0.006    |                 |  |  |
|                                                                                                                                 |          | 12:19:36     | 12:21:59 | 0.099, 0.011         |                 | 0.139, 0.014    |                 | 0.154, N/A      |                 | 0.161 N/A       |                 | 0.154, 0.006    |                 |  |  |
|                                                                                                                                 |          |              |          |                      |                 |                 |                 |                 |                 |                 |                 |                 |                 |  |  |

- Meter was not available

\* Meter did not work

\*\* No obvious impact

# Clarks Ferry Site, Trip 2 (Continued)

| Tow name          | Date     | Passing time |          | Induced velocity m/s |          |               |          |               |          |               |          |
|-------------------|----------|--------------|----------|----------------------|----------|---------------|----------|---------------|----------|---------------|----------|
|                   |          | Beginning    | Ending   | MMB511/1131          |          | MMB527/332    |          | MMB527/642    |          | S4/834        |          |
|                   |          |              |          | $U_{im}$             | $V_{im}$ | $U_{im}$      | $V_{im}$ | $U_{im}$      | $V_{im}$ | $U_{im}$      | $V_{im}$ |
| C.W. Rushing      | 10/17/91 | 07:33:54     | 07:34:17 | 0.092, 0.002         |          | 0.143, -0.036 |          | 0.144, -0.024 |          | -             |          |
| Evey-T            |          | 08:43:43     | 08:45:34 | 0.208, 0.016         |          | 0.348, 0.025  |          | 0.336, 0.011  |          | -             |          |
| Sunflower 1       |          | 11:43:54     | 11:44:12 | 0.096, 0.004         |          | 0.162, -0.011 |          | **            |          | *             |          |
| Evelyn C.         |          | 11:45:01     | 11:45:36 | 0.098, 0.003         |          | 0.161, 0.009  |          | 0.178, -0.021 |          | *             |          |
| Sunflower 2       |          | 17:06:09     | 17:06:35 | 0.178, 0.005         |          | 0.318, 0.014  |          | 0.341, 0.022  |          | *             |          |
| Conti-Nan 1       |          | 18:54:59     | 18:57:14 | 0.069, -0.025        |          | 0.112, -0.026 |          | 0.089, -0.051 |          | 0.241, -0.002 |          |
| Night 1           |          | 20:14:14     | 20:14:33 | 0.159, -0.001        |          | 0.284, 0.016  |          | 0.278, 0.011  |          | *             |          |
| Night 2           |          | 20:19:50     | 20:20:12 | **                   |          | **            |          | 0.274, 0.020  |          | *             |          |
| Night 3           |          | 20:50:43     | 20:51:25 | 0.111, -0.012        |          | **            |          | 0.178, -0.072 |          | *             |          |
| Lady Lone Star 1  | 10/18/91 | 07:16:51     | 07:17:25 | 0.105, -0.015        |          | **            |          | **            |          | 0.258, -0.024 |          |
| Lady Lone Star 2  |          | 07:43:37     | 07:43:44 | **                   |          | 0.292, 0.014  |          | **            |          | *             |          |
| Kevin Michael     |          | 08:24:59     | 08:27:08 | 0.059, -0.020        |          | 0.099, -0.029 |          | 0.123, -0.034 |          | 0.257, -0.055 |          |
| Deborah Valentine |          | 09:55:28     | 09:58:08 | 0.074, -0.011        |          | 0.108, -0.027 |          | 0.093, -0.049 |          | **            |          |
| Volunteer State   |          | 10:06:34     | 10:07:14 | 0.059, -0.010        |          | 0.032, -0.015 |          | 0.080, -0.016 |          | 0.207, -0.071 |          |
| Sunflower 3       |          | 11:26:47     | 11:27:04 | **                   |          | 0.168, -0.020 |          | 0.191, -0.021 |          | **            |          |
| Frank Stegbauer   |          | 12:32:08     | 12:32:52 | 0.081, -0.014        |          | 0.128, -0.042 |          | 0.100, -0.020 |          | *             |          |
| Kathy Ellen       | 10/19/91 | 10:13:44     | 10:16:43 | 0.076, -0.015        |          | 0.107, -0.031 |          | 0.163, -0.044 |          | 0.238, -0.068 |          |
| Jack Bullard      |          | 12:07:14     | 12:09:42 | 0.238, 0.001         |          | 0.415, 0.016  |          | 0.483, 0.001  |          | 0.662, N/A    |          |
| Marc              |          | 12:57:38     | 12:58:29 | 0.097, -0.016        |          | **            |          | 0.126, -0.025 |          | 0.318, -0.025 |          |
| Conti-Nan 2       |          | 13:44:23     | 13:45:17 | 0.174, 0.005         |          | 0.347, 0.021  |          | 0.324, 0.010  |          | 0.540, 0.088  |          |
| Cristina Ecstein  |          | 14:03:17     | 14:04:18 | 0.166, 0.003         |          | 0.321, 0.031  |          | 0.321, 0.006  |          | 0.470, 0.032  |          |
| Coast Guard 65504 |          | 14:54:46     | 14:54:57 | **                   |          | 0.173, -0.035 |          | **            |          | **            |          |
| Prairie Dawn      |          | 17:30:03     | 17:31:27 | 0.202, 0.004         |          | 0.350, 0.043  |          | 0.363, 0.020  |          | *             |          |
| Noname            | 10/20/91 | 06:54:14     | 06:55:25 | *                    |          | 0.357, 0.032  |          | *             |          | 0.542, 0.016  |          |
| Cooperative       |          | 07:05:14     | 07:07:29 | 0.079, -0.014        |          | 0.123, 0.026  |          | *             |          | 0.261, -0.049 |          |
| Ambassador        |          |              |          |                      |          |               |          |               |          |               |          |
| Yazoo City        |          | 09:31:48     | 09:34:30 | 0.203, -0.001        |          | 0.380, 0.030  |          | 0.381, 0.015  |          | *             |          |
| George W. Banta   |          | 12:19:36     | 12:21:59 | 0.176, 0.009         |          | 0.330, 0.016  |          | 0.329, 0.025  |          | 0.660, -0.068 |          |

- Meter was not available

\* Meter did not work

\*\* No obvious impact

# Clarks Ferry Site, Trip 2 (Concluded)

| Tow name          | Date     | Passing time |          | Induced velocity m/s |                 |                 |                 |                 |                 |
|-------------------|----------|--------------|----------|----------------------|-----------------|-----------------|-----------------|-----------------|-----------------|
|                   |          | Beginning    | Ending   | S4/151               |                 | S4/832          |                 | S4/040          |                 |
|                   |          |              |          | U <sub>im</sub>      | V <sub>im</sub> | U <sub>im</sub> | V <sub>im</sub> | U <sub>im</sub> | V <sub>im</sub> |
| C.W. Rushing      | 10/17/91 | 07:33:54     | 07:34:17 | -                    | -               | -               | -               | *               | -               |
| Evey-T            |          | 08:43:43     | 08:45:34 | -                    | -               | -               | -               | *               | -               |
| Sunflower 1       |          | 11:43:54     | 11:44:12 | **                   |                 | 0.154, -0.011   |                 | *               | *               |
| Evelyn C.         |          | 11:45:01     | 11:45:36 | 0.223, 0.012         |                 | **              |                 | *               | *               |
| Sunflower 2       |          | 17:06:09     | 17:06:35 | 0.399, 0.107         |                 | 0.371, 0.030    |                 | -               | -               |
| Conti-Nan 1       |          | 18:54:59     | 18:57:14 | 0.163, 0.206         |                 | 0.123, 0.069    |                 | 0.071, -0.036   |                 |
| Night 1           |          | 20:14:14     | 20:14:33 | 0.390, 0.098         |                 | 0.327, 0.037    |                 | 0.283, 0.010    |                 |
| Night 2           |          | 20:19:50     | 20:20:12 | 0.374, 0.088         |                 | 0.350, 0.034    |                 | *               | *               |
| Night 3           |          | 20:50:43     | 20:51:25 | **                   |                 | **              |                 | 0.047, 0.020    |                 |
| Lady Lone Star 1  | 10/18/91 | 07:16:51     | 07:17:25 | **                   |                 | **              |                 | *               | *               |
| Lady Lone Star 2  |          | 07:43:37     | 07:43:44 | **                   |                 | **              |                 | *               | *               |
| Kevin Michael     |          | 08:24:59     | 08:27:08 | 0.161, 0.196         |                 | 0.101, 0.053    |                 | *               | *               |
| Deborah Valentine |          | 09:55:28     | 09:58:08 | 0.184, 0.153         |                 | 0.146, 0.057    |                 | *               | *               |
| Volunteer State   |          | 10:06:34     | 10:07:14 | 0.032, 0.181         |                 | 0.061, 0.089    |                 | *               | *               |
| Sunflower 3       |          | 11:26:47     | 11:27:04 | -                    |                 | -               |                 | *               | *               |
| Frank Stegbauer   |          | 12:32:08     | 12:32:52 | 0.202, -0.066        |                 | 0.143, -0.044   |                 | *               | *               |
| Kathy Ellen       | 10/19/91 | 10:13:44     | 10:16:43 | 0.212, 0.158         |                 | 0.171, 0.059    |                 | *               | *               |
| Jack Bullard      |          | 12:07:14     | 12:09:42 | 0.626, 0.272         |                 | *               |                 | 0.488, 0.075    |                 |
| Marc              |          | 12:57:38     | 12:58:29 | 0.208, 0.105         |                 | 0.188, 0.031    |                 | *               | *               |
| Conti-Nan 2       |          | 13:44:23     | 13:45:17 | 0.432, 0.131         |                 | 0.370, 0.045    |                 | *               | *               |
| Cristina Ecstein  |          | 14:03:17     | 14:04:18 | 0.359, 0.106         |                 | 0.348, 0.050    |                 | *               | *               |
| Coast Guard 65504 |          | 14:54:46     | 14:54:57 | **                   |                 | 0.196, -0.190   |                 | **              | **              |
| Prairie Dawn      |          | 17:30:03     | 17:31:27 | 0.446, 0.129         |                 | 0.373, 0.046    |                 | 0.252, 0.046    |                 |
| Noname            | 10/20/91 | 06:54:14     | 06:55:25 | 0.398, 0.107         |                 | 0.372, 0.056    |                 | *               | *               |
| Cooperative       |          | 07:05:14     | 07:07:29 | 0.158, 0.150         |                 | 0.189, 0.061    |                 | *               | *               |
| Ambassador        |          | 09:31:48     | 09:34:30 | 0.477, 0.147         |                 | 0.404, 0.069    |                 | *               | *               |
| Yazoo City        |          | 12:19:36     | 12:21:59 | 0.623, 0.272         |                 | **              |                 | *               | *               |
| George W. Banta   |          |              |          |                      |                 |                 |                 |                 |                 |

- Meter was not available

\* Meter did not work

\*\* No obvious impact

**APPENDIX XII.**

**MAXIMUM WAVE HEIGHT AND DRAWDOWN  
AT ALL STUDY SITES AND FOR ALL BARGE-TOW EVENTS**



# McEver's Island Site

| <i>Name</i>          | <i>Date</i> | <i>Maximum*<br/>wave height<br/>(m)</i> | <i>Maximum*<br/>drawdown<br/>(m)</i> |
|----------------------|-------------|-----------------------------------------|--------------------------------------|
| R. W. Naye           | 5/16/89     | 0.03                                    | -0.213                               |
| Evelyn C.            |             |                                         | -0.091                               |
| Mary Ellen           | 5/17/89     |                                         | -0.073                               |
| Elaine Jones         |             | 0.03                                    | -0.17                                |
| Bill McCormick       |             |                                         | -0.11                                |
| Nicolas Duncan       |             | 0.05                                    | -0.05                                |
| Mobil Leader         | 5/18/89     | 0.07                                    | -0.18                                |
| Reliance             |             | 0.14                                    | -0.152                               |
| Cooperative Vanguard |             | 0.15                                    | -0.17                                |
| Marvin E. Norman     |             | 0.05                                    | -0.082                               |
| Illini               |             | 0.06                                    | -0.076                               |
| Thurston B. Morton   | 5/19/89     | 0.02                                    |                                      |
| Clarence G. Frame    |             | 0.01                                    | -0.24                                |

\* taken from a staff gage reading

### Kampsville Site, Trip 1

| <i>Name</i>      | <i>Date</i> | <i>Maximum<br/>wave height<br/>(m)</i> | <i>Maximum<br/>drawdown<br/>(m)</i> |
|------------------|-------------|----------------------------------------|-------------------------------------|
| Mallard          | 10/11/90    | 0.09*                                  | -0.15*                              |
| Nicholas Duncan  |             | 0.04*                                  | -0.03*                              |
| Bill Gee         |             | 0.3*                                   | -0.122*                             |
| Mr. Aldo         | 10/12/90    | 0.061                                  | -0.09                               |
| Floyd H. Blaske  |             | 0.092                                  | -0.075                              |
| Marvin E. Norman | 10/13/90    | 0.061                                  | -0.029                              |
| Luke Burton      |             | 0.244                                  | -0.107                              |
| Sugarland        |             | 0.092                                  | -0.123                              |
| William C Norman |             | 0.122                                  | -0.09                               |
| Frank H. Peavey  |             | 0.13                                   | -0.014                              |
| Conti Karla      |             | 0.107                                  | -0.105                              |
| Margaret O.      |             |                                        | -0.183*                             |
| Mr. Paul         | 10/14/90    | 0.06                                   | -0.075                              |
| Rambler          |             | 0.076                                  | -0.06                               |
| Mr. Lawrence     |             | 0.168                                  | -0.121                              |
| Mallard          |             | 0.137                                  | -0.06                               |
| Charles Lehman   |             | 0.106                                  | -0.106                              |
| Nicholas Duncan  |             | 0.214                                  | -0.09                               |
| Jeff Boat        |             | 0.061                                  | -0.093                              |
| Mary Ann         |             | 0.091                                  | -0.03                               |
| Ardyce Randall   | 10/15/90    | 0.061                                  | -0.032                              |
| Mr. Paul         |             | 0.077                                  | -0.077                              |
| Exxon St. Louis  |             | 0.077                                  | -0.105                              |
| Margaret O.      |             | 0.107                                  | -0.153                              |
| Mr. Lawrence     |             | 0.12*                                  | -0.183*                             |
| A. L. Smith      | 10/16/90    | 0.122                                  | -0.062                              |
| Ste. Genevieve   |             | 0.107                                  | -0.063                              |
| Nicole Brent     | 10/17/90    | 0.229                                  | -0.123                              |
| Frank H. Peavey  |             | 0.153                                  | -0.108                              |

\*taken from a staff gage reading

### Kampsville Site, Trip 2

| <i>Name</i>        | <i>Date</i> | <i>Maximum<br/>wave height<br/>(m)</i> | <i>Maximum<br/>drawdown<br/>(m)</i> |
|--------------------|-------------|----------------------------------------|-------------------------------------|
| Ranger             | 08/13/91    | 0.01*                                  | -0.012*                             |
| Dixie Patriot      |             | 0.153                                  | -0.167                              |
| Orleanian          |             | 0.213                                  | -0.077                              |
| Pat Breen          |             | 0.076                                  | -0.105                              |
| Dixie Express II   |             | 0.091                                  | -0.105                              |
| Jo Anne Stegbauer  |             | 0.122                                  | -0.063                              |
| Ste. Genevieve     |             | 0.061                                  | -0.062                              |
| Bob White          |             | 0.061                                  | -0.078                              |
| Night 14-01        |             | 0.092                                  | -0.062                              |
| Night 14-02        |             | 0.092                                  | -0.062                              |
| Irving Crown       | 08/14/91    | 0.092                                  | -0.047                              |
| Gordon Jones       |             | 0.167                                  | -0.154                              |
| George W. Shamblin |             | 0.122                                  | -0.031                              |
| Katherine L.       |             | 0.198                                  | -0.045                              |
| Thruston B. Morton |             | 0.08                                   | -0.062                              |
| Julie White        |             | 0.045                                  | -0.078                              |
| Ranger             |             | 0.13*                                  | -0.01*                              |
| Illini             |             | 0.076                                  | -0.047                              |
| Bronwynne Brent    |             | 0.076                                  | -0.048                              |
| Sugarland          |             | 0.031                                  | -0.062                              |
| Frank Stegbauer    | 08/15/91    | 0.168                                  | -0.093                              |
| Bill McCormick     |             |                                        |                                     |
| Marvin E. Norman   |             | 0.06*                                  | -0.061*                             |
| Olmstead           |             | 0.076                                  | -0.079                              |
| Jack D. Wofford    |             | 0.061                                  | -0.094                              |
| Dixie Express      |             | 0.122                                  | -0.094                              |
| Hal D. Miller      |             | 0.061                                  | -0.124                              |
| Jesse Brent        |             | 0.107                                  | -0.093                              |

\*taken from a staff gage reading

### Apple River Island Site

| <i>Name</i>            | <i>Date</i> | <i>Maximum<br/>wave height<br/>(m)</i> | <i>Maximum<br/>drawdown<br/>(m)</i> |
|------------------------|-------------|----------------------------------------|-------------------------------------|
| Yazoo                  | 5/18/90     | 0.03*                                  | -0.015*                             |
| Cooperative Ambassador |             | 0.03*                                  | -0.076*                             |
| Christine Bailey       |             | 0.04*                                  | -0.067*                             |
| Kathy Ellen            |             |                                        |                                     |
| W.A. Kernan            | 5/19/90     |                                        |                                     |
| Hornet                 |             | 0.05*                                  | -0.05*                              |
| Conti Bonnie           |             | 0.09*                                  | -0.06*                              |
| Becky Lynn             |             | 0.09*                                  | -0.10*                              |
| Lexington              |             |                                        | -0.046*                             |
| Philip M. Pfeffer      | 5/20/90     |                                        |                                     |
| Merlin Banta           |             |                                        |                                     |
| Rusty Flowers          |             | 0.122                                  | -0.077                              |
| Tom Talbert            |             | 0.29                                   | -0.095                              |
| Herman Pott            |             |                                        | -0.106*                             |
| Walter Brunson         | 5/21/90     | 0.122                                  | -0.073                              |
| Dell Butcher           |             | 0.107                                  | -0.058                              |
| Mary Gail              |             | 0.092                                  | -0.031                              |
| T. S. Kunsman          |             | 0.168                                  | -0.104                              |
| D. Ray Miller          |             | 0.092                                  | -0.088                              |
| Mary Gail              | 5/22/90     | 0.077                                  | -0.042                              |
| Trojan                 |             | 0.107                                  | -0.045                              |
| Melinda Brent          |             | 0.092                                  | -0.015                              |
| Cooperative Mariner    |             | 0.259                                  | -0.095                              |
| Ed Renshaw             |             | 0.16*                                  | -0.122*                             |
| Kevin Michael          | 5/23/90     | 0.11*                                  | -0.03*                              |
| Jack D. Wofford        |             | 0.121                                  | -0.046                              |
| Trojan                 |             | 0.121                                  | -0.031                              |

\*taken from a staff gage reading

# Goose Island Site, Trip 1

| <i>Name</i>            | <i>Date</i> | <i>Maximum<br/>wave height<br/>(m)</i> | <i>Maximum<br/>drawdown<br/>(m)</i> |
|------------------------|-------------|----------------------------------------|-------------------------------------|
| Sierra Dawn            | 8/24/90     |                                        |                                     |
| Dell Butcher           |             | 0.122                                  | -0.061                              |
| William C. Norman      |             | 0.122                                  | -0.046                              |
| Normania               |             | 0.107                                  | -0.046                              |
| Dave Carleton          |             |                                        |                                     |
| Hugh C. Blaske         | 8/25/90     | 0.092                                  | -0.063                              |
| Teresa Renee Beesecker |             | 0.122                                  | -0.094                              |
| Trojan Warrior         |             | 0.122                                  | -0.063                              |
| Hoosier State          |             | 0.12                                   | -0.046                              |
| Reliance               | 8/26/90     |                                        |                                     |
| Kevin Michael          |             | 0.106                                  | -0.063                              |
| Sumac                  |             | 0.655                                  | -0.031                              |
| Twin Cities            |             | 0.167                                  | -0.094                              |
| Cooperative Vanguard   |             |                                        |                                     |
| Superior               | 8/27/90     | 0.106                                  | -0.015                              |
| Helen M. Clements      |             |                                        |                                     |
| Greenville             |             |                                        |                                     |

### Goose Island Site, Trip 2

| <i>Name</i>           | <i>Date</i> | <i>Maximum<br/>wave height<br/>(m)</i> | <i>Maximum<br/>drawdown<br/>(m)</i> |
|-----------------------|-------------|----------------------------------------|-------------------------------------|
| Ardyce Randall        | 7/18/91     | 0.02                                   | -0.032                              |
| Scarlet Knight        |             | 0.107                                  | -0.032                              |
| James F. Neal         |             | 0.077                                  | -0.032                              |
| Helen M. Clements     |             | 0.077                                  | -0.031                              |
| Elizabeth Ann         |             | 0.046                                  | -0.04                               |
| Frank T. Heffelfinger | 7/19/91     | 0.046                                  | -0.031                              |
| Queen City            |             | 0.091                                  | -0.046                              |
| Helen M. Clements     |             | 0.046                                  | -0.033                              |
| Frank T. Heffelfinger |             | 0.061                                  | -0.048                              |
| Cooperative Venture   |             |                                        | -0.03                               |
| Volunteer State       | 7/20/91     | 0.106                                  | -0.094                              |
| Night19-01            |             | 0.031                                  | -0.064                              |
| Night19-02            |             | 0.031                                  | -0.048                              |
| Night20-01            |             |                                        | -0.03                               |
| Night20-02            |             | 0.122                                  | -0.063                              |
| G. R. Packet          |             | 0.077                                  | -0.048                              |
| Prairie Dawn          |             | 0.046                                  | -0.024                              |
| Prosperity            |             | 0.077                                  | -0.024                              |
| Clyde Butcher         |             | 0.046                                  | -0.063                              |
| Lil Charley           |             | 0.091                                  | -0.063                              |
| C. W. Rushing         |             | 0.22                                   |                                     |
| Conti Nan             |             | 0.138                                  | -0.063                              |
| Mary L                |             |                                        | -0.046                              |
| Cooperative Vanguard  |             | 0.077                                  | -0.024                              |
| Conti Karla           |             | 0.091                                  | -0.048                              |
| Cooperative Mariner   | 7/22/91     | 0.107                                  | -0.063                              |
| Hornet                |             | 0.076                                  | -0.078                              |
| Coperative Ambassador |             | 0.037                                  | -0.063                              |
| Eastern               |             |                                        | -0.14                               |
| Sam M. Fleming        |             | 0.061                                  | -0.11                               |
| Kevin Michael         | 7/23/91     | 0.092                                  | -0.063                              |
| A. M. Thompson        |             | 0.046                                  | -0.063                              |
| Susan Elizabeth       |             |                                        |                                     |
| Lil Charley           |             | 0.122                                  | -0.046                              |
| Badger                |             | 0.122                                  | -0.079                              |
| Kay D                 |             | 0.091                                  | -0.045                              |
| Evey T                |             | 0.061                                  | -0.034                              |
| Robert Ingle          |             | 0.061                                  | -0.018                              |

**Goose Island Site, Trip 2 (Concluded)**

| <i>Name</i>            | <i>Date</i> | <i>Maximum<br/>wave height<br/>(m)</i> | <i>Maximum<br/>drawdown<br/>(m)</i> |
|------------------------|-------------|----------------------------------------|-------------------------------------|
| Prairie Dawn           |             | 0.046                                  | -0.012                              |
| G. R. Packet & Pioneer | 7/24/91     | 0.107                                  | -0.046                              |
| Mary L                 |             | 0.077                                  | -0.047                              |
| Dub Hollinger          |             | 0.046                                  | -0.012                              |
| C. W. Rushing          |             | 0.092                                  | -0.032                              |
| Dell Butcher           |             | 0.061                                  | -0.048                              |
| Coral Dawn             |             | 0.046                                  | -0.033                              |
| Teresa R. Beesecker    |             | 0.061                                  | -0.03                               |
| Sir-Ene                |             | 0.03                                   | -0.03                               |
| Rusty Flowers          |             | 0.061                                  | -0.03                               |

### Clarks Ferry Site, Trip 1

| <i>Name</i>          | <i>Date</i> | <i>Maximum<br/>wave height<br/>(m)</i> | <i>Maximum<br/>drawdown<br/>(m)</i> |
|----------------------|-------------|----------------------------------------|-------------------------------------|
| C.W. Rushing (1)     | 5/16/91     | 0.061                                  | -0.03                               |
| Donnie Ray Jr. (1)   |             |                                        |                                     |
| Samantha             |             | 0.214                                  | -0.015                              |
| C.W. Rushing (2)     | 5/17/91     |                                        |                                     |
| Jemco Towing         |             |                                        |                                     |
| T.S. Kunsmann        |             |                                        |                                     |
| Ell Butcher (1)      |             |                                        |                                     |
| Lady Lone Star       | 5/18/91     | 0.137                                  | -0.075                              |
| Pearl B.             | 5/19/91     | 0.092                                  | -0.06                               |
| Conti-Afton          |             | 0.061*                                 | -0.06*                              |
| Jack D. Wofford      |             | 0.091*                                 | -0.06                               |
| Donnie Ray Jr. (2)   | 5/20/91     | 0.061*                                 | -0.06*                              |
| Sunflower (1)        |             | 0.137                                  | -0.03                               |
| American Beauty (1)  |             | 0.214                                  | -0.059                              |
| Sierra Dawn          | 5/21/91     | 0.046                                  | -0.044                              |
| Cooperative Vanguard |             | 0.031                                  | -0.03                               |
| Cindy J. Erickson    |             | 0.091                                  | -0.049                              |
| Frank H. Peavy       |             | 0.076*                                 | 0*                                  |
| Helen M. Clements    |             | 0.153                                  | -0.045                              |
| Sunflower (2)        |             | 0.106                                  | ~0*                                 |
| Dell Butcher (2)     |             | 0.061                                  | -0.06                               |
| Hornet               |             | 0.138                                  | -0.03                               |
| Volunteer State      |             | 0.168                                  | -0.049                              |
| Enterprise Star      |             | 0.137                                  | -0.095                              |
| Edward J. Hancock    | 5/22/91     | 0.065*                                 | -0.03*                              |
| Joe/Nut              |             | 0.091*                                 |                                     |
| Starfire             |             | 0.091*                                 | -0.061*                             |
| Conti-Karla          |             |                                        | -0.031                              |
| American Beauty (2)  |             | 0.107                                  | -0.061                              |

\*taken from a staff gage reading



# Clarks Ferry Site, Trip 2

| <i>Name</i>       | <i>Date</i> | <i>Maximum<br/>wave height (m)*</i> | <i>Maximum<br/>drawdown (m)*</i> |
|-------------------|-------------|-------------------------------------|----------------------------------|
| C.W. Rushing      | 10/17/91    | 0.12                                | -0.12                            |
| Evey-T            |             | 0.08                                | -0.06                            |
| Sunflower         |             | 0.02                                | -0.02                            |
| Evelyn C.         |             | 0.08                                | -0.05                            |
| Sunflower         |             | 0.08                                | -0.01                            |
| Conti-Afton       |             | 0.05                                | -0.08                            |
| Night 1           |             | 0.1                                 | -0.02                            |
| Night 2           |             | 0.08                                | -0.02                            |
| Night 3           |             | 0.05                                | -0.02                            |
| Lady Lone Star    | 10/18/91    | 0.06                                | -0.02                            |
| Lady Lone Star    |             | 0.06                                | -0.01                            |
| Kevin Michael     |             | 0.05                                | -0.02                            |
| Deborah Valentine |             | 0.03                                | -0.05                            |
| Volunteer State   |             | 0.17                                | -0.11                            |
| Sunflower         |             | 0.14                                | -0.02                            |
| Frank Stegbauer   |             | 0.17                                | -0.14                            |
| Joshua            |             | 0.03                                | -0.02                            |
| Kathy Ellen       | 10/19/91    | 0.09                                | -0.04                            |
| Jack Bullard      |             | 0.05                                | -0.07                            |
| Marc              |             | 0.05                                | -0.02                            |
| Conti-Nan         |             | 0.08                                | -0.02                            |
| Cristina Ecstein  |             | 0.04                                | -0.02                            |
| Coast Guard 65504 |             | 0.2                                 | -0.01                            |
| Prairie Dawn      |             | 0.11                                | -0.05                            |
| Noname            | 10/20/91    | 0.06                                | -0.02                            |
| Coop. ambassador  |             | 0.01                                | -0.02                            |
| Yazoo City        |             | 0.08                                | -0.05                            |
| George W. Banta   |             | 0.02                                | -0.04                            |

\*taken from a staff gage reading

**APPENDIX XIII.**

**SUSPENDED SEDIMENT CONCENTRATION DATA  
FOR MCEVER'S ISLAND**

McEver's Island Site

60 Minutes Prior to Barge-Tow Passage

| Tow name             | Date    | Suspended Sediment Concentration, mg/L |            |            |            |            |            |            |            |  |
|----------------------|---------|----------------------------------------|------------|------------|------------|------------|------------|------------|------------|--|
|                      |         | Station a1                             | Station a2 | Station b1 | Station b2 | Station b3 | Station c1 | Station c2 | Station c3 |  |
| Mary Ellen           | 5/17/89 | -                                      | -          | -          | -          | -          | -          | -          | -          |  |
| Elaine Jones         |         | -                                      | -          | -          | -          | -          | -          | -          | -          |  |
| Nicolas Duncan       |         | 63.6                                   | 75.0       | 63.7       | 54.4       | 48.3       | 53.4       | 56.3       | 67.5       |  |
| Mobil Leader         | 5/18/89 | -                                      | -          | -          | -          | -          | -          | -          | -          |  |
| Reliance             |         | 65.8                                   | 62.8       | 43.4       | 55.4       | 48.8       | 67.0       | 60.6       | 52.8       |  |
| Cooperative Vanguard |         | 67.6                                   | 62.5       | 70.0       | 58.2       | 48.2       | 65.2       | 58.8       | 41.6       |  |
| Marvin E. Norman     |         | 107.0                                  | 63.1       | 101.6      | 70.0       | 67.9       | 69.7       | 61.1       | 44.4       |  |
| Illini               |         | 81.0                                   | 94.0       | 106.5      | 120.3      | -          | 82.3       | 74.7       | 77.0       |  |

30 Minutes Prior to Barge-Tow Passage

| Tow name             | Date    | Suspended Sediment Concentration, mg/L |            |            |            |            |            |            |            |  |
|----------------------|---------|----------------------------------------|------------|------------|------------|------------|------------|------------|------------|--|
|                      |         | Station a1                             | Station a2 | Station b1 | Station b2 | Station b3 | Station c1 | Station c2 | Station c3 |  |
| Mary Ellen           | 5/17/89 | -                                      | -          | -          | -          | -          | -          | -          | -          |  |
| Elaine Jones         |         | -                                      | -          | -          | -          | -          | -          | -          | -          |  |
| Nicolas Duncan       |         | 66.0                                   | 90.2       | 64.8       | 52.7       | 54.2       | 53.6       | 60.7       | 70.0       |  |
| Mobil Leader         | 5/18/89 | 39.0                                   | 37.0       | 53.6       | 47.1       | 38.6       | 42.6       | 32.4       | 40.9       |  |
| Reliance             |         | 76.8                                   | 63.2       | 65.0       | 56.2       | 47.4       | 66.8       | 60.0       | 42.6       |  |
| Cooperative Vanguard |         | 109.4                                  | 62.6       | 116.3      | 71.5       | 71.8       | 69.3       | 60.6       | 44.2       |  |
| Marvin E. Norman     |         | 152.5                                  | 102.0      | 171.0      | 125.0      | 78.7       | 128.7      | 96.0       | 71.3       |  |
| Illini               |         | 53.0                                   | 56.4       | 93.2       | 94.0       | -          | 68.8       | 64.9       | 60.4       |  |

**McEver's Island Site**

**10 Minutes Prior to Barge-Tow Passage**

| Tow name                                                                       | Date    | Suspended Sediment Concentration, mg/L |            |            |            |            |            |            |            |  |
|--------------------------------------------------------------------------------|---------|----------------------------------------|------------|------------|------------|------------|------------|------------|------------|--|
|                                                                                |         | Station a1                             | Station a2 | Station b1 | Station b2 | Station b3 | Station c1 | Station c2 | Station c3 |  |
| Mary Ellen<br>Elaine Jones<br>Nicolas Duncan                                   | 5/17/89 | -                                      | -          | -          | -          | -          | -          | -          | -          |  |
|                                                                                |         | 29.0                                   | 29.0       | 42.3       | 34.0       | 32.7       | 37.3       | 34.0       | 30.7       |  |
|                                                                                |         | 60.3                                   | 92.3       | 67.7       | 56.3       | 50.7       | 53.8       | 54.7       | 49.3       |  |
| Mobil Leader<br>Reliance<br>Cooperative Vanguard<br>Marvin E. Norman<br>Illini | 5/18/89 | 42.6                                   | 38.2       | 47.3       | 45.1       | 37.2       | 43.6       | 41.6       | 43.3       |  |
|                                                                                |         | 105.4                                  | 63.5       | 91.9       | 65.4       | 65.3       | 69.9       | 61.5       | 44.5       |  |
|                                                                                |         | 158.0                                  | 88.5       | 156.0      | 102.7      | 86.3       | 106.0      | 97.7       | 78.3       |  |
|                                                                                |         | 129.0                                  | 100.0      | 381.3      | 85.4       | 96.6       | 113.0      | 99.3       | 70.0       |  |
|                                                                                |         | 65.7                                   | 95.0       | 144.6      | 100.1      | -          | 68.9       | 65.6       | 57.4       |  |

**5 Minutes Prior to Barge-Tow Passage**

| Tow name             | Date    | Suspended Sediment Concentration, mg/L |            |            |            |            |            |            |            |  |
|----------------------|---------|----------------------------------------|------------|------------|------------|------------|------------|------------|------------|--|
|                      |         | Station a1                             | Station a2 | Station b1 | Station b2 | Station b3 | Station c1 | Station c2 | Station c3 |  |
| Mary Ellen           | 5/17/89 | 28.0                                   | 28.5       | 145.0      | 32.7       | 32.0       | 34.0       | 34.7       | 31.4       |  |
| Elaine Jones         |         | 161.0                                  | 29.0       | 40.0       | 34.0       | 31.0       | 35.0       | 35.7       | 32.0       |  |
| Nicolas Duncan       |         | 60.7                                   | 87.2       | 65.7       | 56.5       | 52.8       | 53.8       | 53.4       | 49.7       |  |
| Mobil Leader         | 5/18/89 | 44.3                                   | 38.7       | 44.2       | 43.8       | 35.8       | 43.9       | 41.9       | 38.0       |  |
| Reliance             |         | 109.4                                  | 62.6       | 116.3      | 71.5       | 71.8       | 69.3       | 60.6       | 44.2       |  |
| Cooperative Vanguard |         | 154.5                                  | 102.0      | 142.7      | 103.0      | 84.0       | 128.3      | 92.0       | 74.0       |  |
| Marvin E. Norman     |         | 135.0                                  | 106.0      | 293.3      | 82.7       | 72.0       | 87.3       | 81.7       | 62.0       |  |
| Illini               |         | 57.3                                   | 100.0      | 118.6      | 95.7       | -          | 66.1       | 64.4       | 58.6       |  |

# McEver's Island Site

## 2 Minutes Prior to Barge-Tow Passage

| Tow name             | Date    | Suspended Sediment Concentration, mg/L |            |            |            |            |            |            |            |  |
|----------------------|---------|----------------------------------------|------------|------------|------------|------------|------------|------------|------------|--|
|                      |         | Station a1                             | Station a2 | Station b1 | Station b2 | Station b3 | Station c1 | Station c2 | Station c3 |  |
| Mary Ellen           | 5/17/89 | 29.0                                   | 29.0       | 42.0       | 33.3       | 33.3       | 37.0       | 34.3       | 30.0       |  |
| Elaine Jones         |         | 385.0                                  | 166.0      | 352.0      | 119.0      | 66.0       | 377.0      | 100.3      | 43.0       |  |
| Nicolas Duncan       |         | 64.7                                   | 84.6       | 66.7       | 55.9       | 55.4       | 53.8       | 52.8       | 50.6       |  |
| Mobil Leader         | 5/18/89 | 48.0                                   | 39.0       | 59.7       | 43.0       | 35.2       | 75.3       | 49.0       | 35.8       |  |
| Reliance             |         | 101.0                                  | 62.0       | 126.7      | 73.0       | 75.7       | 69.7       | 60.0       | 44.1       |  |
| Cooperative Vanguard |         | 183.0                                  | 111.5      | 201.0      | 111.7      | 76.0       | 119.3      | 96.8       | 70.0       |  |
| Marvin E. Norman     |         | 150.5                                  | 111.0      | 144.0      | 86.7       | 78.0       | 89.3       | 87.3       | 61.0       |  |
| Illini               |         | 57.0                                   | 121.0      | 103.0      | 93.0       | -          | 62.0       | 63.5       | 60.3       |  |

## Peak Suspended Sediment Concentrations

| Tow name             | Date    | Suspended Sediment Concentration, mg/L |            |            |            |            |            |            |            |  |
|----------------------|---------|----------------------------------------|------------|------------|------------|------------|------------|------------|------------|--|
|                      |         | Station a1                             | Station a2 | Station b1 | Station b2 | Station b3 | Station c1 | Station c2 | Station c3 |  |
| Mary Ellen           | 5/17/89 | 292.0                                  | 58.0       | 145.0      | 35.0       | 34.0       | 149.0      | 37.0       | 33.0       |  |
| Elaine Jones         |         | 385.0                                  | 245.0      | 352.0      | 145.7      | 134.0      | 377.0      | 140.0      | 96.7       |  |
| Nicolas Duncan       |         | 70.0                                   | 87.2       | 68.0       | 56.5       | 59.2       | 53.8       | 53.4       | 52.7       |  |
| Mobil Leader         | 5/18/89 | 469.0                                  | 244.0      | 310.0      | 105.0      | 115.0      | 230.0      | 152.0      | 89.0       |  |
| Reliance             |         | 431.0                                  | 143.0      | 304.0      | 177.0      | 101.0      | 187.0      | 119.0      | 52.0       |  |
| Cooperative Vanguard |         | 389.0                                  | 243.0      | 322.0      | 125.0      | 84.7       | 199.0      | 126.0      | 83.7       |  |
| Marvin E. Norman     |         | 298.0                                  | 140.0      | 293.0      | 88.0       | 88.0       | 99.0       | 89.0       | 72.3       |  |
| Illini               |         | 78.0                                   | 155.0      | 168.0      | 108.0      | -          | 82.0       | 72.0       | 64.0       |  |

McEver's Island Site

Average Suspended Sediment Concentrations

| Tow name                                                                       | Date    | Average Suspended Sediment Concentration during Event, mg/L |            |            |            |            |            |            |            |  |
|--------------------------------------------------------------------------------|---------|-------------------------------------------------------------|------------|------------|------------|------------|------------|------------|------------|--|
|                                                                                |         | Station a1                                                  | Station a2 | Station b1 | Station b2 | Station b3 | Station c1 | Station c2 | Station c3 |  |
| Mary Ellen<br>Elaine Jones<br>Nicolas Duncan                                   | 5/17/89 | 29.0                                                        | 29.0       | 41.0       | 33.3       | 32.0       | 37.7       | 35.0       | 31.0       |  |
|                                                                                |         | 130.0                                                       | 206.0      | 344.0      | 145.7      | 134.0      | 232.3      | 135.3      | 61.0       |  |
|                                                                                |         | 67.3                                                        | 82.8       | 67.3       | 55.4       | 57.2       | 53.8       | 52.4       | 51.3       |  |
| Mobil Leader<br>Reliance<br>Cooperative Vanguard<br>Marvin E. Norman<br>Illini | 5/18/89 | 260.0                                                       | 36.0       | 93.0       | 39.7       | 52.7       | 138.0      | 76.7       | 36.0       |  |
|                                                                                |         | 261.0                                                       | 60.0       | 128.0      | 63.0       | 66.3       | 71.0       | 60.7       | 42.3       |  |
|                                                                                |         | 295.0                                                       | 182.0      | 257.3      | 85.0       | 75.3       | 139.7      | 101.0      | 71.3       |  |
|                                                                                |         | 157.5                                                       | 104.0      | 125.0      | 88.0       | 84.7       | 94.3       | 84.0       | 63.0       |  |
|                                                                                |         | 56.0                                                        | 147.5      | 92.5       | 107.0      | -          | 75.3       | 66.0       | 63.0       |  |

2 Minutes after Barge-Tow Passage

| Tow name             | Date    | Suspended Sediment Concentration, mg/L |            |            |            |            |            |            |            |  |
|----------------------|---------|----------------------------------------|------------|------------|------------|------------|------------|------------|------------|--|
|                      |         | Station a1                             | Station a2 | Station b1 | Station b2 | Station b3 | Station c1 | Station c2 | Station c3 |  |
| Mary Ellen           | 5/17/89 | 29.5                                   | 29.0       | 42.0       | 32.0       | 30.0       | 37.0       | 37.0       | 31.0       |  |
| Elaine Jones         |         | 149.0                                  | 144.5      | 317.3      | 115.0      | 129.3      | 150.7      | 140.0      | 77.7       |  |
| Nicolas Duncan       |         | 70.0                                   | 81.0       | 68.0       | 55.0       | 59.0       | 53.8       | 52.0       | 52.2       |  |
| Mobil Leader         | 5/18/89 | 356.5                                  | 244.0      | 237.6      | 60.3       | 88.0       | 199.3      | 113.7      | 38.0       |  |
| Reliance             |         | 382.0                                  | 68.0       | 245.3      | 97.7       | 45.0       | 148.3      | 79.0       | 39.0       |  |
| Cooperative Vanguard |         | 389.0                                  | 206.5      | 310.0      | 93.7       | 75.7       | 199.0      | 111.7      | 75.3       |  |
| Marvin E. Norman     |         | 140.0                                  | 106.0      | 165.0      | 80.0       | 82.3       | 99.0       | 76.0       | 66.3       |  |
| Illini               |         | 78.0                                   | 147.5      | 133.5      | 81.0       | -          | 79.7       | 72.0       | 59.7       |  |

McEver's Island Site

5 Minutes after Barge-Tow Passage

| <i>Tow name</i>      | <i>Date</i> | <i>Suspended Sediment Concentration, mg/L</i> |                   |                   |                   |                   |                                               |
|----------------------|-------------|-----------------------------------------------|-------------------|-------------------|-------------------|-------------------|-----------------------------------------------|
|                      |             | <i>Station a1</i>                             | <i>Station a2</i> | <i>Station b1</i> | <i>Station b2</i> | <i>Station b3</i> | <i>Station c1    Station c2    Station c3</i> |
| Mary Ellen           | 5/17/89     | 292.0                                         | 29.0              | 144.0             | 35.0              | 31.0              | 149.0    35.0    33.0                         |
| Elaine Jones         |             | 123.5                                         | 58.0              | 239.0             | 121.0             | 113.7             | 131.3    128.0    96.7                        |
| Nicolas Duncan       |             | 67.3                                          | 75.8              | 66.6              | 53.7              | 59.2              | 53.8    52.2    52.7                          |
| Mobil Leader         | 5/18/89     | 121.0                                         | 148.0             | 286.0             | 101.7             | 115.0             | 170.7    139.0    89.0                        |
| Reliance             |             | 132.0                                         | 132.5             | 266.0             | 150.0             | 101.0             | 155.7    119.0    52.0                        |
| Cooperative Vanguard |             | 158.0                                         | 108.0             | 322.0             | 102.3             | 84.7              | 147.0    123.0    83.7                        |
| Marvin E. Norman     |             | 298.0                                         | 140.0             | 126.0             | 80.7              | 73.3              | 81.0    72.0    72.3                          |
| Illini               |             | 67.5                                          | 79.0              | 100.0             | 108.0             | -                 | 73.7    63.0    62.0                          |

30 Minutes after Barge-Tow Passage

| <i>Tow name</i>      | <i>Date</i> | <i>Suspended Sediment Concentration, mg/L</i> |                   |                   |                   |                   |                                               |
|----------------------|-------------|-----------------------------------------------|-------------------|-------------------|-------------------|-------------------|-----------------------------------------------|
|                      |             | <i>Station a1</i>                             | <i>Station a2</i> | <i>Station b1</i> | <i>Station b2</i> | <i>Station b3</i> | <i>Station c1    Station c2    Station c3</i> |
| Mary Ellen           | 5/17/89     | 89.1                                          | 85.0              | 103.5             | 86.0              | 79.0              | 99.8    102.9    81.0                         |
| Elaine Jones         |             | 76.5                                          | 141.0             | 82.0              | 74.0              | 61.5              | 84.0    79.0    67.0                          |
| Nicolas Duncan       |             | 64.0                                          | 92.0              | 89.0              | 77.6              | 77.0              | 79.3    73.0    70.0                          |
| Mobil Leader         | 5/18/89     | 61.5                                          | 58.0              | 87.7              | 86.7              | 50.0              | 71.0    64.3    49.3                          |
| Reliance             |             | 158.0                                         | 108.0             | 322.0             | 102.3             | 84.7              | 147.0    123.0    83.7                        |
| Cooperative Vanguard |             | 140.0                                         | 119.5             | 152.0             | 76.0              | 76.7              | 93.0    72.0    68.7                          |
| Marvin E. Norman     |             | 66.0                                          | 73.0              | 81.8              | 90.0              | 79.8              | 68.5    65.5    65.5                          |
| Illini               |             | 72.0                                          | 168.0             | 81.6              | 52.0              | -                 | 68.5    62.9    57.0                          |

# McEver's Island Site

## 60 Minutes after Barge-Tow Passage

| Tow name             | Date    | Suspended Sediment Concentration, mg/L |            |            |            |            |            |            |            |  |
|----------------------|---------|----------------------------------------|------------|------------|------------|------------|------------|------------|------------|--|
|                      |         | Station a1                             | Station a2 | Station b1 | Station b2 | Station b3 | Station c1 | Station c2 | Station c3 |  |
| Mary Ellen           | 5/17/89 | 58.0                                   | 76.0       | 66.0       | 60.0       | 59.0       | 71.0       | 68.0       | 63.0       |  |
| Elaine Jones         |         | 58.0                                   | 75.0       | 61.0       | 59.0       | 53.0       | 64.0       | 62.0       | 54.0       |  |
| Nicolas Duncan       |         | 72.0                                   | 90.0       | 155.0      | 86.0       | 62.0       | 75.0       | 75.0       | 67.5       |  |
| Mobil Leader         | 5/18/89 | 112.0                                  | 84.3       | 123.0      | 86.2       | 55.0       | 65.3       | 61.0       | 52.3       |  |
| Reliance             |         | 199.0                                  | 126.0      | 112.0      | 99.3       | 79.3       | 81.0       | 72.7       | 73.3       |  |
| Cooperative Vanguard |         | 63.0                                   | 70.9       | 80.2       | 89.6       | 73.4       | 74.0       | 72.0       | 70.0       |  |
| Marvin E. Norman     |         | 134.3                                  | 57.2       | 189.9      | 108.2      | -          | 73.3       | 67.0       | 60.2       |  |
| Illini               |         | 84.0                                   | 63.0       | 67.0       | 63.0       | -          | 68.0       | 66.0       | 64.0       |  |

## 90 Minutes after Barge-Tow Passage

| Tow name             | Date    | Suspended Sediment Concentration, mg/L |            |            |            |            |            |            |            |  |
|----------------------|---------|----------------------------------------|------------|------------|------------|------------|------------|------------|------------|--|
|                      |         | Station a1                             | Station a2 | Station b1 | Station b2 | Station b3 | Station c1 | Station c2 | Station c3 |  |
| Mary Ellen           | 5/17/89 | 51.8                                   | 99.1       | 52.3       | 65.2       | 43.0       | 57.7       | 54.5       | 46.5       |  |
| Elaine Jones         |         | 53.6                                   | 74.5       | 52.9       | 54.4       | 43.0       | 54.7       | 48.3       | 45.3       |  |
| Nicolas Duncan       |         | 68.0                                   | 77.0       | 75.5       | -          | 64.0       | 67.0       | 70.0       | 58.0       |  |
| Mobil Leader         | 5/18/89 | 68.6                                   | 65.6       | 48.3       | 56.8       | 51.6       | 63.5       | 57.3       | 52.1       |  |
| Reliance             |         | 57.7                                   | 64.5       | 76.8       | 87.2       | 65.2       | 67.5       | 64.5       | 67.2       |  |
| Cooperative Vanguard |         | 132.0                                  | 64.2       | 191.6      | 108.2      | -          | 73.1       | 66.8       | 59.3       |  |
| Marvin E. Norman     |         | 65.0                                   | 84.5       | 98.5       | 86.0       | -          | 71.3       | 60.0       | 65.3       |  |
| Illini               |         | 65.1                                   | 60.4       | 48.1       | 53.6       | -          | 67.3       | 60.1       | 61.9       |  |



# McEver's Island Site

## 120 Minutes after Barge-Tow Passage

| Tow name             | Date    | Suspended Sediment Concentration, mg/L |            |            |            |            |            |            |            |  |
|----------------------|---------|----------------------------------------|------------|------------|------------|------------|------------|------------|------------|--|
|                      |         | Station a1                             | Station a2 | Station b1 | Station b2 | Station b3 | Station c1 | Station c2 | Station c3 |  |
| Mary Ellen           | 5/17/89 | 48.3                                   | 63.3       | 47.3       | 44.7       | 39.2       | 49.3       | 48.3       | 44.1       |  |
| Elaine Jones         |         | 46.1                                   | 60.6       | 47.0       | 45.4       | 39.8       | 49.4       | 48.0       | 42.4       |  |
| Nicolas Duncan       |         | -                                      | -          | -          | -          | -          | -          | -          | -          |  |
| Mobil Leader         | 5/18/89 | 63.9                                   | 62.2       | 72.0       | 57.4       | 47.4       | 64.4       | 58.3       | 41.2       |  |
| Reliance             |         | 87.0                                   | 84.8       | 165.6      | 165.5      | -          | 70.9       | 66.2       | 57.7       |  |
| Cooperative Vanguard |         | 71.0                                   | 128.0      | 85.0       | 106.5      | -          | 69.7       | 61.0       | 65.3       |  |
| Marvin E. Norman     |         | 85.3                                   | 144.0      | 77.7       | 57.3       | -          | 70.9       | 64.3       | 59.3       |  |
| Illini               |         | 72.6                                   | 63.6       | 59.2       | 98.4       | -          | 77.4       | 67.9       | 60.4       |  |

**APPENDIX XIV.**  
**SUSPENDED SEDIMENT CONCENTRATION DATA**  
**FOR APPLE RIVER ISLAND**

# Apple River Island Site

## 60 Minutes Prior to Barge-Tow Passage

| Tow name               | Date    | Suspended Sediment Concentration, mg/L |            |            |            |            |            |
|------------------------|---------|----------------------------------------|------------|------------|------------|------------|------------|
|                        |         | Station a1                             | Station b1 | Station c1 | Station c2 | Station d1 | Station d2 |
| Yazoo                  | 5/18/90 | -                                      | -          | -          | -          | -          | -          |
| Cooperative Ambassador |         | -                                      | -          | -          | -          | -          | -          |
| Christine Bailey       |         | -                                      | -          | -          | -          | -          | -          |
| Kathy Ellen            |         | -                                      | -          | -          | -          | -          | -          |
| W.A. Kernan            | 5/19/90 | -                                      | -          | -          | -          | -          | -          |
| Hornet                 |         | -                                      | -          | -          | -          | -          | -          |
| Conti-Bonnie           |         | -                                      | -          | -          | -          | -          | -          |
| Becky Lynn             |         | -                                      | -          | -          | -          | -          | -          |
| Merlin Banta           | 5/20/90 | -                                      | -          | -          | -          | -          | -          |
| Rusty Flowers          |         | 49.7                                   | 81.6       | 60.3       | 63.8       | 63.6       | 60.8       |
| Tom Talbert            |         | 85.6                                   | 70.7       | 66.8       | 62.5       | 71.1       | 61.9       |
| Herman Pott            |         | 66.2                                   | 71.4       | 106.9      | 63.1       | 72.8       | 62.9       |
| Walter Brunson         | 5/21/90 | -                                      | -          | -          | -          | -          | -          |
| Dell Butcher           |         | 55.7                                   | 65.9       | 73.6       | 57.4       | 75.6       | 67.2       |
| Mary Gail              |         | 59.6                                   | 69.0       | 77.9       | 64.1       | 84.5       | 66.1       |
| T.S. Kunsman           |         | 58.8                                   | 73.0       | 79.1       | 55.9       | 80.6       | 70.8       |
| D. Ray Miller          |         | 64.8                                   | 71.0       | 79.6       | 60.5       | 78.4       | 69.7       |
| Mary Gail              | 5/22/90 | -                                      | -          | -          | -          | -          | -          |
| Trojan                 |         | -                                      | -          | -          | -          | -          | -          |
| Melinda Brent          |         | -                                      | -          | -          | -          | -          | -          |
| Corporate Mariner      |         | -                                      | -          | -          | -          | -          | -          |
| Ed Renshaw             |         | -                                      | -          | -          | -          | -          | -          |

# Apple River Island Site

## 60 Minutes Prior to Barge-Tow Passage

| <i>Tow name</i> | <i>Date</i> | <i>Suspended Sediment Concentration, mg/L</i> |                   |                   |                   |                   |                   |
|-----------------|-------------|-----------------------------------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
|                 |             | <i>Station a1</i>                             | <i>Station b1</i> | <i>Station c1</i> | <i>Station c2</i> | <i>Station d1</i> | <i>Station d2</i> |
| Kevin Michael   | 5/23/90     | -                                             | -                 | -                 | -                 | -                 | -                 |
| Jack D. Wofford |             | 115.9                                         | 114.9             | 77.0              | 66.3              | 102.1             | 71.5              |
| Trojan          |             | 121.6                                         | 121.2             | 76.3              | 67.4              | 98.9              | 70.7              |

## 30 Minutes Prior to Barge-Tow Passage

| <i>Tow name</i>        | <i>Date</i> | <i>Suspended Sediment Concentration, mg/L</i> |                   |                   |                   |                   |                   |
|------------------------|-------------|-----------------------------------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
|                        |             | <i>Station a1</i>                             | <i>Station b1</i> | <i>Station c1</i> | <i>Station c2</i> | <i>Station d1</i> | <i>Station d2</i> |
| Yazoo                  | 5/18/90     | -                                             | -                 | -                 | -                 | -                 | -                 |
| Cooperative Ambassador |             | -                                             | -                 | -                 | -                 | -                 | -                 |
| Christine Bailey       |             | -                                             | -                 | -                 | -                 | -                 | -                 |
| Kathy Ellen            |             | -                                             | -                 | -                 | -                 | -                 | -                 |
| W.A. Kernan            | 5/19/90     | -                                             | -                 | -                 | -                 | -                 | -                 |
| Hornet                 |             | -                                             | -                 | -                 | -                 | -                 | -                 |
| Conti-Bonnie           |             | -                                             | -                 | -                 | -                 | -                 | -                 |
| Becky Lynn             |             | -                                             | -                 | -                 | -                 | -                 | -                 |
| Merlin Banta           | 5/20/90     | -                                             | -                 | -                 | -                 | -                 | -                 |
| Rusty Flowers          |             | 50.6                                          | 64.7              | 72.4              | 58.8              | 65.4              | 61.0              |
| Tom Talbert            |             | 65.5                                          | 63.0              | 67.4              | 62.4              | 67.3              | 59.5              |
| Herman Pott            |             | 76.8                                          | 74.7              | 76.3              | 83.5              | 65.3              | 63.0              |
| Walter Brunson         | 5/21/90     | 60.0                                          | 66.1              | 74.0              | 142.7             | 79.1              | 64.5              |
| Dell Butcher           |             | 96.1                                          | 83.8              | 91.6              | 101.9             | 73.8              | 64.4              |
| Mary Gail              |             | 62.5                                          | 71.9              | 79.5              | 58.4              | 79.1              | 70.3              |
| T.S. Kunsman           |             | 137.1                                         | 130.8             | 119.4             | 90.3              | 78.2              | 69.9              |
| D. Ray Miller          |             | 143.8                                         | 123.6             | 83.7              | 80.2              | 87.3              | 68.6              |

Apple River Island Site

30 Minutes Prior to Barge-Tow Passage

| Tow name          | Date    | Suspended Sediment Concentration, mg/L |            |            |            |            |            |
|-------------------|---------|----------------------------------------|------------|------------|------------|------------|------------|
|                   |         | Station a1                             | Station b1 | Station c1 | Station c2 | Station d1 | Station d2 |
| Mary Gail         | 5/22/90 | -                                      | 84.8       | 95.7       | 68.2       | 102.5      | 79.4       |
| Trojan            |         | -                                      | -          | -          | -          | -          | -          |
| Melinda Brent     |         | -                                      | -          | -          | -          | -          | -          |
| Corporate Mariner |         | -                                      | -          | -          | -          | -          | -          |
| Ed Renshaw        |         | -                                      | -          | -          | -          | -          | -          |
| Kevin Michael     | 5/23/90 | -                                      | -          | -          | -          | -          | -          |
| Jack D. Wofford   |         | 69.6                                   | 82.5       | 81.5       | 68.8       | 105.1      | 71.5       |
| Trojan            |         | 66.7                                   | 76.8       | 79.3       | 68.5       | 94.2       | 72.1       |

XIV-5

10 Minutes Prior to Barge-Tow Passage

| Tow name               | Date    | Suspended Sediment Concentration, mg/L |            |            |            |            |            |
|------------------------|---------|----------------------------------------|------------|------------|------------|------------|------------|
|                        |         | Station a1                             | Station b1 | Station c1 | Station c2 | Station d1 | Station d2 |
| Yazoo                  | 5/18/90 | -                                      | -          | -          | -          | -          | -          |
| Cooperative Ambassador |         | -                                      | -          | -          | -          | -          | -          |
| Christine Bailey       |         | -                                      | -          | -          | -          | -          | -          |
| Kathy Ellen            |         | -                                      | -          | -          | -          | -          | -          |
| W.A. Kernan            | 5/19/90 | -                                      | -          | -          | -          | -          | -          |
| Hornet                 |         | -                                      | -          | -          | -          | -          | -          |
| Conti-Bonnie           |         | -                                      | -          | -          | -          | -          | -          |
| Becky Lynn             |         | -                                      | -          | -          | -          | -          | -          |

# Apple River Island Site

## 10 Minutes Prior to Barge-Tow Passage

| Tow name          | Date    | Suspended Sediment Concentration, mg/L |            |            |            |            |            |
|-------------------|---------|----------------------------------------|------------|------------|------------|------------|------------|
|                   |         | Station a1                             | Station b1 | Station c1 | Station c2 | Station d1 | Station d2 |
| Merlin Banta      | 5/20/90 | -                                      | 63.6       | 61.5       | 59.9       | 72.5       | 57.2       |
| Rusty Flowers     |         | 108.9                                  | 63.5       | 68.3       | 59.8       | 72.2       | 59.9       |
| Tom Talbert       |         | 58.1                                   | 72.2       | 75.1       | 61.1       | 68.4       | 65.6       |
| Herman Pott       |         | 141.3                                  | 100.5      | 77.2       | 135.0      | 56.1       | 58.4       |
| Walter Brunson    | 5/21/90 | 55.8                                   | 66.8       | 72.8       | 71.4       | 74.1       | 65.0       |
| Dell Butcher      |         | 67.2                                   | 74.2       | 75.3       | 63.5       | 72.8       | 65.3       |
| Mary Gail         |         | 154.8                                  | 145.9      | 129.3      | 97.4       | 78.2       | 70.0       |
| T.S. Kunsman      |         | 132.2                                  | 111.9      | 80.1       | 70.3       | 97.3       | 66.3       |
| D. Ray Miller     |         | 227.7                                  | 98.0       | 80.9       | 55.6       | 80.5       | 68.2       |
| Mary Gail         | 5/22/90 | 250.3                                  | 93.9       | 94.5       | 67.1       | 93.5       | 78.8       |
| Trojan            |         | -                                      | -          | -          | -          | -          | -          |
| Melinda Brent     |         | -                                      | -          | -          | -          | -          | -          |
| Corporate Mariner |         | -                                      | -          | -          | -          | -          | -          |
| Ed Renshaw        |         | -                                      | -          | -          | -          | -          | -          |
| Kevin Michael     | 5/23/90 | -                                      | -          | -          | -          | -          | -          |
| Jack D. Wofford   |         | 65.3                                   | 73.2       | 79.1       | 68.1       | 90.3       | 71.1       |
| Trojan            |         | 65.2                                   | 75.6       | 79.2       | 63.1       | 133.7      | 68.7       |

# Apple River Island Site

## 5 Minutes Prior to Barge-Tow Passage

| Tow name               | Date    | Suspended Sediment Concentration, mg/L |            |            |            |            |            |
|------------------------|---------|----------------------------------------|------------|------------|------------|------------|------------|
|                        |         | Station a1                             | Station b1 | Station c1 | Station c2 | Station d1 | Station d2 |
| Yazoo                  | 5/18/90 | -                                      | -          | -          | -          | -          | -          |
| Cooperative Ambassador |         | -                                      | -          | -          | -          | -          | -          |
| Christine Bailey       |         | -                                      | -          | -          | -          | -          | -          |
| Kathy Ellen            |         | -                                      | -          | -          | -          | -          | -          |
| W.A. Kernan            | 5/19/90 | -                                      | -          | -          | -          | -          | -          |
| Hornet                 |         | -                                      | -          | -          | -          | -          | -          |
| Conti-Bonnie           |         | -                                      | -          | -          | -          | -          | -          |
| Becky Lynn             |         | -                                      | -          | -          | -          | -          | -          |
| Merlin Banta           | 5/20/90 | 54.6                                   | 61.9       | 65.1       | 60.8       | 77.5       | 60.5       |
| Rusty Flowers          |         | 93.1                                   | 70.5       | 69.0       | 60.1       | 91.1       | 60.2       |
| Tom Talbert            |         | 56.7                                   | 78.0       | 70.1       | 61.3       | 68.1       | 60.2       |
| Herman Pott            |         | 130.4                                  | 109.6      | 75.5       | 97.1       | 60.5       | 61.0       |
| Walter Brunson         | 5/21/90 | 55.7                                   | 65.9       | 73.6       | 57.4       | 75.6       | 67.2       |
| Dell Butcher           |         | 61.0                                   | 67.9       | 75.0       | 62.6       | 72.0       | 63.7       |
| Mary Gail              |         | 199.1                                  | 183.6      | 154.1      | 115.1      | 78.3       | 70.4       |
| T.S. Kunsman           |         | 117.4                                  | 96.6       | 77.0       | 63.1       | 92.6       | 68.8       |
| D. Ray Miller          |         | 161.4                                  | 108.6      | 81.1       | 61.1       | 85.8       | 71.9       |
| Mary Gail              | 5/22/90 | 251.3                                  | 105.7      | 91.7       | 74.1       | 94.4       | 78.2       |
| Trojan                 |         | -                                      | -          | -          | -          | -          | -          |
| Melinda Brent          |         | -                                      | -          | -          | -          | -          | -          |
| Corporate Mariner      |         | -                                      | -          | -          | -          | -          | -          |
| Ed Renshaw             |         | -                                      | -          | -          | -          | -          | -          |
| Kevin Michael          | 5/23/90 | -                                      | -          | -          | -          | -          | -          |
| Jack D. Wofford        |         | 67.7                                   | 75.8       | 81.3       | 67.6       | 96.6       | 68.8       |
| Trojan                 |         | 72.7                                   | 75.7       | 99.3       | 66.2       | 88.1       | 68.0       |

# Apple River Island Site

## 2 Minutes Prior to Barge-Tow Passage

| Tow name               | Date    | Suspended Sediment Concentration, mg/L |            |            |            |            |            |
|------------------------|---------|----------------------------------------|------------|------------|------------|------------|------------|
|                        |         | Station a1                             | Station b1 | Station c1 | Station c2 | Station d1 | Station d2 |
| Yazoo                  | 5/18/90 | -                                      | -          | -          | -          | -          | -          |
| Cooperative Ambassador |         | -                                      | -          | -          | -          | -          | -          |
| Christine Bailey       |         | -                                      | -          | -          | -          | -          | -          |
| Kathy Ellen            |         | -                                      | -          | -          | -          | -          | -          |
| W. A. Kernan           | 5/19/90 | -                                      | -          | -          | -          | -          | -          |
| Hornet                 |         | -                                      | -          | -          | -          | -          | -          |
| Conti-Bonnie           |         | -                                      | -          | -          | -          | -          | -          |
| Becky Lynn             |         | -                                      | -          | -          | -          | -          | -          |
| Merlin Banta           | 5/20/90 | 55.1                                   | 62.1       | 67.4       | 60.2       | 80.3       | 55.2       |
| Rusty Flowers          |         | 81.7                                   | 75.6       | 69.9       | 60.2       | 81.4       | 60.4       |
| Tom Talbert            |         | 57.6                                   | 70.7       | 70.7       | 60.7       | 69.0       | 63.2       |
| Herman Pott            |         | 123.9                                  | 115.1      | 74.4       | 74.4       | 63.1       | 62.6       |
| Walter Brunson         | 5/21/90 | 56.3                                   | 64.8       | 75.1       | 59.4       | 78.7       | 70.1       |
| Dell Butcher           |         | 80.5                                   | 66.7       | 72.8       | 62.6       | 73.2       | 65.5       |
| Mary Gail              |         | 225.7                                  | 206.3      | 169.0      | 125.7      | 78.3       | 70.6       |
| T.S. Kunsman           |         | 97.5                                   | 87.6       | 77.4       | 63.7       | 214.1      | 72.5       |
| D. Ray Miller          |         | 161.8                                  | 105.2      | 81.0       | 62.2       | 80.4       | 69.4       |
| Mary Gail              | 5/22/90 | 228.1                                  | 112.8      | 91.4       | 78.4       | 92.7       | 77.8       |
| Trojan                 |         | -                                      | -          | -          | -          | -          | -          |
| Melinda Brent          |         | -                                      | -          | -          | -          | -          | -          |
| Corporate Mariner      |         | -                                      | -          | -          | -          | -          | -          |
| Ed Renshaw             |         | -                                      | -          | -          | -          | -          | -          |
| Kevin Michael          | 5/23/90 | -                                      | -          | -          | -          | -          | -          |
| Jack D. Wofford        |         | 63.3                                   | 77.3       | 80.9       | 67.3       | 125.8      | 67.3       |
| Trojan                 |         | 72.5                                   | 73.5       | 93.0       | 65.9       | 128.0      | 65.3       |



# Apple River Island Site

## Peak Suspended Sediment Concentrations

| Tow name               | Date    | Suspended Sediment Concentration, mg/L |            |            |            |            |            |
|------------------------|---------|----------------------------------------|------------|------------|------------|------------|------------|
|                        |         | Station a1                             | Station b1 | Station c1 | Station c2 | Station d1 | Station d2 |
| Yazoo                  | 5/18/90 | -                                      | -          | -          | -          | -          | -          |
| Cooperative Ambassador |         | -                                      | -          | -          | -          | -          | -          |
| Christine Bailey       |         | -                                      | -          | -          | -          | -          | -          |
| Kathy Ellen            |         | -                                      | -          | -          | -          | -          | -          |
| W.A. Kernan            | 5/19/90 | -                                      | -          | -          | -          | -          | -          |
| Hornet                 |         | -                                      | -          | -          | -          | -          | -          |
| Conti-Bonnie           |         | -                                      | -          | -          | -          | -          | -          |
| Becky Lynn             |         | -                                      | -          | -          | -          | -          | -          |
| Merlin Banta           | 5/20/90 | 59.4                                   | 66.9       | 78.4       | 61.2       | 85.1       | 61.2       |
| Rusty Flowers          |         | 107.9                                  | 77.9       | 80.5       | 61.6       | 192.6      | 61.6       |
| Tom Talbert            |         | 265.1                                  | 178.1      | 91.3       | 65.0       | 75.8       | 66.2       |
| Herman Pott            |         | 207.6                                  | 130.8      | 184.8      | 97.1       | 77.8       | 63.8       |
| Walter Brunson         | 5/21/90 | 90.6                                   | 74.0       | 80.4       | 212.4      | 92.0       | 71.0       |
| Dell Butcher           |         | 98.8                                   | 118.4      | 83.3       | 67.9       | 74.8       | 66.9       |
| Mary Gail              |         | 225.7                                  | 213.9      | 169.0      | 129.3      | 82.3       | 72.1       |
| T.S. Kunsman           |         | 256.0                                  | 97.7       | 82.3       | 67.3       | 328.3      | 72.5       |
| D. Ray Miller          |         | 161.8                                  | 124.3      | 114.5      | 71.8       | 94.8       | 71.9       |
| Mary Gail              | 5/22/90 | 251.6                                  | 173.8      | 98.7       | 78.4       | 94.7       | 80.0       |
| Trojan                 |         | -                                      | -          | -          | -          | -          | -          |
| Melinda Brent          |         | -                                      | -          | -          | -          | -          | -          |
| Corporate Mariner      |         | -                                      | -          | -          | -          | -          | -          |
| Ed Renshaw             |         | -                                      | -          | -          | -          | -          | -          |
| Kevin Michael          | 5/23/90 | -                                      | -          | -          | -          | -          | -          |
| Jack D. Wofford        |         | 72.7                                   | 77.3       | 99.3       | 67.6       | 152.6      | 69.7       |
| Trojan                 |         | 90.0                                   | 80.8       | 99.3       | 69.1       | 161.4      | 70.5       |

# Apple River Island Site

## Average Suspended Sediment Concentrations

| Tow name               | Date    | Average Suspended Sediment Concentration during Event, mg/L |            |            |            |            |
|------------------------|---------|-------------------------------------------------------------|------------|------------|------------|------------|
|                        |         | Station a1                                                  | Station b1 | Station c1 | Station c2 | Station d1 |
| Yazoo                  | 5/18/90 | -                                                           | -          | -          | -          | -          |
| Cooperative Ambassador |         | -                                                           | -          | -          | -          | -          |
| Christine Bailey       |         | -                                                           | -          | -          | -          | -          |
| Kathy Ellen            |         | -                                                           | -          | -          | -          | -          |
| W.A. Kernan            | 5/19/90 | -                                                           | -          | -          | -          | -          |
| Hornet                 |         | -                                                           | -          | -          | -          | -          |
| Conti-Bonnie           |         | -                                                           | -          | -          | -          | -          |
| Becky Lynn             |         | -                                                           | -          | -          | -          | -          |
| Merlin Banta           | 5/20/90 | 51.6                                                        | 64.8       | 64.9       | 60.2       | 74.3       |
| Rusty Flowers          |         | 82.9                                                        | 77.9       | 75.5       | 56.3       | 73.6       |
| Tom Talbert            |         | 65.5                                                        | 64.1       | 70.1       | 57.8       | 68.2       |
| Herman Pott            |         | 165.7                                                       | 118.7      | 76.5       | 60.9       | 73.4       |
| Walter Brunson         | 5/21/90 | 55.1                                                        | 64.8       | 77.2       | 58.3       | 80.7       |
| Dell Butcher           |         | 63.9                                                        | 68.1       | 71.3       | 67.9       | 73.3       |
| Mary Gail              |         | 210.0                                                       | 192.1      | 109.8      | 110.2      | 77.9       |
| T.S. Kunsman           |         | 105.1                                                       | 85.3       | 77.0       | 66.2       | 328.3      |
| D. Ray Miller          |         | 159.4                                                       | 119.0      | 81.6       | 59.1       | 82.3       |
| Mary Gail              | 5/22/90 | 188.7                                                       | 131.8      | 90.5       | 69.4       | 88.3       |
| Trojan                 |         | -                                                           | -          | -          | -          | -          |
| Melinda Brent          |         | -                                                           | -          | -          | -          | -          |
| Corporate Mariner      |         | -                                                           | -          | -          | -          | -          |
| Ed Renshaw             |         | -                                                           | -          | -          | -          | -          |
| Kevin Michael          | 5/23/90 | -                                                           | -          | -          | -          | -          |
| Jack D. Wofford        |         | 65.2                                                        | 75.6       | 79.2       | 63.1       | 133.7      |
| Trojan                 |         | 82.3                                                        | 76.1       | 84.5       | 65.3       | 126.8      |
|                        |         |                                                             |            |            |            | 68.7       |
|                        |         |                                                             |            |            |            | 66.4       |

# Apple River Island Site

## 2 Minutes after Barge-Tow Passage

| Tow name               | Date    | Suspended Sediment Concentration, mg/L |            |            |            |            |            |
|------------------------|---------|----------------------------------------|------------|------------|------------|------------|------------|
|                        |         | Station a1                             | Station b1 | Station c1 | Station c2 | Station d1 | Station d2 |
| Yazoo                  | 5/18/90 | -                                      | -          | -          | -          | -          | -          |
| Cooperative Ambassador |         | -                                      | -          | -          | -          | -          | -          |
| Christine Bailey       |         | -                                      | -          | -          | -          | -          | -          |
| Kathy Ellen            |         | -                                      | -          | -          | -          | -          | -          |
| W.A. Kernan            | 5/19/90 | -                                      | -          | -          | -          | -          | -          |
| Hornet                 |         | -                                      | -          | -          | -          | -          | -          |
| Conti-Bonnie           |         | -                                      | -          | -          | -          | -          | -          |
| Becky Lynn             |         | -                                      | -          | -          | -          | -          | -          |
| Merlin Banta           | 5/20/90 | 52.8                                   | 60.7       | 71.6       | 56.1       | 67.9       | 55.9       |
| Rusty Flowers          |         | 81.8                                   | 72.9       | 79.0       | 61.4       | 76.8       | 59.3       |
| Tom Talbert            |         | 107.1                                  | 70.0       | 83.2       | 60.1       | 71.4       | 65.5       |
| Herman Pott            |         | 207.6                                  | 124.7      | 184.8      | 59.5       | 77.8       | 63.0       |
| Walter Brunson         | 5/21/90 | 58.3                                   | 66.8       | 80.4       | 134.5      | 92.0       | 65.2       |
| Dell Butcher           |         | 69.7                                   | 118.4      | 71.6       | 63.4       | 72.9       | 63.8       |
| Mary Gail              |         | 178.2                                  | 151.1      | 94.4       | 106.0      | 76.0       | 70.7       |
| T.S. Kunsman           |         | 136.0                                  | 87.8       | 74.9       | 63.6       | 84.4       | 69.7       |
| D. Ray Miller          |         | 141.8                                  | 117.2      | 114.5      | 64.0       | 86.8       | 70.0       |
| Mary Gail              | 5/22/90 | 169.9                                  | 173.8      | 88.7       | 69.9       | 87.1       | 80.0       |
| Trojan                 |         | -                                      | -          | -          | -          | -          | -          |
| Melinda Brent          |         | -                                      | -          | -          | -          | -          | -          |
| Corporate Mariner      |         | -                                      | -          | -          | -          | -          | -          |
| Ed Renshaw             |         | -                                      | -          | -          | -          | -          | -          |
| Kevin Michael          | 5/23/90 | -                                      | -          | -          | -          | -          | -          |
| Jack D. Wofford        |         | 69.8                                   | 76.6       | 84.8       | 65.2       | 112.1      | 68.6       |
| Trojan                 |         | 83.4                                   | 80.3       | 84.4       | 65.3       | 89.1       | 70.5       |

# Apple River Island Site

5 Minutes after Barge-Tow Passage

| Tow name               | Date    | Suspended Sediment Concentration, mg/L |            |            |            |            |
|------------------------|---------|----------------------------------------|------------|------------|------------|------------|
|                        |         | Station a1                             | Station b1 | Station c1 | Station c2 | Station d1 |
| Yazoo                  | 5/18/90 | -                                      | -          | -          | -          | -          |
| Cooperative Ambassador |         | -                                      | -          | -          | -          | -          |
| Christine Bailey       |         | -                                      | -          | -          | -          | -          |
| Kathy Ellen            |         | -                                      | -          | -          | -          | -          |
| W.A. Kernan            | 5/19/90 | -                                      | -          | -          | -          | -          |
| Hornet                 |         | -                                      | -          | -          | -          | -          |
| Conti-Bonnie           |         | -                                      | -          | -          | -          | -          |
| Becky Lynn             |         | -                                      | -          | -          | -          | -          |
| Merlin Banta           | 5/20/90 | 56.9                                   | 65.4       | 64.5       | 61.2       | 63.1       |
| Rusty Flowers          |         | 107.9                                  | 72.1       | 75.4       | 61.6       | 192.6      |
| Tom Talbert            |         | 265.1                                  | 178.1      | 90.7       | 60.0       | 75.8       |
| Herman Pott            |         | 201.3                                  | 126.6      | 133.4      | 67.6       | 71.5       |
| Walter Brunson         | 5/21/90 | 90.6                                   | 74.0       | 79.1       | 59.9       | 72.1       |
| Dell Butcher           |         | 67.2                                   | 67.4       | 83.3       | 63.4       | 70.1       |
| Mary Gail              |         | 147.9                                  | 126.0      | 85.7       | 86.1       | 82.3       |
| T.S. Kunsman           |         | 244.1                                  | 97.7       | 82.3       | 59.5       | 151.1      |
| D. Ray Miller          |         | 128.9                                  | 104.2      | 98.0       | 71.6       | 83.5       |
| Mary Gail              | 5/22/90 | 155.7                                  | 160.7      | 98.7       | 72.7       | 93.0       |
| Trojan                 |         | -                                      | -          | -          | -          | -          |
| Melinda Brent          |         | -                                      | -          | -          | -          | -          |
| Corporate Mariner      |         | -                                      | -          | -          | -          | -          |
| Ed Renshaw             |         | -                                      | -          | -          | -          | -          |
| Kevin Michael          | 5/23/90 | -                                      | -          | -          | -          | -          |
| Jack D. Wofford        |         | 72.7                                   | 75.7       | 99.3       | 66.2       | 88.1       |
| Trojan                 |         | 79.1                                   | 80.8       | 83.2       | 67.1       | 93.9       |
|                        |         |                                        |            |            |            | 68.0       |
|                        |         |                                        |            |            |            | 69.4       |

# Apple River Island Site

## 30 Minutes after Barge-Tow Passage

| Tow name               | Date    | Suspended Sediment Concentration, mg/L |            |            |            |            |            |
|------------------------|---------|----------------------------------------|------------|------------|------------|------------|------------|
|                        |         | Station a1                             | Station b1 | Station c1 | Station c2 | Station d1 | Station d2 |
| Yazoo                  | 5/18/90 | -                                      | -          | -          | -          | -          | -          |
| Cooperative Ambassador |         | -                                      | -          | -          | -          | -          | -          |
| Christine Bailey       |         | -                                      | -          | -          | -          | -          | -          |
| Kathy Ellen            |         | -                                      | -          | -          | -          | -          | -          |
| W.A. Kernan            | 5/19/90 | -                                      | -          | -          | -          | -          | -          |
| Hornet                 |         | -                                      | -          | -          | -          | -          | -          |
| Conti-Bonnie           |         | -                                      | -          | -          | -          | -          | -          |
| Becky Lynn             |         | -                                      | -          | -          | -          | -          | -          |
| Merlin Banta           | 5/20/90 | 53.5                                   | 61.9       | 66.7       | 59.5       | 86.0       | 54.4       |
| Rusty Flowers          |         | 69.6                                   | 82.3       | 70.1       | 61.3       | 73.8       | 61.1       |
| Tom Talbert            |         | 114.6                                  | 85.1       | 73.2       | 62.3       | 74.9       | 63.1       |
| Herman Pott            |         | 114.4                                  | 91.4       | 78.2       | 70.5       | 75.4       | 66.2       |
| Walter Brunson         | 5/21/90 | 84.6                                   | 77.2       | 74.6       | 68.6       | 74.7       | 63.3       |
| Dell Butcher           |         | 61.4                                   | 70.2       | 77.9       | 64.6       | 73.2       | 66.4       |
| Mary Gail              |         | 173.6                                  | 104.4      | 78.4       | 61.5       | 76.8       | 72.0       |
| T.S. Kunsman           |         | 105.0                                  | 87.6       | 83.5       | 64.9       | 76.6       | 68.1       |
| D. Ray Miller          |         | 71.6                                   | 75.4       | 82.4       | 64.8       | 80.8       | 72.4       |
| Mary Gail              | 5/22/90 | 84.9                                   | 87.8       | 95.1       | 76.7       | 89.2       | 77.3       |
| Trojan                 |         | -                                      | -          | -          | -          | -          | -          |
| Melinda Brent          |         | -                                      | -          | -          | -          | -          | -          |
| Corporate Mariner      |         | -                                      | -          | -          | -          | -          | -          |
| Ed Renshaw             |         | -                                      | -          | -          | -          | -          | -          |
| Kevin Michael          | 5/23/90 | -                                      | -          | -          | -          | -          | -          |
| Jack D. Wofford        |         | 70.7                                   | 73.8       | 83.1       | 67.5       | 91.1       | 65.7       |
| Trojan                 |         | 66.1                                   | 71.3       | 85.3       | 66.2       | 93.9       | 63.5       |

# Apple River Island Site

## 60 Minutes after Barge-Tow Passage

| Tow name               | Date    | Suspended Sediment Concentration, mg/L |            |            |            |            |            |
|------------------------|---------|----------------------------------------|------------|------------|------------|------------|------------|
|                        |         | Station a1                             | Station b1 | Station c1 | Station c2 | Station d1 | Station d2 |
| Yazoo                  | 5/18/90 | -                                      | -          | -          | -          | -          | -          |
| Cooperative Ambassador |         | -                                      | -          | -          | -          | -          | -          |
| Christine Bailey       |         | -                                      | -          | -          | -          | -          | -          |
| Kathy Ellen            |         | -                                      | -          | -          | -          | -          | -          |
| W.A. Kerman            | 5/19/90 | -                                      | -          | -          | -          | -          | -          |
| Hornet                 |         | -                                      | -          | -          | -          | -          | -          |
| Conti-Bonnie           |         | -                                      | -          | -          | -          | -          | -          |
| Becky Lynn             |         | -                                      | -          | -          | -          | -          | -          |
| Merlin Banta           | 5/20/90 | 64.8                                   | 65.5       | 71.7       | 59.5       | 65.9       | 61.3       |
| Rusty Flowers          |         | 56.8                                   | 79.3       | 71.6       | 61.6       | 67.8       | 60.7       |
| Tom Talbert            |         | 76.8                                   | 73.3       | 73.8       | 63.8       | 72.5       | 69.6       |
| Herman Pott            |         | -                                      | -          | -          | -          | -          | -          |
| Walter Brunson         | 5/21/90 | 67.2                                   | 67.4       | 83.3       | 63.4       | 70.1       | 65.9       |
| Dell Butcher           |         | 72.1                                   | 68.4       | 79.9       | 67.2       | 81.4       | 69.9       |
| Mary Gail              |         | 82.7                                   | 80.0       | 80.4       | 62.4       | 75.3       | 69.9       |
| T.S. Kunsman           |         | 66.6                                   | 73.3       | 80.8       | 65.3       | 75.2       | 67.7       |
| D. Ray Miller          |         | 59.2                                   | 76.2       | 80.9       | 60.2       | 85.9       | 73.9       |
| Mary Gail              | 5/22/90 | 72.2                                   | 80.5       | 87.2       | 75.9       | 86.5       | 76.7       |
| Trojan                 |         | -                                      | -          | -          | -          | -          | -          |
| Melinda Brent          |         | -                                      | -          | -          | -          | -          | -          |
| Corporate Mariner      |         | -                                      | -          | -          | -          | -          | -          |
| Ed Renshaw             |         | -                                      | -          | -          | -          | -          | -          |
| Kevin Michael          | 5/23/90 | -                                      | -          | -          | -          | -          | -          |
| Jack D. Wofford        |         | 56.2                                   | 69.5       | 81.5       | 63.5       | 100.7      | 65.5       |
| Trojan                 |         | 56.3                                   | 71.4       | 78.3       | 64.5       | 91.4       | 80.4       |

Apple River Island Site

90 Minutes after Barge-Tow Passage

| Tow name               | Date    | Suspended Sediment Concentration, mg/L |            |            |            |            |            |
|------------------------|---------|----------------------------------------|------------|------------|------------|------------|------------|
|                        |         | Station a1                             | Station b1 | Station c1 | Station c2 | Station d1 | Station d2 |
| Yazoo                  | 5/18/90 | -                                      | -          | -          | -          | -          | -          |
| Cooperative Ambassador |         | -                                      | -          | -          | -          | -          | -          |
| Christine Bailey       |         | -                                      | -          | -          | -          | -          | -          |
| Kathy Ellen            |         | -                                      | -          | -          | -          | -          | -          |
| W.A. Kernan            | 5/19/90 | -                                      | -          | -          | -          | -          | -          |
| Hornet                 |         | -                                      | -          | -          | -          | -          | -          |
| Conti-Bonnie           |         | -                                      | -          | -          | -          | -          | -          |
| Becky Lynn             |         | -                                      | -          | -          | -          | -          | -          |
| Merlin Banta           | 5/20/90 | 51.6                                   | 60.7       | 69.3       | 59.5       | 66.4       | 56.9       |
| Rusty Flowers          |         | 168.2                                  | 181.6      | 80.0       | 65.1       | 74.1       | 65.1       |
| Tom Talbert            |         | 86.9                                   | 69.6       | 85.2       | 65.0       | 72.7       | 68.9       |
| Herman Pott            |         | -                                      | -          | -          | -          | -          | -          |
| Walter Brunson         | 5/21/90 | 60.8                                   | 71.5       | 77.1       | 65.4       | 76.5       | 66.2       |
| Dell Butcher           |         | 105.4                                  | 93.4       | 79.6       | 66.1       | 80.1       | 69.9       |
| Mary Gail              |         | 66.5                                   | 74.1       | 79.4       | 67.8       | 83.7       | 75.5       |
| T.S. Kunsman           |         | 85.3                                   | 73.8       | 81.7       | 89.5       | 102.7      | 77.5       |
| D. Ray Miller          |         | 72.7                                   | 73.9       | 81.7       | 84.5       | 94.4       | 77.7       |
| Mary Gail              | 5/22/90 | 92.6                                   | 77.8       | 88.8       | 82.1       | 89.2       | 76.0       |
| Trojan                 |         | -                                      | -          | -          | -          | -          | -          |
| Melinda Brent          |         | -                                      | -          | -          | -          | -          | -          |
| Cooperative Mariner    |         | -                                      | -          | -          | -          | -          | -          |
| Ed Renshaw             |         | -                                      | -          | -          | -          | -          | -          |
| Kevin Michael          | 5/23/90 | -                                      | -          | -          | -          | -          | -          |
| Jack D. Wofford        |         | 55.9                                   | 71.3       | 78.4       | 63.9       | 98.2       | 75.9       |
| Trojan                 |         | 52.6                                   | 70.2       | 76.1       | 64.5       | 85.6       | 95.0       |

# Apple River Island Site

## 120 Minutes after Barge-Tow Passage

| Tow name               | Date    | Suspended Sediment Concentration, mg/L |            |            |            |            |            |
|------------------------|---------|----------------------------------------|------------|------------|------------|------------|------------|
|                        |         | Station a1                             | Station b1 | Station c1 | Station c2 | Station d1 | Station d2 |
| Yazoo                  | 5/18/90 | -                                      | -          | -          | -          | -          | -          |
| Cooperative Ambassador |         | -                                      | -          | -          | -          | -          | -          |
| Christine Bailey       |         | -                                      | -          | -          | -          | -          | -          |
| Kathy Ellen            |         | -                                      | -          | -          | -          | -          | -          |
| W.A. Kerman            | 5/19/90 | -                                      | -          | -          | -          | -          | -          |
| Hornet                 |         | -                                      | -          | -          | -          | -          | -          |
| Conti-Bonnie           |         | -                                      | -          | -          | -          | -          | -          |
| Becky Lynn             |         | -                                      | -          | -          | -          | -          | -          |
| Merlin Banta           | 5/20/90 | 64.8                                   | 61.4       | 67.9       | 59.1       | 66.6       | 59.9       |
| Rusty Flowers          |         | 107.0                                  | 71.6       | 77.7       | 62.9       | 72.2       | 63.9       |
| Tom Talbert            |         | 63.3                                   | 70.5       | 113.5      | 62.9       | 71.9       | 63.0       |
| Herman Pott            |         | -                                      | -          | -          | -          | -          | -          |
| Walter Brunson         | 5/21/90 | 112.2                                  | 69.8       | 80.0       | 66.3       | 78.4       | 70.1       |
| Dell Butcher           |         | 64.5                                   | 70.6       | 80.5       | 70.4       | 83.5       | 68.5       |
| Mary Gail              |         | 71.6                                   | 72.0       | 82.3       | 95.1       | 118.3      | 82.6       |
| T.S. Kunsman           |         | 66.5                                   | 75.9       | 81.4       | 77.0       | 88.3       | 76.1       |
| D. Ray Miller          |         | -                                      | -          | -          | -          | -          | -          |
| Mary Gail              | 5/22/90 | 72.7                                   | 85.7       | 95.0       | 70.3       | 87.2       | 66.2       |
| Trojan                 |         | -                                      | -          | -          | -          | -          | -          |
| Melinda Brent          |         | -                                      | -          | -          | -          | -          | -          |
| Corporate Mariner      |         | -                                      | -          | -          | -          | -          | -          |
| Ed Renshaw             |         | -                                      | -          | -          | -          | -          | -          |
| Kevin Michael          | 5/23/90 | -                                      | -          | -          | -          | -          | -          |
| Jack D. Wofford        |         | -                                      | -          | -          | -          | -          | -          |
| Trojan                 |         | -                                      | -          | -          | -          | -          | -          |



**APPENDIX XV.**

**SUSPENDED SEDIMENT CONCENTRATION DATA**  
**FOR GOOSE ISLAND, TRIP 1**

Goose Island Site, Trip 1

60 Minutes Prior to Barge-Tow Passage

| Tow name             | Date    | Suspended Sediment Concentration, mg/L |            |            |            |
|----------------------|---------|----------------------------------------|------------|------------|------------|
|                      |         | Station a1                             | Station b1 | Station b2 | Station c2 |
| Sierra Dawn          | 8/24/90 | -                                      | -          | -          | -          |
| Dell Butcher         |         | 184.0                                  | 217.7      | 203.7      | 181.2      |
| William C. Norman    |         | 187.2                                  | 211.4      | 204.5      | 178.5      |
| Normania             |         | 159.7                                  | 198.3      | 195.0      | 181.1      |
| Dave Carlton         |         | 191.8                                  | 208.0      | 194.7      | 182.1      |
| Hugh C. Blaske       | 8/25/90 | 153.4                                  | 152.7      | 165.6      | 149.4      |
| Teresa Renee         |         | 151.2                                  | 148.5      | 148.8      | 148.0      |
| Trojan Warrior       |         | 154.9                                  | 151.1      | 157.7      | 154.7      |
| Hoosier State        |         | 162.7                                  | 157.8      | 151.0      | 146.9      |
| Reliance             | 8/26/90 | -                                      | -          | -          | -          |
| Kevin Michael        |         | 161.3                                  | 153.9      | 154.0      | 147.7      |
| Sumac                |         | 172.1                                  | 168.3      | 159.9      | 155.8      |
| Twin Cities          |         | 168.4                                  | 166.2      | 166.1      | 147.6      |
| Cooperative Vanguard |         | 170.3                                  | 175.9      | 165.5      | 158.6      |
| Superior             | 8/27/90 | -                                      | -          | -          | -          |
| Helen M. Clements    |         | 165.6                                  | 179.4      | 171.8      | 264.5      |

Goose Island Site, Trip 1

30 Minutes Prior to Barge-Tow Passage

| Tow name             | Date    | Suspended Sediment Concentration, mg/L |            |            |            |            |
|----------------------|---------|----------------------------------------|------------|------------|------------|------------|
|                      |         | Station a1                             | Station b1 | Station b2 | Station c1 | Station c2 |
| Sierra Dawn          | 8/24/90 | -                                      | -          | -          | -          | -          |
| Dell Butcher         |         | 168.7                                  | 201.8      | 198.1      | 203.7      | 180.0      |
| William C. Norman    |         | 187.1                                  | 215.7      | 197.6      | 287.9      | 181.8      |
| Normania             |         | 283.9                                  | 222.4      | 223.5      | 325.4      | 180.1      |
| Dave Carlton         |         | 191.2                                  | 193.4      | 179.6      | 188.4      | 174.1      |
| Hugh C. Blaske       | 8/25/90 | 158.8                                  | 149.6      | 149.1      | 164.4      | 147.8      |
| Teresa Renee         |         | 168.9                                  | 146.5      | 151.7      | 163.0      | 151.9      |
| Trojan Warrior       |         | 155.1                                  | 147.2      | 143.3      | 164.2      | 150.7      |
| Hoosier State        |         | 162.1                                  | 153.1      | 152.5      | 160.6      | 189.1      |
| Reliance             | 8/26/90 | -                                      | -          | -          | -          | -          |
| Kevin Michael        |         | 156.9                                  | 147.8      | 151.4      | 166.3      | 146.7      |
| Sumac                |         | 163.2                                  | 158.2      | 156.8      | 173.0      | 149.8      |
| Twin Cities          |         | 173.2                                  | 165.4      | 163.0      | 181.3      | 158.7      |
| Cooperative Vanguard |         | 187.9                                  | 174.2      | 164.3      | 184.7      | 155.5      |
| Superior             | 8/27/90 | -                                      | -          | -          | -          | -          |
| Helen M. Clements    |         | 167.8                                  | 178.2      | 170.0      | 202.8      | 192.0      |

# Goose Island Site, Trip 1

## 10 Minutes Prior to Barge-Tow Passage

| Tow name             | Date    | Suspended Sediment Concentration, mg/L |            |            |            |            |       |
|----------------------|---------|----------------------------------------|------------|------------|------------|------------|-------|
|                      |         | Station a1                             | Station b1 | Station b2 | Station c1 | Station c2 |       |
| Sierra Dawn          | 8/24/90 | -                                      | -          | -          | -          | -          | -     |
| Dell Butcher         |         | 189.1                                  | 229.2      | 201.7      | 494.5      | 179.5      | 179.5 |
| William C. Norman    |         | 331.5                                  | 251.8      | 237.8      | 253.0      | 186.2      | 186.2 |
| Normania             |         | 217.3                                  | 228.0      | 199.0      | 204.5      | 269.1      | 269.1 |
| Dave Carlton         |         | 182.2                                  | 188.5      | 179.6      | 189.7      | 176.2      | 176.2 |
| Hugh C. Blaske       | 8/25/90 | 155.7                                  | 148.9      | 148.6      | 164.0      | 148.1      | 148.1 |
| Teresa Renee         |         | 152.5                                  | 164.1      | 136.7      | 164.4      | 146.0      | 146.0 |
| Trojan Warrior       |         | 164.4                                  | 162.3      | 140.6      | 160.0      | 149.1      | 149.1 |
| Hoosier State        |         | 160.5                                  | 153.3      | 151.0      | 160.0      | 158.0      | 158.0 |
| Reliance             | 8/26/90 | -                                      | -          | -          | -          | -          | -     |
| Kevin Michael        |         | 149.6                                  | 155.0      | 151.6      | 167.8      | 145.6      | 145.6 |
| Sumac                |         | 163.7                                  | 163.4      | 160.6      | 171.1      | 147.6      | 147.6 |
| Twin Cities          |         | 168.3                                  | 170.0      | 158.6      | 173.7      | 153.0      | 153.0 |
| Cooperative Vanguard |         | 186.8                                  | 168.2      | 157.1      | 176.1      | 153.7      | 153.7 |
| Superior             | 8/27/90 | 229.7                                  | 222.3      | 201.5      | 223.3      | 181.3      | 181.3 |
| Helen M. Clements    |         | 180.3                                  | 190.3      | 179.3      | 244.8      | 178.6      | 178.6 |

**Goose Island Site, Trip 1**

**5 Minutes Prior to Barge-Tow Passage**

| Tow name             | Date    | Suspended Sediment Concentration, mg/L |            |            |            |            |
|----------------------|---------|----------------------------------------|------------|------------|------------|------------|
|                      |         | Station a1                             | Station b1 | Station b2 | Station c1 | Station c2 |
| Sierra Dawn          | 8/24/90 | -                                      | -          | -          | -          | -          |
| Dell Butcher         |         | 190.5                                  | 238.8      | 204.6      | 642.1      | 177.9      |
| William C. Norman    |         | 258.4                                  | 217.1      | 204.7      | 217.1      | 177.0      |
| Normania             |         | 214.9                                  | 199.5      | 190.9      | 202.0      | 199.6      |
| Dave Carlton         |         | 182.7                                  | 187.7      | 180.6      | 191.3      | 177.2      |
| Hugh C. Blaske       | 8/25/90 | 152.0                                  | 148.6      | 148.8      | 164.5      | 148.0      |
| Teresa Renee         |         | 156.2                                  | 161.3      | 138.4      | 166.7      | 148.6      |
| Trojan Warrior       |         | 164.2                                  | 156.4      | 139.6      | 165.2      | 146.9      |
| Hoosier State        |         | 160.4                                  | 153.3      | 151.0      | 160.7      | 146.8      |
| Reliance             | 8/26/90 | -                                      | -          | -          | -          | -          |
| Kevin Michael        |         | 150.0                                  | 158.7      | 152.0      | 166.7      | 146.2      |
| Sumac                |         | 166.0                                  | 165.0      | 164.4      | 170.3      | 147.3      |
| Twin Cities          |         | 245.4                                  | 171.0      | 160.6      | 172.7      | 153.0      |
| Cooperative Vanguard |         | 186.3                                  | 173.0      | 155.5      | 177.7      | 152.8      |
| Superior             | 8/27/90 | 258.7                                  | 235.8      | 211.0      | 234.1      | 184.9      |
| Helen M. Clements    |         | 253.4                                  | 195.0      | 182.8      | 241.4      | 187.5      |

Goose Island Site, Trip 1

2 Minutes Prior to Barge-Tow Passage

| Tow name             | Date    | Suspended Sediment Concentration, mg/L |            |            |            |            |
|----------------------|---------|----------------------------------------|------------|------------|------------|------------|
|                      |         | Station a1                             | Station b1 | Station b2 | Station c1 | Station c2 |
| Sierra Dawn          | 8/24/90 | -                                      | -          | -          | -          | -          |
| Dell Butcher         |         | 303.4                                  | 207.6      | 207.1      | 211.6      | 181.3      |
| William C. Norman    |         | 232.3                                  | 206.3      | 208.2      | 199.9      | 185.0      |
| Normania             |         | 254.0                                  | 201.1      | 195.4      | 200.4      | 237.6      |
| Dave Carlton         |         | 183.0                                  | 187.2      | 181.2      | 192.2      | 177.8      |
| Hugh C. Blaske       | 8/25/90 | 149.7                                  | 148.4      | 148.9      | 164.7      | 148.0      |
| Teresa Renee         |         | 160.9                                  | 162.5      | 144.0      | 162.3      | 155.4      |
| Trojan Warrior       |         | 159.4                                  | 158.8      | 141.7      | 164.5      | 149.5      |
| Hoosier State        |         | 160.2                                  | 153.2      | 152.0      | 162.8      | 145.4      |
| Reliance             | 8/26/90 | -                                      | -          | -          | -          | -          |
| Kevin Michael        |         | 152.6                                  | 158.2      | 152.6      | 167.7      | 147.3      |
| Sumac                |         | 173.0                                  | 168.4      | 169.4      | 172.1      | 148.3      |
| Twin Cities          |         | 269.9                                  | 169.3      | 163.5      | 183.6      | 153.8      |
| Cooperative Vanguard |         | 183.9                                  | 174.7      | 155.6      | 180.3      | 154.2      |
| Superior             | 8/27/90 | 276.2                                  | 243.9      | 216.8      | 240.6      | 187.1      |
| Helen M. Clements    |         | 359.8                                  | 198.5      | 185.3      | 225.0      | 199.6      |

# Goose Island Site, Trip 1

## Peak Suspended Sediment Concentrations for the Events

| Tow name             | Date    | Suspended Sediment Concentration, mg/L |            |            |            |            |
|----------------------|---------|----------------------------------------|------------|------------|------------|------------|
|                      |         | Station a1                             | Station b1 | Station b2 | Station c1 | Station c2 |
| Sierra Dawn          | 8/24/90 | -                                      | -          | -          | -          | -          |
| Dell Butcher         |         | 331.5                                  | 251.8      | 241.7      | 642.1      | 190.0      |
| William C. Norman    |         | 258.4                                  | 217.1      | 211.8      | 233.3      | 235.7      |
| Normania             |         | 267.7                                  | 215.7      | 210.1      | 203.4      | 276.9      |
| Dave Carlton         |         | 198.8                                  | 191.7      | 191.2      | 192.2      | 178.0      |
| Hugh C. Blaske       | 8/25/90 | 154.9                                  | 153.3      | 159.7      | 193.4      | 155.3      |
| Teresa Renee         |         | 164.4                                  | 162.6      | 144.0      | 166.7      | 155.4      |
| Trojan Warrior       |         | 192.7                                  | 168.8      | 143.7      | 185.7      | 276.5      |
| Hoosier State        |         | 160.4                                  | 166.5      | 153.9      | 178.9      | 194.1      |
| Reliance             | 8/26/90 | -                                      | -          | -          | -          | -          |
| Kevin Michael        |         | 158.9                                  | 160.9      | 154.0      | 179.6      | 147.3      |
| Sumac                |         | 194.5                                  | 176.2      | 181.0      | 197.1      | 155.2      |
| Twin Cities          |         | 297.0                                  | 182.7      | 173.2      | 195.2      | 160.2      |
| Cooperative Vanguard |         | 187.0                                  | 179.0      | 163.6      | 190.8      | 155.1      |
| Superior             | 8/27/90 | 305.2                                  | 257.4      | 236.3      | 258.4      | 198.7      |
| Helen M. Clements    |         | 359.8                                  | 225.8      | 215.6      | 252.3      | 265.3      |

# Goose Island Site, Trip 1

## Average Suspended Sediment Concentrations

| Tow name             | Date    | Average Suspended Sediment Concentration during Event, mg/L |            |            |            |
|----------------------|---------|-------------------------------------------------------------|------------|------------|------------|
|                      |         | Station a1                                                  | Station b1 | Station b2 | Station c1 |
| Sierra Dawn          | 8/24/90 | -                                                           | -          | -          | -          |
| Dell Butcher         |         | 292.4                                                       | 204.3      | 203.5      | 223.2      |
| William C. Norman    |         | 231.7                                                       | 212.5      | 204.1      | 196.1      |
| Normania             |         | 248.6                                                       | 203.0      | 189.3      | 200.0      |
| Dave Carlton         |         | 180.5                                                       | 185.1      | 186.3      | 189.8      |
| Hugh C. Blaske       | 8/25/90 | 151.8                                                       | 148.8      | 149.0      | 169.9      |
| Teresa Renee         |         | 159.6                                                       | 159.8      | 137.2      | 158.1      |
| Trojan Warrior       |         | 163.8                                                       | 163.0      | 139.1      | 179.8      |
| Hoosier State        |         | 157.6                                                       | 153.0      | 152.6      | 167.6      |
| Reliance             | 8/26/90 | -                                                           | -          | -          | -          |
| Kevin Michael        |         | 154.4                                                       | 156.3      | 154.0      | 174.9      |
| Sumac                |         | 170.1                                                       | 170.6      | 179.7      | 175.6      |
| Twin Cities          |         | 217.5                                                       | 170.0      | 164.4      | 194.4      |
| Cooperative Vanguard |         | 184.6                                                       | 177.2      | 155.7      | 184.5      |
| Superior             | 8/27/90 | 287.8                                                       | 249.3      | 220.6      | 244.9      |
| Helen M. Clements    |         | 290.5                                                       | 204.3      | 193.4      | 210.8      |
|                      |         |                                                             |            |            | 188.6      |
|                      |         |                                                             |            |            | 234.5      |



**Goose Island Site, Trip 1**

**2 Minutes after Barge-Tow Passage**

| Tow name             | Date    | Suspended Sediment Concentration, mg/L |            |            |            |            |
|----------------------|---------|----------------------------------------|------------|------------|------------|------------|
|                      |         | Station a1                             | Station b1 | Station b2 | Station c1 | Station c2 |
| Sierra Dawn          | 8/24/90 | -                                      | -          | -          | -          | -          |
| Dell Butcher         |         | 250.5                                  | 228.4      | 233.9      | 252.4      | 190.0      |
| William C. Norman    |         | 213.7                                  | 210.7      | 198.2      | 201.5      | 213.8      |
| Normania             |         | 229.2                                  | 205.2      | 210.1      | 200.8      | 188.0      |
| Dave Carlton         |         | 193.2                                  | 187.0      | 184.6      | 188.0      | 173.9      |
| Hugh C. Blaske       | 8/25/90 | 153.5                                  | 151.3      | 159.7      | 184.2      | 149.2      |
| Teresa Renee         |         | 159.4                                  | 156.6      | 137.1      | 160.5      | 145.6      |
| Trojan Warrior       |         | 192.7                                  | 163.6      | 139.4      | 177.1      | 150.2      |
| Hoosier State        |         | 156.0                                  | 151.1      | 146.0      | 166.3      | 142.2      |
| Reliance             | 8/26/90 | -                                      | -          | -          | -          | -          |
| Kevin Michael        |         | 156.2                                  | 156.0      | 149.9      | 175.8      | 146.8      |
| Sumac                |         | 179.7                                  | 172.9      | 176.0      | 187.8      | 150.9      |
| Twin Cities          |         | 181.4                                  | 177.5      | 162.1      | 194.9      | 154.1      |
| Cooperative Vanguard |         | 186.5                                  | 176.3      | 160.6      | 189.2      | 152.2      |
| Superior             | 8/27/90 | 299.4                                  | 254.7      | 224.4      | 249.2      | 190.1      |
| Helen M. Clements    |         | 275.9                                  | 198.1      | 195.4      | 209.9      | 225.6      |

# Goose Island Site, Trip 1

## 5 Minutes after Barge-Tow Passage

| <i>Tow name</i>      | <i>Date</i> | <i>Suspended Sediment Concentration, mg/L</i> |                   |                   |                   |
|----------------------|-------------|-----------------------------------------------|-------------------|-------------------|-------------------|
|                      |             | <i>Station a1</i>                             | <i>Station b1</i> | <i>Station b2</i> | <i>Station c2</i> |
| Sierra Dawn          | 8/24/90     | -                                             | -                 | -                 | -                 |
| Dell Butcher         |             | 296.1                                         | 225.1             | 232.6             | 449.9             |
| William C. Norman    |             | 205.7                                         | 207.5             | 183.8             | 204.4             |
| Normania             |             | 222.6                                         | 215.7             | 199.1             | 203.2             |
| Dave Carlton         |             | 194.3                                         | 191.7             | 177.3             | 188.1             |
| Hugh C. Blaske       | 8/25/90     | 154.9                                         | 151.1             | 157.7             | 169.8             |
| Teresa Renee         |             | 164.4                                         | 157.0             | 140.6             | 165.6             |
| Trojan Warrior       |             | 190.8                                         | 168.8             | 143.7             | 185.7             |
| Hoosier State        |             | 156.3                                         | 166.5             | 153.9             | 178.9             |
| Reliance             | 8/26/90     | -                                             | -                 | -                 | -                 |
| Kevin Michael        |             | 158.9                                         | 154.8             | 151.8             | 167.8             |
| Sumac                |             | 193.7                                         | 176.2             | 181.0             | 178.1             |
| Twin Cities          |             | 169.0                                         | 172.6             | 169.0             | 181.1             |
| Cooperative Vanguard |             | 176.8                                         | 176.3             | 163.6             | 190.8             |
| Superior             | 8/27/90     | 296.3                                         | 252.7             | 236.3             | 258.4             |
| Helen M. Clements    |             | 259.7                                         | 225.8             | 215.6             | 252.3             |
|                      |             |                                               |                   |                   | 198.7             |
|                      |             |                                               |                   |                   | 208.1             |

# Goose Island Site, Trip 1

## 30 Minutes after Barge-Tow Passage

| Tow name             | Date    | Suspended Sediment Concentration, mg/L |            |            |            |            |
|----------------------|---------|----------------------------------------|------------|------------|------------|------------|
|                      |         | Station a1                             | Station b1 | Station b2 | Station c1 | Station c2 |
| Sierra Dawn          | 8/24/90 | -                                      | -          | -          | -          | -          |
| Dell Butcher         |         | 218.9                                  | 201.5      | 194.4      | 204.1      | 199.6      |
| William C. Norman    |         | 232.5                                  | 211.6      | 203.2      | 204.7      | 273.3      |
| Normania             |         | 228.1                                  | 220.4      | 210.1      | 211.0      | 185.1      |
| Dave Carlton         |         | 183.0                                  | 196.1      | 195.7      | 190.2      | 179.3      |
| Hugh C. Blaske       | 8/25/90 | 157.3                                  | 140.3      | 151.0      | 163.5      | 149.1      |
| Teresa Renee         |         | 200.1                                  | 176.5      | 153.3      | 170.5      | 190.0      |
| Trojan Warrior       |         | 204.1                                  | 169.1      | 153.4      | 172.7      | 187.7      |
| Hoosier State        |         | 194.6                                  | 168.5      | 203.1      | 168.1      | 147.7      |
| Reliance             | 8/26/90 | -                                      | -          | -          | -          | -          |
| Kevin Michael        |         | 163.4                                  | 165.8      | 158.6      | 174.4      | 152.9      |
| Sumac                |         | 168.4                                  | 169.2      | 164.4      | 178.8      | 160.2      |
| Twin Cities          |         | 186.5                                  | 171.1      | 156.1      | 177.1      | 153.2      |
| Cooperative Vanguard |         | 175.3                                  | 173.9      | 161.5      | 188.7      | 155.6      |
| Superior             | 8/27/90 | 220.9                                  | 202.2      | 192.4      | 221.8      | 180.7      |
| Helen M. Clements    |         | 194.7                                  | 204.9      | 193.1      | 214.8      | 278.1      |

Goose Island Site, Trip 1

60 Minutes after Barge-Tow Passage

| <i>Tow name</i>      | <i>Date</i> | <i>Suspended Sediment Concentration, mg/L</i> |                   |                   |                   |
|----------------------|-------------|-----------------------------------------------|-------------------|-------------------|-------------------|
|                      |             | <i>Station a1</i>                             | <i>Station b1</i> | <i>Station b2</i> | <i>Station c2</i> |
| Sierra Dawn          | 8/24/90     | -                                             | -                 | -                 | -                 |
| Dell Butcher         |             | 228.4                                         | 220.6             | 211.4             | 217.3             |
| William C. Norman    |             | 207.3                                         | 210.4             | 204.5             | 204.9             |
| Normania             |             | 218.9                                         | 201.5             | 194.4             | 198.1             |
| Dave Carlton         |             | 174.8                                         | 185.4             | 211.4             | 188.6             |
| Hugh C. Blaske       | 8/25/90     | 164.2                                         | 156.4             | 139.6             | 165.2             |
| Teresa Renee         |             | 284.2                                         | 175.5             | 186.7             | 196.3             |
| Trojan Warrior       |             | 272.5                                         | 206.7             | 197.7             | 208.1             |
| Hoosier State        |             | 191.0                                         | 155.2             | 154.8             | 162.8             |
| Reliance             | 8/26/90     | -                                             | -                 | -                 | -                 |
| Kevin Michael        |             | 166.2                                         | 163.8             | 159.4             | 180.9             |
| Sumac                |             | 169.8                                         | 177.7             | 173.2             | 188.2             |
| Twin Cities          |             | 188.0                                         | 174.1             | 161.3             | 174.2             |
| Cooperative Vanguard |             | 170.2                                         | 171.7             | 163.1             | 180.6             |
| Superior             | 8/27/90     | 163.3                                         | 184.1             | 173.8             | 203.9             |
| Helen M. Clements    |             | 171.9                                         | 238.4             | 176.7             | 205.3             |
|                      |             |                                               |                   |                   | 206.3             |
|                      |             |                                               |                   |                   | 174.1             |

**Goose Island Site, Trip 1**

**90 Minutes after Barge-Tow Passage**

| Tow name             | Date    | Suspended Sediment Concentration, mg/L |            |            |            |            |
|----------------------|---------|----------------------------------------|------------|------------|------------|------------|
|                      |         | Station a1                             | Station b1 | Station b2 | Station c1 | Station c2 |
| Sierra Dawn          | 8/24/90 | -                                      | -          | -          | -          | -          |
| Dell Butcher         |         | 218.7                                  | 202.8      | 193.3      | 199.3      | 179.8      |
| William C. Norman    |         | 213.6                                  | 199.0      | 191.0      | 200.1      | 179.6      |
| Normania             |         | 234.3                                  | 195.9      | 188.3      | 190.6      | 176.7      |
| Dave Carlton         | 8/25/90 | -                                      | -          | -          | -          | -          |
| Hugh C. Blaske       |         | 193.0                                  | 169.7      | 152.2      | 175.0      | 156.5      |
| Teresa Renee         |         | 194.9                                  | 178.6      | 171.6      | 174.4      | 154.8      |
| Trojan Warrior       |         | 181.0                                  | 167.7      | 163.9      | 172.4      | 264.1      |
| Hoosier State        |         | -                                      | -          | -          | -          | -          |
| Reliance             | 8/26/90 | -                                      | -          | -          | -          | -          |
| Kevin Michael        |         | 163.7                                  | 163.4      | 160.4      | 171.1      | 147.6      |
| Sumac                |         | 184.7                                  | 174.2      | 155.6      | 179.4      | 153.7      |
| Twin Cities          |         | 168.4                                  | 173.6      | 166.7      | 185.2      | 157.6      |
| Cooperative Vanguard | 8/27/90 | 159.9                                  | 167.2      | 154.7      | 188.0      | 154.2      |
| Superior             |         | 163.9                                  | 178.3      | 170.2      | 487.8      | 236.4      |
| Helen M. Clements    |         | 162.0                                  | 179.4      | 169.7      | 186.7      | 158.8      |

Goose Island Site, Trip 1

120 Minutes after Barge-Tow Passage

| Tow name             | Date    | Suspended Sediment Concentration, mg/L |            |            |            |            |   |
|----------------------|---------|----------------------------------------|------------|------------|------------|------------|---|
|                      |         | Station a1                             | Station b1 | Station b2 | Station c1 | Station c2 |   |
| Sierra Dawn          | 8/24/90 | -                                      | -          | -          | -          | -          | - |
| Dell Butcher         |         | 206.0                                  | 204.0      | 192.6      | 192.5      | 180.3      |   |
| William C. Norman    |         | 216.3                                  | 195.8      | 184.0      | 190.2      | 174.9      |   |
| Normania             |         | 182.2                                  | 190.5      | 177.7      | 186.8      | 174.1      |   |
| Dave Carlton         |         | -                                      | -          | -          | -          | -          | - |
| Hugh C. Blaske       | 8/25/90 | 260.1                                  | 196.8      | 197.0      | 198.7      | 257.1      |   |
| Teresa Renee         |         | 165.3                                  | 161.2      | 153.6      | 165.8      | 175.5      |   |
| Trojan Warrior       |         | 162.9                                  | 160.5      | 151.7      | 165.4      | 147.5      |   |
| Hoosier State        |         | -                                      | -          | -          | -          | -          | - |
| Reliance             | 8/26/90 | -                                      | -          | -          | -          | -          | - |
| Kevin Michael        |         | 175.0                                  | 164.2      | 163.0      | 178.5      | 151.7      |   |
| Sumac                |         | 189.4                                  | 232.7      | 162.4      | 186.8      | 158.1      |   |
| Twin Cities          |         | 165.6                                  | 164.8      | 154.8      | 182.2      | 152.6      |   |
| Cooperative Vanguard |         | -                                      | -          | -          | -          | -          | - |
| Superior             | 8/27/90 | 168.9                                  | 181.1      | 172.4      | 205.0      | 251.4      |   |
| Helen M. Clements    |         | 151.4                                  | 174.2      | 166.8      | 180.2      | 160.9      |   |

**APPENDIX XVI.**

**SUSPENDED SEDIMENT CONCENTRATION DATA**  
**FOR KAMPSVILLE, TRIP 1**

**Kampsville Site, Trip 1**  
**60 Minutes Prior to Barge-Tow Passage**

| Tow name          | Date     | Suspended Sediment Concentration, mg/L |            |            |            |            |            |            |            |            |  |
|-------------------|----------|----------------------------------------|------------|------------|------------|------------|------------|------------|------------|------------|--|
|                   |          | Station a1                             | Station a2 | Station b1 | Station b2 | Station c1 | Station c2 | Station d1 | Station d2 | Station d3 |  |
| Mr. Aldo          | 10/12/90 | 95.1                                   | 91.1       | 159.0      | 138.8      | 195.3      | -          | -          | -          | -          |  |
| Floyd Blaske      |          | 95.9                                   | 92.2       | 162.3      | 140.5      | 198.9      | -          | -          | -          | -          |  |
| Luke Burton       | 10/13/90 | -                                      | -          | -          | -          | -          | -          | -          | -          | -          |  |
| Sugarland         |          | -                                      | -          | -          | -          | -          | -          | -          | -          | -          |  |
| William C. Norman |          | 312.0                                  | 288.9      | 245.5      | 220.6      | 291.4      | 244.0      | -          | -          | -          |  |
| Frank H. Peavey   |          | 153.7                                  | 147.5      | -          | -          | 296.2      | 244.7      | -          | -          | -          |  |
| Conti-Karla       |          | 181.1                                  | 173.4      | -          | -          | 349.8      | 252.9      | -          | -          | -          |  |
| Mr. Paul          | 10/14/90 | 227.6                                  | 214.8      | 317.8      | 414.0      | -          | -          | -          | -          | -          |  |
| Rambler           |          | 202.7                                  | 188.3      | 284.8      | 258.8      | -          | -          | -          | -          | -          |  |
| Mr. Lawrence      |          | 318.5                                  | 300.7      | 373.2      | 389.7      | -          | -          | -          | -          | -          |  |
| Mallard           |          | 215.7                                  | 171.5      | 300.6      | 933.7      | -          | -          | -          | -          | -          |  |
| Charles Lehman    |          | 248.6                                  | 223.0      | 304.2      | 274.5      | -          | -          | -          | -          | -          |  |
| Nicholas Duncan   |          | -                                      | -          | -          | -          | -          | -          | -          | -          | -          |  |
| Ardyce Randall    | 10/15/90 | -                                      | -          | -          | -          | -          | -          | -          | -          | -          |  |
| Mr. Paul          |          | 206.0                                  | 188.8      | 287.3      | 268.0      | 419.7      | 284.2      | -          | -          | -          |  |
| Exxon St. Louis   |          | 193.4                                  | 183.6      | 297.2      | 270.6      | 367.5      | 296.5      | -          | -          | -          |  |
| Margaret O        |          | 190.0                                  | 181.4      | 296.3      | 267.4      | 369.7      | 300.9      | -          | -          | -          |  |
| Mr. Lawrence      |          | -                                      | -          | -          | -          | -          | -          | -          | -          | -          |  |



# Kampsville Site, Trip 1

## 60 Minutes Prior to Barge-Tow Passage

| Tow name                        | Date     | Suspended Sediment Concentration, mg/L |            |            |            |            |            |            |            |
|---------------------------------|----------|----------------------------------------|------------|------------|------------|------------|------------|------------|------------|
|                                 |          | Station a1                             | Station a2 | Station b1 | Station b2 | Station c1 | Station c2 | Station d1 | Station d2 |
| A. L. Smith<br>Ste. Genevieve   | 10/16/90 | 201.7                                  | 200.6      | 255.4      | 234.7      | 499.8      | 315.5      | -          | -          |
|                                 |          | 246.2                                  | 217.7      | -          | -          | 338.3      | 265.8      | 453.8      | 316.0      |
| Nicole Brent<br>Frank H. Peavey | 10/17/90 | -                                      | -          | -          | -          | -          | -          | -          | -          |
|                                 |          | 182.9                                  | 186.0      | 226.3      | 194.0      | -          | -          | -          | -          |
|                                 |          |                                        |            |            |            |            |            |            | 482.8      |

## 30 Minutes Prior to Barge-Tow Passage

| Tow name                             | Date     | Suspended Sediment Concentration, mg/L |            |            |            |            |            |            |            |
|--------------------------------------|----------|----------------------------------------|------------|------------|------------|------------|------------|------------|------------|
|                                      |          | Station a1                             | Station a2 | Station b1 | Station b2 | Station c1 | Station c2 | Station d1 | Station d2 |
| Mr. Aldo<br>Floyd Blaske             | 10/12/90 | 96.9                                   | 93.5       | 166.1      | 142.3      | 203.1      | -          | -          | -          |
|                                      |          | 97.8                                   | 94.6       | 169.4      | 143.9      | 206.7      | -          | -          | -          |
| Luke Burton<br>Sugarland             | 10/13/90 | -                                      | -          | -          | -          | -          | -          | -          | -          |
|                                      |          | -                                      | -          | -          | -          | -          | -          | -          | -          |
| William C. Norman<br>Frank H. Peavey |          | 333.4                                  | 293.4      | 263.2      | 231.6      | 303.2      | 226.4      | -          | -          |
|                                      |          | 157.6                                  | 137.6      | -          | -          | 292.4      | 233.9      | -          | -          |
| Conti-Karla                          |          | 201.1                                  | 193.2      | -          | -          | 313.7      | 269.0      | -          | -          |

# Kampsville Site, Trip 1

## 30 Minutes Prior to Barge-Tow Passage

| Tow name        | Date     | Suspended Sediment Concentration, mg/L |            |            |            |            |            |            |            |            |
|-----------------|----------|----------------------------------------|------------|------------|------------|------------|------------|------------|------------|------------|
|                 |          | Station a1                             | Station a2 | Station b1 | Station b2 | Station c1 | Station c2 | Station d1 | Station d2 | Station d3 |
| Mr. Paul        | 10/14/90 | 208.9                                  | 194.2      | 284.0      | 272.3      | -          | -          | -          | -          | -          |
| Rambler         |          | 186.2                                  | 178.6      | 290.9      | 268.0      | -          | -          | -          | -          | -          |
| Mr. Lawrence    |          | 242.4                                  | 223.6      | 332.0      | 297.2      | -          | -          | -          | -          | -          |
| Mallard         |          | 336.8                                  | 327.0      | 302.1      | 268.7      | -          | -          | -          | -          | -          |
| Charles Lehman  |          | 230.1                                  | 209.3      | 306.7      | 265.3      | -          | -          | -          | -          | -          |
| Nicholas Duncan |          | -                                      | -          | -          | -          | -          | -          | -          | -          | -          |
| Ardyce Randall  | 10/15/90 | -                                      | -          | -          | -          | -          | -          | -          | -          | -          |
| Mr. Paul        |          | 195.6                                  | 176.9      | 280.4      | 246.5      | 385.9      | 279.1      | -          | -          | -          |
| Exxon St. Louis |          | 205.3                                  | 190.6      | 308.6      | 277.4      | 356.7      | 292.2      | -          | -          | -          |
| Margaret O      |          | 215.6                                  | 192.7      | 314.0      | 281.9      | 356.3      | 288.2      | -          | -          | -          |
| Mr. Lawrence    |          | -                                      | -          | -          | -          | -          | -          | -          | -          | -          |
| A. L. Smith     | 10/16/90 | 229.8                                  | 185.2      | 230.2      | 215.6      | 552.7      | 242.4      | -          | -          | -          |
| Ste. Genevieve  |          | 228.1                                  | 202.7      | -          | -          | 339.2      | 278.6      | 444.9      | 354.2      | 475.7      |
| Nicole Brent    | 10/17/90 | 181.1                                  | 184.4      | 217.5      | 187.5      | -          | -          | -          | -          | -          |
| Frank H. Peavey |          | 222.7                                  | 221.7      | 240.1      | 208.1      | -          | -          | -          | -          | -          |

# Kampsville Site, Trip 1

## 10 Minutes Prior to Barge-Tow Passage

| Tow name                                                                            | Date     | Suspended Sediment Concentration, mg/L |            |            |            |            |            |            |            |
|-------------------------------------------------------------------------------------|----------|----------------------------------------|------------|------------|------------|------------|------------|------------|------------|
|                                                                                     |          | Station a1                             | Station a2 | Station b1 | Station b2 | Station c1 | Station c2 | Station d1 | Station d2 |
| Mr. Aldo<br>Floyd Blaske                                                            | 10/12/90 | 97.7                                   | 94.7       | 172.5      | 151.5      | 207.4      | -          | -          | -          |
|                                                                                     |          | 99.4                                   | 98.5       | 173.6      | 153.0      | 211.1      | -          | -          | -          |
| Luke Burton<br>Sugarland<br>William C. Norman<br>Frank H. Peavey<br>Conti-Karla     | 10/13/90 | -                                      | -          | -          | -          | -          | -          | -          | -          |
|                                                                                     |          | 139.5                                  | 127.6      | 220.0      | 199.1      | 274.8      | 227.0      | -          | -          |
|                                                                                     |          | 176.2                                  | 161.4      | 256.4      | 218.7      | 319.4      | 253.8      | -          | -          |
|                                                                                     |          | 145.0                                  | 139.8      | -          | -          | 293.6      | 237.5      | -          | -          |
|                                                                                     |          | 179.9                                  | 171.9      | -          | -          | 370.1      | 446.1      | -          | -          |
| Mr. Paul<br>Rambler<br>Mr. Lawrence<br>Mallard<br>Charles Lehman<br>Nicholas Duncan | 10/14/90 | 193.9                                  | 179.7      | 293.3      | 267.4      | -          | -          | -          | -          |
|                                                                                     |          | 307.2                                  | 291.3      | 360.8      | 416.6      | -          | -          | -          | -          |
|                                                                                     |          | 233.1                                  | 217.6      | 315.0      | 262.9      | -          | -          | -          | -          |
|                                                                                     |          | 256.0                                  | 234.0      | 310.8      | 275.3      | -          | -          | -          | -          |
|                                                                                     |          | 229.3                                  | 214.6      | 275.9      | 254.1      | -          | -          | -          | -          |
|                                                                                     |          | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Ardyce Randall<br>Mr. Paul<br>Exxon St. Louis<br>Margaret O<br>Mr. Lawrence         | 10/15/90 | 211.2                                  | 198.8      | 334.1      | 269.9      | 357.7      | 296.7      | -          | -          |
|                                                                                     |          | 198.7                                  | 177.1      | 279.7      | 232.3      | 336.7      | 278.5      | -          | -          |
|                                                                                     |          | 227.1                                  | 187.2      | 314.9      | 283.1      | 371.6      | 287.1      | -          | -          |
|                                                                                     |          | 347.1                                  | 249.6      | 316.0      | 284.4      | 398.8      | 292.0      | -          | -          |
|                                                                                     |          | -                                      | -          | -          | -          | -          | -          | -          | -          |
| A. L. Smith<br>Ste. Genevieve                                                       | 10/16/90 | 229.6                                  | 179.3      | 230.5      | 211.2      | 557.8      | 275.1      | -          | -          |
|                                                                                     |          | 233.9                                  | 211.3      | -          | -          | 331.7      | 283.2      | 426.6      | 349.1      |
| Nicole Brent<br>Frank H. Peavey                                                     | 10/17/90 | 182.5                                  | 185.4      | 227.4      | 194.7      | -          | -          | -          | -          |
|                                                                                     |          | 204.5                                  | 205.7      | 239.1      | 212.7      | -          | -          | -          | -          |
|                                                                                     |          |                                        |            |            |            |            |            | 457.6      |            |

# Kampsville Site, Trip 1

## 5 Minutes Prior to Barge-Tow Passage

| Tow name                                                                            | Date     | Suspended Sediment Concentration, mg/L |            |            |            |            |            |            |            |            |  |
|-------------------------------------------------------------------------------------|----------|----------------------------------------|------------|------------|------------|------------|------------|------------|------------|------------|--|
|                                                                                     |          | Station a1                             | Station a2 | Station b1 | Station b2 | Station c1 | Station c2 | Station d1 | Station d2 | Station d3 |  |
| Mr. Aldo<br>Floyd Blaske                                                            | 10/12/90 | 97.5                                   | 94.7       | 175.3      | 158.9      | 207.7      | -          | -          | -          | -          |  |
|                                                                                     |          | 108.9                                  | 100.9      | 210.4      | 163.7      | 204.4      | -          | -          | -          | -          |  |
| Luke Burton<br>Sugarland<br>William C. Norman<br>Frank H. Peavey<br>Conti-Karla     | 10/13/90 | 138.8                                  | 128.4      | 219.4      | 198.8      | 277.3      | 229.6      | -          | -          | -          |  |
|                                                                                     |          | 135.8                                  | 131.5      | 217.1      | 197.8      | 287.2      | 239.9      | -          | -          | -          |  |
|                                                                                     |          | 172.0                                  | 155.9      | 257.6      | 230.6      | 316.9      | 259.3      | -          | -          | -          |  |
|                                                                                     |          | 145.0                                  | 140.7      | -          | -          | 287.9      | 235.9      | -          | -          | -          |  |
|                                                                                     |          | 182.4                                  | 172.1      | -          | -          | 537.4      | 265.9      | -          | -          | -          |  |
| Mr. Paul<br>Rambler<br>Mr. Lawrence<br>Mallard<br>Charles Lehman<br>Nicholas Duncan | 10/14/90 | 197.5                                  | 183.4      | 289.6      | 271.4      | -          | -          | -          | -          | -          |  |
|                                                                                     |          | 290.4                                  | 278.3      | 348.5      | 386.8      | -          | -          | -          | -          | -          |  |
|                                                                                     |          | 220.6                                  | 208.5      | 303.5      | 260.7      | -          | -          | -          | -          | -          |  |
|                                                                                     |          | 238.5                                  | 221.7      | 298.3      | 261.1      | -          | -          | -          | -          | -          |  |
|                                                                                     |          | 230.3                                  | 218.6      | 339.6      | 271.6      | -          | -          | -          | -          | -          |  |
| Ardyce Randall<br>Mr. Paul<br>Exxon St. Louis<br>Margaret O<br>Mr. Lawrence         | 10/15/90 | -                                      | -          | -          | -          | -          | -          | -          | -          | -          |  |
|                                                                                     |          | 209.3                                  | 196.4      | 330.6      | 269.8      | 351.5      | 295.6      | -          | -          | -          |  |
|                                                                                     |          | 201.8                                  | 180.2      | 280.1      | 235.8      | 333.0      | 278.8      | -          | -          | -          |  |
|                                                                                     |          | 233.5                                  | 184.1      | 315.4      | 283.7      | 380.1      | 286.5      | -          | -          | -          |  |
|                                                                                     |          | 287.2                                  | 257.2      | 316.5      | 285.0      | 351.6      | 297.8      | -          | -          | -          |  |
| A. L. Smith<br>Ste. Genevieve                                                       | 10/16/90 | -                                      | -          | -          | -          | -          | -          | -          | -          | -          |  |
|                                                                                     |          | 189.0                                  | 172.4      | 231.0      | 211.0      | 561.7      | 311.1      | -          | -          | -          |  |
| Nicole Brent<br>Frank H. Peavey                                                     | 10/17/90 | 234.5                                  | 213.5      | -          | -          | 327.8      | 285.3      | 421.7      | 346.7      | 454.2      |  |
|                                                                                     |          | 181.4                                  | 184.0      | 230.3      | 196.4      | -          | -          | -          | -          | -          |  |
|                                                                                     |          | 204.0                                  | 204.2      | 236.0      | 212.0      | -          | -          | -          | -          | -          |  |

# Kampsville Site, Trip 1

## 2 Minutes Prior to Barge-Tow Passage

| Tow name                                                                            | Date     | Suspended Sediment Concentration, mg/L |            |            |            |            |            |            |            |            |
|-------------------------------------------------------------------------------------|----------|----------------------------------------|------------|------------|------------|------------|------------|------------|------------|------------|
|                                                                                     |          | Station a1                             | Station a2 | Station b1 | Station b2 | Station c1 | Station c2 | Station d1 | Station d2 | Station d3 |
| Mr. Aldo<br>Floyd Blaske                                                            | 10/12/90 | 100.5                                  | 98.1       | 186.5      | 158.5      | 230.0      | -          | -          | -          | -          |
|                                                                                     |          | 109.6                                  | 103.2      | 206.5      | 157.5      | 197.4      | -          | -          | -          | -          |
| Luke Burton<br>Sugarland<br>William C. Norman<br>Frank H. Peavey<br>Conti-Karla     | 10/13/90 | 136.6                                  | 130.7      | 217.7      | 198.1      | 284.7      | 237.4      | -          | -          | -          |
|                                                                                     |          | 218.9                                  | 174.6      | 254.1      | 205.8      | 307.1      | 182.3      | -          | -          | -          |
|                                                                                     |          | 172.1                                  | 155.1      | 258.8      | 239.2      | 314.4      | 262.9      | -          | -          | -          |
|                                                                                     |          | 149.1                                  | 141.3      | -          | -          | 370.2      | 234.9      | -          | -          | -          |
|                                                                                     |          | 239.9                                  | 180.2      | -          | -          | 536.5      | 249.6      | -          | -          | -          |
| Mr. Paul<br>Rambler<br>Mr. Lawrence<br>Mallard<br>Charles Lehman<br>Nicholas Duncan | 10/14/90 | 198.1                                  | 188.7      | 296.2      | 273.9      | -          | -          | -          | -          | -          |
|                                                                                     |          | 271.3                                  | 264.6      | 337.5      | 368.4      | -          | -          | -          | -          | -          |
|                                                                                     |          | 193.8                                  | 196.0      | 303.4      | 263.9      | -          | -          | -          | -          | -          |
|                                                                                     |          | 227.2                                  | 208.6      | 292.8      | 259.6      | -          | -          | -          | -          | -          |
|                                                                                     |          | 217.7                                  | 206.3      | 319.9      | 271.8      | -          | -          | -          | -          | -          |
| Ardyce Randall<br>Mr. Paul<br>Exxon St. Louis<br>Margaret O<br>Mr. Lawrence         | 10/15/90 | 208.1                                  | 195.0      | 328.5      | 269.7      | 347.8      | 294.9      | -          | -          | -          |
|                                                                                     |          | 204.6                                  | 183.3      | 280.6      | 240.7      | 334.1      | 279.3      | -          | -          | -          |
|                                                                                     |          | 237.3                                  | 182.3      | 315.7      | 284.0      | 385.2      | 286.1      | -          | -          | -          |
|                                                                                     |          | 290.9                                  | 253.2      | 316.8      | 285.4      | 361.3      | 287.4      | -          | -          | -          |
|                                                                                     |          | -                                      | -          | -          | -          | -          | -          | -          | -          | -          |
| A. L. Smith<br>Ste. Genevieve                                                       | 10/16/90 | 166.9                                  | 168.3      | 231.2      | 210.9      | 422.3      | 332.7      | -          | -          | -          |
|                                                                                     |          | 234.9                                  | 214.9      | -          | -          | 325.5      | 286.6      | 422.5      | 345.2      | 456.4      |
| Nicole Brent<br>Frank H. Peavey                                                     | 10/17/90 | 180.8                                  | 183.2      | 231.9      | 197.4      | -          | -          | -          | -          | -          |
|                                                                                     |          | 200.7                                  | 210.6      | 251.5      | 213.8      | -          | -          | -          | -          | -          |

# Kampsville Site, Trip 1

## Peak Suspended Sediment Concentrations

| Tow name                                                                            | Date     | Suspended Sediment Concentration, mg/L |            |            |            |            |            |            |            |            |
|-------------------------------------------------------------------------------------|----------|----------------------------------------|------------|------------|------------|------------|------------|------------|------------|------------|
|                                                                                     |          | Station a1                             | Station a2 | Station b1 | Station b2 | Station c1 | Station c2 | Station d1 | Station d2 | Station d3 |
| Mr. Aldo<br>Floyd Blaske                                                            | 10/12/90 | 106.3                                  | 101.4      | 349.9      | 161.9      | 230.0      | -          | -          | -          | -          |
|                                                                                     |          | 157.1                                  | 144.8      | 248.3      | 186.8      | 253.2      | -          | -          | -          | -          |
| Luke Burton<br>Sugarland<br>William C. Norman<br>Frank H. Peavey<br>Conti-Karla     | 10/13/90 | 245.8                                  | 193.1      | 256.9      | 210.1      | 313.3      | 242.5      | -          | -          | -          |
|                                                                                     |          | 285.8                                  | 257.0      | 287.8      | 229.3      | 319.5      | 251.4      | -          | -          | -          |
|                                                                                     |          | 188.9                                  | 155.4      | 276.3      | 242.1      | 332.9      | 264.2      | -          | -          | -          |
|                                                                                     |          | 213.6                                  | 167.9      | -          | -          | 454.7      | 246.0      | -          | -          | -          |
|                                                                                     |          | 286.3                                  | 267.3      | -          | -          | 551.1      | 279.4      | -          | -          | -          |
| Mr. Paul<br>Rambler<br>Mr. Lawrence<br>Mallard<br>Charles Lehman<br>Nicholas Duncan | 10/14/90 | 201.0                                  | 188.7      | 306.4      | 273.9      | -          | -          | -          | -          | -          |
|                                                                                     |          | 277.7                                  | 269.2      | 341.1      | 374.5      | -          | -          | -          | -          | -          |
|                                                                                     |          | 356.8                                  | 275.7      | 348.3      | 362.9      | -          | -          | -          | -          | -          |
|                                                                                     |          | 276.9                                  | 226.7      | 320.4      | 274.5      | -          | -          | -          | -          | -          |
|                                                                                     |          | 379.4                                  | 275.7      | 443.8      | 305.2      | -          | -          | -          | -          | -          |
| Ardyce Randall<br>Mr. Paul<br>Exxon St. Louis<br>Margaret O<br>Mr. Lawrence         | 10/15/90 | -                                      | -          | -          | -          | -          | -          | -          | -          | -          |
|                                                                                     |          | 208.5                                  | 195.5      | 329.2      | 269.7      | 349.0      | 295.1      | -          | -          | -          |
|                                                                                     |          | 209.2                                  | 188.5      | 281.4      | 248.8      | 336.1      | 280.0      | -          | -          | -          |
|                                                                                     |          | 379.1                                  | 274.0      | 316.2      | 284.7      | 448.1      | 305.4      | -          | -          | -          |
|                                                                                     |          | 310.6                                  | 257.5      | 317.2      | 286.0      | 373.4      | 318.8      | -          | -          | -          |
| A. L. Smith<br>Ste. Genevieve                                                       | 10/16/90 | -                                      | -          | -          | -          | -          | -          | -          | -          | -          |
|                                                                                     |          | 174.5                                  | 169.7      | 231.7      | 210.9      | 563.2      | 332.7      | -          | -          | -          |
| Nicole Brent<br>Frank H. Peavey                                                     | 10/17/90 | 261.3                                  | 229.6      | -          | -          | 328.3      | 287.1      | 477.8      | 345.7      | 529.5      |
|                                                                                     |          | 223.1                                  | 231.5      | 252.2      | 208.4      | -          | -          | -          | -          | -          |
|                                                                                     |          | 229.5                                  | 236.5      | 252.2      | 215.1      | -          | -          | -          | -          | -          |

# Kampsville Site, Trip 1

## 2 Minutes after Barge-Tow Passage

| Tow name                 | Date     | Suspended Sediment Concentration, mg/L |            |            |            |            |            |            |            |            |   |
|--------------------------|----------|----------------------------------------|------------|------------|------------|------------|------------|------------|------------|------------|---|
|                          |          | Station a1                             | Station a2 | Station b1 | Station b2 | Station c1 | Station c2 | Station d1 | Station d2 | Station d3 |   |
| Mr. Aldo<br>Floyd Blaske | 10/12/90 | 103.9                                  | 95.6       | 173.7      | 145.0      | 191.8      | -          | -          | -          | -          |   |
|                          |          | 153.1                                  | 142.3      | 222.8      | 184.5      | 253.2      | -          | -          | -          | -          |   |
| Luke Burton              | 10/13/90 | 218.9                                  | 174.6      | 254.1      | 205.8      | 307.1      | 182.3      | -          | -          | -          |   |
| Sugarland                |          | 270.0                                  | 239.7      | 269.5      | 229.3      | 302.8      | 251.4      | -          | -          | -          |   |
| William C. Norman        |          | 177.5                                  | 149.7      | 273.3      | 222.2      | 322.3      | 251.8      | -          | -          | -          |   |
| Frank H. Peavey          |          | 199.2                                  | 162.3      | -          | -          | 336.9      | 239.2      | -          | -          | -          |   |
| Conti-Karla              |          | 263.1                                  | 245.0      | -          | -          | 450.3      | 279.4      | -          | -          | -          |   |
| Mr. Paul                 | 10/14/90 | 193.2                                  | 182.9      | 282.1      | 255.4      | -          | -          | -          | -          | -          |   |
| Rambler                  |          | 232.8                                  | 232.8      | 321.2      | 274.5      | -          | -          | -          | -          | -          |   |
| Mr. Lawrence             |          | 306.6                                  | 264.5      | 348.3      | 316.7      | -          | -          | -          | -          | -          |   |
| Mallard                  |          | 262.8                                  | 226.7      | 312.3      | 270.8      | -          | -          | -          | -          | -          |   |
| Charles Lehman           |          | 379.4                                  | 257.1      | 443.8      | 292.1      | -          | -          | -          | -          | -          |   |
| Nicholas Duncan          |          | -                                      | -          | -          | -          | -          | -          | -          | -          | -          |   |
| Ardyce Randall           | 10/15/90 | 206.6                                  | 193.1      | 325.7      | 269.6      | 342.8      | 294.0      | -          | -          | -          |   |
| Mr. Paul                 |          | 208.3                                  | 187.5      | 281.2      | 247.2      | 335.7      | 279.8      | -          | -          | -          |   |
| Exxon St. Louis          |          | 315.1                                  | 261.8      | 316.1      | 284.5      | 448.1      | 298.7      | -          | -          | -          |   |
| Margaret O               |          | 276.2                                  | 252.2      | 317.2      | 285.9      | 369.8      | 315.4      | -          | -          | -          |   |
| Mr. Lawrence             |          | -                                      | -          | -          | -          | -          | -          | -          | -          | -          | - |
| A. L. Smith              | 10/16/90 | 165.7                                  | 160.7      | 231.6      | 210.8      | 351.6      | 226.3      | -          | -          | -          |   |
| Ste. Genevieve           |          | 261.3                                  | 226.9      | -          | -          | 320.6      | 283.3      | 477.8      | 343.3      | 529.5      |   |
| Nicole Brent             | 10/17/90 | 198.2                                  | 219.2      | 226.3      | 204.7      | -          | -          | -          | -          | -          |   |
| Frank H. Peavey          |          | 223.7                                  | 224.7      | 250.6      | 213.3      | -          | -          | -          | -          | -          |   |

# Kampsville Site, Trip 1

## 5 Minutes after Barge-Tow Passage

| Tow name                                                                            | Date     | Suspended Sediment Concentration, mg/L |            |            |            |            |            |            |            |            |
|-------------------------------------------------------------------------------------|----------|----------------------------------------|------------|------------|------------|------------|------------|------------|------------|------------|
|                                                                                     |          | Station a1                             | Station a2 | Station b1 | Station b2 | Station c1 | Station c2 | Station d1 | Station d2 | Station d3 |
| Mr. Aldo<br>Floyd Blaske                                                            | 10/12/90 | 105.2                                  | 100.6      | 179.8      | 157.3      | 208.0      | -          | -          | -          | -          |
|                                                                                     |          | 139.4                                  | 120.8      | 205.0      | 176.2      | 217.8      | -          | -          | -          | -          |
| Luke Burton<br>Sugarland<br>William C. Norman<br>Frank H. Peavey<br>Conti-Karla     | 10/13/90 | 285.8                                  | 225.6      | 287.8      | 221.9      | 319.5      | 247.2      | -          | -          | -          |
|                                                                                     |          | 354.4                                  | 279.1      | 226.6      | 212.7      | 279.6      | 243.4      | -          | -          | -          |
|                                                                                     |          | 194.0                                  | 170.4      | 285.0      | 257.9      | 346.4      | 264.0      | -          | -          | -          |
|                                                                                     |          | 177.4                                  | 170.3      | -          | -          | 391.7      | 244.7      | -          | -          | -          |
|                                                                                     |          | 252.8                                  | 210.9      | -          | -          | 409.0      | 265.7      | -          | -          | -          |
|                                                                                     |          |                                        |            |            |            |            |            |            |            |            |
| Mr. Paul<br>Rambler<br>Mr. Lawrence<br>Mallard<br>Charles Lehman<br>Nicholas Duncan | 10/14/90 | 196.5                                  | 173.6      | 293.7      | 260.0      | -          | -          | -          | -          | -          |
|                                                                                     |          | 242.6                                  | 241.3      | 338.7      | 307.5      | -          | -          | -          | -          | -          |
|                                                                                     |          | 301.5                                  | 299.8      | 305.0      | 300.7      | -          | -          | -          | -          | -          |
|                                                                                     |          | 255.1                                  | 222.8      | 325.5      | 273.1      | -          | -          | -          | -          | -          |
|                                                                                     |          | 294.1                                  | 280.2      | 312.7      | 287.8      | -          | -          | -          | -          | -          |
|                                                                                     |          | -                                      | -          | -          | -          | -          | -          | -          | -          | -          |
| Ardyce Randall<br>Mr. Paul<br>Exxon St. Louis<br>Margaret O<br>Mr. Lawrence         | 10/15/90 | 205.4                                  | 191.7      | 323.6      | 269.5      | 339.1      | 293.3      | -          | -          | -          |
|                                                                                     |          | 211.1                                  | 190.6      | 281.7      | 252.1      | 336.8      | 280.2      | -          | -          | -          |
|                                                                                     |          | 285.0                                  | 252.6      | 316.4      | 284.9      | 355.5      | 304.0      | -          | -          | -          |
|                                                                                     |          | 252.0                                  | 234.6      | 317.4      | 286.3      | 361.2      | 324.9      | -          | -          | -          |
|                                                                                     |          | -                                      | -          | -          | -          | -          | -          | -          | -          | -          |
|                                                                                     |          |                                        |            |            |            |            |            |            |            |            |
| A. L. Smith<br>Ste. Genevieve                                                       | 10/16/90 | 175.6                                  | 163.2      | 231.9      | 210.7      | 373.2      | 204.2      | -          | -          | -          |
|                                                                                     |          | 238.4                                  | 214.5      | -          | -          | 323.4      | 279.5      | 409.2      | 341.8      | 445.7      |
| Nicole Brent<br>Frank H. Peavey                                                     | 10/17/90 | 342.9                                  | 213.0      | 234.3      | 202.3      | -          | -          | -          | -          | -          |
|                                                                                     |          | 236.8                                  | 241.4      | 251.8      | 222.3      | -          | -          | -          | -          | -          |



# Kampsville Site, Trip 1

## 30 Minutes after Barge-Tow Passage

| Tow name                                                                            | Date     | Suspended Sediment Concentration, mg/L |            |            |            |            |            |            |            |            |
|-------------------------------------------------------------------------------------|----------|----------------------------------------|------------|------------|------------|------------|------------|------------|------------|------------|
|                                                                                     |          | Station a1                             | Station a2 | Station b1 | Station b2 | Station c1 | Station c2 | Station d1 | Station d2 | Station d3 |
| Mr. Aldo<br>Floyd Blaske                                                            | 10/12/90 | 134.0                                  | 128.5      | 214.2      | 224.7      | 229.8      | -          | -          | -          | -          |
|                                                                                     |          | 124.6                                  | 117.5      | 194.9      | 169.0      | 226.9      | -          | -          | -          | -          |
| Luke Burton<br>Sugarland<br>William C. Norman<br>Frank H. Peavey<br>Conti-Karla     | 10/13/90 | 302.0                                  | 201.0      | 260.0      | 225.1      | 297.5      | 248.4      | -          | -          | -          |
|                                                                                     |          | 348.1                                  | 270.1      | 256.1      | 220.5      | 289.1      | 234.5      | -          | -          | -          |
|                                                                                     |          | 191.5                                  | 193.3      | 270.3      | 294.7      | 398.4      | 321.4      | -          | -          | -          |
|                                                                                     |          | 268.4                                  | 241.5      | -          | -          | 309.6      | 247.4      | -          | -          | -          |
|                                                                                     |          | 256.5                                  | 211.7      | -          | -          | 381.7      | 294.0      | -          | -          | -          |
| Mr. Paul<br>Rambler<br>Mr. Lawrence<br>Mallard<br>Charles Lehman<br>Nicholas Duncan | 10/14/90 | 305.9                                  | 290.0      | 359.1      | 410.7      | -          | -          | -          | -          | -          |
|                                                                                     |          | 217.3                                  | 180.3      | 304.5      | 765.8      | -          | -          | -          | -          | -          |
|                                                                                     |          | 285.9                                  | 252.5      | 311.5      | 270.8      | -          | -          | -          | -          | -          |
|                                                                                     |          | 230.0                                  | 208.1      | 302.2      | 269.3      | -          | -          | -          | -          | -          |
|                                                                                     |          | 310.8                                  | 291.0      | 355.9      | 292.4      | -          | -          | -          | -          | -          |
|                                                                                     |          | -                                      | -          | -          | -          | -          | -          | -          | -          | -          |
| Ardyce Randall<br>Mr. Paul<br>Exxon St. Louis<br>Margaret O<br>Mr. Lawrence         | 10/15/90 | 195.4                                  | 181.8      | 306.1      | 260.7      | 328.2      | 279.9      | -          | -          | -          |
|                                                                                     |          | 221.2                                  | 202.7      | 290.0      | 269.3      | 362.0      | 281.3      | -          | -          | -          |
|                                                                                     |          | 294.5                                  | 259.4      | 318.8      | 288.0      | 474.6      | 365.7      | -          | -          | -          |
|                                                                                     |          | 272.6                                  | 234.4      | 319.9      | 289.4      | 419.0      | 343.8      | -          | -          | -          |
|                                                                                     |          | -                                      | -          | -          | -          | -          | -          | -          | -          | -          |
| A. L. Smith<br>Ste. Genevieve                                                       | 10/16/90 | 255.4                                  | 240.3      | 234.1      | 209.7      | 271.9      | 238.7      | -          | -          | -          |
|                                                                                     |          | 248.5                                  | 231.2      | -          | -          | 330.5      | 271.5      | 445.1      | 329.7      | 472.7      |
| Nicole Brent<br>Frank H. Peavey                                                     | 10/17/90 | 208.2                                  | 210.0      | 238.4      | 209.4      | -          | -          | -          | -          | -          |
|                                                                                     |          | 205.9                                  | 213.0      | 263.1      | 243.9      | -          | -          | -          | -          | -          |

# Kampsville Site, Trip 1

## 60 Minutes after Barge-Tow Passage

| Tow name                                                                            | Date     | Suspended Sediment Concentration, mg/L         |                                                |                                                |                                                |                                           |                                           |                            |                            |
|-------------------------------------------------------------------------------------|----------|------------------------------------------------|------------------------------------------------|------------------------------------------------|------------------------------------------------|-------------------------------------------|-------------------------------------------|----------------------------|----------------------------|
|                                                                                     |          | Station a1                                     | Station a2                                     | Station b1                                     | Station b2                                     | Station c1                                | Station c2                                | Station d1                 | Station d2                 |
| Mr. Aldo<br>Floyd Blaske                                                            | 10/12/90 | 116.7<br>124.3                                 | 111.4<br>454.0                                 | 189.0<br>187.6                                 | 174.2<br>172.4                                 | 220.9<br>229.1                            | -<br>-                                    | -<br>-                     | -<br>-                     |
| Luke Burton<br>Sugarland<br>William C. Norman<br>Frank H. Peavey<br>Conti-Karla     | 10/13/90 | 189.1<br>171.9<br>190.5<br>188.2<br>222.2      | 174.3<br>157.1<br>181.4<br>174.8<br>200.0      | 257.4<br>256.1<br>260.1<br>-<br>-              | 217.8<br>219.0<br>233.7<br>-<br>-              | 317.3<br>320.1<br>304.7<br>536.1<br>397.9 | 252.1<br>254.4<br>251.1<br>260.4<br>282.6 | -<br>-<br>-<br>-<br>-      | -<br>-<br>-<br>-<br>-      |
| Mr. Paul<br>Rambler<br>Mr. Lawrence<br>Mallard<br>Charles Lehman<br>Nicholas Duncan | 10/14/90 | 228.8<br>348.6<br>235.2<br>223.7<br>260.1<br>- | 227.7<br>321.5<br>225.2<br>212.4<br>241.9<br>- | 312.5<br>305.2<br>293.6<br>338.2<br>348.8<br>- | 282.6<br>274.5<br>273.5<br>274.2<br>312.3<br>- | -<br>-<br>-<br>-<br>-<br>-                | -<br>-<br>-<br>-<br>-<br>-                | -<br>-<br>-<br>-<br>-<br>- | -<br>-<br>-<br>-<br>-<br>- |
| Ardyce Randall<br>Mr. Paul<br>Exxon St. Louis<br>Margaret O<br>Mr. Lawrence         | 10/15/90 | 204.0<br>206.3<br>233.9<br>261.7<br>-          | 188.1<br>189.1<br>225.6<br>253.6<br>-          | 292.8<br>305.5<br>321.7<br>322.8<br>-          | 268.0<br>252.1<br>291.8<br>293.1<br>-          | 391.9<br>398.0<br>372.3<br>374.6<br>-     | 281.9<br>278.4<br>383.0<br>293.7<br>-     | -<br>-<br>-<br>-<br>-      | -<br>-<br>-<br>-<br>-      |
| A. L. Smith<br>Ste. Genevieve                                                       | 10/16/90 | 185.2<br>249.4                                 | 193.7<br>221.4                                 | 236.8<br>-                                     | 208.6<br>-                                     | 275.6<br>321.7                            | 236.5<br>284.6                            | -<br>406.0                 | -<br>306.4                 |
| Nicole Brent<br>Frank H. Peavey                                                     | 10/17/90 | 236.5<br>200.9                                 | 247.2<br>203.1                                 | 249.8<br>257.3                                 | 221.3<br>231.2                                 | -<br>-                                    | -<br>-                                    | -<br>-                     | -<br>-                     |

# Kampsville Site, Trip 1

## 90 Minutes after Barge-Tow Passage

| Tow name          | Date     | Suspended Sediment Concentration, mg/L |            |            |            |            |            |            |            |            |  |
|-------------------|----------|----------------------------------------|------------|------------|------------|------------|------------|------------|------------|------------|--|
|                   |          | Station a1                             | Station a2 | Station b1 | Station b2 | Station c1 | Station c2 | Station d1 | Station d2 | Station d3 |  |
| Mr. Aldo          | 10/12/90 | 113.7                                  | 110.1      | 196.0      | 177.9      | 237.8      | -          | -          | -          | -          |  |
| Floyd Blaske      |          | 116.1                                  | 109.7      | 203.2      | 182.9      | 236.5      | -          | -          | -          | -          |  |
| Luke Burton       | 10/13/90 | 213.6                                  | 184.4      | 275.2      | 249.0      | 334.2      | 264.2      | -          | -          | -          |  |
| Sugarland         |          | 223.6                                  | 203.4      | 279.9      | 249.3      | 321.3      | 260.9      | -          | -          | -          |  |
| William C. Norman |          | 178.7                                  | 154.6      | 233.7      | 316.2      | 295.3      | 241.3      | -          | -          | -          |  |
| Frank H. Peavey   |          | 268.6                                  | 224.9      | -          | -          | 378.3      | 286.9      | -          | -          | -          |  |
| Conti-Karla       |          | -                                      | -          | -          | -          | -          | -          | -          | -          | -          |  |
| Mr. Paul          | 10/14/90 | 301.5                                  | 299.8      | 305.0      | 300.7      | -          | -          | -          | -          | -          |  |
| Rambler           |          | 276.9                                  | 213.3      | 320.4      | 264.7      | -          | -          | -          | -          | -          |  |
| Mr. Lawrence      |          | 218.3                                  | 199.0      | 391.6      | 262.7      | -          | -          | -          | -          | -          |  |
| Mallard           |          | 301.9                                  | 281.4      | 357.1      | 296.4      | -          | -          | -          | -          | -          |  |
| Charles Lehman    |          | -                                      | -          | 348.4      | 317.0      | -          | -          | -          | -          | -          |  |
| Nicholas Duncan   |          | -                                      | -          | -          | -          | -          | -          | -          | -          | -          |  |
| Ardyce Randall    | 10/15/90 | 199.7                                  | 182.3      | 283.7      | 259.3      | 412.0      | 281.5      | -          | -          | -          |  |
| Mr. Paul          |          | 203.5                                  | 189.9      | 302.2      | 279.0      | 360.1      | 286.4      | -          | -          | -          |  |
| Exxon St. Louis   |          | 283.4                                  | 274.5      | 324.6      | 295.5      | 413.9      | 413.2      | -          | -          | -          |  |
| Margaret O        |          | 303.6                                  | 300.7      | 325.7      | 296.9      | 483.7      | 402.5      | -          | -          | -          |  |
| Mr. Lawrence      |          | -                                      | -          | -          | -          | -          | -          | -          | -          | -          |  |
| A. L. Smith       | 10/16/90 | 200.0                                  | 176.7      | 239.5      | 207.5      | 284.2      | 227.8      | -          | -          | -          |  |
| Ste. Genevieve    |          | 265.5                                  | 231.0      | -          | -          | -          | -          | 406.5      | -          | -          |  |
| Nicole Brent      | 10/17/90 | 206.5                                  | 206.0      | 256.3      | 228.0      | -          | -          | -          | -          | -          |  |
| Frank H. Peavey   |          | 206.7                                  | 205.4      | 248.6      | 233.2      | -          | -          | -          | -          | -          |  |

# Kampsville Site, Trip 1

## 120 Minutes after Barge-Tow Passage

| Tow name                                                                            | Date     | Suspended Sediment Concentration, mg/L     |                                            |                                            |                                            |                                       |                                       |                            |                            |                            |  |
|-------------------------------------------------------------------------------------|----------|--------------------------------------------|--------------------------------------------|--------------------------------------------|--------------------------------------------|---------------------------------------|---------------------------------------|----------------------------|----------------------------|----------------------------|--|
|                                                                                     |          | Station a1                                 | Station a2                                 | Station b1                                 | Station b2                                 | Station c1                            | Station c2                            | Station d1                 | Station d2                 | Station d3                 |  |
| Mr. Aldo<br>Floyd Blaske                                                            | 10/12/90 | 113.5<br>118.1                             | 109.6<br>125.4                             | 213.8<br>212.7                             | 181.2<br>191.3                             | 246.4<br>251.0                        | -<br>-                                | -<br>-                     | -<br>-                     | -<br>-                     |  |
| Luke Burton<br>Sugarland<br>William C. Norman<br>Frank H. Peavey<br>Conti-Karla     | 10/13/90 | 191.5<br>211.5<br>173.6<br>230.5<br>-      | 177.0<br>192.6<br>162.2<br>206.4<br>-      | 260.9<br>261.6<br>259.7<br>-<br>-          | 293.4<br>334.5<br>314.0<br>-<br>-          | 322.3<br>315.2<br>303.0<br>416.0<br>- | 262.0<br>251.8<br>246.3<br>294.7<br>- | -<br>-<br>-<br>-<br>-      | -<br>-<br>-<br>-<br>-      | -<br>-<br>-<br>-<br>-      |  |
| Mr. Paul<br>Rambler<br>Mr. Lawrence<br>Mallard<br>Charles Lehman<br>Nicholas Duncan | 10/14/90 | 249.2<br>230.0<br>565.4<br>261.4<br>-<br>- | 230.0<br>208.5<br>434.4<br>244.8<br>-<br>- | 305.5<br>303.7<br>333.2<br>348.4<br>-<br>- | 268.4<br>268.0<br>307.7<br>315.2<br>-<br>- | -<br>-<br>-<br>-<br>-<br>-            | -<br>-<br>-<br>-<br>-<br>-            | -<br>-<br>-<br>-<br>-<br>- | -<br>-<br>-<br>-<br>-<br>- | -<br>-<br>-<br>-<br>-<br>- |  |
| Ardyce Randall<br>Mr. Paul<br>Exxon St. Louis<br>Margaret O<br>Mr. Lawrence         | 10/15/90 | 197.5<br>194.0<br>272.7<br>243.8<br>-      | 177.0<br>183.8<br>262.7<br>264.1<br>-      | 280.0<br>299.6<br>327.5<br>327.6<br>-      | 238.0<br>270.0<br>299.3<br>294.9<br>-      | 356.4<br>366.3<br>423.2<br>415.7<br>- | 278.7<br>298.6<br>336.1<br>332.7<br>- | -<br>-<br>-<br>-<br>-      | -<br>-<br>-<br>-<br>-      | -<br>-<br>-<br>-<br>-      |  |
| A. L. Smith<br>Ste. Genevieve                                                       | 10/16/90 | 196.3<br>-                                 | 178.3<br>-                                 | 238.4<br>-                                 | 212.8<br>-                                 | 266.9<br>-                            | 229.5<br>-                            | -<br>-                     | -<br>-                     | -<br>-                     |  |
| Nicole Brent<br>Frank H. Peavey                                                     | 10/17/90 | 202.1<br>-                                 | 201.6<br>-                                 | 251.5<br>-                                 | 224.5<br>-                                 | -<br>-                                | -<br>-                                | -<br>-                     | -<br>-                     | -<br>-                     |  |

**APPENDIX XVII.**

**SUSPENDED SEDIMENT CONCENTRATION DATA**  
**FOR CLARKS FERRY, TRIP 1**

# Clarks Ferry Site, Trip 1

## 60 Minutes Prior to Barge-Tow Passage

| Tow name             | Date    | Suspended Sediment Concentration, mg/L |            |            |            |            |            |            |            |
|----------------------|---------|----------------------------------------|------------|------------|------------|------------|------------|------------|------------|
|                      |         | Station a1                             | Station a2 | Station b1 | Station b2 | Station b3 | Station c1 | Station c2 | Station c3 |
| C.W. Rushing (1)     | 5/16/91 | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Donnie Ray Jr. (1)   |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Samantha             |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| C.W. Rushing (2)     | 5/17/91 | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Jemco Towing         |         | 123.8                                  | 122.4      | 147.5      | 122.4      | -          | 174.0      | 161.3      | 156.1      |
| T.S. Kunsmann        |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Dell Butcher (1)     |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Pearl B.             | 5/19/91 | -                                      | 150.7      | 161.1      | 158.6      | 153.6      | 204.2      | 194.5      | 192.5      |
| Conti-Afton          |         | 166.7                                  | -          | -          | -          | -          | -          | 197.7      | -          |
| Jack D. Wofford      |         | 159.1                                  | 155.9      | 173.4      | 172.6      | 171.8      | 209.8      | 207.4      | 202.1      |
| Donnie Ray Jr. (2)   | 5/20/91 | -                                      | -          | 156.4      | -          | -          | 173.5      | -          | -          |
| Sunflower (1)        |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| American Beauty (1)  |         | -                                      | -          | 171.9      | -          | -          | 160.1      | -          | -          |
| Sierra Dawn          | 5/21/91 | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Cooperative Vanguard |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Cindy J. Erickson    |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Frank H. Peavy       |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Helen M. Clements    |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Sunflower (2)        |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Dell Butcher (2)     |         | -                                      | -          | 166.1      | -          | -          | -          | -          | -          |
| Hornet               |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Volunteer State      |         | -                                      | -          | 127.0      | -          | -          | 129.0      | -          | -          |

# Clarks Ferry Site, Trip 1

## 30 Minutes Prior to Barge-Tow Passage

| Tow name             | Date    | Suspended Sediment Concentration, mg/L |            |            |            |            |            |            |            |
|----------------------|---------|----------------------------------------|------------|------------|------------|------------|------------|------------|------------|
|                      |         | Station a1                             | Station a2 | Station b1 | Station b2 | Station b3 | Station c1 | Station c2 | Station c3 |
| C.W. Rushing (1)     | 5/16/91 | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Donnie Ray Jr. (1)   |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Samantha             |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| C.W. Rushing (2)     | 5/17/91 | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Jemco Towing         |         | 148.8                                  | 145.9      | 161.1      | 144.8      | -          | 176.9      | 164.9      | 158.9      |
| T.S. Kunsmann        |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Dell Butcher (1)     |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Pearl B.             | 5/19/91 | -                                      | 147.3      | 164.4      | 159.3      | 154.7      | 204.5      | 192.5      | 193.4      |
| Conti-Afton          |         | 145.0                                  | 142.3      | 163.0      | 157.6      | 158.8      | 194.3      | 189.0      | 190.5      |
| Jack D. Wofford      |         | 167.2                                  | 160.1      | 168.0      | 165.9      | 166.0      | 213.0      | 207.7      | 222.5      |
| Donnie Ray Jr. (2)   | 5/20/91 | -                                      | -          | 148.9      | -          | -          | 174.6      | -          | -          |
| Sunflower (1)        |         | -                                      | -          | 157.3      | -          | -          | -          | -          | -          |
| American Beauty (1)  |         | -                                      | -          | 183.4      | -          | -          | 175.6      | -          | -          |
| Sierra Dawn          | 5/21/91 | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Cooperative Vanguard |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Cindy J. Erickson    |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Frank H. Peavy       |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Helen M. Clements    |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Sunflower (2)        |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Dell Butcher (2)     |         | -                                      | -          | 167.9      | -          | -          | 149.6      | -          | -          |
| Hornet               |         | -                                      | -          | 137.1      | -          | -          | 138.4      | -          | -          |
| Volunteer State      |         | -                                      | -          | 123.6      | -          | -          | 127.0      | -          | -          |

# Clarks Ferry Site, Trip 1

## 10 Minutes Prior to Barge-Tow Passage

| Tow name             | Date    | Suspended Sediment Concentration, mg/L |            |            |            |            |                                        |
|----------------------|---------|----------------------------------------|------------|------------|------------|------------|----------------------------------------|
|                      |         | Station a1                             | Station a2 | Station b1 | Station b2 | Station b3 | Station c1    Station c2    Station c3 |
| C.W. Rushing (1)     | 5/16/91 | -                                      | -          | -          | -          | -          | -                                      |
| Donnie Ray Jr. (1)   |         | -                                      | -          | -          | -          | -          | -                                      |
| Samantha             |         | -                                      | -          | -          | -          | -          | -                                      |
| C.W. Rushing (2)     | 5/17/91 | -                                      | -          | -          | -          | -          | -                                      |
| Jemco Towing         |         | 170.1                                  | 157.9      | 180.8      | 164.3      | 185.9      | 188.9    249.6                         |
| T.S. Kunsmann        |         | -                                      | -          | -          | -          | -          | -                                      |
| Dell Butcher (1)     |         | -                                      | -          | -          | -          | -          | -                                      |
| Pearl B.             | 5/19/91 | -                                      | 140.4      | 157.9      | 153.3      | 152.3      | 193.5    182.0    188.3                |
| Conti-Afton          |         | 150.2                                  | 142.0      | 163.0      | 159.5      | 161.0      | 202.3    199.3    200.3                |
| Jack D. Wofford      |         | 160.2                                  | 158.1      | 174.1      | 178.5      | 180.4      | 217.2    215.9    214.8                |
| Donnie Ray Jr. (2)   | 5/20/91 | -                                      | -          | 150.8      | -          | -          | 170.4    -    -                        |
| Sunflower (1)        |         | -                                      | -          | 185.6      | -          | -          | 189.6    -    -                        |
| American Beauty (1)  |         | -                                      | -          | 195.0      | -          | -          | 172.4    -    -                        |
| Sierra Dawn          | 5/21/91 | -                                      | -          | 142.0      | -          | -          | 140.9    -    -                        |
| Cooperative Vanguard |         | -                                      | -          | 143.1      | -          | -          | 136.5    -    -                        |
| Cindy J. Erickson    |         | -                                      | -          | -          | -          | -          | -    -    -                            |
| Frank H. Peavy       |         | -                                      | -          | -          | -          | -          | -    -    -                            |
| Helen M. Clements    |         | -                                      | -          | -          | -          | -          | -    -    -                            |
| Sunflower (2)        |         | -                                      | -          | -          | -          | -          | -    -    -                            |
| Dell Butcher (2)     |         | -                                      | -          | 171.9      | -          | -          | 141.8    -    -                        |
| Hornet               |         | -                                      | -          | 132.5      | -          | -          | 131.8    -    -                        |
| Volunteer State      |         | -                                      | -          | 120.9      | -          | -          | 126.5    -    -                        |



# Clarks Ferry Site, Trip 1

## 5 Minutes Prior to Barge-Tow Passage

| Tow name             | Date    | Suspended Sediment Concentration, mg/L |            |            |            |            |            |            |            |  |
|----------------------|---------|----------------------------------------|------------|------------|------------|------------|------------|------------|------------|--|
|                      |         | Station a1                             | Station a2 | Station b1 | Station b2 | Station b3 | Station c1 | Station c2 | Station c3 |  |
| C.W. Rushing (1)     | 5/16/91 | -                                      | -          | -          | -          | -          | -          | -          | -          |  |
| Donnie Ray Jr. (1)   |         | -                                      | -          | -          | -          | -          | -          | -          | -          |  |
| Samantha             |         | -                                      | -          | -          | -          | -          | -          | -          | -          |  |
| C.W. Rushing (2)     | 5/17/91 | -                                      | -          | -          | -          | -          | -          | -          | -          |  |
| Jemco Towing         |         | 176.9                                  | 160.6      | 185.7      | 169.2      | -          | 188.1      | 194.8      | 272.2      |  |
| T.S. Kunsmann        |         | -                                      | -          | -          | -          | -          | -          | -          | -          |  |
| Dell Butcher (1)     |         | -                                      | -          | -          | -          | -          | -          | -          | -          |  |
| Pearl B.             | 5/19/91 | -                                      | 139.0      | 156.2      | 154.1      | 151.3      | 191.3      | 181.1      | 183.1      |  |
| Conti-Afton          |         | 153.8                                  | 140.6      | 163.6      | 155.4      | 157.2      | 196.4      | 196.3      | 199.8      |  |
| Jack D. Wofford      |         | 158.4                                  | 157.6      | 175.6      | 181.6      | 184.0      | 218.3      | 217.9      | 212.9      |  |
| Donnie Ray Jr. (2)   | 5/20/91 | -                                      | -          | 151.3      | -          | -          | 169.4      | -          | -          |  |
| Sunflower (1)        |         | -                                      | -          | 183.8      | -          | -          | 185.5      | -          | -          |  |
| American Beauty (1)  |         | -                                      | -          | 200.0      | -          | -          | 173.1      | -          | -          |  |
| Sierra Dawn          | 5/21/91 | -                                      | -          | 135.8      | -          | -          | 139.7      | -          | -          |  |
| Cooperative Vanguard |         | -                                      | -          | 138.8      | -          | -          | 137.7      | -          | -          |  |
| Cindy J. Erickson    |         | -                                      | -          | -          | -          | -          | -          | -          | -          |  |
| Frank H. Peavy       |         | -                                      | -          | -          | -          | -          | -          | -          | -          |  |
| Helen M. Clements    |         | -                                      | -          | -          | -          | -          | -          | -          | -          |  |
| Sunflower (2)        |         | -                                      | -          | -          | -          | -          | -          | -          | -          |  |
| Dell Butcher (2)     |         | -                                      | -          | 172.9      | -          | -          | 139.9      | -          | -          |  |
| Hornet               |         | -                                      | -          | 130.1      | -          | -          | 132.4      | -          | -          |  |
| Volunteer State      |         | -                                      | -          | 114.8      | -          | -          | 128.6      | -          | -          |  |

# Clarks Ferry Site, Trip 1

## 2 Minutes Prior to Barge-Tow Passage

| Tow name             | Date    | Suspended Sediment Concentration, mg/L |            |            |            |            |            |            |
|----------------------|---------|----------------------------------------|------------|------------|------------|------------|------------|------------|
|                      |         | Station a1                             | Station a2 | Station b1 | Station b2 | Station b3 | Station c1 | Station c2 |
| C.W. Rushing (1)     | 5/16/91 | -                                      | -          | -          | -          | -          | -          | -          |
| Donnie Ray Jr. (1)   |         | -                                      | -          | -          | -          | -          | -          | -          |
| Samantha             |         | -                                      | -          | -          | -          | -          | -          | -          |
| C.W. Rushing (2)     | 5/17/91 | -                                      | -          | -          | -          | -          | -          | -          |
| Jemco Towing         |         | 175.2                                  | 157.3      | 183.6      | 172.1      | -          | 192.3      | 187.5      |
| T.S. Kunsmann        |         | -                                      | -          | -          | -          | -          | -          | -          |
| Dell Butcher (1)     |         | -                                      | -          | -          | -          | -          | -          | -          |
| Pearl B.             | 5/19/91 | -                                      | 139.1      | 156.8      | 159.8      | 150.5      | 192.0      | 184.6      |
| Conti-Afton          |         | 156.0                                  | 139.7      | 164.0      | 152.9      | 154.9      | 192.8      | 194.5      |
| Jack D. Wofford      |         | 157.3                                  | 157.3      | 180.1      | 183.5      | 186.2      | 218.9      | 209.4      |
| Donnie Ray Jr. (2)   | 5/20/91 | -                                      | -          | 151.5      | -          | -          | 168.7      | -          |
| Sunflower (1)        |         | -                                      | -          | 183.7      | -          | -          | 181.9      | -          |
| American Beauty (1)  |         | -                                      | -          | 203.0      | -          | -          | 173.6      | -          |
| Sierra Dawn          | 5/21/91 | -                                      | -          | 132.0      | -          | -          | 138.9      | -          |
| Cooperative Vanguard |         | -                                      | -          | 147.0      | -          | -          | 142.8      | -          |
| Cindy J. Erickson    |         | -                                      | -          | -          | -          | -          | -          | -          |
| Frank H. Peavy       |         | -                                      | -          | -          | -          | -          | -          | -          |
| Helen M. Clements    |         | -                                      | -          | -          | -          | -          | -          | -          |
| Sunflower (2)        |         | -                                      | -          | -          | -          | -          | -          | -          |
| Dell Butcher (2)     |         | -                                      | -          | 159.0      | -          | -          | 139.8      | -          |
| Hornet               |         | -                                      | -          | 134.6      | -          | -          | 131.7      | -          |
| Volunteer State      |         | -                                      | -          | 116.0      | -          | -          | 130.9      | -          |

# Clarks Ferry Site, Trip 1

## Peak Suspended Sediment Concentrations

| Tow name             | Date    | Suspended Sediment Concentration, mg/L |            |            |            |            |            |            |            |
|----------------------|---------|----------------------------------------|------------|------------|------------|------------|------------|------------|------------|
|                      |         | Station a1                             | Station a2 | Station b1 | Station b2 | Station b3 | Station c1 | Station c2 | Station c3 |
| C.W. Rushing (1)     | 5/16/91 | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Donnie Ray Jr. (1)   |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Samantha             |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| C.W. Rushing (2)     | 5/17/91 | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Jemco Towing         |         | 179.1                                  | 163.0      | 187.6      | 174.2      | -          | 193.9      | 196.0      | 294.9      |
| T.S. Kunsmann        |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Dell Butcher (1)     |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Pearl B.             | 5/19/91 | -                                      | 152.4      | 174.3      | 171.4      | 169.4      | 198.6      | 198.0      | 189.8      |
| Conti-Afton          |         | 156.0                                  | 161.2      | 176.4      | 171.3      | 166.3      | 210.0      | 201.9      | 200.4      |
| Jack D. Wofford      |         | 179.2                                  | 170.2      | 190.2      | 184.7      | 187.6      | 220.0      | 221.7      | 224.0      |
| Donnie Ray Jr. (2)   | 5/20/91 | -                                      | -          | 167.3      | -          | -          | 186.4      | -          | -          |
| Sunflower (1)        |         | -                                      | -          | 192.9      | -          | -          | 189.6      | -          | -          |
| American Beauty (1)  |         | -                                      | -          | 211.1      | -          | -          | 185.9      | -          | -          |
| Sierra Dawn          | 5/21/91 | -                                      | -          | 142.0      | -          | -          | 140.9      | -          | -          |
| Cooperative Vanguard |         | -                                      | -          | 200.8      | -          | -          | 142.8      | -          | -          |
| Cindy J. Erickson    |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Frank H. Peavy       |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Helen M. Clements    |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Sunflower (2)        |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Dell Butcher (2)     |         | -                                      | -          | 172.9      | -          | -          | 145.4      | -          | -          |
| Hornet               |         | -                                      | -          | 139.3      | -          | -          | 138.0      | -          | -          |
| Volunteer State      |         | -                                      | -          | 209.6      | -          | -          | 144.4      | -          | -          |

# Clarks Ferry Site, Trip 1

## Average Suspended Sediment Concentrations

| Tow name             | Date    | Average Suspended Sediment Concentration during Event, mg/L |            |            |            |            |                                  |
|----------------------|---------|-------------------------------------------------------------|------------|------------|------------|------------|----------------------------------|
|                      |         | Station a1                                                  | Station a2 | Station b1 | Station b2 | Station b3 | Station c1 Station c2 Station c3 |
| C.W. Rushing (1)     | 5/16/91 | -                                                           | -          | -          | -          | -          | - - -                            |
| Donnie Ray Jr. (1)   |         | -                                                           | -          | -          | -          | -          | - - -                            |
| Samantha             |         | -                                                           | -          | -          | -          | -          | - - -                            |
| C.W. Rushing (2)     | 5/17/91 | -                                                           | -          | -          | -          | -          | - - -                            |
| Jenco Towing         |         | 167.4                                                       | 153.1      | 181.6      | -          | -          | 179.0 227.1                      |
| T.S. Kunsmann        |         | -                                                           | -          | -          | -          | -          | - - -                            |
| Dell Butcher (1)     |         | -                                                           | -          | -          | -          | -          | - - -                            |
| Pearl B.             | 5/19/91 | -                                                           | -          | -          | -          | -          | - - -                            |
| Conti-Afton          |         | 150.8                                                       | -          | 164.2      | -          | -          | - 199.4                          |
| Jack D. Wofford      |         | -                                                           | -          | -          | -          | -          | 219.4 216.7 198.5                |
| Donnie Ray Jr. (2)   | 5/20/91 | -                                                           | -          | -          | -          | -          | - - -                            |
| Sunflower (1)        |         | -                                                           | -          | 183.5      | -          | -          | 179.6 - -                        |
| American Beauty (1)  |         | -                                                           | -          | -          | -          | -          | - - -                            |
| Sierra Dawn          | 5/21/91 | -                                                           | -          | 137.6      | -          | -          | 138.3 - -                        |
| Cooperative Vanguard |         | -                                                           | -          | -          | -          | -          | 137.5 - -                        |
| Cindy J. Erickson    |         | -                                                           | -          | -          | -          | -          | - - -                            |
| Frank H. Peavy       |         | -                                                           | -          | -          | -          | -          | - - -                            |
| Helen M. Clements    |         | -                                                           | -          | -          | -          | -          | - - -                            |
| Sunflower (2)        |         | -                                                           | -          | -          | -          | -          | - - -                            |
| Dell Butcher (2)     |         | -                                                           | -          | 148.3      | -          | -          | - - -                            |
| Hornet               | -       | -                                                           | -          | -          | -          | -          | - - -                            |
| Volunteer State      | -       | -                                                           | -          | -          | -          | -          | - - -                            |

# Clarks Ferry Site, Trip 1

## 2 Minutes after Barge-Tow Passage

| Tow name             | Date    | Suspended Sediment Concentration, mg/L |            |            |            |            |            |            |            |  |
|----------------------|---------|----------------------------------------|------------|------------|------------|------------|------------|------------|------------|--|
|                      |         | Station a1                             | Station a2 | Station b1 | Station b2 | Station b3 | Station c1 | Station c2 | Station c3 |  |
| C.W. Rushing (1)     | 5/16/91 | -                                      | -          | -          | -          | -          | -          | -          | -          |  |
| Donnie Ray Jr. (1)   |         | -                                      | -          | -          | -          | -          | -          | -          | -          |  |
| Samantha             |         | -                                      | -          | -          | -          | -          | -          | -          | -          |  |
| C.W. Rushing (2)     | 5/17/91 | -                                      | -          | -          | -          | -          | -          | -          | -          |  |
| Jemco Towing         |         | 159.6                                  | 163.0      | 173.7      | 174.1      | -          | 192.3      | 180.3      | 267.8      |  |
| T.S. Kunsmann        |         | -                                      | -          | -          | -          | -          | -          | -          | -          |  |
| Dell Butcher (1)     |         | -                                      | -          | -          | -          | -          | -          | -          | -          |  |
| Pearl B.             | 5/19/91 | -                                      | 142.0      | 161.2      | 158.1      | 149.8      | 189.0      | 187.1      | 183.9      |  |
| Conti-Afton          |         | 154.9                                  | 139.0      | 165.3      | 156.1      | 157.5      | 194.0      | 196.7      | 196.8      |  |
| Jack D. Wofford      |         | 155.0                                  | 159.4      | 183.4      | 181.7      | 176.2      | 217.8      | 212.3      | 205.2      |  |
| Donnie Ray Jr. (2)   | 5/20/91 | -                                      | -          | 151.6      | -          | -          | 186.4      | -          | -          |  |
| Sunflower (1)        |         | -                                      | -          | 182.6      | -          | -          | 178.1      | -          | -          |  |
| American Beauty (1)  |         | -                                      | -          | 190.0      | -          | -          | 177.1      | -          | -          |  |
| Sierra Dawn          | 5/21/91 | -                                      | -          | 139.7      | -          | -          | 128.8      | -          | -          |  |
| Cooperative Vanguard |         | -                                      | -          | 144.9      | -          | -          | 140.2      | -          | -          |  |
| Cindy J. Erickson    |         | -                                      | -          | -          | -          | -          | -          | -          | -          |  |
| Frank H. Peavy       |         | -                                      | -          | -          | -          | -          | -          | -          | -          |  |
| Helen M. Clements    |         | -                                      | -          | -          | -          | -          | -          | -          | -          |  |
| Sunflower (2)        |         | -                                      | -          | -          | -          | -          | -          | -          | -          |  |
| Dell Butcher (2)     |         | -                                      | -          | 150.9      | -          | -          | 145.4      | -          | -          |  |
| Hornet               |         | -                                      | -          | 132.3      | -          | -          | 137.6      | -          | -          |  |
| Volunteer State      |         | -                                      | -          | 126.4      | -          | -          | 138.6      | -          | -          |  |

# Clarks Ferry Site, Trip 1

## 5 Minutes after Barge-Tow Passage

| Tow name             | Date    | Suspended Sediment Concentrations, mg/L |            |            |            |            |            |            |            |
|----------------------|---------|-----------------------------------------|------------|------------|------------|------------|------------|------------|------------|
|                      |         | Station a1                              | Station a2 | Station b1 | Station b2 | Station b3 | Station c1 | Station c2 | Station c3 |
| C.W. Rushing (1)     | 5/16/91 | -                                       | -          | -          | -          | -          | -          | -          | -          |
| Donnie Ray Jr. (1)   |         | -                                       | -          | -          | -          | -          | -          | -          | -          |
| Samantha             |         | -                                       | -          | -          | -          | -          | -          | -          | -          |
| C.W. Rushing (2)     | 5/17/91 | -                                       | -          | -          | -          | -          | -          | -          | -          |
| Jemco Towing         |         | 151.2                                   | 145.1      | 167.6      | 171.9      | -          | 192.1      | 179.5      | 227.1      |
| T.S. Kunsmann        |         | -                                       | -          | -          | -          | -          | -          | -          | -          |
| Dell Butcher (1)     |         | -                                       | -          | -          | -          | -          | -          | -          | -          |
| Pearl B.             | 5/19/91 | -                                       | 145.2      | 159.6      | 162.2      | 154.8      | 194.7      | 194.4      | 184.6      |
| Conti-Afton          |         | 167.3                                   | 153.1      | 166.4      | 163.9      | 164.0      | 203.5      | 199.4      | 195.5      |
| Jack D. Wofford      |         | 173.0                                   | 163.7      | 187.2      | 182.3      | 172.7      | 215.5      | 203.6      | 204.2      |
| Donnie Ray Jr. (2)   | 5/20/91 | -                                       | -          | 161.0      | -          | -          | 180.1      | -          | -          |
| Sunflower (1)        |         | -                                       | -          | 181.3      | -          | -          | 175.9      | -          | -          |
| American Beauty (1)  |         | -                                       | -          | 199.2      | -          | -          | 176.8      | -          | -          |
| Sierra Dawn          | 5/21/91 | -                                       | -          | 139.9      | -          | -          | 135.1      | -          | -          |
| Cooperative Vanguard |         | -                                       | -          | 140.0      | -          | -          | 134.9      | -          | -          |
| Cindy J. Erickson    |         | -                                       | -          | -          | -          | -          | -          | -          | -          |
| Frank H. Peavy       |         | -                                       | -          | -          | -          | -          | -          | -          | -          |
| Helen M. Clements    |         | -                                       | -          | -          | -          | -          | -          | -          | -          |
| Sunflower (2)        |         | -                                       | -          | -          | -          | -          | -          | -          | -          |
| Dell Butcher (2)     |         | -                                       | -          | 150.1      | -          | -          | 139.9      | -          | -          |
| Hornet               |         | -                                       | -          | 134.7      | -          | -          | 136.7      | -          | -          |
| Volunteer State      |         | -                                       | -          | 127.1      | -          | -          | 139.7      | -          | -          |

**Clarks Ferry Site, Trip 1**

**30 Minutes after Barge-Tow Passage**

| <i>Tow name</i>      | <i>Date</i> | <i>Suspended Sediment Concentration, mg/L</i> |                   |                   |                   |                   |                                               |
|----------------------|-------------|-----------------------------------------------|-------------------|-------------------|-------------------|-------------------|-----------------------------------------------|
|                      |             | <i>Station a1</i>                             | <i>Station a2</i> | <i>Station b1</i> | <i>Station b2</i> | <i>Station b3</i> | <i>Station c1    Station c2    Station c3</i> |
| C.W. Rushing (1)     | 5/16/91     | -                                             | -                 | -                 | -                 | -                 | -                                             |
| Donnie Ray Jr. (1)   |             | -                                             | -                 | -                 | -                 | -                 | -                                             |
| Samantha             |             | -                                             | -                 | -                 | -                 | -                 | -                                             |
| C.W. Rushing (2)     | 5/17/91     | -                                             | -                 | -                 | -                 | -                 | -                                             |
| Jemco Towing         |             | 139.3                                         | 136.6             | 162.4             | 162.3             | -                 | 185.4    173.8    270.3                       |
| T.S. Kunsmann        |             | -                                             | -                 | -                 | -                 | -                 | -                                             |
| Dell Butcher (1)     |             | -                                             | -                 | -                 | -                 | -                 | -                                             |
| Pearl B.             | 5/19/91     | -                                             | 151.8             | 170.8             | 175.0             | 165.8             | 196.0    198.6    195.5                       |
| Conti-Afton          |             | 155.4                                         | 151.8             | 180.6             | 173.0             | 171.8             | 201.1    199.8    195.9                       |
| Jack D. Wofford      |             | 183.2                                         | 159.8             | 194.2             | 179.7             | 181.9             | 220.1    208.6    209.6                       |
| Donnie Ray Jr. (2)   | 5/20/91     | -                                             | -                 | 179.2             | -                 | -                 | -                                             |
| Sunflower (1)        |             | -                                             | -                 | 174.6             | -                 | -                 | 178.1    -    -                               |
| American Beauty (1)  |             | -                                             | -                 | 201.7             | -                 | -                 | 183.1    -    -                               |
| Sierra Dawn          | 5/21/91     | -                                             | -                 | -                 | -                 | -                 | -                                             |
| Cooperative Vanguard |             | -                                             | -                 | 135.8             | -                 | -                 | 139.4    -    -                               |
| Cindy J. Erickson    |             | -                                             | -                 | -                 | -                 | -                 | -                                             |
| Frank H. Peavy       |             | -                                             | -                 | -                 | -                 | -                 | -                                             |
| Helen M. Clements    |             | -                                             | -                 | -                 | -                 | -                 | -                                             |
| Sunflower (2)        |             | -                                             | -                 | -                 | -                 | -                 | -                                             |
| Dell Butcher (2)     |             | -                                             | -                 | 141.1             | -                 | -                 | 140.2    -    -                               |
| Hornet               |             | -                                             | -                 | 136.3             | -                 | -                 | 132.8    -    -                               |
| Volunteer State      |             | -                                             | -                 | 166.7             | -                 | -                 | 154.3    -    -                               |

# Clarks Ferry Site, Trip 1

## 60 Minutes after Barge-Tow Passage

| Tow name             | Date    | Suspended Sediment Concentration, mg/L |            |            |            |            |            |                       |
|----------------------|---------|----------------------------------------|------------|------------|------------|------------|------------|-----------------------|
|                      |         | Station a1                             | Station a2 | Station b1 | Station b2 | Station b3 | Station c1 | Station c2 Station c3 |
| C.W. Rushing (1)     | 5/16/91 | -                                      | -          | -          | -          | -          | -          | -                     |
| Donnie Ray Jr. (1)   |         | -                                      | -          | -          | -          | -          | -          | -                     |
| Samantha             |         | -                                      | -          | -          | -          | -          | -          | -                     |
| C.W. Rushing (2)     | 5/17/91 | -                                      | -          | -          | -          | -          | -          | -                     |
| Jenco Towing         |         | -                                      | 132.3      | 141.3      | -          | -          | 183.0      | 166.0 208.1           |
| T.S. Kunsmann        |         | -                                      | -          | -          | -          | -          | -          | -                     |
| Dell Butcher (1)     |         | -                                      | -          | -          | -          | -          | -          | -                     |
| Pearl B.             | 5/19/91 | -                                      | 143.1      | 163.0      | 156.9      | 157.8      | -          | 186.1                 |
| Conti-Afton          |         | 160.1                                  | 156.2      | 173.6      | 170.9      | 171.7      | 202.1      | 194.6                 |
| Jack D. Wofford      |         | 165.0                                  | 160.2      | 181.9      | 174.4      | 168.4      | 200.7      | 201.7 195.6           |
| Donnie Ray Jr. (2)   | 5/20/91 | -                                      | -          | -          | -          | -          | -          | -                     |
| Sunflower (1)        |         | -                                      | -          | 168.8      | -          | -          | 131.9      | -                     |
| American Beauty (1)  |         | -                                      | -          | 186.2      | -          | -          | 176.1      | -                     |
| Sierra Dawn          | 5/21/91 | -                                      | -          | -          | -          | -          | -          | -                     |
| Cooperative Vanguard |         | -                                      | -          | 151.4      | -          | -          | 142.5      | -                     |
| Cindy J. Erickson    |         | -                                      | -          | -          | -          | -          | -          | -                     |
| Frank H. Peavy       |         | -                                      | -          | -          | -          | -          | -          | -                     |
| Helen M. Clements    |         | -                                      | -          | -          | -          | -          | -          | -                     |
| Sunflower (2)        |         | -                                      | -          | -          | -          | -          | -          | -                     |
| Dell Butcher (2)     |         | -                                      | -          | 133.3      | -          | -          | -          | -                     |
| Hornet               |         | -                                      | -          | 143.5      | -          | -          | 130.6      | -                     |
| Volunteer State      |         | -                                      | -          | 149.5      | -          | -          | 141.2      | -                     |



# Clarks Ferry Site, Trip 1

## 90 Minutes after Barge-Tow Passage

| Tow name             | Date    | Suspended Sediment Concentration, mg/L |            |            |            |            |                                        |
|----------------------|---------|----------------------------------------|------------|------------|------------|------------|----------------------------------------|
|                      |         | Station a1                             | Station a2 | Station b1 | Station b2 | Station b3 | Station c1    Station c2    Station c3 |
| C.W. Rushing (1)     | 5/16/91 | -                                      | -          | -          | -          | -          | -                                      |
| Donnie Ray Jr. (1)   |         | -                                      | -          | -          | -          | -          | -                                      |
| Samantha             |         | -                                      | -          | -          | -          | -          | -                                      |
| C.W. Rushing (2)     | 5/17/91 | -                                      | -          | -          | -          | -          | -                                      |
| Jenco Towing         |         | -                                      | -          | -          | -          | -          | -                                      |
| T.S. Kunsmann        |         | -                                      | -          | -          | -          | -          | -                                      |
| Dell Butcher (1)     |         | -                                      | -          | -          | -          | -          | -                                      |
| Pearl B.             | 5/19/91 | -                                      | -          | -          | 155.4      | -          | -                                      |
| Conti-Afton          |         | 161.8                                  | 151.0      | 168.6      | 166.1      | 172.1      | 205.0    185.8    201.5                |
| Jack D. Wofford      |         | 158.7                                  | 154.7      | 190.3      | 176.9      | 179.5      | 210.2    297.4    199.0                |
| Donnie Ray Jr. (2)   | 5/20/91 | -                                      | -          | -          | -          | -          | -                                      |
| Sunflower (1)        |         | -                                      | -          | 163.3      | -          | -          | 161.9    -    -                        |
| American Beauty (1)  |         | -                                      | -          | 173.9      | -          | -          | 167.5    -    -                        |
| Sierra Dawn          | 5/21/91 | -                                      | -          | -          | -          | -          | -                                      |
| Cooperative Vanguard |         | -                                      | -          | 165.9      | -          | -          | 149.4    -    -                        |
| Cindy J. Erickson    |         | -                                      | -          | -          | -          | -          | -                                      |
| Frank H. Peavy       |         | -                                      | -          | -          | -          | -          | -                                      |
| Helen M. Clements    |         | -                                      | -          | -          | -          | -          | -                                      |
| Sunflower (2)        |         | -                                      | -          | -          | -          | -          | -                                      |
| Dell Butcher (2)     |         | -                                      | -          | -          | -          | -          | -                                      |
| Hornet               |         | -                                      | -          | 127.4      | -          | -          | 129.2    -    -                        |
| Volunteer State      |         | -                                      | -          | -          | -          | -          | -                                      |

# Clarks Ferry Site, Trip 1

## 120 Minutes after Barge-Tow Passage

| Tow name             | Date    | Suspended Sediment Concentration, mg/L |            |            |            |            |            |            |            |  |
|----------------------|---------|----------------------------------------|------------|------------|------------|------------|------------|------------|------------|--|
|                      |         | Station a1                             | Station a2 | Station b1 | Station b2 | Station b3 | Station c1 | Station c2 | Station c3 |  |
| C.W. Rushing (1)     | 5/16/91 | -                                      | -          | -          | -          | -          | -          | -          | -          |  |
| Donnie Ray Jr. (1)   |         | -                                      | -          | -          | -          | -          | -          | -          | -          |  |
| Samantha             |         | -                                      | -          | -          | -          | -          | -          | -          | -          |  |
| C.W. Rushing (2)     | 5/17/91 | -                                      | -          | -          | -          | -          | -          | -          | -          |  |
| Jemco Towing         |         | -                                      | -          | -          | -          | -          | -          | -          | -          |  |
| T.S. Kunsmann        |         | -                                      | -          | -          | -          | -          | -          | -          | -          |  |
| Dell Butcher (1)     |         | -                                      | -          | -          | -          | -          | -          | -          | -          |  |
| Pearl B.             | 5/19/91 | -                                      | -          | -          | -          | -          | -          | -          | -          |  |
| Conti-Afton          |         | 157.5                                  | 154.4      | 171.0      | 167.1      | 168.8      | 206.1      | 210.3      | 204.9      |  |
| Jack D. Wofford      |         | -                                      | 170.1      | 179.3      | -          | 178.6      | -          | 198.8      | 194.8      |  |
| Donnie Ray Jr. (2)   | 5/20/91 | -                                      | -          | -          | -          | -          | -          | -          | -          |  |
| Sunflower (1)        |         | -                                      | -          | 160.4      | -          | -          | 135.6      | -          | -          |  |
| American Beauty (1)  |         | -                                      | -          | -          | -          | -          | -          | -          | -          |  |
| Sierra Dawn          | 5/21/91 | -                                      | -          | -          | -          | -          | -          | -          | -          |  |
| Cooperative Vanguard |         | -                                      | -          | 166.1      | -          | -          | 149.6      | -          | -          |  |
| Cindy J. Erickson    |         | -                                      | -          | -          | -          | -          | -          | -          | -          |  |
| Frank H. Peavy       |         | -                                      | -          | -          | -          | -          | -          | -          | -          |  |
| Helen M. Clements    |         | -                                      | -          | -          | -          | -          | -          | -          | -          |  |
| Sunflower (2)        |         | -                                      | -          | -          | -          | -          | -          | -          | -          |  |
| Dell Butcher (2)     |         | -                                      | -          | -          | -          | -          | -          | -          | -          |  |
| Hornet               | -       | -                                      | -          | 125.5      | -          | -          | 128.3      | -          | -          |  |
| Volunteer State      | -       | -                                      | -          | -          | -          | -          | -          | -          | -          |  |

**APPENDIX XVIII.**  
**SUSPENDED SEDIMENT CONCENTRATION DATA**  
**FOR GOOSE ISLAND, TRIP 2**

Goose Island Site, Trip 2

60 Minutes before Barge-Tow Passage

| Tow name              | Date    | Suspended Sediment Concentration, mg/L |            |            |            |            |            |            |            |
|-----------------------|---------|----------------------------------------|------------|------------|------------|------------|------------|------------|------------|
|                       |         | Station a1                             | Station b1 | Station b2 | Station c1 | Station c2 | Station d1 | Station e1 | Station e2 |
| Ardyce Randall        | 7/18/91 | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Scarlet Knight        |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| James F. Neal         |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Helen M. Clements     |         | 130.0                                  | 117.6      | 105.5      | 119.0      | 124.6      | -          | -          | -          |
| Elizabeth Ann         |         | 115.2                                  | 108.2      | 110.5      | 119.5      | 127.6      | -          | -          | -          |
| Frank T. Heffelfinger | 7/19/91 | 89.3                                   | 93.4       | 85.5       | 114.9      | 73.2       | -          | -          | -          |
| Queen City            |         | 102.3                                  | 94.6       | 80.6       | 68.9       | 58.6       | -          | -          | -          |
| Helen M. Clements     |         | 104.3                                  | 71.0       | 121.2      | 71.1       | 66.9       | -          | -          | -          |
| Frank T. Heffelfinger |         | 101.4                                  | 89.0       | 129.3      | 75.9       | 73.2       | -          | -          | -          |
| Cooperative Venture   |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Volunteer State       |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| No name               |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Night 1               |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Night 2               | 7/20/91 | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Night 3               |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| G.R. Packet           |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Prairie Dawn          |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Prosperity            |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Clyde Butcher         |         | -                                      | 123.5      | 133.5      | -          | -          | -          | -          | -          |
| Lil Charley           |         | -                                      | 124.7      | 131.1      | -          | -          | -          | -          | -          |
| C.W. Rushing          |         | -                                      | 164.7      | 184.3      | -          | -          | -          | -          | -          |
| Conti-Nan             |         | -                                      | 121.4      | 121.5      | -          | -          | -          | 135.9      | 140.0      |
| Mary L                |         | -                                      | 117.1      | 119.9      | -          | -          | -          | 109.0      | 138.1      |
| Scarlet Knight        | 7/21/91 | -                                      | 126.4      | 117.4      | -          | -          | -          | -          | -          |
| Conti-Karla           |         | -                                      | 274.5      | 271.5      | -          | -          | -          | 88.5       | 133.7      |

Goose Island Site, Trip 2

60 Minutes before Barge-Tow Passage (Concluded)

| Tow name               | Date    | Suspended Sediment Concentration, mg/L |            |            |            |            |            |            |            |
|------------------------|---------|----------------------------------------|------------|------------|------------|------------|------------|------------|------------|
|                        |         | Station a1                             | Station b1 | Station b2 | Station c1 | Station c2 | Station d1 | Station e1 | Station e2 |
| Cooperative Mariner    | 7/22/91 | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Hornet                 |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Cooperative Ambassador |         | -                                      | 124.9      | 103.0      | -          | -          | -          | 69.4       | 69.8       |
| Eastern                |         | -                                      | 127.4      | 104.7      | -          | -          | -          | 68.9       | 71.1       |
| Sam M. Fleming         |         | -                                      | 129.3      | 106.0      | -          | -          | -          | 68.6       | 72.1       |
| Kevin Michael          |         | -                                      | 111.7      | 115.9      | -          | -          | 56.6       | 70.1       | 69.0       |
| A.M. Thompson          | 7/23/91 | -                                      | 74.1       | 67.6       | -          | -          | 63.5       | 66.7       | 71.3       |
| Susan Elizabeth        |         | -                                      | 72.6       | 67.9       | -          | -          | 63.2       | 65.9       | 71.6       |
| Lil Charley            |         | -                                      | 72.6       | 67.9       | -          | -          | 63.2       | 65.9       | 71.6       |
| Badger                 |         | -                                      | 150.8      | 145.9      | -          | -          | 64.2       | 65.8       | 68.0       |
| Kay D                  |         | -                                      | 150.5      | 132.0      | -          | -          | 65.2       | 68.6       | 68.9       |
| Evey-T                 |         | -                                      | 104.4      | 97.6       | -          | -          | 60.0       | 65.4       | 69.0       |
| Robert Ingle           |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Prairie Dawn           |         | -                                      | -          | -          | -          | -          | -          | -          | -          |

Goose Island Site, Trip 2

30 Minutes before Barge-Tow Passage

| Tow name              | Date    | Suspended Sediment Concentration, mg/L |            |            |            |            |            |            |            |
|-----------------------|---------|----------------------------------------|------------|------------|------------|------------|------------|------------|------------|
|                       |         | Station a1                             | Station b1 | Station b2 | Station c1 | Station c2 | Station d1 | Station e1 | Station e2 |
| Ardyce Randall        | 7/18/91 | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Scarlet Knight        |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| James F. Neal         |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Helen M. Clements     |         | 120.6                                  | 109.3      | 110.0      | 120.0      | 126.4      | -          | -          | -          |
| Elizabeth Ann         |         | 117.8                                  | 95.6       | 79.5       | 126.8      | 126.3      | -          | -          | -          |
| Frank T. Heffelfinger | 7/19/91 | 87.9                                   | 109.8      | 97.0       | 113.0      | 78.7       | -          | -          | -          |
| Queen City            |         | 77.8                                   | 74.9       | 91.2       | 70.5       | 46.6       | -          | -          | -          |
| Helen M. Clements     |         | 103.1                                  | 71.5       | 121.1      | 95.1       | 74.9       | -          | -          | -          |
| Frank T. Heffelfinger |         | 100.0                                  | 74.2       | 117.9      | 92.2       | 76.8       | -          | -          | -          |
| Cooperative Venture   |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Volunteer State       |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| No name               |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Night 1               |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Night 2               | 7/20/91 | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Night 3               |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| G.R. Packet           |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Prairie Dawn          |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Prosperity            |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Clyde Butcher         |         | -                                      | 129.5      | 132.1      | -          | -          | -          | -          | -          |
| Lil Charley           |         | -                                      | 142.6      | 140.0      | -          | -          | -          | -          | -          |
| C.W. Rushing          |         | -                                      | 161.2      | 167.0      | -          | -          | -          | -          | -          |
| Conti-Nan             |         | -                                      | 129.3      | 132.0      | -          | -          | -          | 124.6      | 136.8      |
| Mary L                |         | -                                      | 99.0       | 96.9       | -          | -          | -          | 111.7      | 122.1      |
| Scarlet Knight        | 7/21/91 | -                                      | 162.7      | 151.5      | -          | -          | -          | -          | -          |
| Conti-Karla           |         | -                                      | 160.5      | 144.1      | -          | -          | -          | 84.2       | 102.7      |

Goose Island Site, Trip 2

30 Minutes before Barge-Tow Passage (Concluded)

| Tow name               | Date    | Suspended Sediment Concentration, mg/L |            |            |            |            |            |            |            |
|------------------------|---------|----------------------------------------|------------|------------|------------|------------|------------|------------|------------|
|                        |         | Station a1                             | Station b1 | Station b2 | Station c1 | Station c2 | Station d1 | Station e1 | Station e2 |
| Cooperative Mariner    | 7/22/91 | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Hornet                 |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Cooperative Ambassador |         | -                                      | 119.6      | 113.2      | -          | -          | -          | 65.8       | 71.5       |
| Eastern                |         | -                                      | 116.7      | 114.4      | -          | -          | -          | 67.2       | 70.6       |
| Sam M. Fleming         |         | -                                      | 114.6      | 115.2      | -          | -          | -          | 68.3       | 70.0       |
| Kevin Michael          |         | -                                      | 265.9      | 183.1      | -          | -          | 68.2       | 67.8       | 67.3       |
| A.M. Thompson          | 7/23/91 | -                                      | 73.4       | 69.6       | -          | -          | 63.9       | 66.8       | 71.5       |
| Susan Elizabeth        |         | -                                      | 75.1       | 70.5       | -          | -          | 64.5       | 67.9       | 71.2       |
| Lil Charley            |         | -                                      | 75.1       | 70.5       | -          | -          | 64.5       | 67.9       | 71.2       |
| Badger                 |         | -                                      | 109.0      | 105.3      | -          | -          | 60.5       | 65.4       | 69.2       |
| Kay D                  |         | -                                      | 122.7      | 128.5      | -          | -          | 62.2       | 65.5       | 69.7       |
| Evey-T                 |         | -                                      | 92.5       | 88.8       | -          | -          | 62.2       | 64.8       | 68.1       |
| Robert Ingle           |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Prairie Dawn           |         | -                                      | -          | -          | -          | -          | -          | -          | -          |

# Goose Island Site, Trip 2

## 10 Minutes before Barge-Tow Passage

| Tow name              | Date    | Suspended Sediment Concentration, mg/L |            |            |            |            |            |            |            |
|-----------------------|---------|----------------------------------------|------------|------------|------------|------------|------------|------------|------------|
|                       |         | Station a1                             | Station b1 | Station b2 | Station c1 | Station c2 | Station d1 | Station e1 | Station e2 |
| Ardyce Randall        | 7/18/91 | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Scarlet Knight        |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| James F. Neal         |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Helen M. Clements     |         | 100.9                                  | 114.5      | 110.2      | 116.9      | 130.3      | -          | -          | -          |
| Elizabeth Ann         |         | 113.6                                  | 88.5       | 90.2       | 87.2       | 82.8       | -          | -          | -          |
| Frank T. Heffelfinger | 7/19/91 | 76.6                                   | 93.0       | 103.5      | 111.8      | 83.4       | -          | -          | -          |
| Queen City            |         | 71.9                                   | 73.1       | 74.0       | 78.7       | 57.7       | -          | -          | -          |
| Helen M. Clements     |         | 90.0                                   | 72.8       | 117.6      | 82.2       | 74.0       | -          | -          | -          |
| Frank T. Heffelfinger |         | 98.9                                   | 86.7       | 129.0      | 71.2       | 73.5       | -          | -          | -          |
| Cooperative Venture   |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Volunteer State       |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| No name               |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Night 1               |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Night 2               | 7/20/91 | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Night 3               |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| G.R. Packet           |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Prairie Dawn          |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Prosperity            |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Clyde Butcher         |         | -                                      | 145.9      | 141.9      | -          | -          | -          | -          | -          |
| Lil Charley           |         | -                                      | 134.6      | 146.0      | -          | -          | -          | -          | -          |
| C.W. Rushing          |         | -                                      | 145.6      | 155.5      | -          | -          | -          | -          | -          |
| Conti-Nan             |         | -                                      | 131.2      | 129.1      | -          | -          | -          | 132.4      | 129.1      |
| Mary L                |         | -                                      | 87.1       | 100.2      | -          | -          | -          | 112.9      | 118.5      |
| Scarlet Knight        | 7/21/91 | -                                      | 141.5      | 141.4      | -          | -          | -          | -          | -          |
| Conti-Karla           |         | -                                      | 159.4      | 158.5      | -          | -          | -          | 85.9       | 105.5      |



Goose Island Site, Trip 2

10 Minutes before Barge-Tow Passage (Concluded)

| Tow name               | Date    | Suspended Sediment Concentration, mg/L |            |            |            |            |            |            |            |
|------------------------|---------|----------------------------------------|------------|------------|------------|------------|------------|------------|------------|
|                        |         | Station a1                             | Station b1 | Station b2 | Station c1 | Station c2 | Station d1 | Station e1 | Station e2 |
| Cooperative Mariner    | 7/22/91 | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Hornet                 |         | -                                      | 115.3      | 96.5       | -          | -          | -          | -          | -          |
| Cooperative Ambassador |         | -                                      | 116.7      | 110.6      | -          | -          | 61.8       | 69.9       | 69.4       |
| Eastern                |         | -                                      | 119.6      | 107.6      | -          | -          | 64.7       | 69.7       | 69.7       |
| Sam M. Fleming         |         | -                                      | 121.7      | 105.3      | -          | -          | 66.9       | 69.6       | 69.8       |
| Kevin Michael          |         | -                                      | 169.6      | 144.0      | -          | -          | 71.9       | 68.3       | 77.6       |
| A.M. Thompson          | 7/23/91 | -                                      | 84.8       | 86.4       | -          | -          | 65.9       | 68.5       | 71.7       |
| Susan Elizabeth        |         | -                                      | 105.0      | 126.3      | -          | -          | 64.7       | 67.0       | 74.3       |
| Lil Charley            |         | -                                      | 105.0      | 126.3      | -          | -          | 64.7       | 67.0       | 74.3       |
| Badger                 |         | -                                      | 109.3      | 93.8       | -          | -          | 62.1       | 60.3       | 69.6       |
| Kay D                  |         | -                                      | 103.1      | 82.3       | -          | -          | 62.1       | 58.0       | 69.7       |
| Evey-T                 |         | -                                      | 110.6      | 88.0       | -          | -          | 62.6       | 64.2       | 69.3       |
| Robert Ingle           |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Prairie Dawn           |         | -                                      | -          | -          | -          | -          | -          | -          | -          |

**Goose Island Site, Trip 2**  
**5 Minutes before Barge-Tow Passage**

| Tow name              | Suspended Sediment Concentration, mg/L |            |            |            |            |            |            |            |            |
|-----------------------|----------------------------------------|------------|------------|------------|------------|------------|------------|------------|------------|
|                       | Date                                   | Station a1 | Station b1 | Station b2 | Station c1 | Station c2 | Station d1 | Station e1 | Station e2 |
| Ardyce Randall        | 7/18/91                                | -          | -          | -          | -          | -          | -          | -          | -          |
| Scarlet Knight        |                                        | -          | -          | -          | -          | -          | -          | -          | -          |
| James F. Neal         |                                        | 127.6      | 133.2      | 106.1      | 122.2      | 143.3      | -          | -          | -          |
| Helen M. Clements     |                                        | 94.9       | 117.2      | 110.1      | 115.8      | 131.4      | -          | -          | -          |
| Elizabeth Ann         |                                        | 123.9      | 101.3      | 90.6       | 105.5      | 78.5       | -          | -          | -          |
| Frank T. Heffelfinger | 7/19/91                                | 73.8       | 88.8       | 105.1      | 111.5      | 84.6       | -          | -          | -          |
| Queen City            |                                        | 70.4       | 72.6       | 69.7       | 80.8       | 60.5       | -          | -          | -          |
| Helen M. Clements     |                                        | 85.0       | 72.1       | 117.5      | 77.3       | 72.6       | -          | -          | -          |
| Frank T. Heffelfinger |                                        | 88.4       | 80.2       | 116.6      | 75.3       | 70.6       | -          | -          | -          |
| Cooperative Venture   |                                        | -          | -          | -          | -          | -          | -          | -          | -          |
| Volunteer State       |                                        | -          | -          | -          | -          | -          | -          | -          | -          |
| No name               |                                        | -          | -          | -          | -          | -          | -          | -          | -          |
| Night 1               |                                        | -          | -          | -          | -          | -          | -          | -          | -          |
| Night 2               | 7/20/91                                | -          | -          | -          | -          | -          | -          | -          | -          |
| Night 3               |                                        | -          | -          | -          | -          | -          | -          | -          | -          |
| G.R. Packet           |                                        | -          | -          | -          | -          | -          | -          | -          | -          |
| Prairie Dawn          |                                        | -          | -          | -          | -          | -          | -          | -          | -          |
| Prosperity            |                                        | -          | -          | -          | -          | -          | -          | -          | -          |
| Clyde Butcher         |                                        | -          | 142.4      | 143.2      | -          | -          | -          | -          | -          |
| Lil Charley           |                                        | -          | 131.1      | 147.3      | -          | -          | -          | -          | -          |
| C.W. Rushing          |                                        | -          | 141.6      | 152.6      | -          | -          | -          | -          | -          |
| Conti-Nan             |                                        | -          | 131.6      | 128.0      | -          | -          | -          | 134.8      | 127.0      |
| Mary L                |                                        | -          | 84.6       | 105.3      | -          | -          | -          | 110.7      | 117.9      |
| Scarlet Knight        | 7/21/91                                | -          | 148.2      | 145.7      | -          | -          | -          | -          | -          |
| Conti-Karla           |                                        | -          | 161.4      | 165.2      | -          | -          | -          | 86.8       | 107.4      |

# Goose Island Site, Trip 2

## 5 Minutes before Barge-Tow Passage (Concluded)

| Tow name               | Date    | Suspended Sediment Concentration, mg/L |            |            |            |            |            |            |            |
|------------------------|---------|----------------------------------------|------------|------------|------------|------------|------------|------------|------------|
|                        |         | Station a1                             | Station b1 | Station b2 | Station c1 | Station c2 | Station d1 | Station e1 | Station e2 |
| Cooperative Mariner    | 7/22/91 | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Hornet                 |         | -                                      | 118.5      | 98.7       | -          | -          | -          | -          | -          |
| Cooperative Ambassador |         | -                                      | 120.3      | 106.8      | -          | -          | 65.4       | 69.7       | 69.7       |
| Eastern                |         | -                                      | 133.7      | 103.8      | -          | -          | 65.6       | 68.8       | 70.6       |
| Sam M. Fleming         |         | -                                      | 135.0      | 102.0      | -          | -          | 65.9       | 67.8       | 69.1       |
| Kevin Michael          | 7/23/91 | -                                      | 135.6      | 137.3      | -          | -          | 68.2       | 69.2       | 73.8       |
| A.M. Thompson          |         | -                                      | 97.9       | 111.3      | -          | -          | 67.0       | 66.4       | 73.9       |
| Susan Elizabeth        |         | -                                      | 90.7       | 105.6      | -          | -          | 63.3       | 61.6       | 69.9       |
| Lil Charley            |         | -                                      | 90.7       | 105.6      | -          | -          | 63.3       | 61.6       | 69.9       |
| Badger                 |         | -                                      | 94.7       | 80.3       | -          | -          | 62.1       | 60.8       | 69.0       |
| Kay D                  |         | -                                      | 82.1       | 77.4       | -          | -          | 62.2       | 65.0       | 67.9       |
| Evey-T                 |         | -                                      | 157.6      | 87.3       | -          | -          | 62.0       | 65.4       | 74.4       |
| Robert Ingle           |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Prairie Dawn           |         | -                                      | -          | -          | -          | -          | -          | -          | -          |

Goose Island Site, Trip 2

2 Minutes before Barge-Tow Passage

| Tow name              | Date    | Suspended Sediment Concentration, mg/L |            |            |            |            |            |            |            |
|-----------------------|---------|----------------------------------------|------------|------------|------------|------------|------------|------------|------------|
|                       |         | Station a1                             | Station b1 | Station b2 | Station c1 | Station c2 | Station d1 | Station e1 | Station e2 |
| Ardyce Randall        | 7/18/91 | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Scarlet Knight        |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| James F. Neal         |         | 131.0                                  | 131.0      | 108.2      | 128.0      | 148.6      | -          | -          | -          |
| Helen M. Clements     |         | 86.0                                   | 106.0      | 94.7       | 113.0      | 130.3      | -          | -          | -          |
| Elizabeth Ann         |         | 112.4                                  | 97.3       | 86.5       | 113.7      | 76.6       | -          | -          | -          |
| Frank T. Heffelfinger | 7/19/91 | 91.8                                   | 90.7       | 85.7       | 111.4      | 97.1       | -          | -          | -          |
| Queen City            |         | 76.1                                   | 76.7       | 69.0       | 74.1       | 60.6       | -          | -          | -          |
| Helen M. Clements     |         | 91.2                                   | 85.6       | 117.4      | 73.2       | 71.8       | -          | -          | -          |
| Frank T. Heffelfinger |         | 108.7                                  | 86.2       | 123.6      | 93.8       | 75.9       | -          | -          | -          |
| Cooperative Venture   |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Volunteer State       |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| No name               |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Night 1               |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Night 2               | 7/20/91 | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Night 3               |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| G.R. Packet           |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Prairie Dawn          |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Prosperity            |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Clyde Butcher         |         | -                                      | 140.3      | 144.0      | -          | -          | -          | -          | -          |
| Lil Charley           |         | -                                      | 128.9      | 148.1      | -          | -          | -          | -          | -          |
| C.W. Rushing          |         | -                                      | 139.3      | 150.9      | -          | -          | -          | -          | -          |
| Conti-Nan             |         | -                                      | 128.1      | 127.4      | -          | -          | -          | 134.6      | 135.3      |
| Mary L                |         | -                                      | 109.6      | 127.2      | -          | -          | -          | 108.8      | 109.7      |
| Scarlet Knight        | 7/21/91 | -                                      | 152.2      | 148.3      | -          | -          | -          | -          | -          |
| Conti-Karla           |         | -                                      | 162.7      | 169.2      | -          | -          | -          | 87.2       | 108.6      |

**Goose Island Site, Trip 2**

**2 Minutes before Barge-Tow Passage (Concluded)**

| <i>Tow name</i>        | <i>Date</i> | <i>Suspended Sediment Concentration, mg/L</i> |                   |                   |                   |                   |                   |                   |                   |
|------------------------|-------------|-----------------------------------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
|                        |             | <i>Station a1</i>                             | <i>Station b1</i> | <i>Station b2</i> | <i>Station c1</i> | <i>Station c2</i> | <i>Station d1</i> | <i>Station e1</i> | <i>Station e2</i> |
| Cooperative Mariner    | 7/22/91     | -                                             | -                 | -                 | -                 | -                 | -                 | -                 | -                 |
| Hornet                 |             | -                                             | 120.4             | 100.0             | -                 | -                 | -                 | -                 | -                 |
| Cooperative Ambassador |             | -                                             | 122.4             | 104.6             | -                 | -                 | 67.6              | 69.6              | 69.9              |
| Eastern                |             | -                                             | 135.0             | 102.0             | -                 | -                 | 65.9              | 67.8              | 69.1              |
| Sam M. Fleming         |             | -                                             | 113.3             | 105.8             | -                 | -                 | 66.8              | 69.1              | 69.4              |
| Kevin Michael          |             | -                                             | 125.4             | 116.5             | -                 | -                 | 68.0              | 69.0              | 69.0              |
| A.M. Thompson          | 7/23/91     | -                                             | 105.0             | 126.3             | -                 | -                 | 64.7              | 67.0              | 74.3              |
| Susan Elizabeth        |             | -                                             | 132.6             | 88.7              | -                 | -                 | 63.8              | 66.7              | 72.6              |
| Lil Charley            |             | -                                             | 132.6             | 88.7              | -                 | -                 | 63.8              | 66.7              | 72.6              |
| Badger                 |             | -                                             | 82.1              | 77.4              | -                 | -                 | 62.2              | 65.0              | 67.9              |
| Kay D                  |             | -                                             | 113.3             | 111.7             | -                 | -                 | 62.3              | 64.5              | 68.6              |
| Evey-T                 |             | -                                             | 154.5             | 91.1              | -                 | -                 | 64.9              | 65.8              | 74.5              |
| Robert Ingle           |             | -                                             | -                 | -                 | -                 | -                 | -                 | -                 | -                 |
| Prairie Dawn           |             | -                                             | -                 | -                 | -                 | -                 | -                 | -                 | -                 |

Goose Island Site, Trip 2

Peak Suspended Sediment Concentrations

| Tow name              | Date    | Peak Suspended Sediment Concentration, mg/L |            |            |            |            |            |            |            |
|-----------------------|---------|---------------------------------------------|------------|------------|------------|------------|------------|------------|------------|
|                       |         | Station a1                                  | Station b1 | Station b2 | Station c1 | Station c2 | Station d1 | Station e1 | Station e2 |
| Ardyce Randall        | 7/18/91 | -                                           | -          | -          | -          | -          | -          | -          | -          |
| Scarlet Knight        |         | -                                           | -          | -          | -          | -          | -          | -          | -          |
| James F. Neal         | 148.3   | 133.2                                       | 113.2      | 131.8      | 153.8      |            |            |            |            |
| Helen M. Clements     | 120.0   | 117.7                                       | 110.1      | 122.8      | 136.5      |            |            |            |            |
| Elizabeth Ann         | 123.9   | 101.3                                       | 90.6       | 123.7      | 79.1       |            |            |            |            |
| Frank T. Heffelfinger | 7/19/91 | 104.0                                       | 110.0      | 109.8      | 124.8      | 97.1       | -          | -          | -          |
| Queen City            | 92.8    | 92.1                                        | 88.2       | 93.3       | 61.6       |            |            |            |            |
| Helen M. Clements     | 99.4    | 99.3                                        | 129.0      | 77.3       | 73.5       |            |            |            |            |
| Frank T. Heffelfinger | 111.1   | 104.9                                       | 135.6      | 103.4      | 79.5       |            |            |            |            |
| Cooperative Venture   | -       | -                                           | -          | -          | -          | -          | -          | -          | -          |
| Volunteer State       | -       | -                                           | -          | -          | -          | -          | -          | -          | -          |
| No name               | -       | -                                           | -          | -          | -          | -          | -          | -          | -          |
| Night 1               | -       | -                                           | -          | -          | -          | -          | -          | -          | -          |
| Night 2               | 7/20/91 | -                                           | -          | -          | -          | -          | -          | -          | -          |
| Night 3               |         | -                                           | -          | -          | -          | -          | -          | -          | -          |
| G.R. Packet           |         | -                                           | -          | -          | -          | -          | -          | -          | -          |
| Prairie Dawn          |         | -                                           | -          | -          | -          | -          | -          | -          | -          |
| Prosperity            |         | -                                           | -          | -          | -          | -          | -          | -          | -          |
| Clyde Butcher         |         | -                                           | 142.4      | 145.8      | -          | -          | -          | -          | -          |
| Lil Charley           |         | -                                           | 131.1      | 150.8      | -          | -          | -          | -          | -          |
| C.W. Rushing          |         | -                                           | 150.1      | 161.6      | -          | -          | -          | -          | -          |
| Conti-Nan             |         | -                                           | 131.7      | 128.0      | -          | -          | -          | 135.7      | 139.3      |
| Mary L                |         | -                                           | 147.8      | 158.5      | -          | -          | -          | 110.7      | 122.7      |
| Scarlet Knight        | 7/21/91 | -                                           | 161.5      | 154.4      | -          | -          | -          | -          | -          |
| Conti-Karla           |         | -                                           | 163.1      | 184.3      | -          | -          | -          | 91.9       | 129.3      |

Goose Island Site, Trip 2

Peak Suspended Sediment Concentrations (Concluded)

| Tow name               | Date    | Peak Suspended Sediment Concentration, mg/L |            |            |            |            |            |            |            |
|------------------------|---------|---------------------------------------------|------------|------------|------------|------------|------------|------------|------------|
|                        |         | Station a1                                  | Station b1 | Station b2 | Station c1 | Station c2 | Station d1 | Station e1 | Station e2 |
| Cooperative Mariner    | 7/22/91 | -                                           | -          | -          | -          | -          | -          | -          | -          |
| Hornet                 |         | -                                           | 124.9      | 103.0      | -          | -          | -          | -          | -          |
| Cooperative Ambassador |         | -                                           | 145.0      | 106.8      | -          | -          | 67.6       | 69.7       | 71.3       |
| Eastern                |         | -                                           | 254.2      | 183.6      | -          | -          | 70.3       | 73.8       | 71.3       |
| Sam M. Fleming         |         | -                                           | 280.0      | 231.2      | -          | -          | 71.6       | 73.8       | 70.3       |
| Kevin Michael          |         | -                                           | 142.3      | 150.8      | -          | -          | 69.1       | 77.1       | 73.8       |
| A.M. Thompson          | 7/23/91 | -                                           | 164.7      | 126.3      | -          | -          | 67.4       | 68.5       | 74.7       |
| Susan Elizabeth        |         | -                                           | 164.7      | 109.5      | -          | -          | 70.0       | 69.8       | 72.7       |
| Lil Charley            |         | -                                           | 164.7      | 109.5      | -          | -          | 70.0       | 69.8       | 72.7       |
| Badger                 |         | -                                           | 153.0      | 150.5      | -          | -          | 62.4       | 65.0       | 69.4       |
| Kay D                  |         | -                                           | 181.3      | 174.3      | -          | -          | 62.5       | 65.1       | 69.8       |
| Evey-T                 |         | -                                           | 157.6      | 95.9       | -          | -          | 65.9       | 66.8       | 78.2       |
| Robert Ingle           |         | -                                           | -          | -          | -          | -          | -          | -          | -          |
| Prairie Dawn           |         | -                                           | -          | -          | -          | -          | -          | -          | -          |

Goose Island Site, Trip 2

Average Suspended Sediment Concentrations

| Tow name              | Date    | Average Suspended Sediment Concentration, mg/L |            |            |            |            |            |            |            |
|-----------------------|---------|------------------------------------------------|------------|------------|------------|------------|------------|------------|------------|
|                       |         | Station a1                                     | Station b1 | Station b2 | Station c1 | Station c2 | Station d1 | Station e1 | Station e2 |
| Ardyce Randall        | 7/18/91 | -                                              | -          | -          | -          | -          | -          | -          | -          |
| Scarlet Knight        |         | -                                              | -          | -          | -          | -          | -          | -          | -          |
| James F. Neal         | 105.8   | 129.6                                          | 109.6      | 131.8      | 152.1      | -          | -          | -          | -          |
| Helen M. Clements     | 120.0   | 108.4                                          | 86.8       | 111.4      | 124.3      | -          | -          | -          | -          |
| Elizabeth Ann         | 97.9    | 83.4                                           | 84.8       | 123.7      | 75.6       | -          | -          | -          | -          |
| Frank T. Heffelfinger | 7/19/91 | 87.4                                           | 98.3       | 99.4       | 111.1      | 86.8       | -          | -          | -          |
| Queen City            | 92.8    | 85.1                                           | 72.4       | 75.5       | 60.7       | -          | -          | -          | -          |
| Helen M. Clements     | 98.9    | 86.7                                           | 129.0      | 71.2       | 73.5       | -          | -          | -          | -          |
| Frank T. Heffelfinger | 107.3   | 74.5                                           | 135.6      | 102.2      | 75.6       | -          | -          | -          | -          |
| Cooperative Venture   | -       | -                                              | -          | -          | -          | -          | -          | -          | -          |
| Volunteer State       | -       | -                                              | -          | -          | -          | -          | -          | -          | -          |
| No name               | -       | -                                              | -          | -          | -          | -          | -          | -          | -          |
| Night 1               | -       | -                                              | -          | -          | -          | -          | -          | -          | -          |
| Night 2               | 7/20/91 | -                                              | -          | -          | -          | -          | -          | -          | -          |
| Night 3               | -       | -                                              | -          | -          | -          | -          | -          | -          | -          |
| G.R. Packet           | -       | -                                              | -          | -          | -          | -          | -          | -          | -          |
| Prairie Dawn          | -       | -                                              | -          | -          | -          | -          | -          | -          | -          |
| Prosperity            | -       | -                                              | -          | -          | -          | -          | -          | -          | -          |
| Clyde Butcher         | -       | 138.8                                          | 144.5      | -          | -          | -          | -          | -          | -          |
| Lil Charley           | -       | 127.5                                          | 148.6      | -          | -          | -          | -          | -          | -          |
| C.W. Rushing          | -       | 131.6                                          | 156.0      | -          | -          | -          | -          | -          | -          |
| Conti-Nan             | -       | 120.8                                          | 116.7      | -          | -          | -          | -          | 129.7      | 139.3      |
| Mary L                | -       | 135.1                                          | 148.1      | -          | -          | -          | -          | 107.5      | 115.8      |
| Scarlet Knight        | 7/21/91 | -                                              | 154.8      | 150.0      | -          | -          | -          | -          | -          |
| Conti-Karla           | -       | -                                              | 160.3      | 164.4      | -          | -          | -          | 90.6       | 108.8      |



Goose Island Site, Trip 2

Average Suspended Sediment Concentrations (Concluded)

| Tow name               | Date    | Average Suspended Sediment Concentration, mg/L |            |            |            |            |            |            |            |
|------------------------|---------|------------------------------------------------|------------|------------|------------|------------|------------|------------|------------|
|                        |         | Station a1                                     | Station b1 | Station b2 | Station c1 | Station c2 | Station d1 | Station e1 | Station e2 |
| Cooperative Mariner    | 7/22/91 | -                                              | -          | -          | -          | -          | -          | -          | -          |
| Hornet                 |         | -                                              | 121.7      | 100.8      | -          | -          | -          | -          | -          |
| Cooperative Ambassador |         | -                                              | 145.0      | 105.8      | -          | -          | 63.6       | 67.9       | 71.3       |
| Eastern                |         | -                                              | 113.6      | 101.0      | -          | -          | 65.7       | 68.1       | 69.1       |
| Sam M. Fleming         |         | -                                              | 178.0      | 112.8      | -          | -          | 68.4       | 72.0       | 70.0       |
| Kevin Michael          |         | -                                              | 131.2      | 117.7      | -          | -          | 68.4       | 68.4       | 68.3       |
| A.M. Thompson          | 7/23/91 | -                                              | 105.4      | 113.0      | -          | -          | 62.2       | 67.3       | 72.2       |
| Susan Elizabeth        |         | -                                              | 99.4       | 109.5      | -          | -          | 65.0       | 66.9       | 72.2       |
| Lil Charley            |         | -                                              | 99.4       | 109.5      | -          | -          | 65.0       | 66.9       | 72.2       |
| Badger                 |         | -                                              | 102.9      | 100.3      | -          | -          | 62.3       | 64.6       | 68.4       |
| Kay D                  |         | -                                              | 134.1      | 134.6      | -          | -          | 62.4       | 64.1       | 69.1       |
| Evey-T                 |         | -                                              | 152.6      | 92.9       | -          | -          | 64.4       | 66.2       | 75.2       |
| Robert Ingle           |         | -                                              | -          | -          | -          | -          | -          | -          | -          |
| Prairie Dawn           |         | -                                              | -          | -          | -          | -          | -          | -          | -          |

Goose Island Site, Trip 2

2 Minutes after Barge-Tow Passage

| Tow name              | Date    | Suspended Sediment Concentration, mg/L |            |            |            |            |            |            |            |
|-----------------------|---------|----------------------------------------|------------|------------|------------|------------|------------|------------|------------|
|                       |         | Station a1                             | Station b1 | Station b2 | Station c1 | Station c2 | Station d1 | Station e1 | Station e2 |
| Ardyce Randall        | 7/18/91 | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Scarlet Knight        |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| James F. Neal         |         | 105.8                                  | 128.1      | 111.1      | 124.2      | 152.3      | -          | -          | -          |
| Helen M. Clements     |         | 102.6                                  | 113.6      | 97.6       | 115.7      | 124.4      | -          | -          | -          |
| Elizabeth Ann         |         | 97.6                                   | 83.8       | 84.4       | 89.5       | 71.6       | -          | -          | -          |
| Frank T. Heffelfinger | 7/19/91 | 104.0                                  | 106.2      | 108.1      | 112.0      | 76.9       | -          | -          | -          |
| Queen City            |         | 76.2                                   | 83.9       | 88.2       | 86.2       | 61.3       | -          | -          | -          |
| Helen M. Clements     |         | 93.8                                   | 73.7       | 118.9      | 74.0       | 65.4       | -          | -          | -          |
| Frank T. Heffelfinger |         | 104.8                                  | 78.6       | 131.8      | 100.0      | 77.1       | -          | -          | -          |
| Cooperative Venture   |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Volunteer State       |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| No name               |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Night 1               |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Night 2               | 7/20/91 | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Night 3               |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| G.R. Packet           |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Prairie Dawn          |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Prosperity            |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Clyde Butcher         |         | -                                      | 137.4      | 145.0      | -          | -          | -          | -          | -          |
| Lil Charley           |         | -                                      | 126.1      | 149.1      | -          | -          | -          | -          | -          |
| C.W. Rushing          |         | -                                      | 140.8      | 155.4      | -          | -          | -          | -          | -          |
| Conti-Nan             |         | -                                      | 112.7      | 123.0      | -          | -          | -          | 127.2      | 136.8      |
| Mary L                |         | -                                      | 139.3      | 131.7      | -          | -          | -          | -          | 121.6      |
| Scarlet Knight        | 7/21/91 | -                                      | 157.5      | 151.8      | -          | -          | -          | -          | -          |
| Conti-Karla           |         | -                                      | 145.2      | 135.5      | -          | -          | -          | 81.5       | 114.1      |

Goose Island Site, Trip 2

2 Minutes after Barge-Tow Passage (Concluded)

| Tow name               | Date    | Suspended Sediment Concentration, mg/L |            |            |            |            |            |            |            |
|------------------------|---------|----------------------------------------|------------|------------|------------|------------|------------|------------|------------|
|                        |         | Station a1                             | Station b1 | Station b2 | Station c1 | Station c2 | Station d1 | Station e1 | Station e2 |
| Cooperative Mariner    | 7/22/91 | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Hornet                 |         | -                                      | 123.0      | 101.7      | -          | -          | -          | -          | -          |
| Cooperative Ambassador |         | -                                      | 135.0      | 102.0      | -          | -          | 65.9       | 67.8       | 69.1       |
| Eastern                |         | -                                      | 112.9      | 109.3      | -          | -          | 67.9       | 70.1       | 69.7       |
| Sam M. Fleming         |         | -                                      | 254.2      | 183.6      | -          | -          | 70.3       | 71.3       | 68.6       |
| Kevin Michael          | 7/23/91 | -                                      | 142.3      | 124.7      | -          | -          | 67.4       | 67.4       | 68.1       |
| A.M. Thompson          |         | -                                      | 97.4       | 103.2      | -          | -          | 62.9       | 63.9       | 70.3       |
| Susan Elizabeth        |         | -                                      | 100.5      | 93.0       | -          | -          | 67.9       | 66.5       | 69.6       |
| Lil Charley            |         | -                                      | 100.5      | 93.0       | -          | -          | 67.9       | 66.5       | 69.6       |
| Badger                 |         | -                                      | 123.7      | 123.2      | -          | -          | 62.4       | 64.3       | 68.9       |
| Kay D                  |         | -                                      | 153.0      | 150.5      | -          | -          | 62.4       | 64.5       | 69.4       |
| Evey-T                 |         | -                                      | 150.7      | 94.1       | -          | -          | 61.5       | 66.5       | 76.5       |
| Robert Ingle           |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Prairie Dawn           |         | -                                      | -          | -          | -          | -          | -          | -          | -          |

**Goose Island Site, Trip 2**  
**5 Minutes after Barge-Tow Passage**

| Tow name              | Date    | Suspended Sediment Concentration, mg/L |            |            |            |            |            |            |            |
|-----------------------|---------|----------------------------------------|------------|------------|------------|------------|------------|------------|------------|
|                       |         | Station a1                             | Station b1 | Station b2 | Station c1 | Station c2 | Station d1 | Station e1 | Station e2 |
| Ardyce Randall        | 7/18/91 | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Scarlet Knight        |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| James F. Neal         |         | 108.3                                  | 125.9      | 113.2      | 121.8      | 148.0      | -          | -          | -          |
| Helen M. Clements     |         | 95.2                                   | 106.5      | 107.1      | 118.9      | 136.5      | -          | -          | -          |
| Elizabeth Ann         |         | 100.5                                  | 90.3       | 88.3       | 78.5       | 78.8       | -          | -          | -          |
| Frank T. Heffelfinger | 7/19/91 | 79.7                                   | 88.9       | 96.4       | 101.7      | 72.2       | -          | -          | -          |
| Queen City            |         | 84.3                                   | 73.3       | 69.4       | 92.9       | 61.6       | -          | -          | -          |
| Helen M. Clements     |         | 88.4                                   | 80.2       | 116.6      | 75.3       | 70.6       | -          | -          | -          |
| Frank T. Heffelfinger |         | 109.0                                  | 104.9      | 132.6      | 84.3       | 77.0       | -          | -          | -          |
| Cooperative Venture   |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Volunteer State       |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| No name               |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Night 1               |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Night 2               | 7/20/91 | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Night 3               |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| G.R. Packet           |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Prairie Dawn          |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Prosperity            |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Clyde Butcher         |         | -                                      | 135.3      | 145.8      | -          | -          | -          | -          | -          |
| Lil Charley           |         | -                                      | 126.0      | 150.8      | -          | -          | -          | -          | -          |
| C.W. Rushing          |         | -                                      | 150.1      | 129.7      | -          | -          | -          | -          | -          |
| Conti-Nan             |         | -                                      | 101.3      | 104.7      | -          | -          | -          | 134.9      | 134.7-     |
| Mary L                |         | -                                      | 144.4      | 131.8      | -          | -          | -          | -          | 119.7      |
| Scarlet Knight        | 7/21/91 | -                                      | 161.5      | 154.4      | -          | -          | -          | -          | -          |
| Conti-Karla           |         | -                                      | 151.1      | 164.1      | -          | -          | -          | 89.8       | 129.3      |

Goose Island Site, Trip 2

5 Minutes after Barge-Tow Passage (Concluded)

| Tow name               | Date    | Suspended Sediment Concentration, mg/L |            |            |            |            |            |            |            |
|------------------------|---------|----------------------------------------|------------|------------|------------|------------|------------|------------|------------|
|                        |         | Station a1                             | Station b1 | Station b2 | Station c1 | Station c2 | Station d1 | Station e1 | Station e2 |
| Cooperative Mariner    | 7/22/91 | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Hornet                 |         | -                                      | 124.9      | 103.0      | -          | -          | -          | -          | -          |
| Cooperative Ambassador |         | -                                      | 113.3      | 105.8      | -          | -          | 66.8       | 69.1       | 69.4       |
| Eastern                |         | -                                      | 254.2      | 183.6      | -          | -          | 70.3       | 71.3       | 68.6       |
| Sam M. Fleming         |         | -                                      | 280.0      | 207.2      | -          | -          | 70.3       | 68.1       | 65.9       |
| Kevin Michael          |         | -                                      | 123.7      | 131.8      | -          | -          | 66.8       | 77.1       | 69.2       |
| A.M. Thompson          | 7/23/91 | -                                      | 164.7      | 98.3       | -          | -          | 63.5       | 63.6       | 72.4       |
| Susan Elizabeth        |         | -                                      | 101.6      | 90.3       | -          | -          | 61.9       | 64.9       | 72.2       |
| Lil Charley            |         | -                                      | 101.6      | 90.3       | -          | -          | 61.9       | 64.9       | 72.2       |
| Badger                 |         | -                                      | 153.0      | 150.5      | -          | -          | 62.4       | 64.5       | 69.4       |
| Kay D                  |         | -                                      | 181.3      | 174.3      | -          | -          | 62.5       | 65.1       | 69.8       |
| Evey-T                 |         | -                                      | 148.0      | 95.9       | -          | -          | 59.5       | 66.5       | 78.2       |
| Robert Ingle           |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Prairie Dawn           |         | -                                      | -          | -          | -          | -          | -          | -          | -          |

**Goose Island Site, Trip 2**  
**30 Minutes after Barge-Tow Passage**

| Tow name              | Suspended Sediment Concentration, mg/L |            |            |            |            |            |            |            |            |
|-----------------------|----------------------------------------|------------|------------|------------|------------|------------|------------|------------|------------|
|                       | Date                                   | Station a1 | Station b1 | Station b2 | Station c1 | Station c2 | Station d1 | Station e1 | Station e2 |
| Ardyce Randall        | 7/18/91                                | -          | -          | -          | -          | -          | -          | -          | -          |
| Scarlet Knight        |                                        | -          | -          | -          | -          | -          | -          | -          | -          |
| James F. Neal         |                                        | 122.0      | 125.3      | 116.3      | 113.1      | 133.8      | -          | -          | -          |
| Helen M. Clements     |                                        | 101.1      | 105.3      | 90.9       | 97.3       | 79.9       | -          | -          | -          |
| Elizabeth Ann         |                                        | 115.3      | 106.6      | 112.6      | 131.6      | 95.9       | -          | -          | -          |
| Frank T. Heffelfinger | 7/19/91                                | 74.4       | 102.8      | 87.9       | 66.0       | 65.0       | -          | -          | -          |
| Queen City            |                                        | 105.3      | 77.8       | 131.5      | 87.0       | 62.7       | -          | -          | -          |
| Helen M. Clements     |                                        | 205.7      | 163.5      | 145.3      | 119.9      | 133.6      | -          | -          | -          |
| Frank T. Heffelfinger |                                        | 169.6      | 105.0      | 120.2      | 120.4      | 123.4      | -          | -          | -          |
| Cooperative Venture   |                                        | -          | -          | -          | -          | -          | -          | -          | -          |
| Volunteer State       |                                        | -          | -          | -          | -          | -          | -          | -          | -          |
| No name               |                                        | -          | -          | -          | -          | -          | -          | -          | -          |
| Night 1               |                                        | -          | -          | -          | -          | -          | -          | -          | -          |
| Night 2               | 7/20/91                                | -          | -          | -          | -          | -          | -          | -          | -          |
| Night 3               |                                        | -          | -          | -          | -          | -          | -          | -          | -          |
| G.R. Packet           |                                        | -          | -          | -          | -          | -          | -          | -          | -          |
| Prairie Dawn          |                                        | -          | -          | -          | -          | -          | -          | -          | -          |
| Prosperity            |                                        | -          | -          | -          | -          | -          | -          | -          | -          |
| Clyde Butcher         |                                        | -          | 138.1      | 161.4      | -          | -          | -          | -          | -          |
| Lil Charley           |                                        | -          | 159.5      | 180.2      | -          | -          | -          | -          | -          |
| C.W. Rushing          |                                        | -          | 153.2      | 147.3      | -          | -          | -          | -          | -          |
| Conti-Nan             |                                        | -          | 104.1      | 86.7       | -          | -          | -          | 139.4      | 118.1      |
| Mary L                |                                        | -          | 105.6      | 124.9      | -          | -          | -          | -          | 140.9      |
| Scarlet Knight        | 7/21/91                                | -          | 214.7      | 204.5      | -          | -          | -          | -          | -          |
| Conti-Karla           |                                        | -          | 118.0      | 118.6      | -          | -          | -          | 81.5       | 96.6       |

Goose Island Site, Trip 2

30 Minutes after Barge-Tow Passage (Concluded)

| Tow name               | Date    | Suspended Sediment Concentration, mg/L |            |            |            |            |            |            |            |
|------------------------|---------|----------------------------------------|------------|------------|------------|------------|------------|------------|------------|
|                        |         | Station a1                             | Station b1 | Station b2 | Station c1 | Station c2 | Station d1 | Station e1 | Station e2 |
| Cooperative Mariner    | 7/22/91 | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Hornet                 |         | -                                      | 123.2      | 111.8      | -          | -          | -          | -          | -          |
| Cooperative Ambassador |         | -                                      | 209.3      | 178.6      | -          | -          | 71.1       | 67.2       | 72.4       |
| Eastern                |         | -                                      | 162.5      | 146.0      | -          | -          | 73.7       | 66.6       | 80.1       |
| Sam M. Fleming         |         | -                                      | 138.1      | 130.2      | -          | -          | 66.4       | 68.8       | 83.8       |
| Kevin Michael          | 7/23/91 | -                                      | 108.9      | 118.8      | -          | -          | 94.3       | 72.7       | 68.6       |
| A.M. Thompson          |         | -                                      | 139.0      | 109.5      | -          | -          | 61.6       | 64.1       | 69.7       |
| Susan Elizabeth        |         | -                                      | 147.3      | 137.8      | -          | -          | 61.7       | 63.9       | 72.3       |
| Lil Charley            |         | -                                      | 147.3      | 137.8      | -          | -          | 61.7       | 63.9       | 72.3       |
| Badger                 |         | -                                      | 151.7      | 93.5       | -          | -          | 62.9       | 66.3       | 75.8       |
| Kay D                  |         | -                                      | 148.9      | 95.3       | -          | -          | 58.5       | 66.8       | 77.7       |
| Evey-T                 |         | -                                      | 97.7       | 79.3       | -          | -          | -          | -          | -          |
| Robert Ingle           |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Prairie Dawn           |         | -                                      | -          | -          | -          | -          | -          | -          | -          |

Goose Island Site, Trip 2

60 Minutes after Barge-Tow Passage

| Tow name              | Date    | Suspended Sediment Concentration, mg/L |            |            |            |            |            |            |            |
|-----------------------|---------|----------------------------------------|------------|------------|------------|------------|------------|------------|------------|
|                       |         | Station a1                             | Station b1 | Station b2 | Station c1 | Station c2 | Station d1 | Station e1 | Station e2 |
| Ardyce Randall        | 7/18/91 | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Scarlet Knight        |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| James F. Neal         |         | 187.5                                  | 223.6      | 172.6      | 115.4      | 127.2      | -          | -          | -          |
| Helen M. Clements     |         | 123.8                                  | 101.9      | 109.0      | 101.5      | 68.5       | -          | -          | -          |
| Elizabeth Ann         |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Frank T. Heffelfinger | 7/19/91 | 121.1                                  | 128.9      | 118.3      | 84.5       | 72.2       | -          | -          | -          |
| Queen City            |         | 101.4                                  | 89.0       | 129.3      | 75.9       | 73.2       | -          | -          | -          |
| Helen M. Clements     |         | 185.7                                  | 85.1       | 109.6      | 123.4      | 128.9      | -          | -          | -          |
| Frank T. Heffelfinger |         | 162.8                                  | 87.1       | 158.2      | 119.1      | 123.8      | -          | -          | -          |
| Cooperative Venture   |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Volunteer State       |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| No name               |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Night 1               |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Night 2               | 7/20/91 | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Night 3               |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| G.R. Packet           |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Prairie Dawn          |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Prosperity            |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Clyde Butcher         |         | -                                      | 163.9      | 179.1      | -          | -          | -          | -          | -          |
| Lil Charley           |         | -                                      | 162.4      | 169.9      | -          | -          | -          | -          | -          |
| C.W. Rushing          |         | -                                      | 128.7      | 137.1      | -          | -          | -          | -          | -          |
| Conti-Nan             |         | -                                      | 122.4      | 137.6      | -          | -          | -          | 134.6      | 108.8      |
| Mary L                |         | -                                      | 120.5      | 120.2      | -          | -          | -          | -          | 141.7      |
| Scarlet Knight        | 7/21/91 | -                                      | 238.0      | 230.8      | -          | -          | -          | -          | -          |
| Conti-Karla           |         | -                                      | 118.5      | 127.0      | -          | -          | -          | 94.2       | 83.4       |



Goose Island Site, Trip 2

60 Minutes after Barge-Tow Passage (Concluded)

| Tow name               | Date    | Suspended Sediment Concentration, mg/L |            |            |            |            |            |            |            |
|------------------------|---------|----------------------------------------|------------|------------|------------|------------|------------|------------|------------|
|                        |         | Station a1                             | Station b1 | Station b2 | Station c1 | Station c2 | Station d1 | Station e1 | Station e2 |
| Cooperative Mariner    | 7/22/91 | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Hornet                 |         | -                                      | 120.3      | 106.8      | -          | -          | -          | -          | -          |
| Cooperative Ambassador |         | -                                      | 85.9       | 110.3      | -          | -          | 65.4       | 67.7       | 69.4       |
| Eastern                |         | -                                      | 89.0       | 90.1       | -          | -          | 70.7       | 70.6       | 70.5       |
| Sam M. Fleming         |         | -                                      | 115.7      | 91.8       | -          | -          | 81.2       | 69.2       | 69.3       |
| Kevin Michael          | 7/23/91 | -                                      | 112.5      | 100.1      | -          | -          | 73.4       | 75.8       | 83.4       |
| A.M. Thompson          |         | -                                      | 137.9      | 134.4      | -          | -          | 63.5       | 65.6       | 68.6       |
| Susan Elizabeth        |         | -                                      | 120.8      | 99.3       | -          | -          | 63.2       | 62.7       | 68.0       |
| Lil Charley            |         | -                                      | 120.8      | 99.3       | -          | -          | 63.2       | 62.7       | 68.0       |
| Badger                 |         | -                                      | 94.1       | 78.6       | -          | -          | -          | -          | -          |
| Kay D                  |         | -                                      | 83.3       | 76.5       | -          | -          | -          | -          | -          |
| Evey-T                 |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Robert Ingle           |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Prairie Dawn           |         | -                                      | -          | -          | -          | -          | -          | -          | -          |

# Goose Island Site, Trip 2

## 90 Minutes after Barge-Tow Passage

| Tow name              | Date    | Suspended Sediment Concentration, mg/L |            |            |            |            |            |            |            |
|-----------------------|---------|----------------------------------------|------------|------------|------------|------------|------------|------------|------------|
|                       |         | Station a1                             | Station b1 | Station b2 | Station c1 | Station c2 | Station d1 | Station e1 | Station e2 |
| Ardyce Randall        | 7/18/91 | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Scarlet Knight        |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| James F. Neal         |         | 165.8                                  | 193.1      | 141.6      | 114.9      | 127.1      | -          | -          | -          |
| Helen M. Clements     |         | 109.8                                  | 99.8       | 106.6      | 127.8      | 103.4      | -          | -          | -          |
| Elizabeth Ann         |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Frank T. Heffelfinger | 7/19/91 | 243.9                                  | 137.7      | 131.6      | 88.4       | 64.2       | -          | -          | -          |
| Queen City            |         | 100.0                                  | 74.2       | 117.9      | 92.2       | 76.8       | -          | -          | -          |
| Helen M. Clements     |         | 144.9                                  | 86.6       | 101.7      | 123.3      | 124.0      | -          | -          | -          |
| Frank T. Heffelfinger |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Cooperative Venture   |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Volunteer State       |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| No name               |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Night 1               |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Night 2               | 7/20/91 | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Night 3               |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| G.R. Packet           |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Prairie Dawn          |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Prosperity            |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Clyde Butcher         |         | -                                      | 154.2      | 161.8      | -          | -          | -          | -          | -          |
| Lil Charley           |         | -                                      | 141.6      | 152.6      | -          | -          | -          | -          | -          |
| C.W. Rushing          |         | -                                      | 140.5      | 150.8      | -          | -          | -          | -          | -          |
| Conti-Nan             |         | -                                      | 109.4      | 119.9      | -          | -          | -          | 110.4      | 146.2      |
| Mary L                |         | -                                      | 124.4      | 126.8      | -          | -          | -          | -          | 132.7      |
| Scarlet Knight        | 7/21/91 | -                                      | 156.1      | 147.9      | -          | -          | -          | -          | -          |
| Conti-Karla           |         | -                                      | 127.4      | 134.8      | -          | -          | -          | 93.0       | 81.1       |

Goose Island Site, Trip 2

90 Minutes after Barge-Tow Passage (Concluded)

| Tow name               | Date    | Suspended Sediment Concentration, mg/L |            |            |            |            |            |            |            |
|------------------------|---------|----------------------------------------|------------|------------|------------|------------|------------|------------|------------|
|                        |         | Station a1                             | Station b1 | Station b2 | Station c1 | Station c2 | Station d1 | Station e1 | Station e2 |
| Cooperative Mariner    | 7/22/91 | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Hornet                 |         | -                                      | 272.7      | 184.9      | -          | -          | -          | -          | -          |
| Cooperative Ambassador |         | -                                      | 112.1      | 104.9      | -          | 63.3       | 69.6       | 79.2       | -          |
| Eastern                |         | -                                      | 106.2      | 96.2       | -          | 62.4       | 71.3       | 78.5       | -          |
| Sam M. Fleming         |         | -                                      | 104.7      | 90.3       | -          | 60.5       | 74.8       | 78.7       | -          |
| Kevin Michael          |         | -                                      | 91.7       | 80.6       | -          | 64.8       | 90.3       | 84.8       | -          |
| A.M. Thompson          | 7/23/91 | -                                      | 117.6      | 109.2      | -          | 62.1       | 63.3       | 69.4       | -          |
| Susan Elizabeth        |         | -                                      | 98.9       | 81.3       | -          | -          | 59.4       | -          | -          |
| Lil Charley            |         | -                                      | 98.9       | 81.3       | -          | -          | -          | -          | -          |
| Badger                 |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Kay D                  |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Evey-T                 |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Robert Ingle           |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Prairie Dawn           |         | -                                      | -          | -          | -          | -          | -          | -          | -          |

**Goose Island Site, Trip 2**  
**120 Minutes after Barge-Tow Passage**

| Tow name              | Suspended Sediment Concentration, mg/L |            |            |            |            |            |            |            |            |   |
|-----------------------|----------------------------------------|------------|------------|------------|------------|------------|------------|------------|------------|---|
|                       | Date                                   | Station a1 | Station b1 | Station b2 | Station c1 | Station c2 | Station d1 | Station e1 | Station e2 |   |
| Ardyce Randall        | 7/18/91                                | -          | -          | -          | -          | -          | -          | -          | -          | - |
| Scarlet Knight        |                                        | -          | -          | -          | -          | -          | -          | -          | -          | - |
| James F. Neal         |                                        | 127.2      | 116.9      | 102.9      | 117.4      | 125.7      | -          | -          | -          | - |
| Helen M. Clements     |                                        | -          | -          | -          | -          | -          | -          | -          | -          | - |
| Elizabeth Ann         |                                        | -          | -          | -          | -          | -          | -          | -          | -          | - |
| Frank T. Heffelfinger | 7/19/91                                | 109.1      | 97.2       | 91.5       | 78.0       | 63.9       | -          | -          | -          | - |
| Queen City            |                                        | 107.3      | 74.5       | 135.6      | 102.2      | 75.6       | -          | -          | -          | - |
| Helen M. Clements     |                                        | -          | -          | -          | -          | -          | -          | -          | -          | - |
| Frank T. Heffelfinger |                                        | -          | -          | -          | -          | -          | -          | -          | -          | - |
| Cooperative Venture   |                                        | -          | -          | -          | -          | -          | -          | -          | -          | - |
| Volunteer State       |                                        | -          | -          | -          | -          | -          | -          | -          | -          | - |
| No name               |                                        | -          | -          | -          | -          | -          | -          | -          | -          | - |
| Night 1               |                                        | -          | -          | -          | -          | -          | -          | -          | -          | - |
| Night 2               | 7/20/91                                | -          | -          | -          | -          | -          | -          | -          | -          | - |
| Night 3               |                                        | -          | -          | -          | -          | -          | -          | -          | -          | - |
| G.R. Packet           |                                        | -          | -          | -          | -          | -          | -          | -          | -          | - |
| Prairie Dawn          |                                        | -          | -          | -          | -          | -          | -          | -          | -          | - |
| Prosperity            |                                        | -          | -          | -          | -          | -          | -          | -          | -          | - |
| Clyde Butcher         |                                        | -          | 237.2      | 280.1      | -          | -          | -          | -          | -          | - |
| Lil Charley           |                                        | -          | 148.3      | 173.1      | -          | -          | -          | -          | -          | - |
| C.W. Rushing          |                                        | -          | 133.0      | 125.0      | -          | -          | -          | -          | -          | - |
| Conti-Nan             |                                        | -          | 120.4      | 119.4      | -          | -          | -          | 111.6      | 140.5      | - |
| Mary L                |                                        | -          | -          | -          | -          | -          | -          | -          | -          | - |
| Scarlet Knight        | 7/21/91                                | -          | 146.3      | 175.7      | -          | -          | -          | -          | -          | - |
| Conti-Karla           |                                        | -          | 98.5       | 103.4      | -          | -          | -          | 89.2       | 76.9       | - |

Goose Island Site, Trip 2

120 Minutes after Barge-Tow Passage (Concluded)

| Tow name               | Date    | Suspended Sediment Concentration, mg/L |            |            |            |            |            |            |            |
|------------------------|---------|----------------------------------------|------------|------------|------------|------------|------------|------------|------------|
|                        |         | Station a1                             | Station b1 | Station b2 | Station c1 | Station c2 | Station d1 | Station e1 | Station e2 |
| Cooperative Mariner    | 7/22/91 | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Hornet                 |         | -                                      | 105.9      | 130.6      | -          | -          | -          | -          | -          |
| Cooperative Ambassador |         | -                                      | 99.0       | 89.9       | -          | -          | 72.9       | 72.3       | 83.5       |
| Eastern                |         | -                                      | 96.2       | 86.4       | -          | -          | 70.7       | 74.0       | 85.0       |
| Sam M. Fleming         |         | -                                      | 94.2       | 84.0       | -          | -          | 68.4       | 80.3       | 85.0       |
| Kevin Michael          | 7/23/91 | -                                      | 118.8      | 104.0      | -          | -          | 72.5       | 74.7       | 78.3       |
| A.M. Thompson          |         | -                                      | 122.7      | 109.4      | -          | -          | 63.3       | 64.2       | 68.3       |
| Susan Elizabeth        |         | -                                      | 157.6      | 87.3       | -          | -          | 62.0       | 65.4       | 74.4       |
| Lil Charley            |         | -                                      | 157.6      | 87.3       | -          | -          | 62.0       | 65.4       | 74.4       |
| Badger                 |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Kay D                  |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Evey-T                 |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Robert Ingle           |         | -                                      | -          | -          | -          | -          | -          | -          | -          |
| Prairie Dawn           |         | -                                      | -          | -          | -          | -          | -          | -          | -          |

**APPENDIX XIX.**  
**DATABASE ORGANIZATION FOR ALL STUDY SITES**

## DATABASE ORGANIZATION

The following eight databases were established for storing data from each site and trip:

| <i>Database name</i> | <i>Database contents</i>  | <i>No. of tables</i> |
|----------------------|---------------------------|----------------------|
| mcevers              | McEver's Island data      | 21                   |
| applrivr             | Apple River Island data   | 24                   |
| goose1               | Goose Island, Trip 1 data | 24                   |
| goose2               | Goose Island, Trip 2 data | 27                   |
| kamp1                | Kampsville, Trip 1 data   | 25                   |
| kamp2                | Kampsville, Trip 2 data   | 9                    |
| clarks1              | Clarks Ferry, Trip 1 data | 26                   |
| clarks2              | Clarks Ferry, Trip 2 data | 11                   |

## **McEver's Island Site**

This section describes the 21 tables of the "mcevers" database.

**ambvel1** : Contains the data for the mean ambient velocity from  
MMB511/998,999,1000,1001 meters before barge-tow passage.

**ambvel2** : Contains the data for the mean ambient velocity from  
MMB527/642 and S4/071 meters before barge-tow passage.

**impvel1** : Contains the data for the impact velocity from  
MMB511/998,999,1000,1001 meters during barge-tow passage.

**impvel2** : Contains the data for the impact velocity from  
MMB527/642 and S4/071 meters during barge-tow passage.

**brgeinfo** : Contains the data for the traffic characteristics.

**wvhtdrdn** : Contains the data for the maximum waveheight and  
maximum drawdown.

**watrslope** : Contains the data for the water surface slopes.

**bedprtl** : Contains the data for the bed material characteristics.

**peakssc** : Contains the data for the peak suspended sediment  
concentrations for the events for this trip.

**avssc** : Contains the data for the average suspended sediment  
concentrations during the events for this trip.

**ssc2bef** : Contains the data for the suspended sediment concentrations  
2 minutes prior to barge-tow passage for this trip.

**ssc5bef** : Contains the data for the suspended sediment concentrations  
5 minutes prior to barge-tow passage for this trip.

**ssc10bef** : Contains the data for the suspended sediment concentrations  
10 minutes prior to barge-tow passage for this trip.

**ssc30bef** : Contains the data for the suspended sediment concentrations  
30 minutes prior to barge-tow passage for this trip.



### **McEver's Island Site (Concluded)**

ssc60bef : Contains the data for the suspended sediment concentrations

60 minutes prior to barge-tow passage for this trip.

ssc2af : Contains the data for the suspended sediment concentrations

2 minutes after barge-tow passage for this trip.

ssc5af : Contains the data for the suspended sediment concentrations

5 minutes after barge-tow passage for this trip.

ssc30af : Contains the data for the suspended sediment concentrations

30 minutes after barge-tow passage for this trip.

ssc60af : Contains the data for the suspended sediment concentrations

60 minutes after barge-tow passage for this trip.

ssc90af : Contains the data for the suspended sediment concentrations

90 minutes after barge-tow passage for this trip.

ssc120af : Contains the data for the suspended sediment concentrations

120 minutes after barge-tow passage for this trip.

## **Apple River Island Site**

This section describes the 24 tables of the “applivr” database.

**ambvel1** : Contains the data for the mean ambient velocity from  
MMB511/998,1000,1001 and MMB527/332,642 meters before  
barge-tow passage.

**ambvel2** : Contains the data for the mean ambient velocity from  
MMB511/999 and S4/071,040 meters before barge-tow passage.

**impvel1** : Contains the data for the impact velocity from  
MMB511/998,1000,1001 and MMB527/332,642 meters during  
barge-tow passage.

**impvel2** : Contains the data for the impact velocity from  
MMB511/999 and S4/071,040 meters during barge-tow passage.

**brgeinfo** : Contains the data for the traffic characteristics.

**wvhtdrdn** : Contains the data for the maximum waveheight and  
maximum drawdown.

**watrslope** : Contains the data for the water surface slopes.

**windinfo** : Contains the data for wind speed and direction.

**tempinfo** : Contains the data for water and air temperatures and stages  
for this trip.

**recvesl** : Contains the data for the recreational vessels characteristics.

**bedprctl** : Contains the data for the bed material characteristics.

**peakssc** : Contains the data for the peak suspended sediment  
concentrations for the events for this trip.

**avssc** : Contains the data for the average suspended sediment  
concentrations during the events for this trip.

**ssc2bef** : Contains the data for the suspended sediment concentrations  
2 minutes prior to barge-tow passage for this trip.

### **Apple River Island Site (Concluded)**

- ssc5bef : Contains the data for the suspended sediment concentrations  
5 minutes prior to barge-tow passage for this trip.
- ssc10bef : Contains the data for the suspended sediment concentrations  
10 minutes prior to barge-tow passage for this trip.
- ssc30bef : Contains the data for the suspended sediment concentrations  
30minutes prior to barge-tow passage for this trip.
- ssc60bef : Contains the data for the suspended sediment concentrations  
60 minutes prior to barge-tow passage for this trip.
- ssc2af : Contains the data for the suspended sediment concentrations  
2 minutes after barge-tow passage for this trip.
- ssc5af : Contains the data for the suspended sediment concentrations  
5 minutes after barge-tow passage for this trip.
- ssc30af : Contains the data for the suspended sediment concentrations  
30 minutes after barge-tow passage for this trip.
- ssc60af : Contains the data for the suspended sediment concentrations  
60 minutes after barge-tow passage for this trip.
- ssc90af : Contains the data for the suspended sediment concentrations  
90 minutes after barge-tow passage for this trip.
- ssc120af : Contains the data for the suspended sediment concentrations  
120 minutes after barge-tow passage for this trip.

## **Goose Island Site, Trip 1**

This section describes the 24 tables of the “goose1” database.

**ambvel1** : Contains the data for the mean ambient velocity from

MMB511/998,999,1000,1001 and MMB527/642 meters before  
barge-tow passage.

**ambvel2** : Contains the data for the mean ambient velocity from

MMB527/332 and S4/071,040 meters before barge-tow passage.

**impvel1** : Contains the data for the impact velocity from

MMB511/998,999,1000,1001 and MMB527/642 meters during  
barge-tow passage.

**impvel2** : Contains the data for the impact velocity from

MMB527/332 and S4/071,040 meters during barge-tow passage.

**brgeinfo** : Contains the data for the traffic characteristics.

**wvhtdrdn** : Contains the data for the maximum waveheight and  
maximum drawdown.

**watrslope** : Contains the data for the water surface slopes.

**windinfo** : Contains the data for wind speed and direction.

**tempinfo** : Contains the data for water and air temperatures and stages  
for this trip.

**recvesl** : Contains the data for the recreational vessels characteristics.

**bedprctl** : Contains the data for the bed material characteristics.

**peakssc** : Contains the data for the peak suspended sediment  
concentrations for the events for this trip.

**avssc** : Contains the data for the average suspended sediment  
concentrations during the events for this trip.

**ssc2bef** : Contains the data for the suspended sediment concentrations  
2 minutes prior to barge-tow passage for this trip.

### **Goose Island Site, Trip 1 (Concluded)**

- ssc5bef : Contains the data for the suspended sediment concentrations  
5 minutes prior to barge-tow passage for this trip.
- ssc10bef : Contains the data for the suspended sediment concentrations  
10 minutes prior to barge-tow passage for this trip.
- ssc30bef : Contains the data for the suspended sediment concentrations  
30minutes prior to barge-tow passage for this trip.
- ssc60bef : Contains the data for the suspended sediment concentrations  
60 minutes prior to barge-tow passage for this trip.
- ssc2af : Contains the data for the suspended sediment concentrations  
2 minutes after barge-tow passage for this trip.
- ssc5af : Contains the data for the suspended sediment concentrations  
5 minutes after barge-tow passage for this trip.
- ssc30af : Contains the data for the suspended sediment concentrations  
30 minutes after barge-tow passage for this trip.
- ssc60af : Contains the data for the suspended sediment concentrations  
60 minutes after barge-tow passage for this trip.
- ssc90af : Contains the data for the suspended sediment concentrations  
90 minutes after barge-tow passage for this trip.
- ssc120af : Contains the data for the suspended sediment concentrations  
120 minutes after barge-tow passage for this trip.

## **Goose Island Site, Trip 2**

This section describes the 27 tables of the "goose2" database.

**ambvel1** : Contains the data for the mean ambient velocity from

MMB511/998,999,1001,1130,1131 meters before  
barge-tow passage.

**ambvel2** : Contains the data for the mean ambient velocity from

MMB511/1000,MMB527/332,642 and S4/071,151 meters before  
barge-tow passage.

**ambvel3** : Contains the data for the mean ambient velocity from

S4/040,832,834 meters before barge-tow passage.

**impvel1** : Contains the data for the impact velocity from

MMB511/998,999,1001,1130,1131 meters during barge-tow  
passage.

**impvel2** : Contains the data for the impact velocity from MMB511/1000,

MMB527/332,642 and S4/071,151 meters during barge-tow  
passage.

**impvel3** : Contains the data for the impact velocity from S4/040,832,834

meters during barge-tow passage.

**brgeinfo** : Contains the data for the traffic characteristics.

**wvhtdrdn** : Contains the data for the maximum waveheight and

maximum drawdown.

**watrslope** : Contains the data for the water surface slopes.

**windinfo** : Contains the data for wind speed and direction.

**tempinfo** : Contains the data for water and air temperatures and stages  
for this trip.

**recvesl** : Contains the data for the recreational vessels characteristics.

**bedprctl** : Contains the data for the bed material characteristics.

## **Goose Island Site, Trip 2 (Concluded)**

- ambssc** : Contains the data for ambient suspended sediment concentrations.
- peakssc** : Contains the data for the peak suspended sediment concentrations for the events for this trip.
- avssc** : Contains the data for the average suspended sediment concentrations during the events for this trip.
- ssc2bef** : Contains the data for the suspended sediment concentrations 2 minutes prior to barge-tow passage for this trip.
- ssc5bef** : Contains the data for the suspended sediment concentrations 5 minutes prior to barge-tow passage for this trip.
- ssc10bef** : Contains the data for the suspended sediment concentrations 10 minutes prior to barge-tow passage for this trip.
- ssc30bef** : Contains the data for the suspended sediment concentrations 30minutes prior to barge-tow passage for this trip.
- ssc60bef** : Contains the data for the suspended sediment concentrations 60 minutes prior to barge-tow passage for this trip.
- ssc2af** : Contains the data for the suspended sediment concentrations 2 minutes after barge-tow passage for this trip.
- ssc5af** : Contains the data for the suspended sediment concentrations 5 minutes after barge-tow passage for this trip.
- ssc30af** : Contains the data for the suspended sediment concentrations 30 minutes after barge-tow passage for this trip.
- ssc60af** : Contains the data for the suspended sediment concentrations 60 minutes after barge-tow passage for this trip.
- ssc90af** : Contains the data for the suspended sediment concentrations 90 minutes after barge-tow passage for this trip.
- ssc120af** : Contains the data for the suspended sediment concentrations 120 minutes after barge-tow passage for this trip.

## **Kampsville Site, Trip 1**

This section describes the 25 tables of the “kamp1” database.

**ambvel1** : Contains the data for the mean ambient velocity from

MMB511/998,999,1000,1001 and MMB527/642 meters before  
barge-tow passage.

**ambvel2** : Contains the data for the mean ambient velocity from

MMB527/332 and S4/040,071 meters before barge-tow passage.

**impvel1** : Contains the data for the impact velocity from

MMB511/998,999,1000,1001 and MMB527/642 meters during  
barge-tow passage.

**impvel2** : Contains the data for the impact velocity from MMB527/332 and

S4/040,071 meters during barge-tow passage.

**brgeinfo** : Contains the data for the traffic characteristics.

**wvhtdrdn** : Contains the data for the maximum waveheight and  
maximum drawdown.

**watrslope** : Contains the data for the water surface slopes.

**windinfo** : Contains the data for wind speed and direction.

**tempinfo** : Contains the data for water and air temperatures and stages  
for this trip.

**recvesl** : Contains the data for the recreational vessels characteristics.

**bedprtcl** : Contains the data for the bed material characteristics.

**ambssc** : Contains the data for ambient suspended sediment  
concentrations.

**peakssc** : Contains the data for the peak suspended sediment  
concentrations for the events for this trip.

**avssc** : Contains the data for the average suspended sediment  
concentrations during the events for this trip.



### **Kampsville Site, Trip 1 (Concluded)**

**ssc2bef** : Contains the data for the suspended sediment concentrations

2 minutes prior to barge-tow passage for this trip.

**ssc5bef** : Contains the data for the suspended sediment concentrations

5 minutes prior to barge-tow passage for this trip.

**ssc10bef** : Contains the data for the suspended sediment concentrations

10 minutes prior to barge-tow passage for this trip.

**ssc30bef** : Contains the data for the suspended sediment concentrations

30minutes prior to barge-tow passage for this trip.

**ssc60bef** : Contains the data for the suspended sediment concentrations

60 minutes prior to barge-tow passage for this trip.

**ssc2af** : Contains the data for the suspended sediment concentrations

2 minutes after barge-tow passage for this trip.

**ssc5af** : Contains the data for the suspended sediment concentrations

5 minutes after barge-tow passage for this trip.

**ssc30af** : Contains the data for the suspended sediment concentrations

30 minutes after barge-tow passage for this trip.

**ssc60af** : Contains the data for the suspended sediment concentrations

60 minutes after barge-tow passage for this trip.

**ssc90af** : Contains the data for the suspended sediment concentrations

90 minutes after barge-tow passage for this trip.

**ssc120af** : Contains the data for the suspended sediment concentrations

120 minutes after barge-tow passage for this trip.

## **Kampsville Site, Trip 2**

This section describes the 9 tables of the “kamp2” database.

**ambvel1** : Contains the data for the mean ambient velocity from

MMB511/998,999,1001 meters before barge-tow passage.

**ambvel2** : Contains the data for the mean ambient velocity from

MMB511/1000 and MMB527/332,642 meters before barge-tow passage.

**impvel1** : Contains the data for the impact velocity from

MMB511/998,999,1001 meters during barge-tow passage.

**impvel2** : Contains the data for the impact velocity from MMB511/1000 and

MMB527/332,642 meters during barge-tow passage.

**brgeinfo** : Contains the data for the traffic characteristics.

**wvhtdrdn** : Contains the data for the maximum waveheight and maximum drawdown.

**watrslope** : Contains the data for the water surface slopes.

**tempinfo** : Contains the data for water and air temperatures and stages for this trip.

**ambssc** : Contains the data for ambient suspended sediment concentrations

### **Clarks Ferry Site, Trip 1**

This section describes the 26 tables of the "clarks1" database.

**ambvel1** : Contains the data for the mean ambient velocity from

MMB511/1001,1130,1131,998,999 meters before barge-tow  
passage.

**ambvel2** : Contains the data for the mean ambient velocity from

MB511/1000,MMB527/332,642 and S4/151,834 meters before  
barge-tow passage.

**ambvel3** : Contains the data for the mean ambient velocity from

S4/040,832,071 meters before barge-tow passage.

**impvel1** : Contains the data for the impact velocity from

MMB511/1001,1130,1131,998,999 meters during barge-tow  
passage.

**impvel2** : Contains the data for the impact velocity from MMB511/1000,

MMB527/332,642 and S4/151,834 meters during barge-tow  
passage.

**impvel3** : Contains the data for the impact velocity from S4/040,832,071

meters during barge-tow passage.

**brgeinfo** : Contains the data for the traffic characteristics.

**wvhtdrdn** : Contains the data for the maximum waveheight and

maximum drawdown.

**watrslope** : Contains the data for the water surface slopes.

**windinfo** : Contains the data for wind speed and direction.

**tempinfo** : Contains the data for water and air temperatures and stages

for this trip.

**recvesl** : Contains the data for the recreational vessels characteristics.

**ambssc** : Contains the data for ambient suspended sediment concentrations.

### **Clarks Ferry Site, Trip 1 (Concluded)**

- peakssc** : Contains the data for the peak suspended sediment concentrations for the events for this trip.
- avssc** : Contains the data for the average suspended sediment concentrations during the events for this trip.
- ssc2bef** : Contains the data for the suspended sediment concentrations 2 minutes prior to barge-tow passage for this trip.
- ssc5bef** : Contains the data for the suspended sediment concentrations 5 minutes prior to barge-tow passage for this trip.
- ssc10bef** : Contains the data for the suspended sediment concentrations 10 minutes prior to barge-tow passage for this trip.
- ssc30bef** : Contains the data for the suspended sediment concentrations 30minutes prior to barge-tow passage for this trip.
- ssc60bef** : Contains the data for the suspended sediment concentrations 60 minutes prior to barge-tow passage for this trip.
- ssc2af** : Contains the data for the suspended sediment concentrations 2 minutes after barge-tow passage for this trip.
- ssc5af** : Contains the data for the suspended sediment concentrations 5 minutes after barge-tow passage for this trip.
- ssc30af** : Contains the data for the suspended sediment concentrations 30 minutes after barge-tow passage for this trip.
- ssc60af** : Contains the data for the suspended sediment concentrations 60 minutes after barge-tow passage for this trip.
- ssc90af** : Contains the data for the suspended sediment concentrations 90 minutes after barge-tow passage for this trip.
- ssc120af** : Contains the data for the suspended sediment concentrations 120 minutes after barge-tow passage for this trip.

## **Clarks Ferry Site, Trip 2**

This section describes the 11 tables of the "clarks2" database.

- ambvel1** : Contains the data for the mean ambient velocity from  
MMB511/998,999,1000,1001,1130 meters before barge-tow  
passage.
- ambvel2** : Contains the data for the mean ambient velocity from  
MB511/1131,MMB527/332,642 and S4/834 meters before barge-  
tow passage.
- ambvel3** : Contains the data for the mean ambient velocity from  
S4/151,832,040 meters before barge-tow passage.
- impvel1** : Contains the data for the impact velocity from  
511/998,999,1000,1001,1130 meters during barge-tow passage.
- impvel2** : Contains the data for the impact velocity from MMB511/1131,  
MMB527/332,642 and S4/834 meters during barge-tow passage.
- impvel3** : Contains the data for the impact velocity from S4/151,832,040  
meters during barge-tow passage.
- brgeinfo** : Contains the data for the traffic characteristics.
- wvhtdrdn** : Contains the data for the maximum waveheight and  
maximum drawdown.
- tempinfo** : Contains the data for water and air temperatures and stages  
for this trip
- recvesl** : Contains the data for the recreational vessels characteristics.
- bedprctl** : Contains the data for the bed material characteristics.

**APPENDIX XX.**

**SAMPLE PLOTS OF ALTERED VELOCITY REGIMES  
DUE TO MOVEMENT OF NAVIGATION TRAFFIC**

XX-1. Velocity fluctuations measured by two-dimensional current meters  
for barge *Reliance*, McEver's Island

Reliance (5/18/89)

Status of Electromagnetic Current Meters:

|          |          |          |          |
|----------|----------|----------|----------|
| 998      | 999      | 1000     | 1001     |
| (MMB511) | (MMB511) | (MMB511) | (MMB511) |
| ✓        | ✓        | ✓        | *        |

642  
(MMB527)  
✓

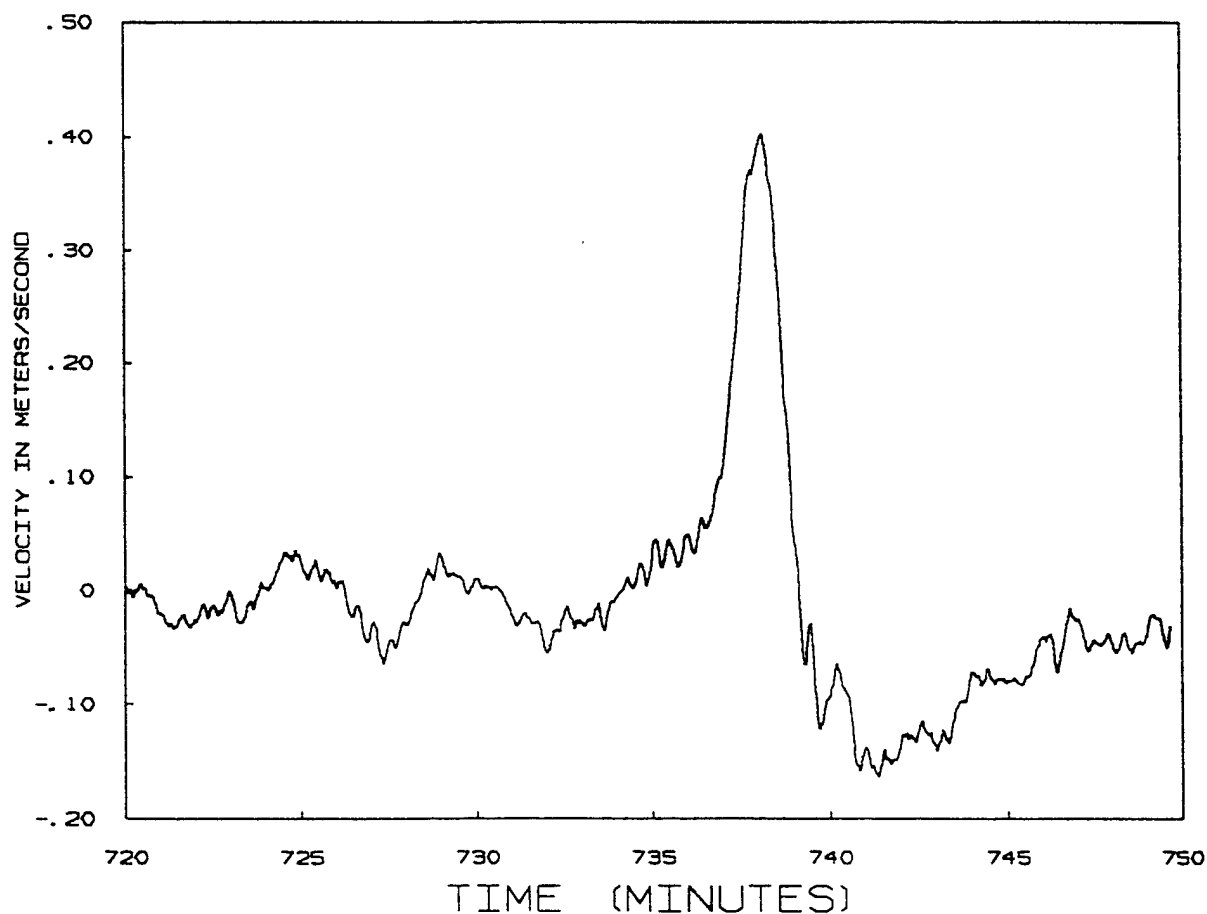
071  
(S4)  
✓

Note: ✓ : Working  
\* : Not working  
- : Unavailable



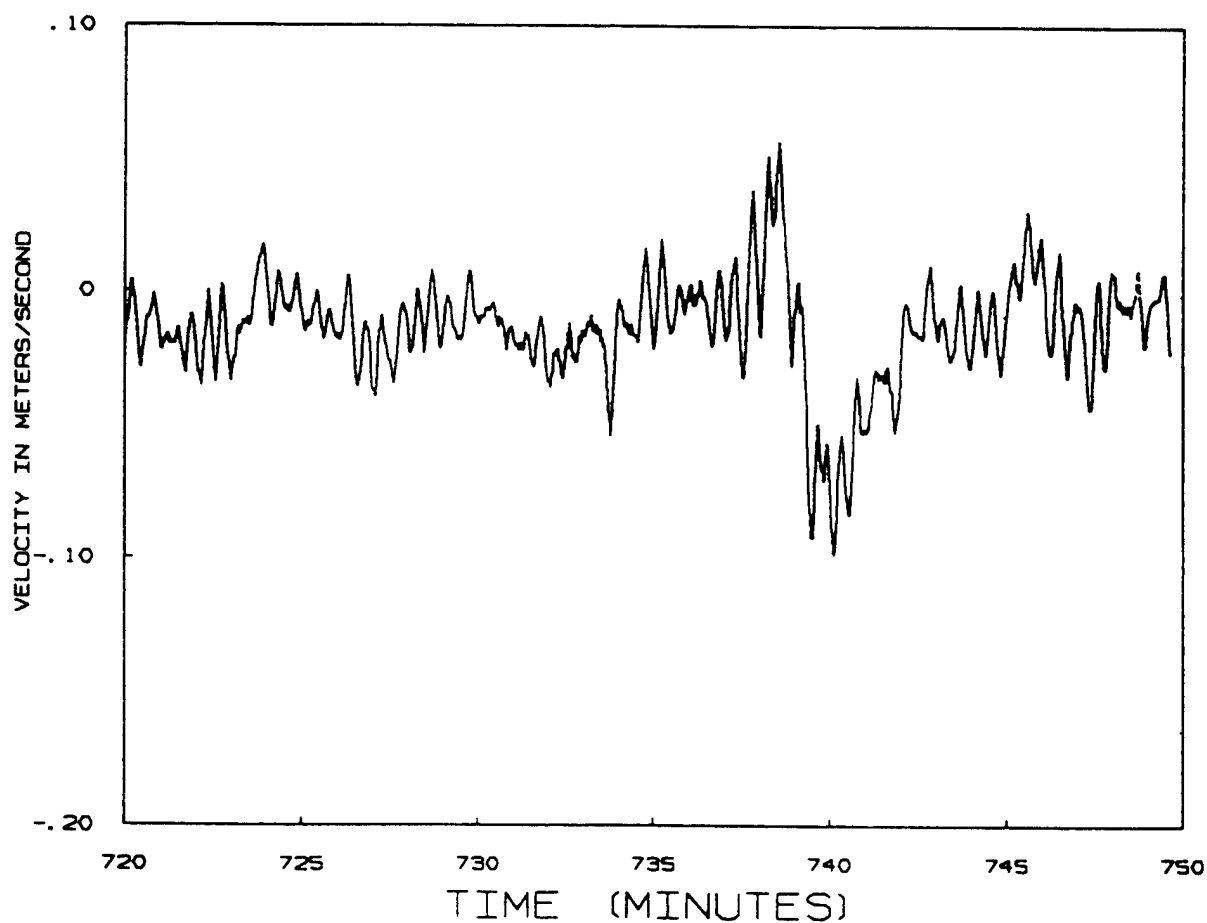
|               |          |            |                  |
|---------------|----------|------------|------------------|
| meter number  | 511- 998 | start-time | 1200             |
| tow name      | reliance | end-time   | 1230             |
| configuration | 3x5      | mean =     | -0.01            |
| draft         | 6.8      | vmax =     | 0.00 tmax = 738. |
| speed         | 5.1 mph  | vmin =     | 0.00 tmin = 741. |
| direction     | upstream |            |                  |
| distance      | 623      |            |                  |

MARSH MCBIRNEY 511/527 PLOTTING ROUTINE X - COMPONENT



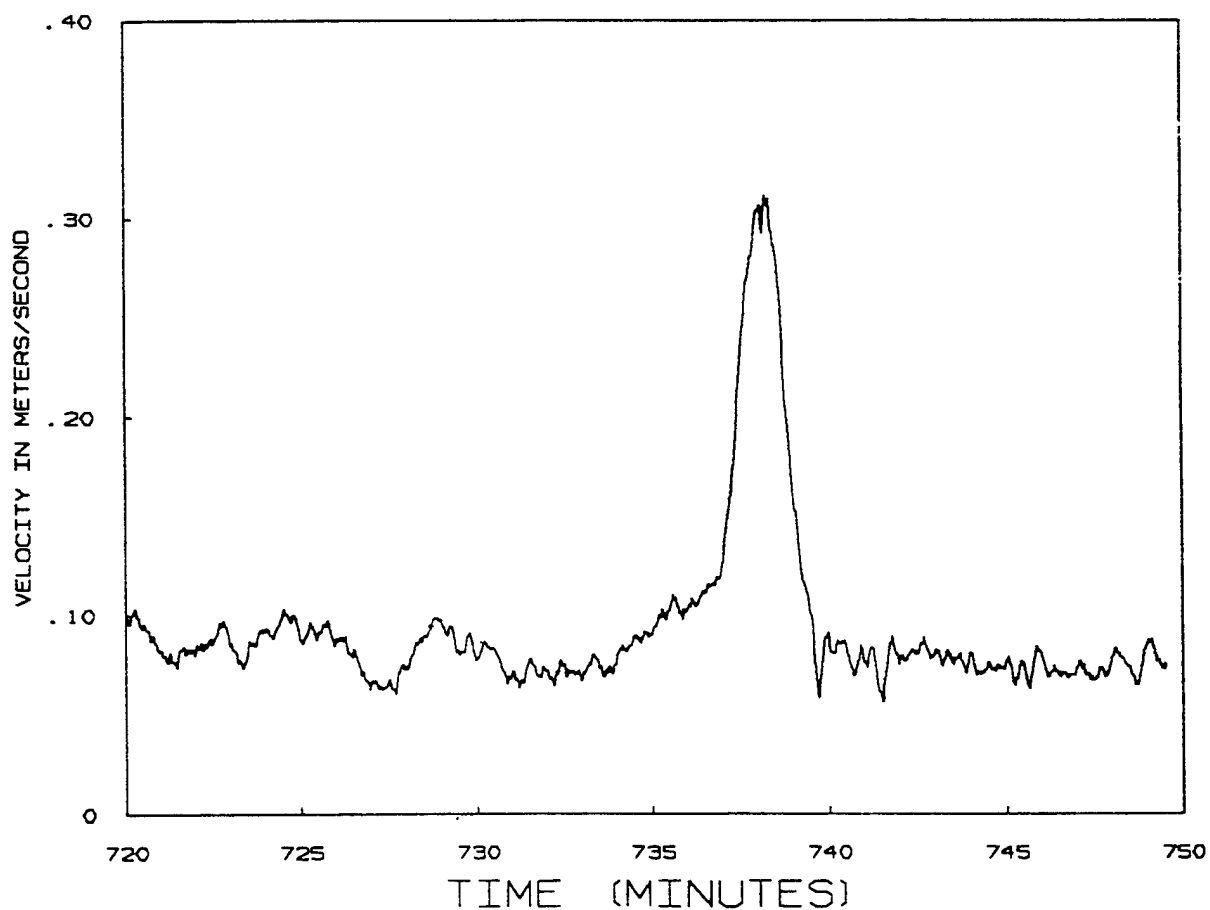
|               |          |            |                  |
|---------------|----------|------------|------------------|
| meter number  | 511- 998 | start-time | 1200             |
| tow name      | reliance | end-time   | 1230             |
| configuration | 3x5      | mean =     | -0.01            |
| draft         | 6.8      | vmax =     | 0.00 tmax = 739. |
| speed         | 5.1 mph  | vmin =     | 0.00 tmin = 740. |
| direction     | upstream |            |                  |
| distance      | 623      |            |                  |

MARSH MCBIRNEY 511/527 PLOTTING ROUTINE Y - COMPONENT



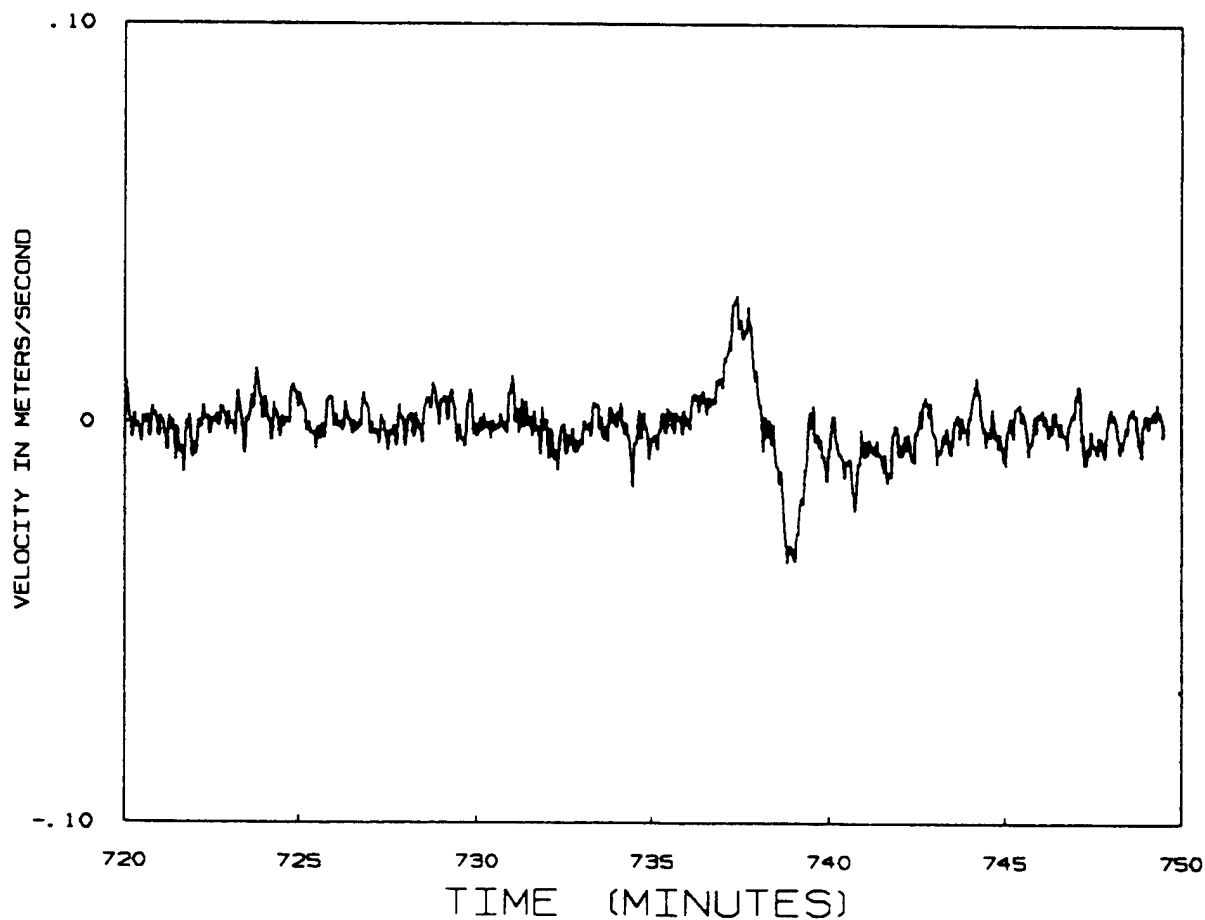
|               |          |            |                  |
|---------------|----------|------------|------------------|
| meter number  | 999      | distance   | 623              |
| tow name      | reliance | start-time | 1200             |
| configuration | 3x5      | end-time   | 1230             |
| draft         | 6.8      | mean =     | 0.09             |
| speed         | 5.1 mph  | vmax =     | 0.31 tmax = 738. |
| direction     | upstream | vmin =     | 0.06 tmin = 742. |

MARSH MCBIRNEY S11/LOGGER2 PLOTTING ROUT X - COMPONENT



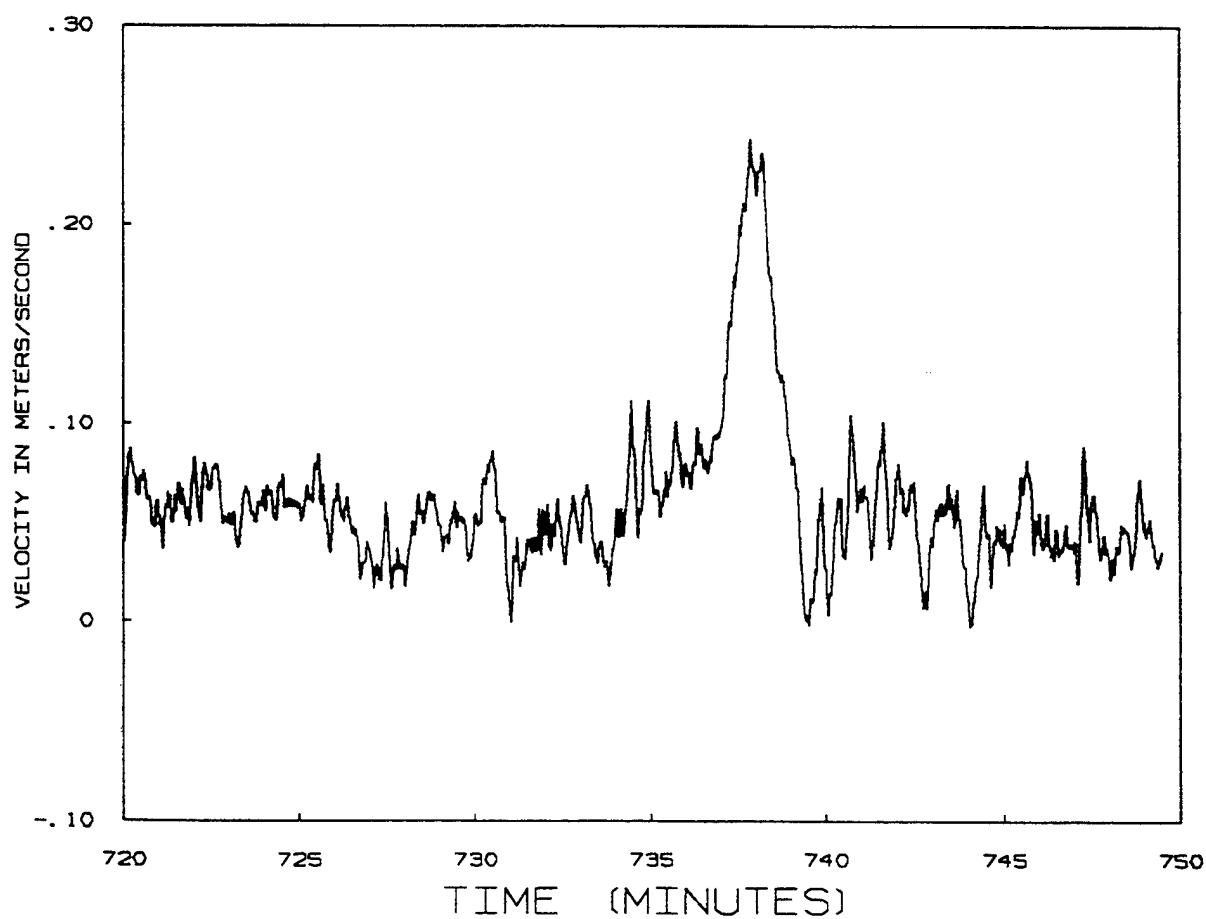
|               |          |            |                   |
|---------------|----------|------------|-------------------|
| meter number  | 999      | distance   | 623               |
| tow name      | reliance | start-time | 1200              |
| configuration | 3x5      | end-time   | 1230              |
| draft         | 6.8      | mean =     | 0.00              |
| speed         | 5.1 mph  | vmax =     | 0.03 tmax = 737.  |
| direction     | upstream | vmin =     | -0.03 tmin = 739. |

MARSH MCBIRNEY S11/LOGGER2 PLOTTING ROUT Y - COMPONENT



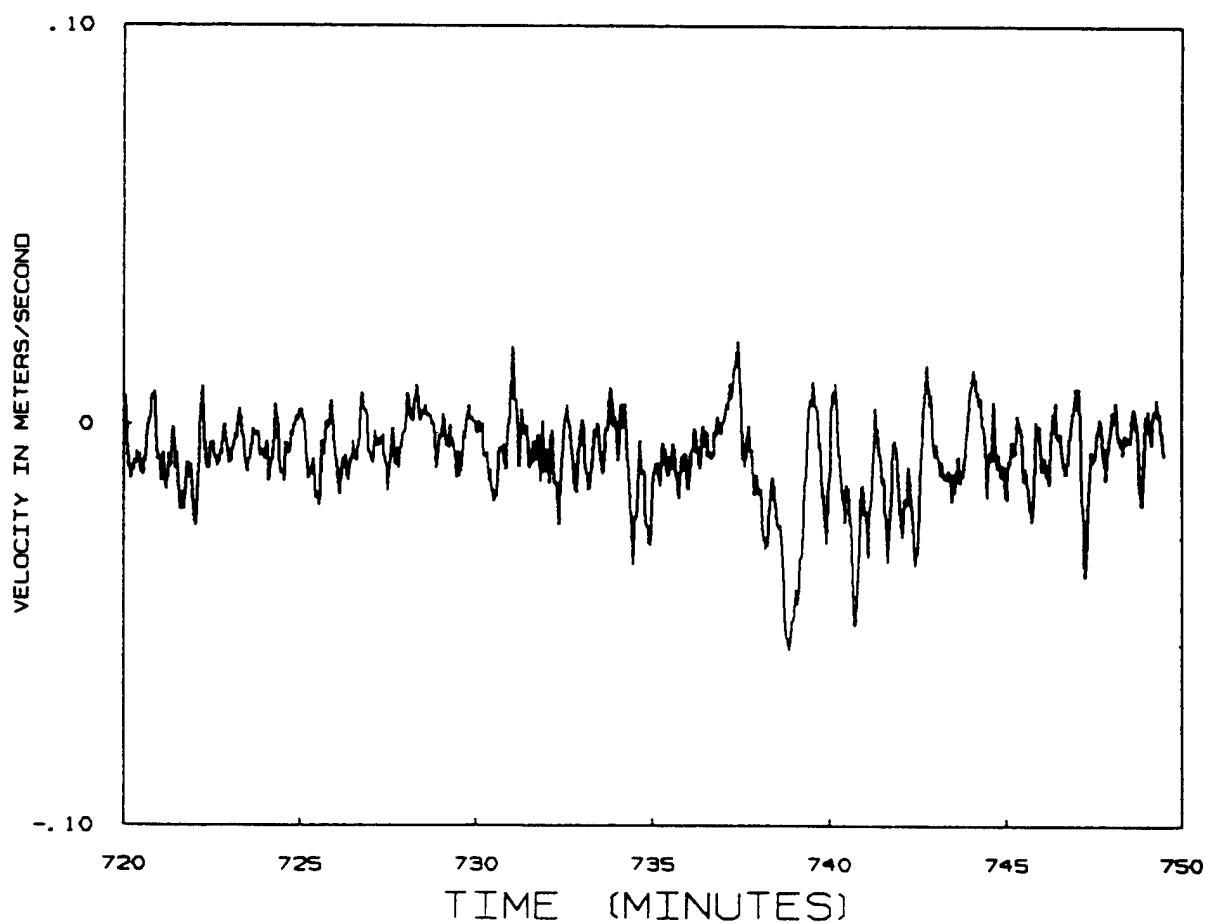
|               |          |            |                  |
|---------------|----------|------------|------------------|
| meter number  | 1000     | distance   | 623              |
| tow name      | reliance | start-time | 1200             |
| configuration | 3x5      | end-time   | 1230             |
| draft         | 6.8      | mean =     | 0.05             |
| speed         | 5.1 mph  | vmax =     | 0.24 tmax = 738. |
| direction     | upstream | vmin =     | 0.00 tmin = 744. |

MARSH MCBIRNEY 511/LOGGER2 PLOTTING ROUT X - COMPONENT



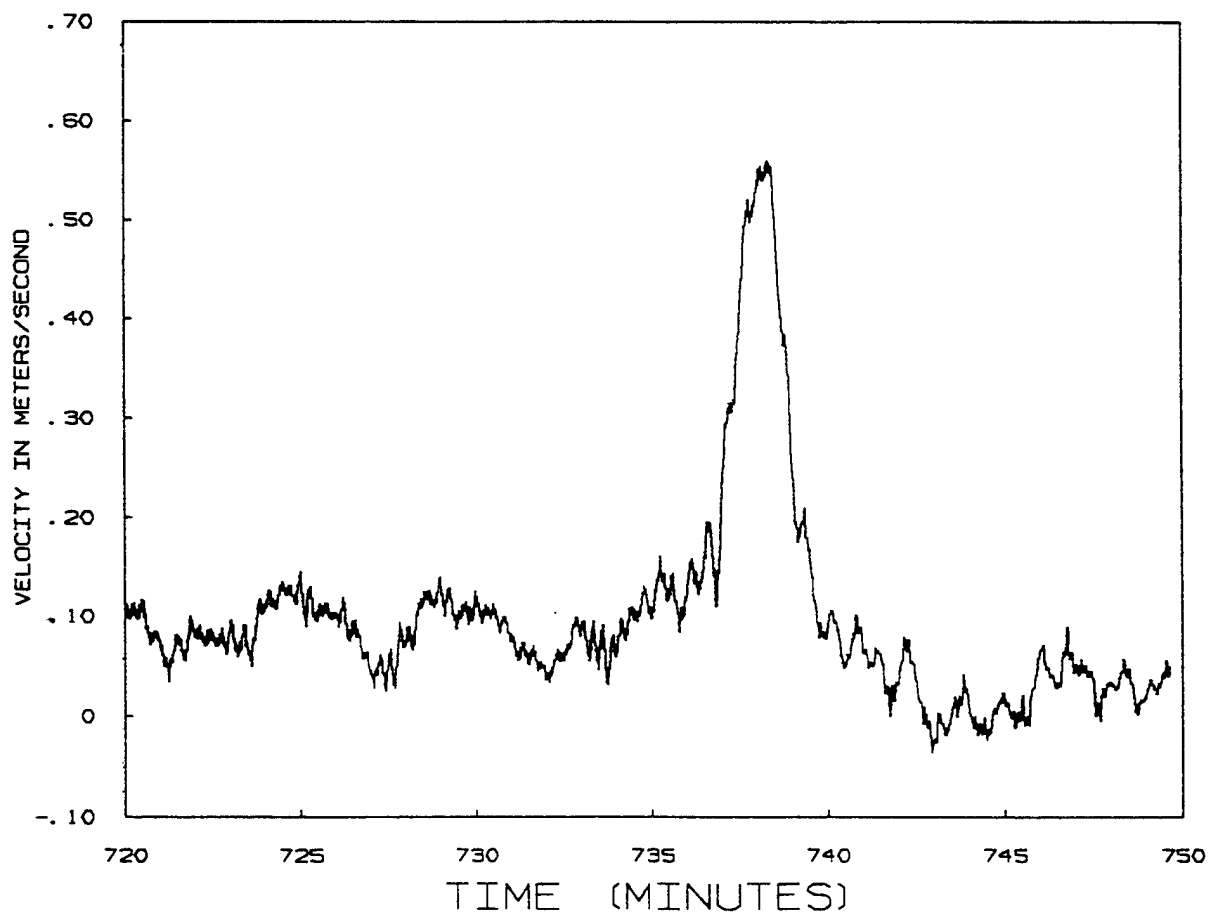
|               |          |            |                   |
|---------------|----------|------------|-------------------|
| meter number  | 1000     | distance   | 623               |
| tow name      | reliance | start-time | 1200              |
| configuration | 3x5      | end-time   | 1230              |
| draft         | 6.8      | mean =     | -0.01             |
| speed         | 5.1 mph  | vmax =     | 0.02 tmax = 737.  |
| direction     | upstream | vmin =     | -0.06 tmin = 739. |

MARSH MCBIRNEY S11/LOGGER2 PLOTTING ROUT Y - COMPONENT



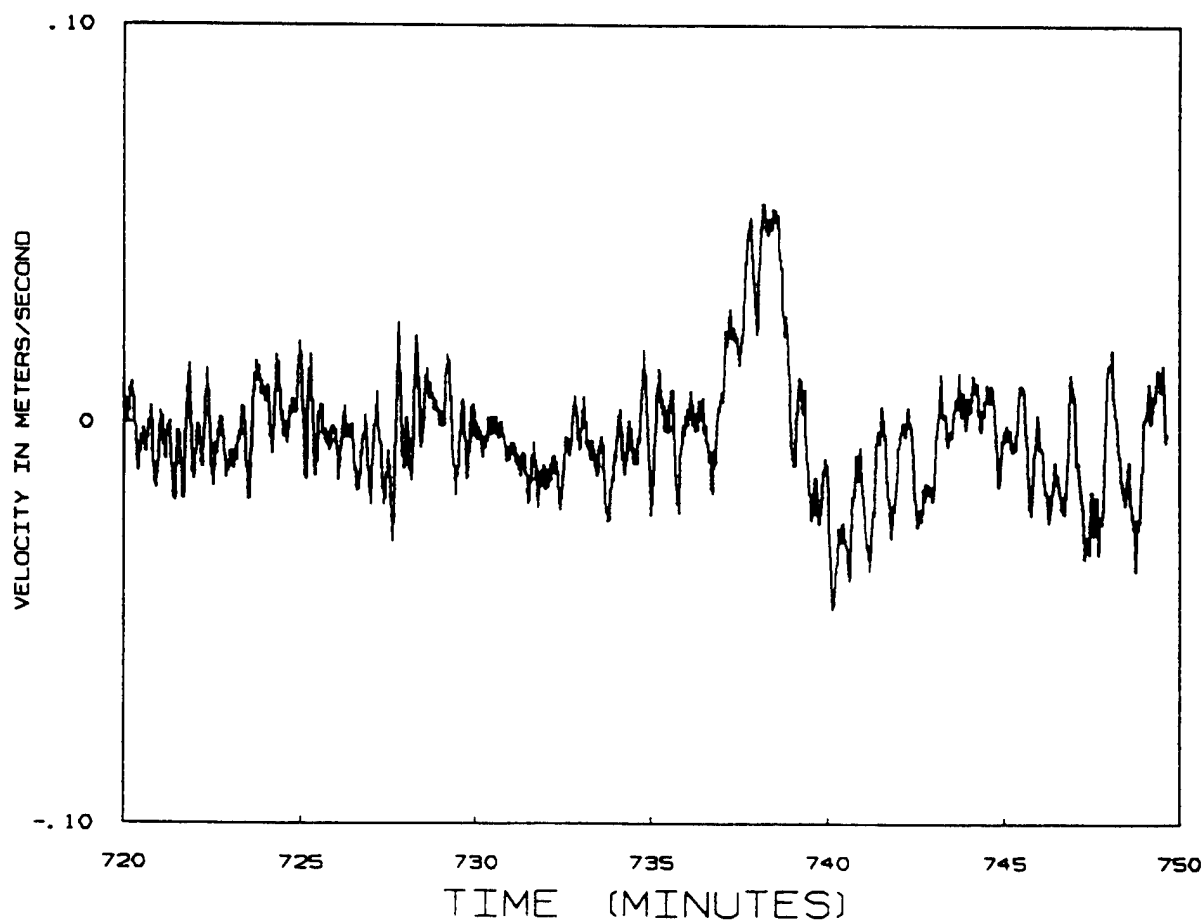
|               |          |            |                  |
|---------------|----------|------------|------------------|
| meter number  | B-642    | start-time | 1200             |
| tow name      | reliance | end-time   | 1230             |
| configuration | 3x5      | mean =     | 0.09             |
| draft         | 6.8      | vmax =     | 0.00 tmax = 738. |
| speed         | 5.1 mph  | vmin =     | 0.00 tmin = 743. |
| direction     | upstream |            |                  |
| distance      | 623      |            |                  |

MARSH MCBIRNEY S11/S27 PLOTTING ROUTINE X - COMPONENT



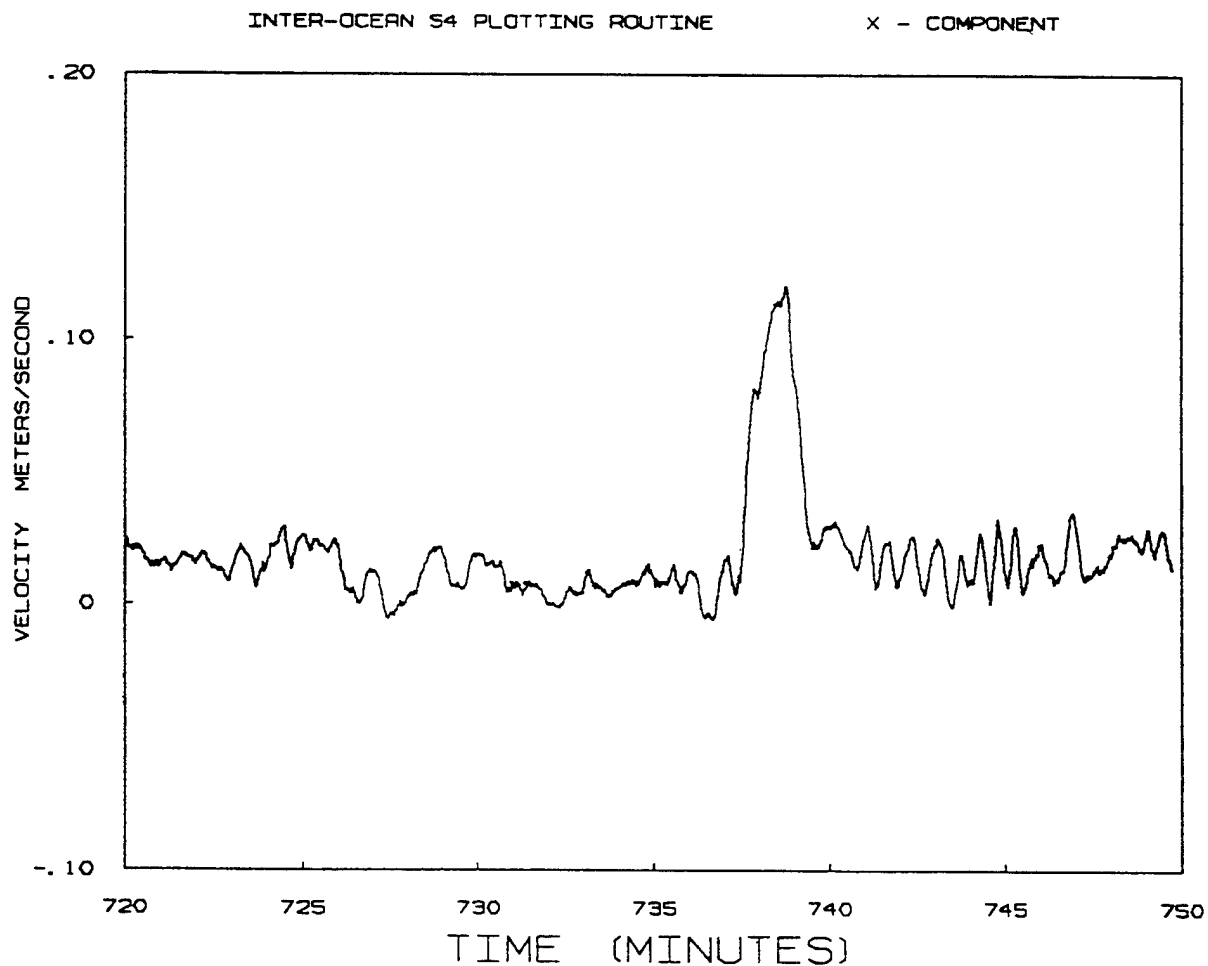
|               |          |            |                  |
|---------------|----------|------------|------------------|
| meter number  | B-642    | start-time | 1200             |
| tow name      | reliance | end-time   | 1230             |
| configuration | 3x5      | mean =     | 0.00             |
| draft         | 6.8      | vmax =     | 0.00 tmax = 738. |
| speed         | 5.1 mph  | vmin =     | 0.00 tmin = 740. |
| direction     | upstream |            |                  |
| distance      | 623      |            |                  |

MARSH MCBIRNEY 511/527 PLOTTING ROUTINE Y - COMPONENT

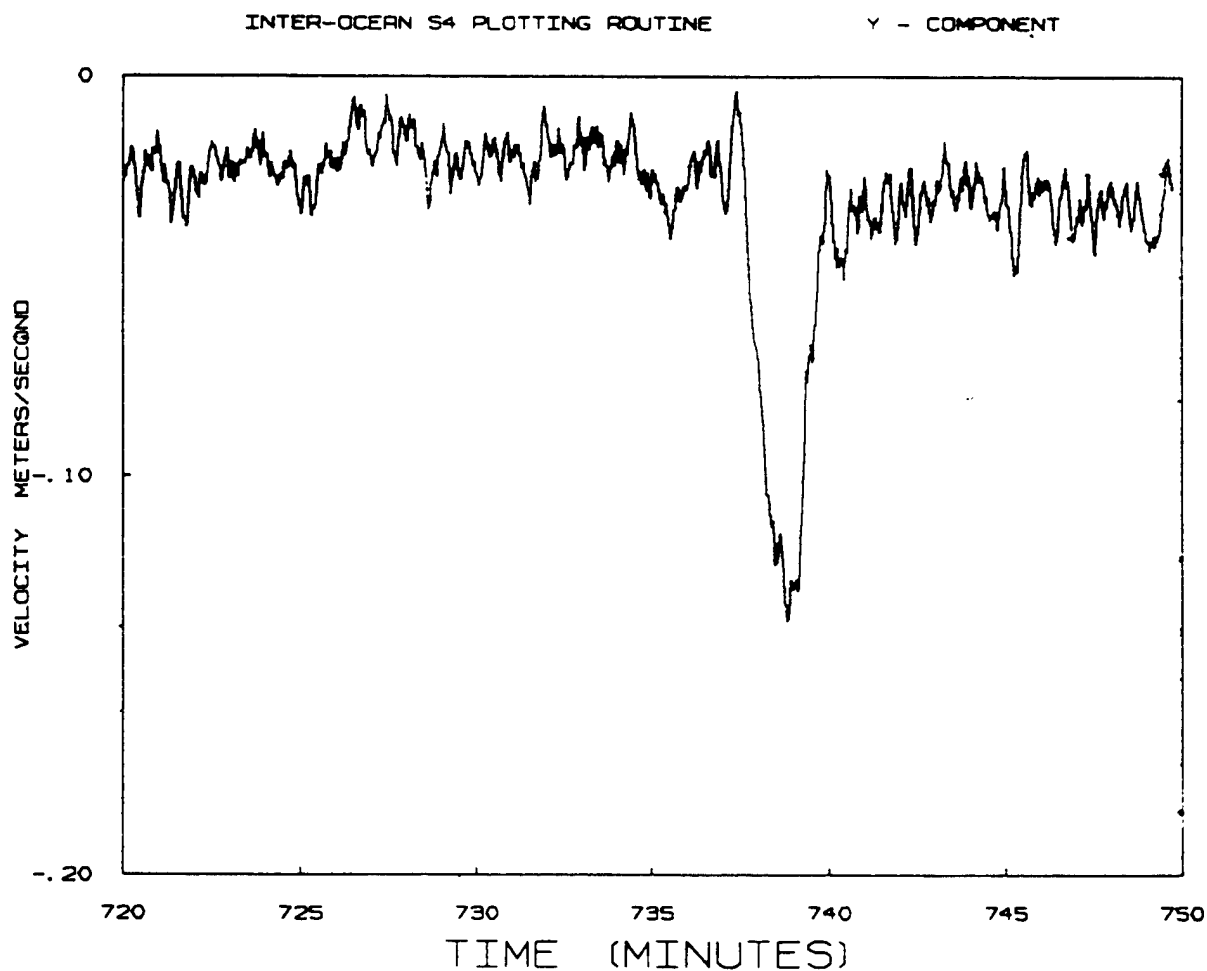




|               |          |            |                   |
|---------------|----------|------------|-------------------|
| meter number  | 071      | distance   | 623               |
| tow name      | reliance | start-time | 1200              |
| configuration | 3x5      | end-time   | 1230              |
| draft         | 6.8      | MEAN =     | 0.01              |
| speed         | 5.1 mph  | VMAX =     | 0.12 TMAX = 739.  |
| direction     | upstream | VMIN =     | -0.01 TMIN = 737. |



|               |          |            |                     |
|---------------|----------|------------|---------------------|
| meter number  | 071      | distance   | 623                 |
| tow name      | reliance | start-time | 1200                |
| configuration | 3x5      | end-time   | 1230                |
| draft         | 6.8      | MEAN       | = -0.02             |
| speed         | 5.1 mph  | VMAX       | = 0.00 TMAX = 737.  |
| direction     | upstream | VMIN       | = -0.14 TMIN = 739. |



XX-2. Velocity fluctuations measured by two-dimensional current meters  
for barge *D. Ray Miller*, Apple River Island

D. Ray Miller (5/21/90)

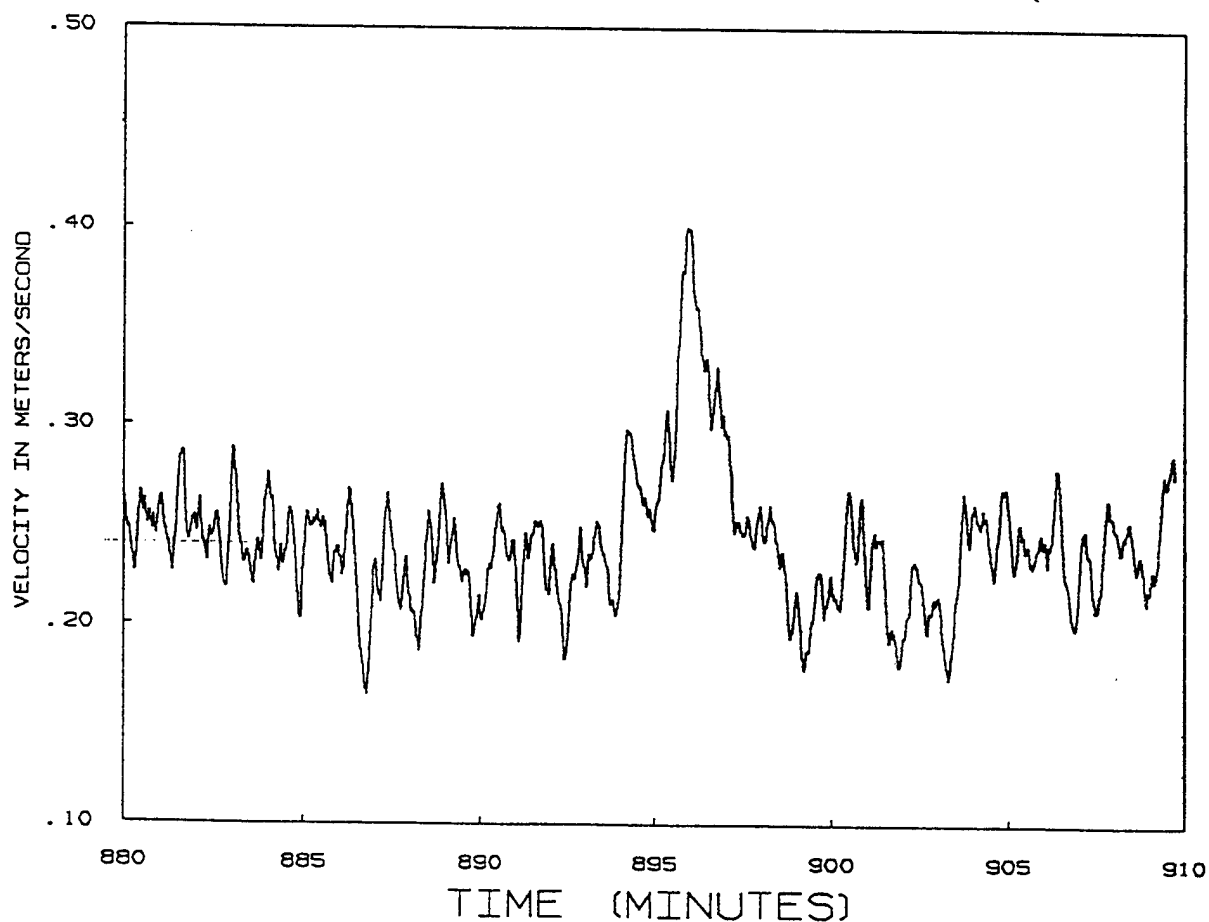
Status of Electromagnetic Current Meters:

|                       |                       |                      |                      |
|-----------------------|-----------------------|----------------------|----------------------|
| 1001<br>(MMB511)<br>✓ | 1000<br>(MMB511)<br>✓ | 998<br>(MMB511)<br>✓ | 999<br>(MMB511)<br>* |
| 642<br>(MMB527)<br>✓  | 332<br>(MMB527)<br>✓  |                      |                      |
| 071<br>(S4)<br>✓      | 040<br>(S4)<br>✓      |                      |                      |

Note: ✓ : Working  
\* : Not working  
- : Unavailable

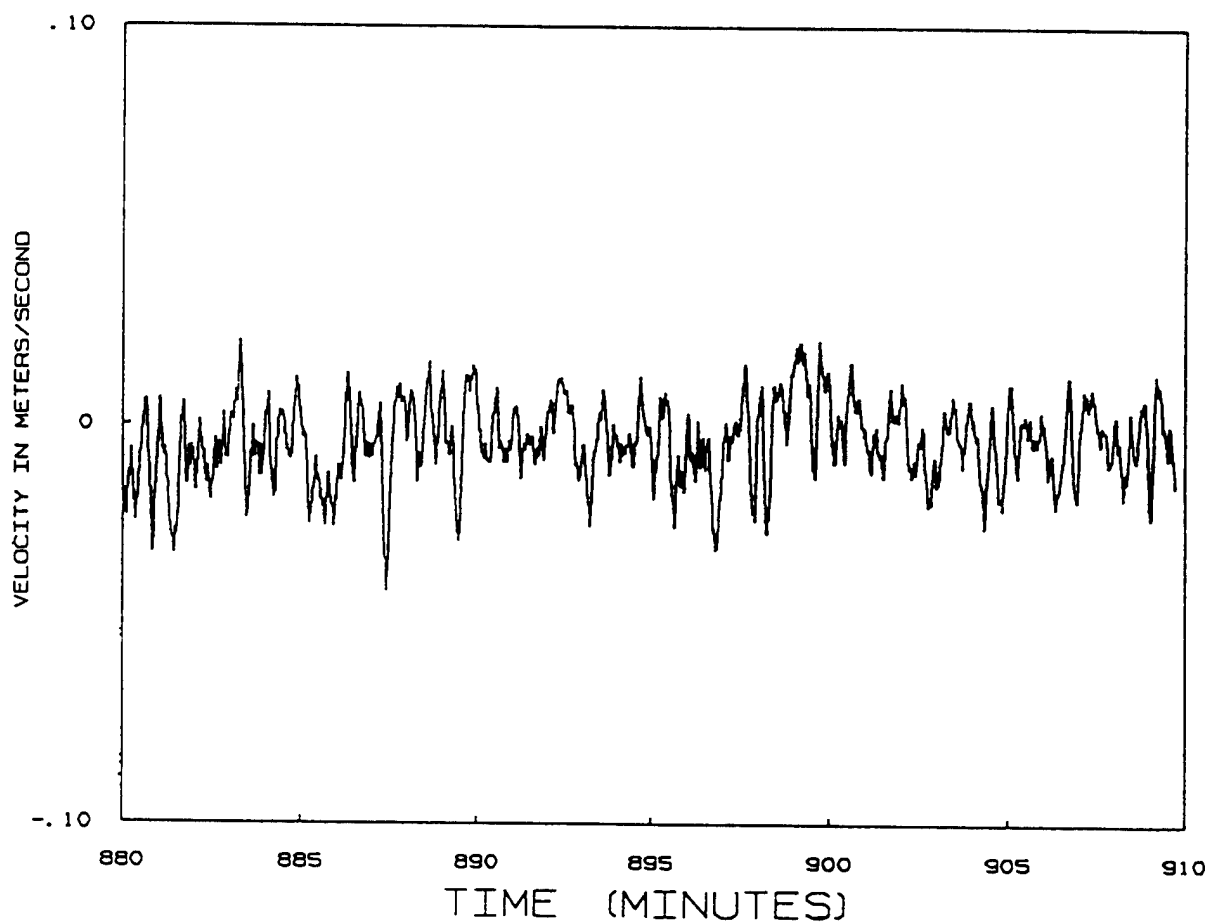
|               |              |            |                  |
|---------------|--------------|------------|------------------|
| meter number  | 511-1001     | start-time | 1440             |
| tow name      | d.ray miller | end-time   | 1510             |
| configuration | 3x3+2x1      | mean =     | 0.24             |
| draft         | 7.1          | vmax =     | 0.00 tmax = 896. |
| speed         | 4.9 mph      | vmin =     | 0.00 tmin = 887. |
| direction     | upstream     |            |                  |
| distance      | 700          |            |                  |

MARSH MCBIRNEY 511/527 PLOTTING ROUTINE X - COMPONENT



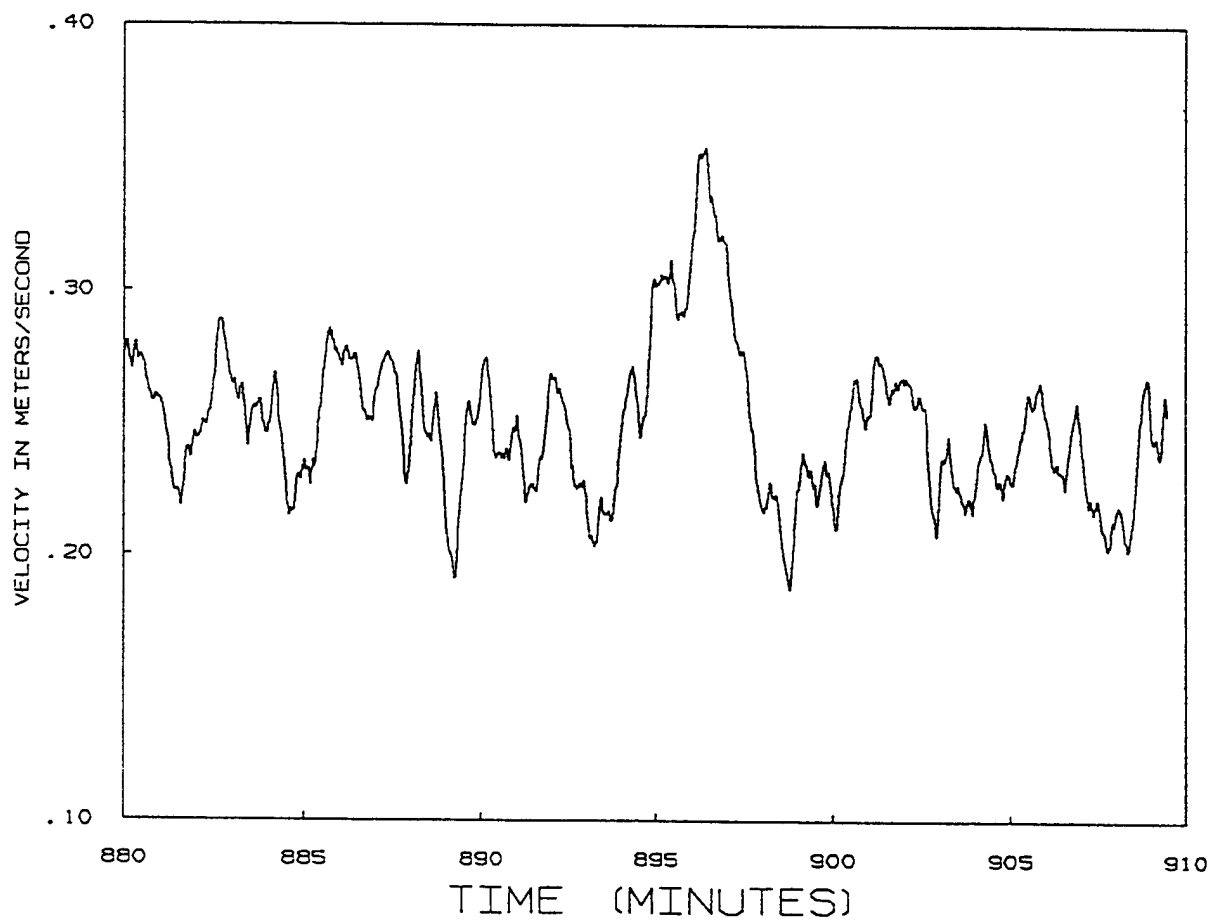
|               |              |            |                    |
|---------------|--------------|------------|--------------------|
| meter number  | 511-1001     | start-time | 1440               |
| tow name      | d.ray miller | end-time   | 1510               |
| configuration | 3x3+2x1      | mean       | = -0.01            |
| draft         | 7.1          | vmax       | = 0.00 tmax = 900. |
| speed         | 4.9 mph      | vmin       | = 0.00 tmin = 887. |
| direction     | upstream     |            |                    |
| distance      | 700          |            |                    |

MARSH MCBIRNEY 511/527 PLOTTING ROUTINE Y - COMPONENT



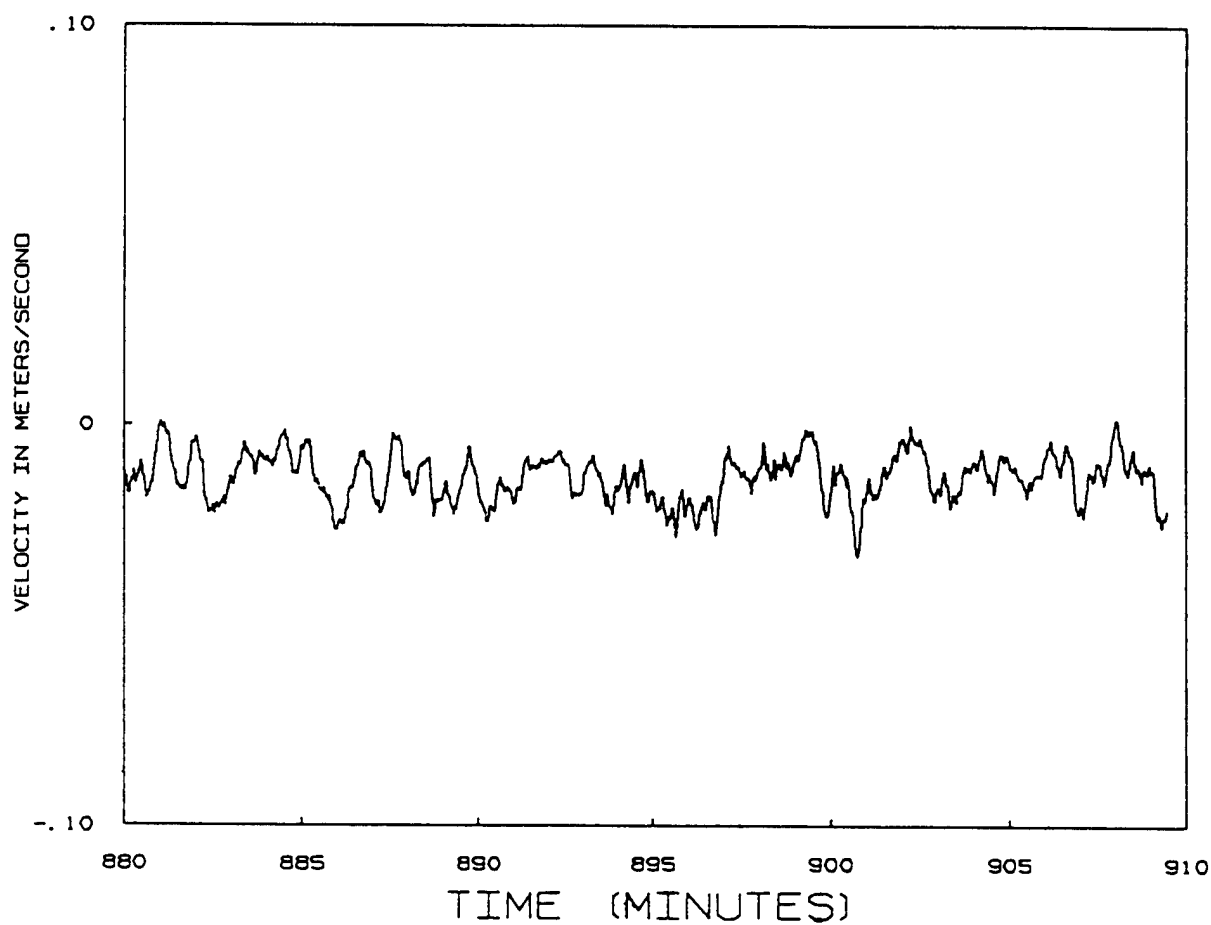
|               |              |            |                  |
|---------------|--------------|------------|------------------|
| meter number  | 1000         | distance   | 700              |
| tow name      | d.ray miller | start-time | 1440             |
| configuration | 3x3+2x1      | end-time   | 1510             |
| draft         | 7.1          | mean =     | 0.25             |
| speed         | 4.9 mph      | vmax =     | 0.35 tmax = 896. |
| direction     | upstream     | vmin =     | 0.19 tmin = 899. |

MARSH MCBIRNEY S11/LOGGER2 PLOTTING ROUT X - COMPONENT



|               |              |            |                   |
|---------------|--------------|------------|-------------------|
| meter number  | 1000         | distance   | 700               |
| tow name      | d.ray miller | start-time | 1440              |
| configuration | 3x3+2x1      | end-time   | 1510              |
| draft         | 7.1          | mean =     | -0.01             |
| speed         | 4.9 mph      | vmax =     | 0.00 tmax = 908.  |
| direction     | upstream     | vmin =     | -0.03 tmin = 901. |

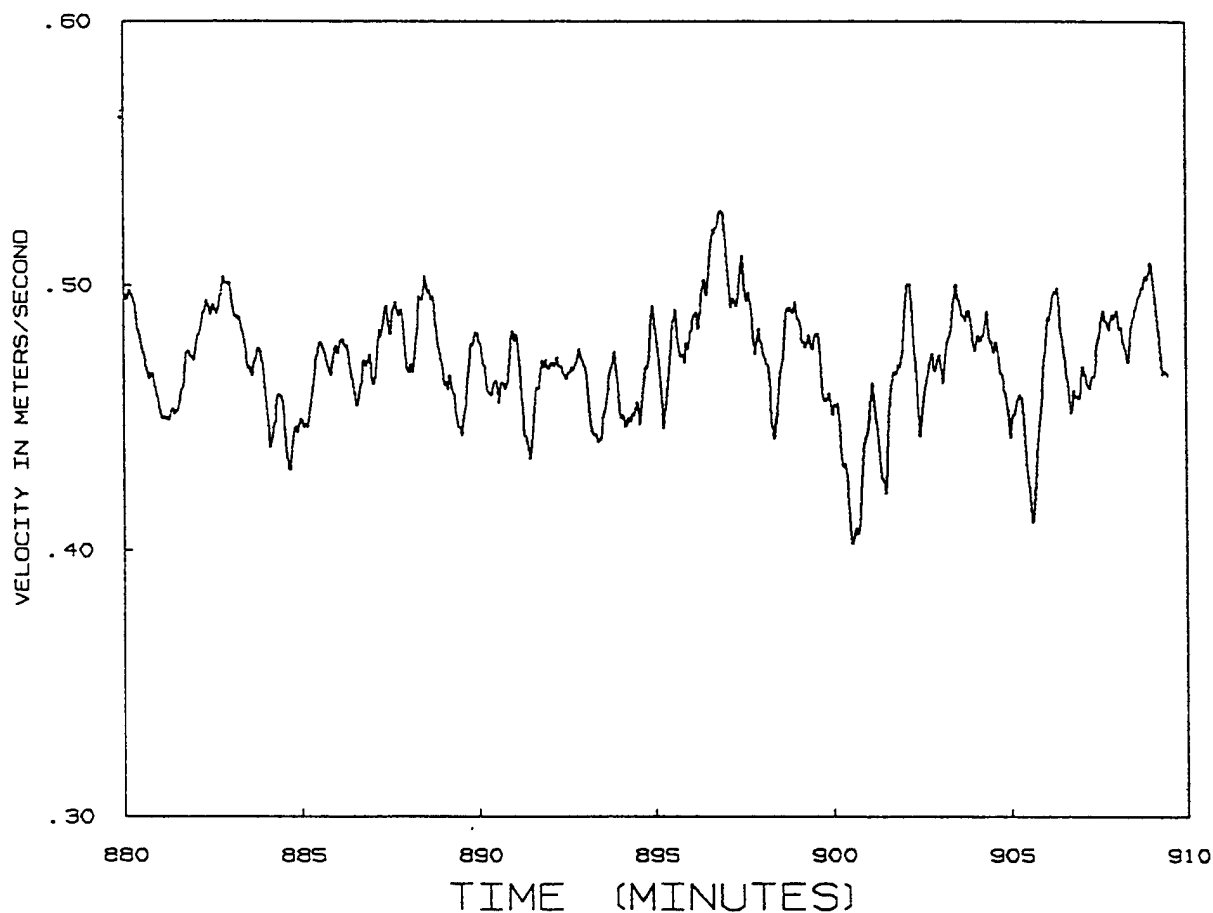
MARSH MCBIRNEY S11/LOGGER2 PLOTTING ROUT Y - COMPONENT





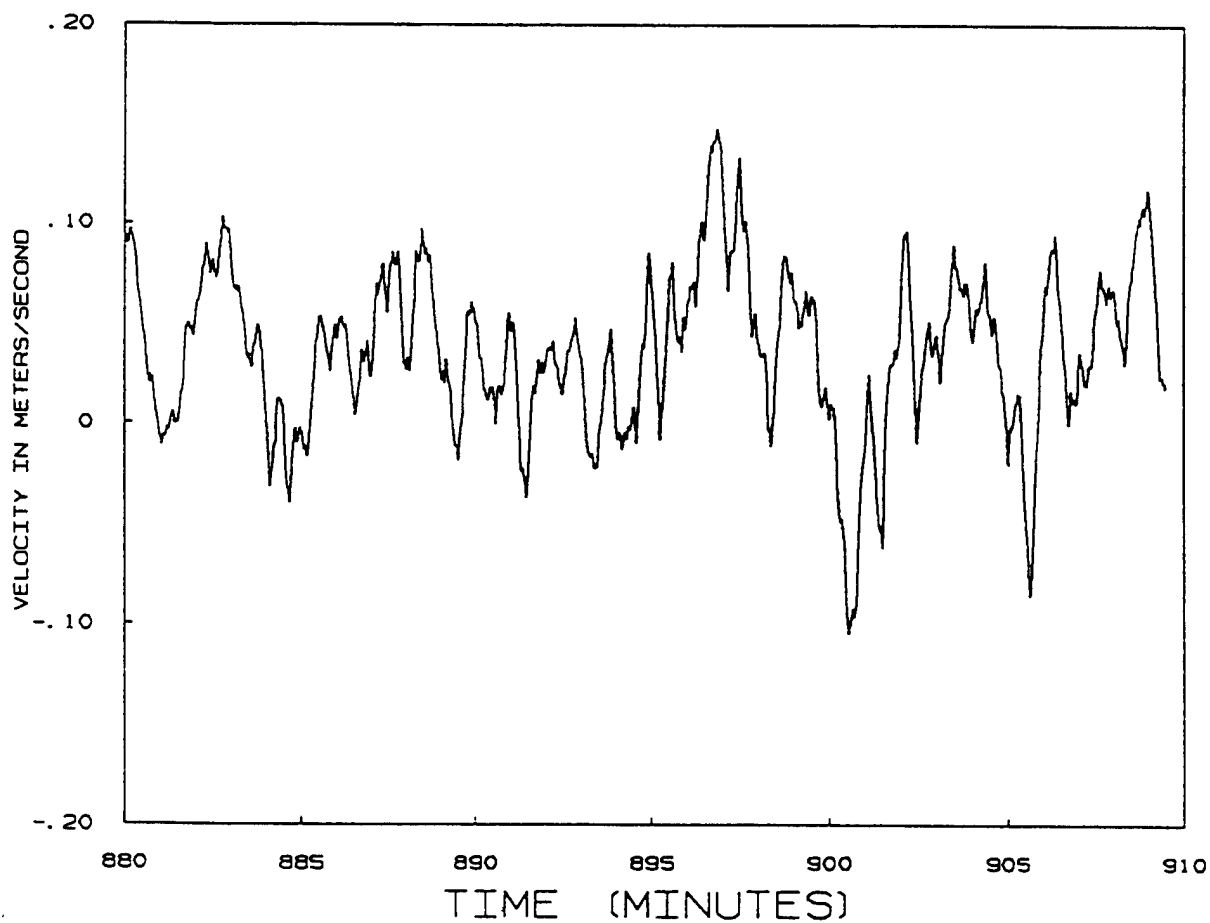
|               |              |            |                  |
|---------------|--------------|------------|------------------|
| meter number  | 998          | distance   | 700              |
| tow name      | d.ray miller | start-time | 1440             |
| configuration | 3x3+2x1      | end-time   | 1510             |
| draft         | 7.1          | mean =     | 0.47             |
| speed         | 4.9 mph      | vmax =     | 0.53 tmax = 897. |
| direction     | upstream     | vmmin =    | 0.40 tmin = 901. |

MARSH MCBIRNEY S11/LOGGER2 PLOTTING ROUT X - COMPONENT



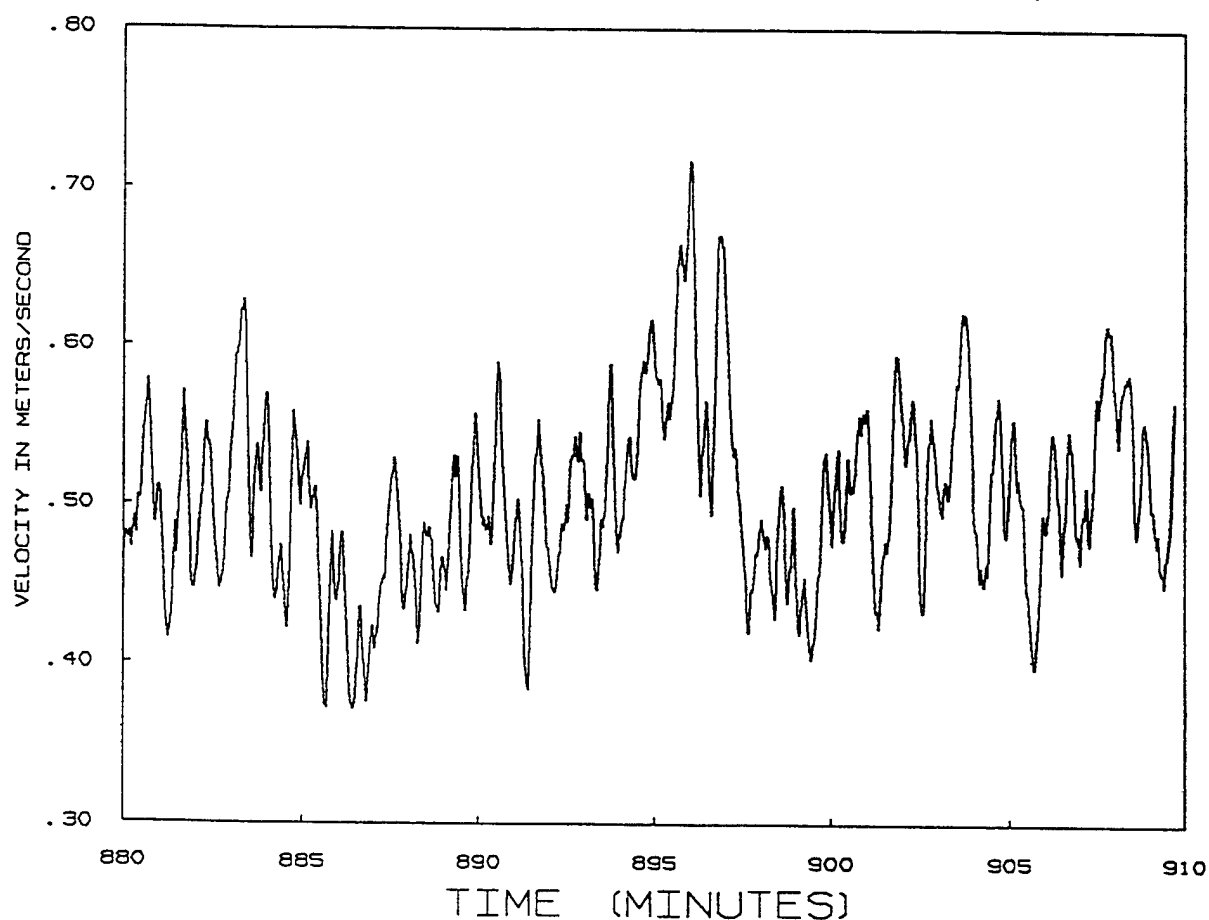
|               |              |            |                   |
|---------------|--------------|------------|-------------------|
| meter number  | 998          | distance   | 700               |
| tow name      | d.ray miller | start-time | 1440              |
| configuration | 3x3+2x1      | end-time   | 1510              |
| draft         | 7.1          | mean =     | 0.04              |
| speed         | 4.9 mph      | vmax =     | 0.15 tmax = 897.  |
| direction     | upstream     | vmin =     | -0.10 tmin = 901. |

MARSH MCBIRNEY S11/LOGGER2 PLOTTING ROUT Y - COMPONENT



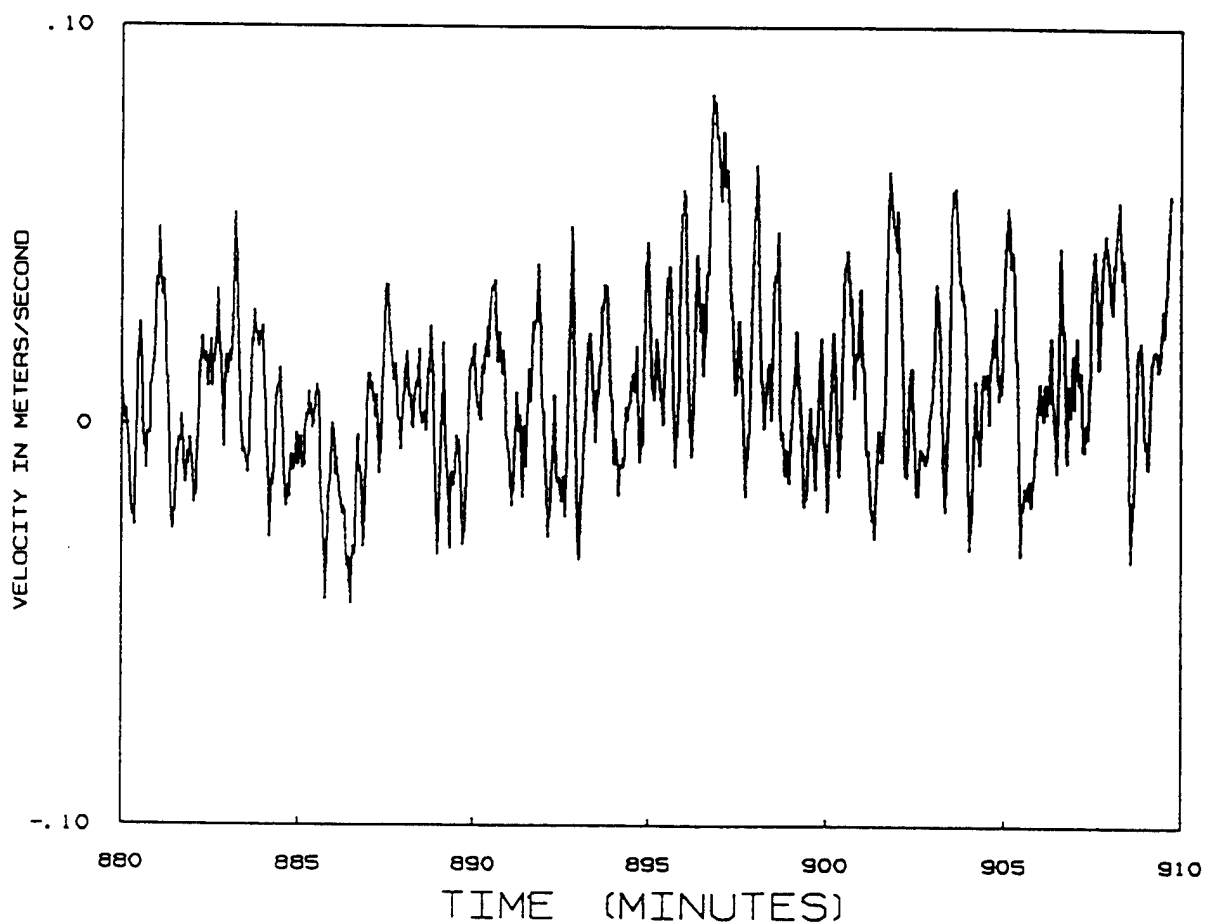
|               |              |            |                  |
|---------------|--------------|------------|------------------|
| meter number  | B-642        | start-time | 1440             |
| tow name      | d.ray miller | end-time   | 1510             |
| configuration | 3x3+2x1      | mean =     | 0.48             |
| draft         | 7.1          | vmax =     | 0.00 tmax = 896. |
| speed         | 4.9 mph      | vmin =     | 0.00 tmin = 886. |
| direction     | upstream     |            |                  |
| distance      | 700          |            |                  |

MARSH MCBIRNEY 511/527 PLOTTING ROUTINE X - COMPONENT



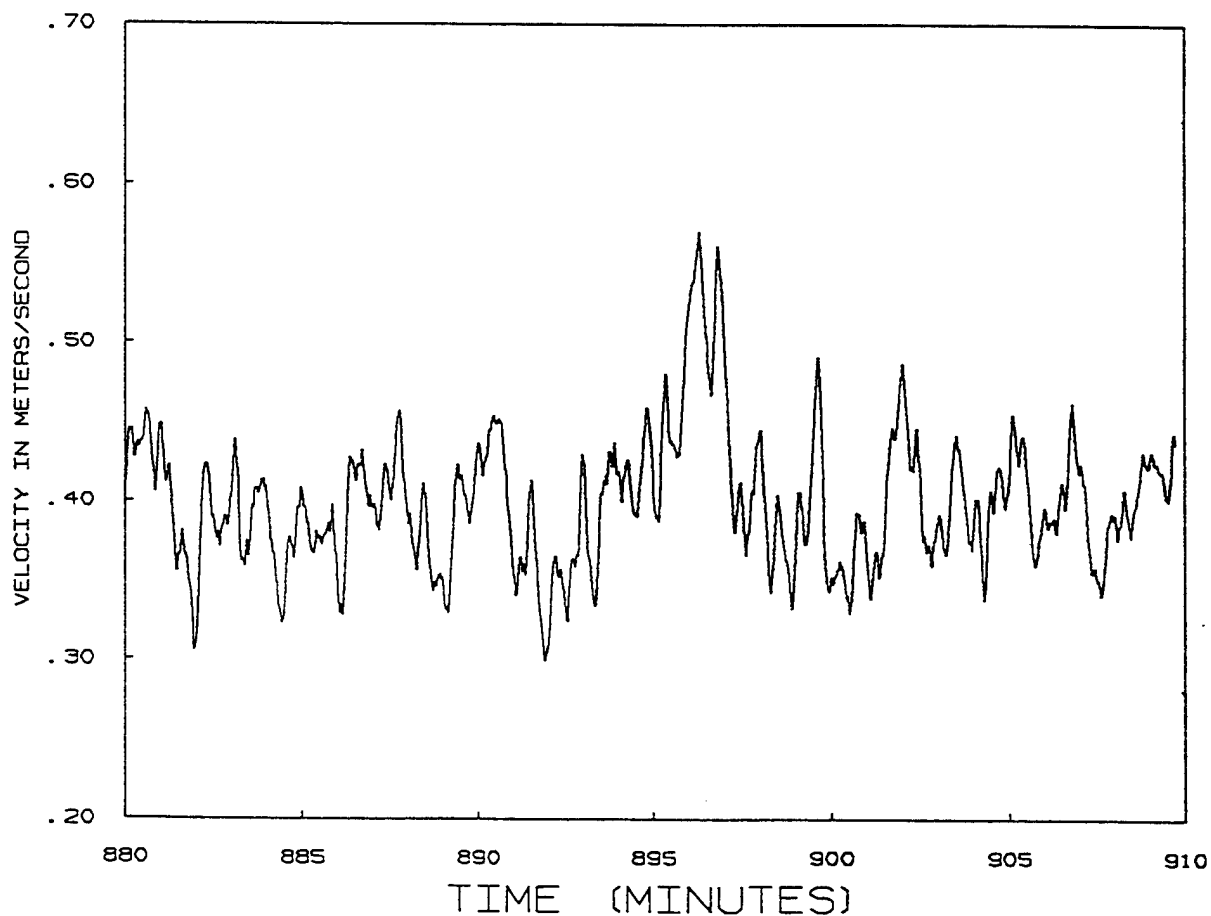
|               |              |            |                  |
|---------------|--------------|------------|------------------|
| meter number  | B-642        | start-time | 1440             |
| tow name      | d.ray miller | end-time   | 1510             |
| configuration | 3x3+2x1      | mean =     | 0.00             |
| draft         | 7.1          | vmax =     | 0.00 tmax = 897. |
| speed         | 4.9 mph      | vmin =     | 0.00 tmin = 886. |
| direction     | upstream     |            |                  |
| distance      | 700          |            |                  |

MARSH MCBIRNEY S11/S27 PLOTTING ROUTINE Y - COMPONENT



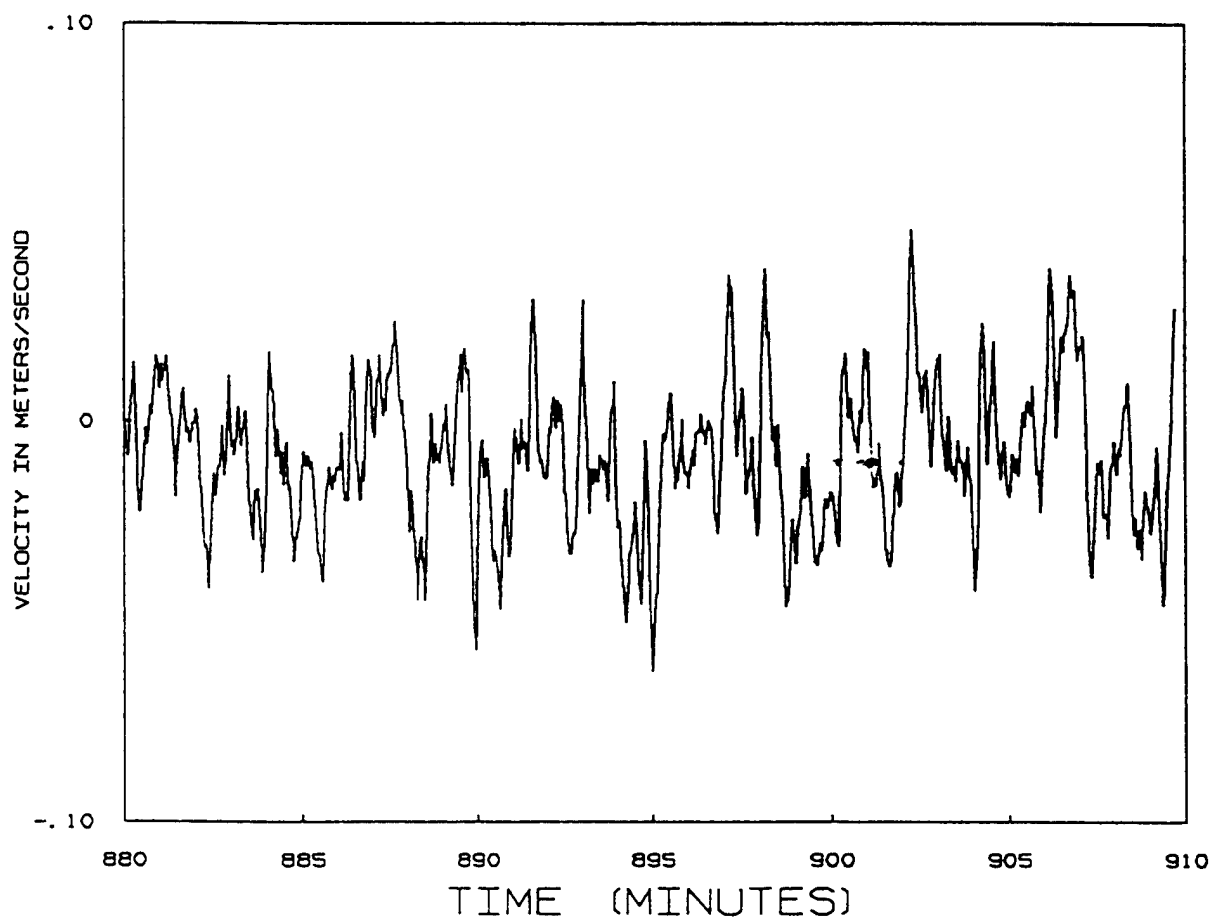
|               |              |            |                  |
|---------------|--------------|------------|------------------|
| meter number  | B-332        | start-time | 1440             |
| tow name      | d.ray miller | end-time   | 1510             |
| configuration | 3x3+2x1      | mean =     | 0.39             |
| draft         | 7.1          | vmax =     | 0.00 tmax = 896. |
| speed         | 4.9 mph      | vmin =     | 0.00 tmin = 892. |
| direction     | upstream     |            |                  |
| distance      | 700          |            |                  |

MARSH MCBIRNEY 511/527 PLOTTING ROUTINE X - COMPONENT

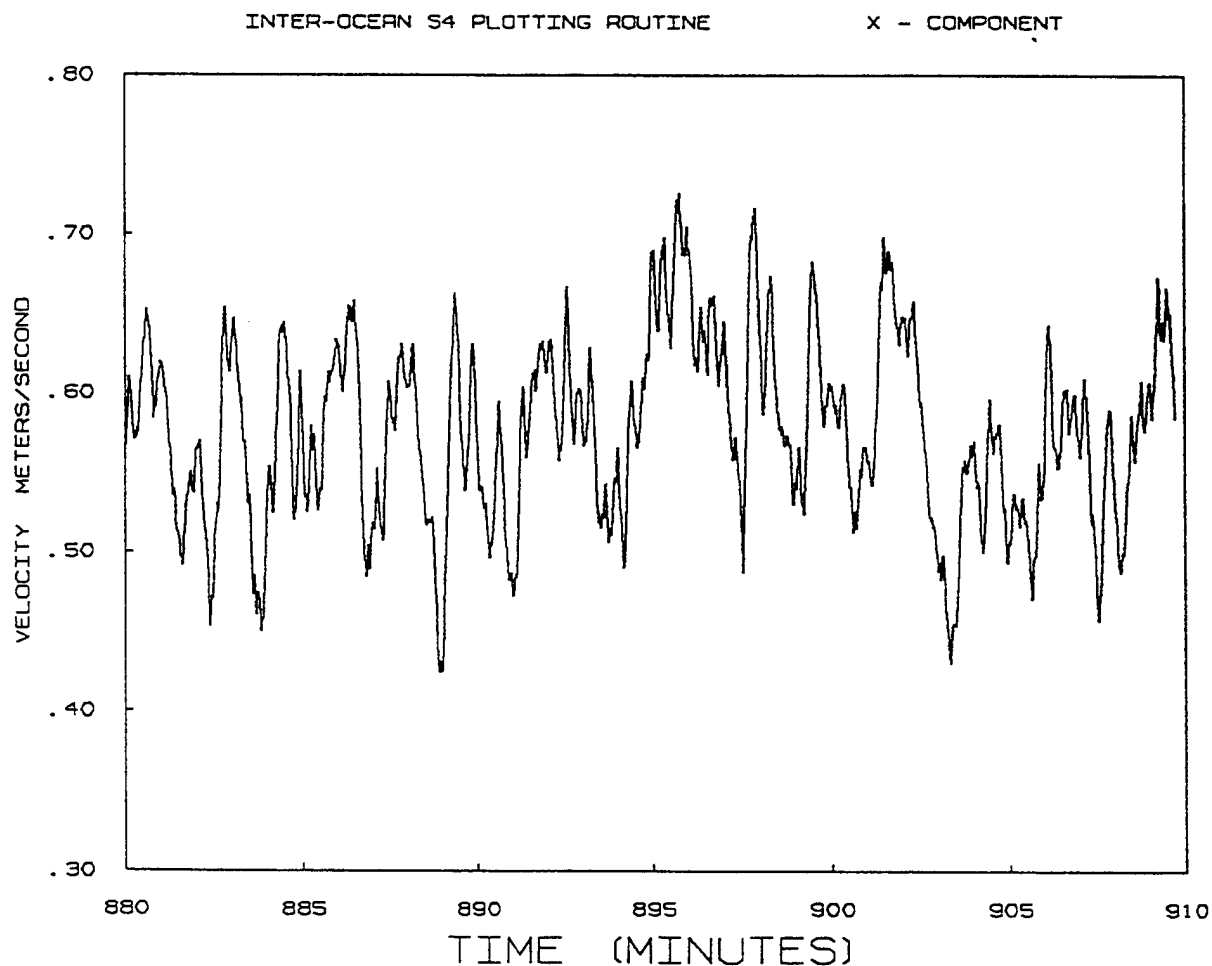


|               |              |            |                    |
|---------------|--------------|------------|--------------------|
| meter number  | B-332        | start-time | 1440               |
| tow name      | d.ray miller | end-time   | 1510               |
| configuration | 3x3+2x1      | mean       | = -0.01            |
| draft         | 7.1          | vmax       | = 0.00 tmax = 902. |
| speed         | 4.9 mph      | vmin       | = 0.00 tmin = 895. |
| direction     | upstream     |            |                    |
| distance      | 700          |            |                    |

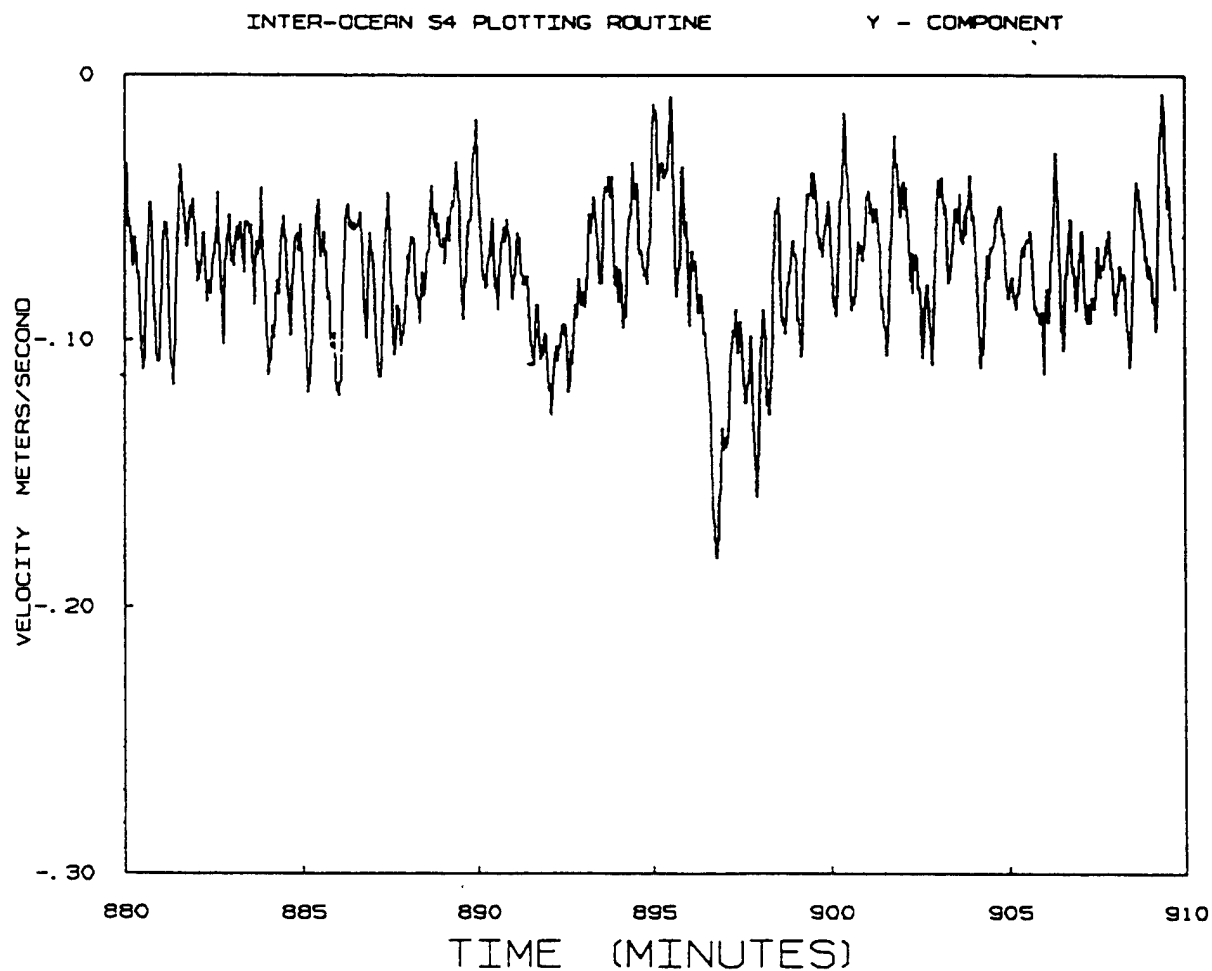
MARSH MCBIRNEY 511/527 PLOTTING ROUTINE Y - COMPONENT



|               |               |            |                  |
|---------------|---------------|------------|------------------|
| meter number  | 071           | distance   | 700              |
| tow name      | d. ray miller | start-time | 1440             |
| configuration | 3x3+2x1       | end-time   | 1510             |
| draft         | 7.1           | MEAN =     | 0.57             |
| speed         | 4.9 mph       | VMAX =     | 0.73 TMAX = 896. |
| direction     | upstream      | VMIN =     | 0.42 TMIN = 889. |

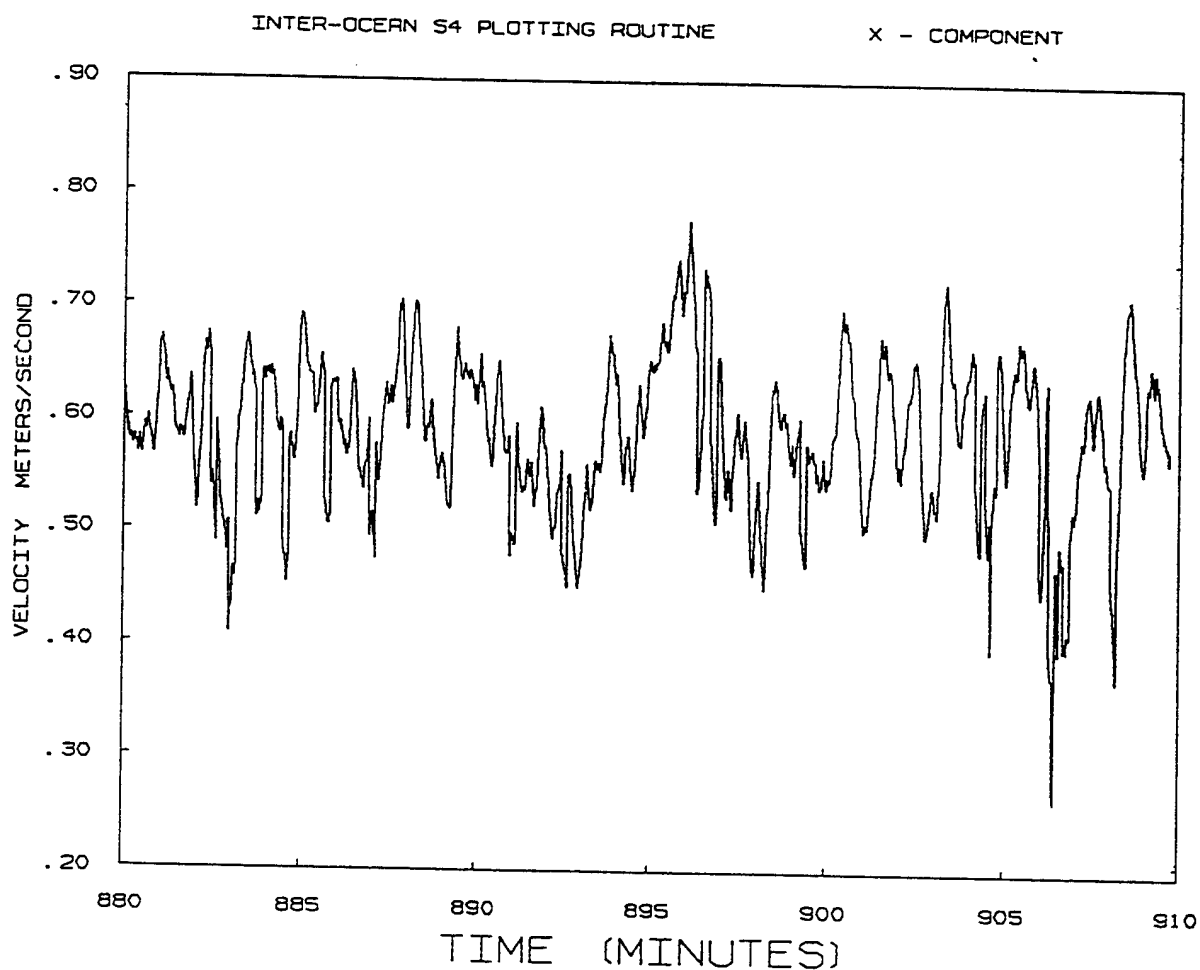


|               |               |            |                     |
|---------------|---------------|------------|---------------------|
| meter number  | 071           | distance   | 700                 |
| tow name      | d. ray miller | start-time | 1440                |
| configuration | 3x3+2x1       | end-time   | 1510                |
| draft         | 7.1           | MEAN       | = -0.07             |
| speed         | 4.9 mph       | VMAX       | = -0.01 TMAX = 909. |
| direction     | upstream      | VMIN       | = -0.18 TMIN = 897. |





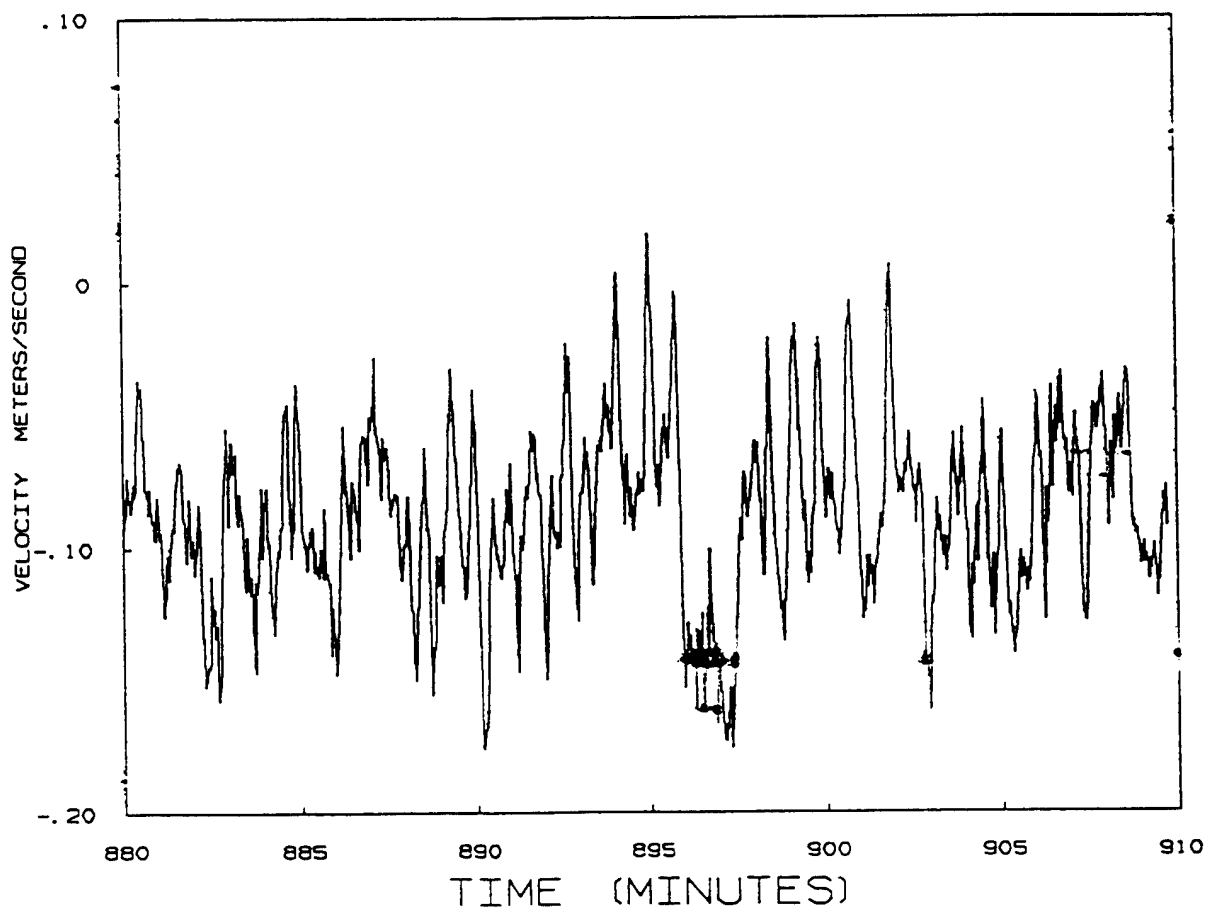
|               |               |            |                  |
|---------------|---------------|------------|------------------|
| meter number  | 040           | distance   | 700              |
| tow name      | d. ray miller | start-time | 1440             |
| configuration | 3x3+2x1       | end-time   | 1510             |
| draft         | 7.1           | MEAN =     | 0.60             |
| speed         | 4.9 mph       | VMAX =     | 0.78 TMAX = 896. |
| direction     | upstream      | VMIN =     | 0.26 TMIN = 906. |



|               |               |            |                   |
|---------------|---------------|------------|-------------------|
| meter number  | 040           | distance   | 700               |
| tow name      | d. ray miller | start-time | 1440              |
| configuration | 3x3+2x1       | end-time   | 1510              |
| draft         | 7.1           | MEAN =     | -0.09             |
| speed         | 4.9 mph       | VMAX =     | 0.02 TMAX = 895.  |
| direction     | upstream      | VMIN =     | -0.18 TMIN = 890. |

INTER-OCEAN S4 PLOTTING ROUTINE

Y - COMPONENT



XX-3. Velocity fluctuations measured by two-dimensional current meters  
for barge *Hugh C. Blaske* at Goose Island, trip 1

Hugh C. Blaske (8/25/90)

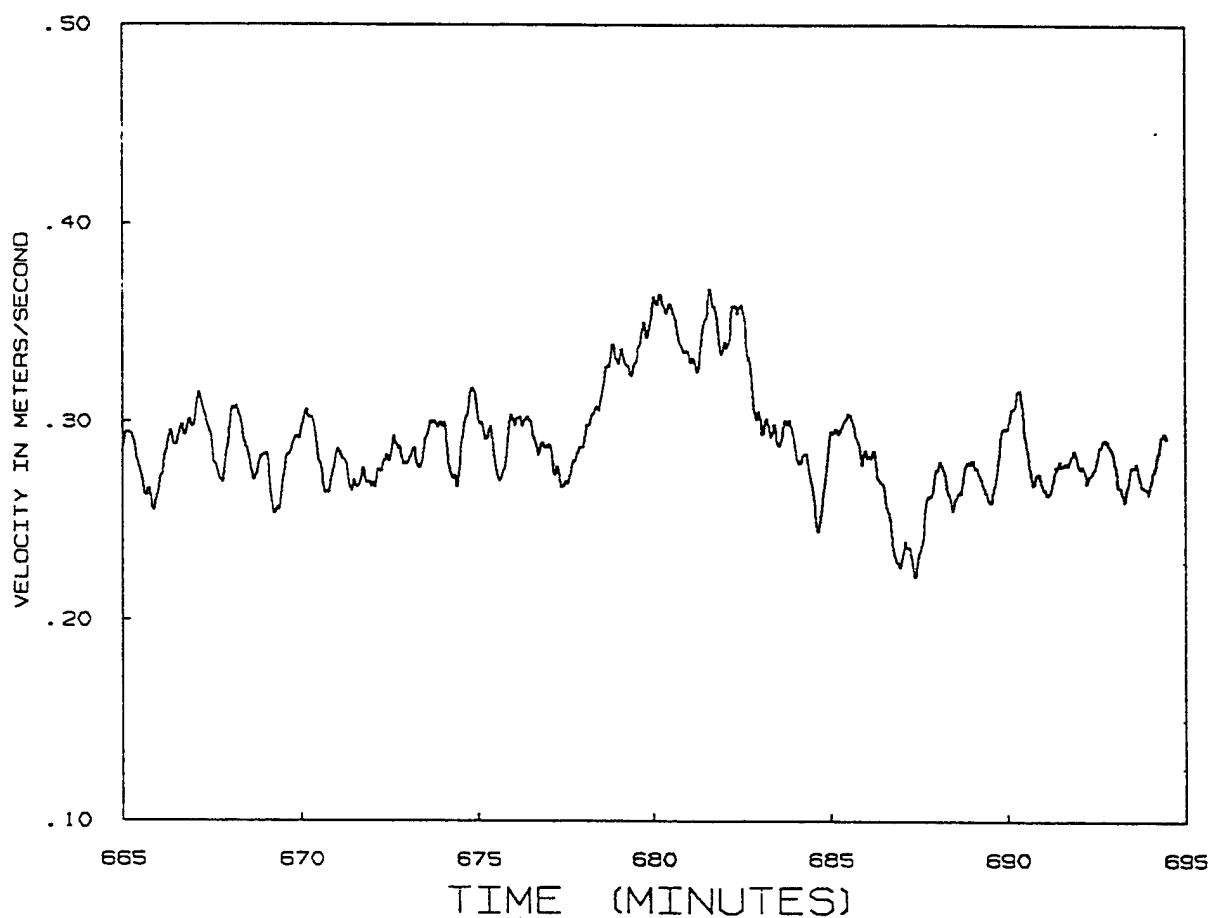
Status of Electromagnetic Current Meters:

|                       |                      |                      |                       |
|-----------------------|----------------------|----------------------|-----------------------|
| 1000<br>(MMB511)<br>√ | 998<br>(MMB511)<br>√ | 999<br>(MMB511)<br>√ | 1001<br>(MMB511)<br>√ |
| 642<br>(MMB527)<br>√  | 332<br>(MMB527)<br>√ |                      |                       |
| 040<br>(S4)<br>√      | 071<br>(S4)<br>√     |                      |                       |

Note: √ : Working  
\* : Not working  
- : Unavailable

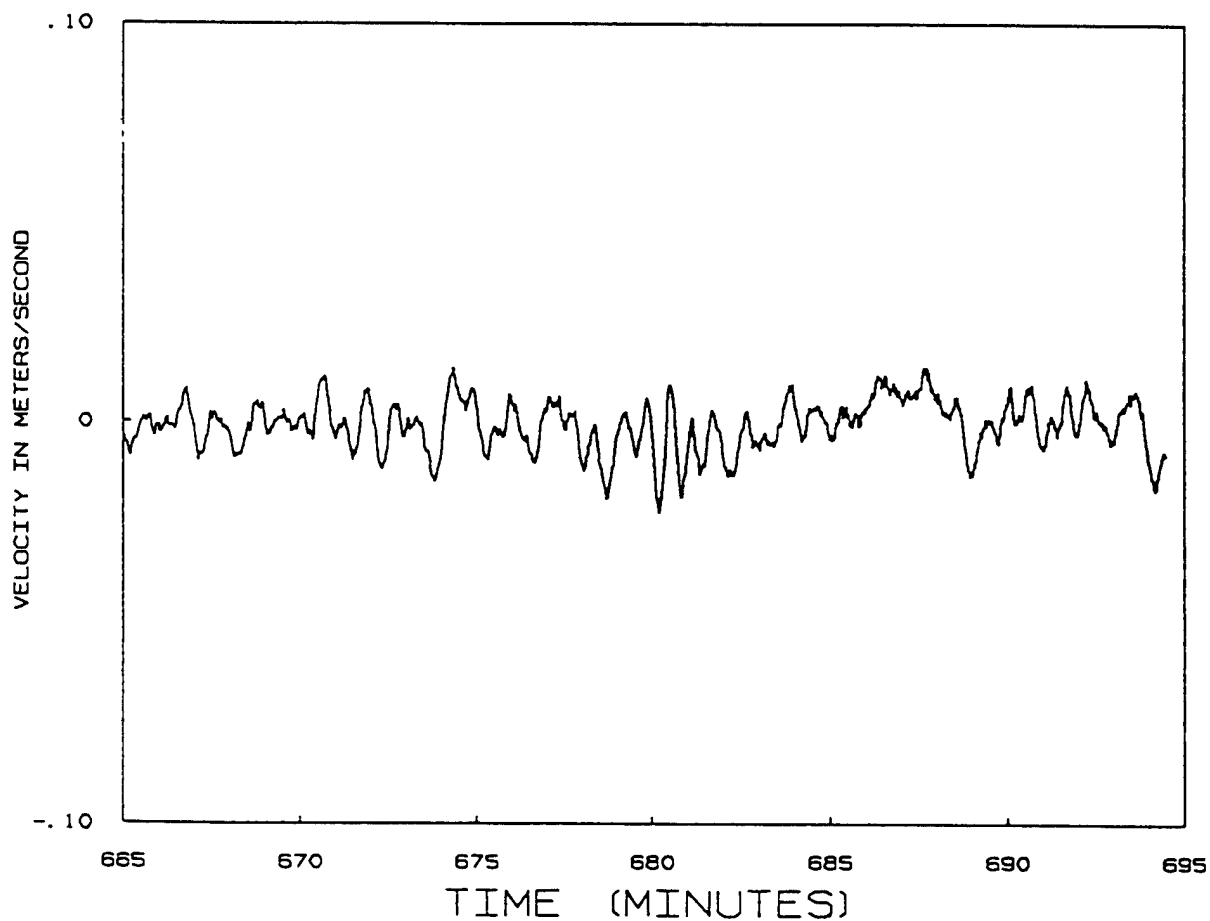
|               |          |            |                  |
|---------------|----------|------------|------------------|
| meter number  | 1000     | distance   | 310              |
| tow name      | hugh c.  | start-time | 1105             |
| configuration | 3x5      | end-time   | 1135             |
| draft         | 8.5      | mean =     | 0.28             |
| speed         | 4.2 mph  | vmax =     | 0.37 tmax = 682. |
| direction     | upstream | vmin =     | 0.22 tmin = 687. |

MARSH MCBIRNEY S11/LOGGER2 PLOTTING ROUT X - COMPONENT



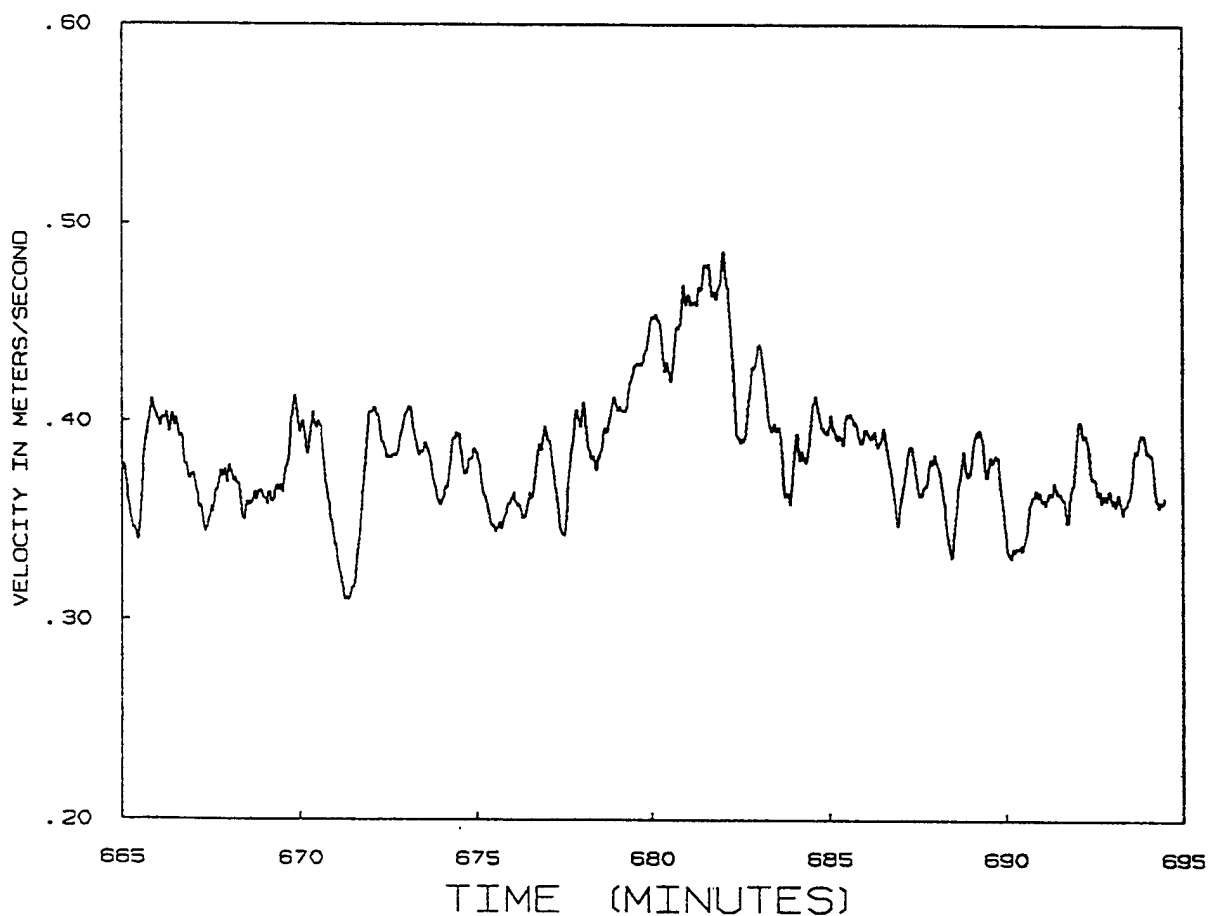
|               |          |            |                   |
|---------------|----------|------------|-------------------|
| meter number  | 1000     | distance   | 310               |
| tow name      | hugh c.  | start-time | 1105              |
| configuration | 3x5      | end-time   | 1135              |
| draft         | 8.5      | mean =     | 0.00              |
| speed         | 4.2 mph  | vmax =     | 0.01 tmax = 688.  |
| direction     | upstream | vmin =     | -0.02 tmin = 680. |

MARSH MCBIRNEY S11/LOGGER2 PLOTTING ROUT Y - COMPONENT



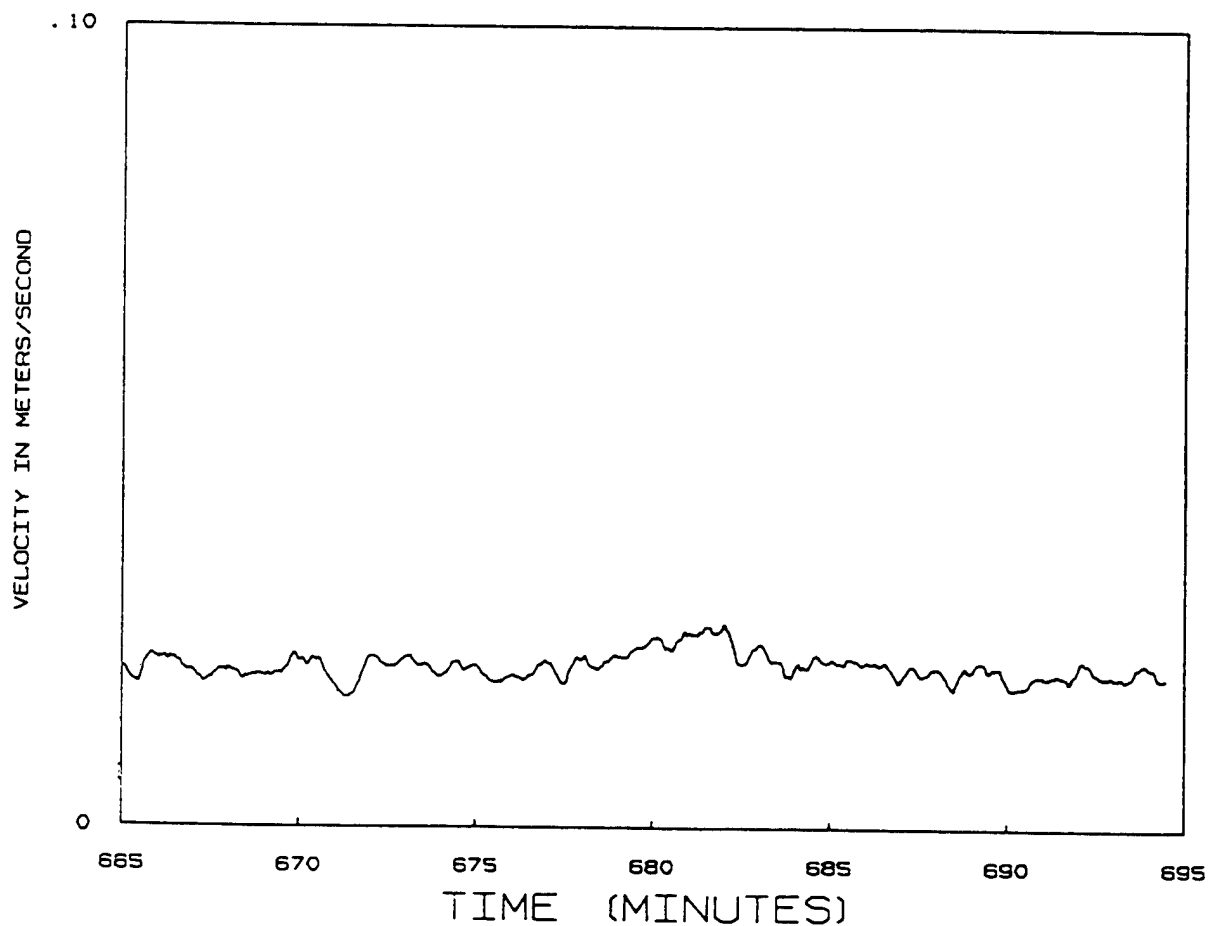
|               |          |            |                  |
|---------------|----------|------------|------------------|
| meter number  | 998      | distance   | 310              |
| tow name      | hugh c.  | start-time | 1105             |
| configuration | 3x5      | end-time   | 1135             |
| draft         | 8.5      | mean =     | 0.37             |
| speed         | 4.2 mph  | vmax =     | 0.49 tmax = 682. |
| direction     | upstream | vmin =     | 0.31 tmin = 671. |

MARSH MCBIRNEY S11/LOGGER2 PLOTTING ROUT X - COMPONENT



|               |          |            |                  |
|---------------|----------|------------|------------------|
| meter number  | 998      | distance   | 310              |
| tow name      | hugh c.  | start-time | 1105             |
| configuration | 3x5      | end-time   | 1135             |
| draft         | 8.5      | mean =     | 0.02             |
| speed         | 4.2 mph  | vmax =     | 0.03 tmax = 682. |
| direction     | upstream | vmin =     | 0.02 tmin = 671. |

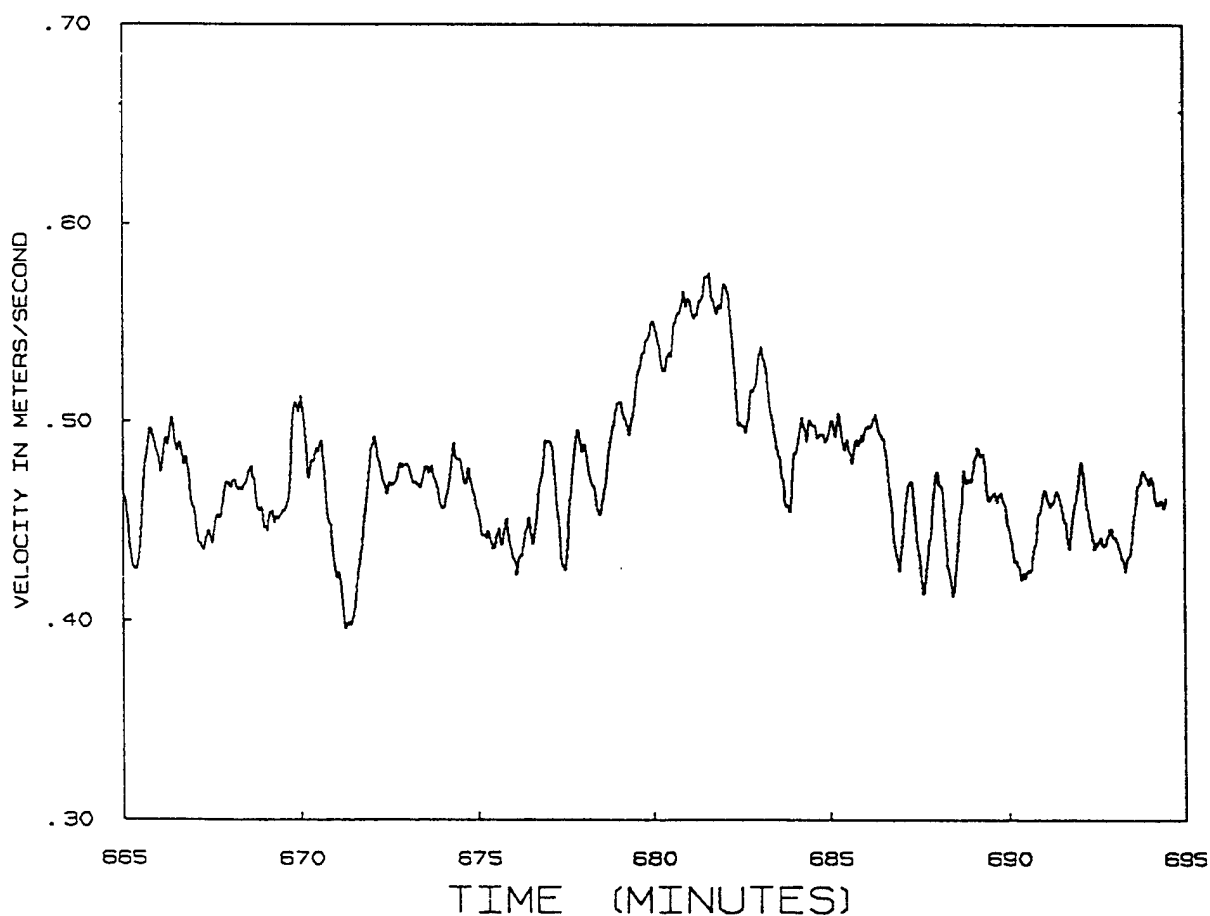
MARSH MCBIRNEY S11/LOGGER2 PLOTTING ROUT Y - COMPONENT





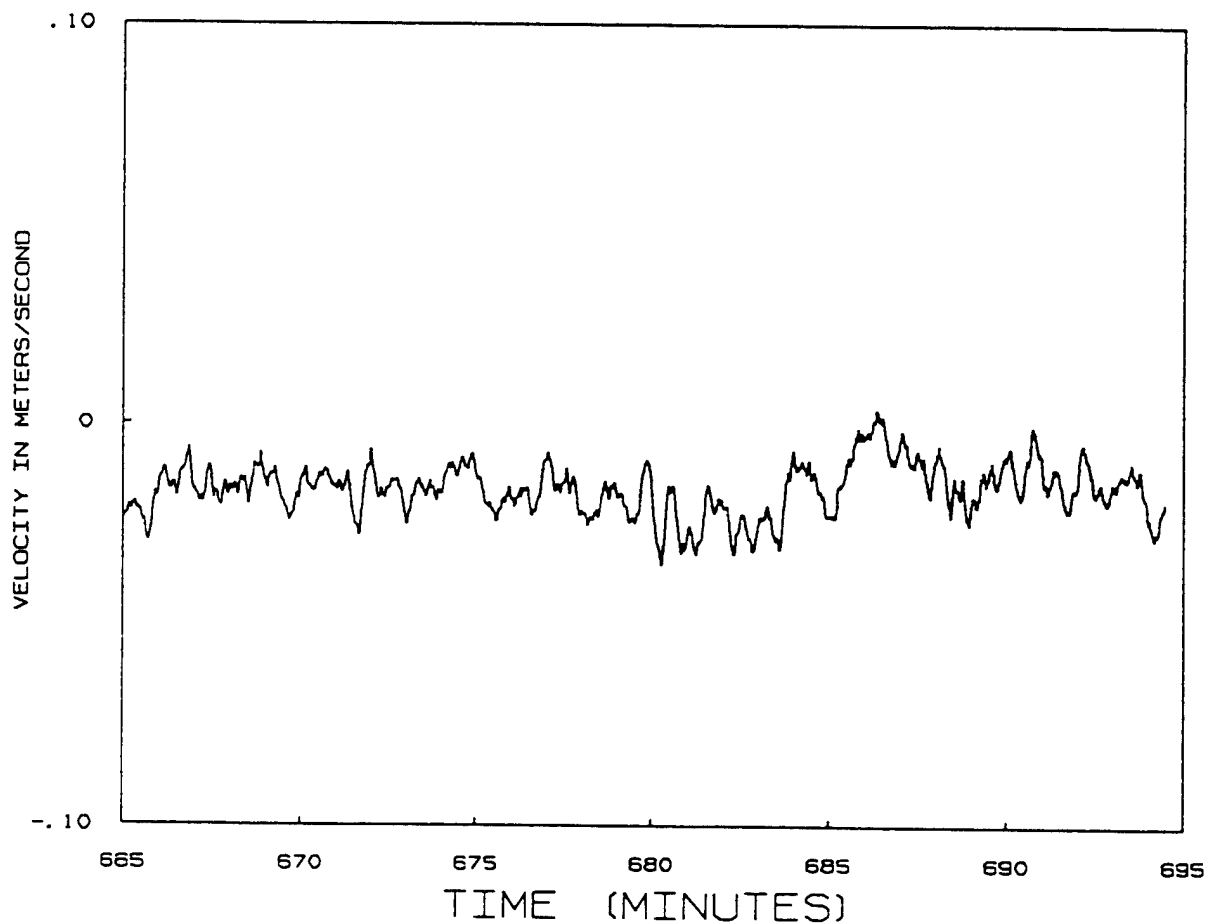
|               |          |            |                  |
|---------------|----------|------------|------------------|
| meter number  | 999      | distance   | 310              |
| tow name      | hugh c.  | start-time | 1105             |
| configuration | 3x5      | end-time   | 1135             |
| draft         | 8.5      | mean =     | 0.46             |
| speed         | 4.2 mph  | vmax =     | 0.58 tmax = 682. |
| direction     | upstream | vmin =     | 0.40 tmin = 671. |

MARSH MCBIRNEY 511/LOGGER2 PLOTTING ROUT X - COMPONENT



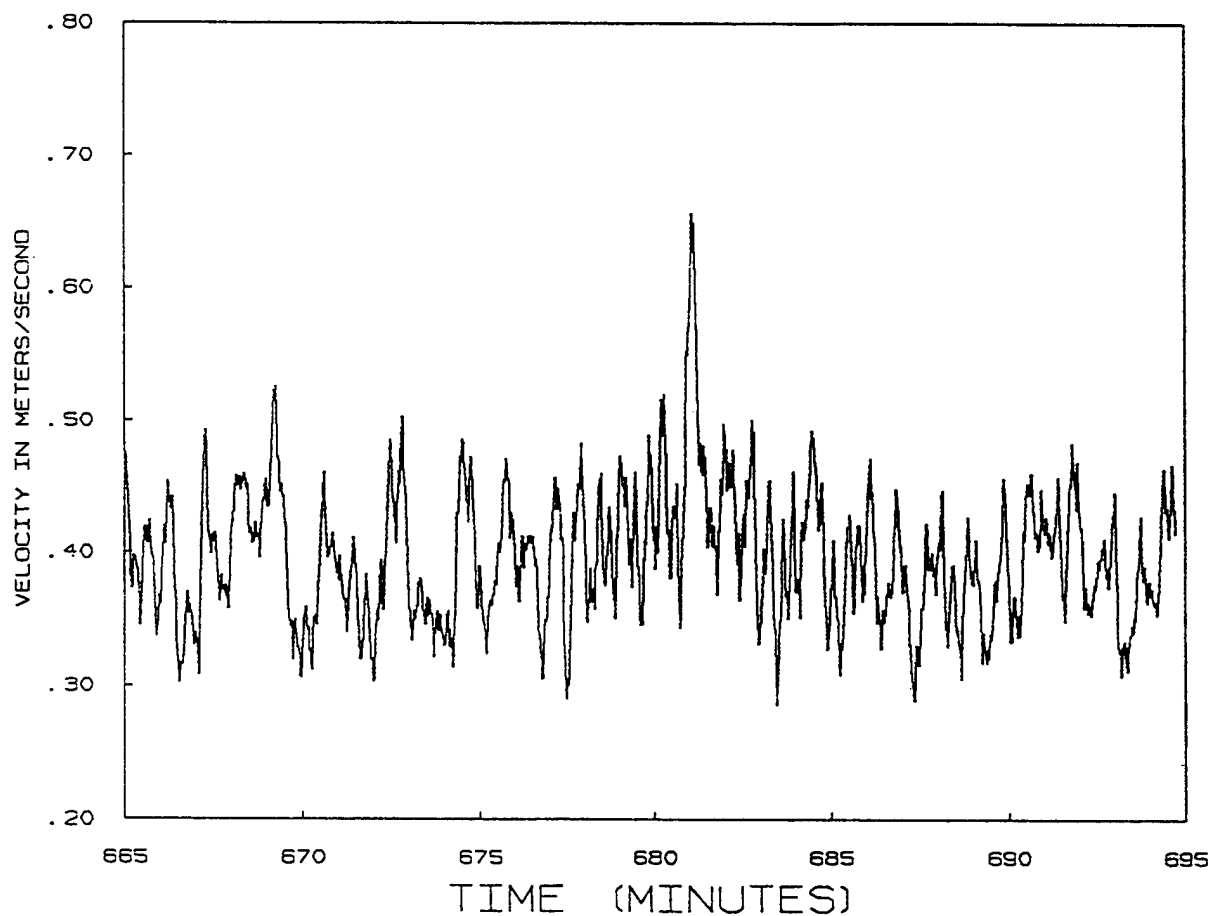
|               |          |            |                     |
|---------------|----------|------------|---------------------|
| meter number  | 999      | distance   | 310                 |
| tow name      | hugh c.  | start-time | 1105                |
| configuration | 3x5      | end-time   | 1135                |
| draft         | 8.5      | mean       | = -0.02             |
| speed         | 4.2 mph  | vmax       | = 0.00 tmax = 686.  |
| direction     | upstream | vmin       | = -0.03 tmin = 680. |

MARSH MCBIRNEY S11/LOGGER2 PLOTTING ROUT Y - COMPONENT



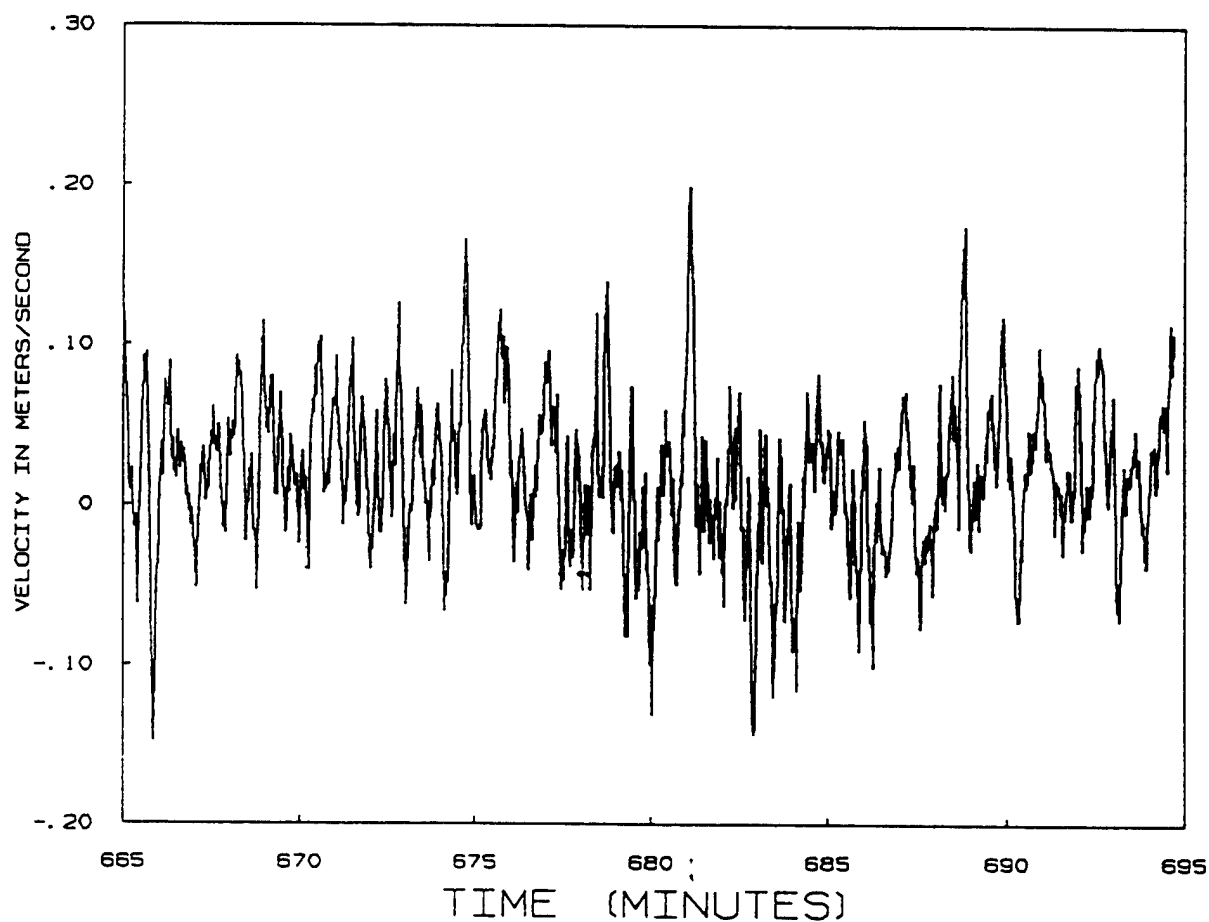
|               |          |            |                  |
|---------------|----------|------------|------------------|
| meter number  | 511-1001 | start-time | 1105             |
| tow name      | hugh c.  | end-time   | 1135             |
| configuration | 3x5      | mean =     | 0.39             |
| draft         | 8.5      | vmax =     | 0.00 tmax = 681. |
| speed         | 4.2 mph  | vmin =     | 0.00 tmin = 683. |
| direction     | upstream |            |                  |
| distance      | 310      |            |                  |

MARSH MCBIRNEY 511/527 PLOTTING ROUTINE X - COMPONENT



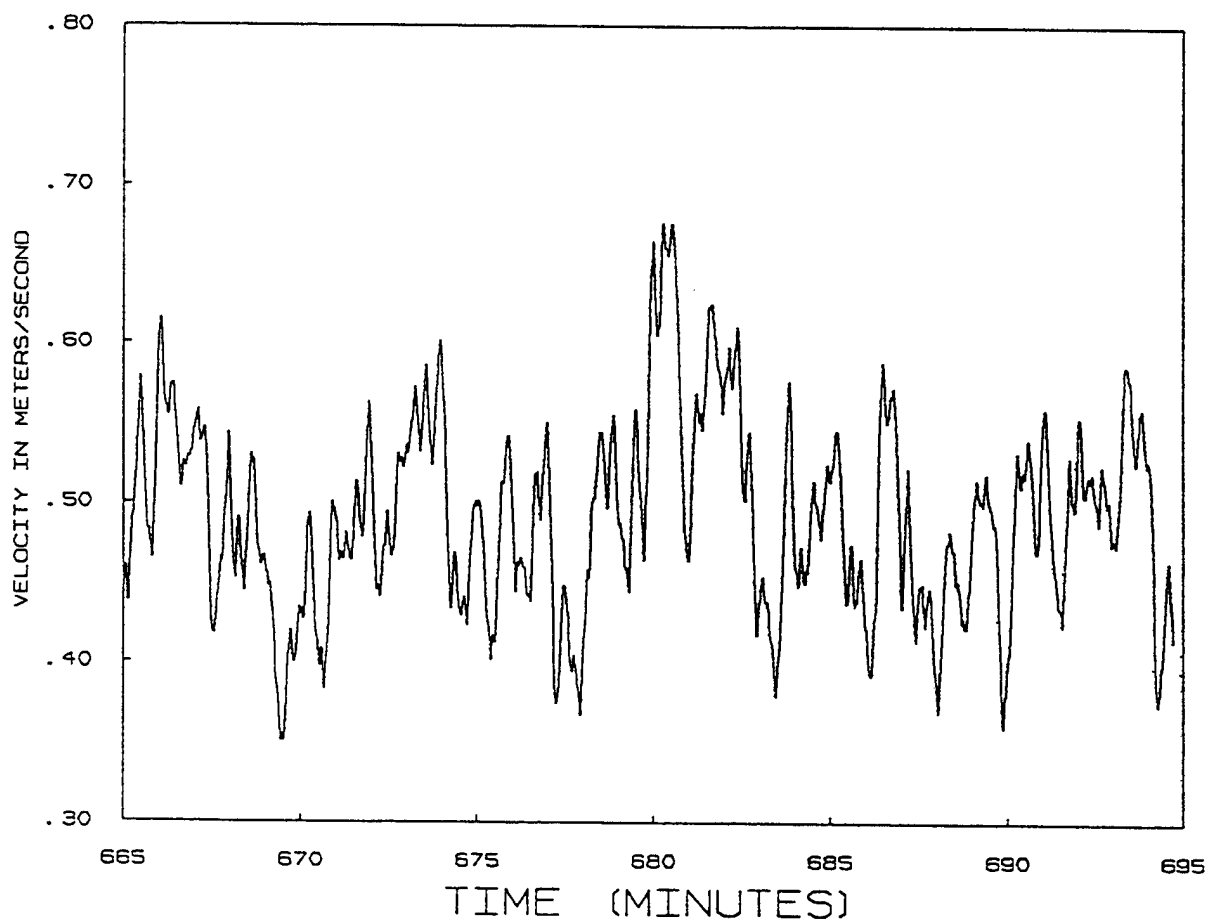
|               |          |            |                  |
|---------------|----------|------------|------------------|
| meter number  | 511-1001 | start-time | 1105             |
| tow name      | hugh c.  | end-time   | 1135             |
| configuration | 3x5      | mean =     | 0.03             |
| draft         | 8.5      | vmax =     | 0.00 tmax = 681. |
| speed         | 4.2 mph  | vmin =     | 0.00 tmin = 666. |
| direction     | upstream |            |                  |
| distance      | 310      |            |                  |

MARSH MCBIRNEY 511/527 PLOTTING ROUTINE Y - COMPONENT



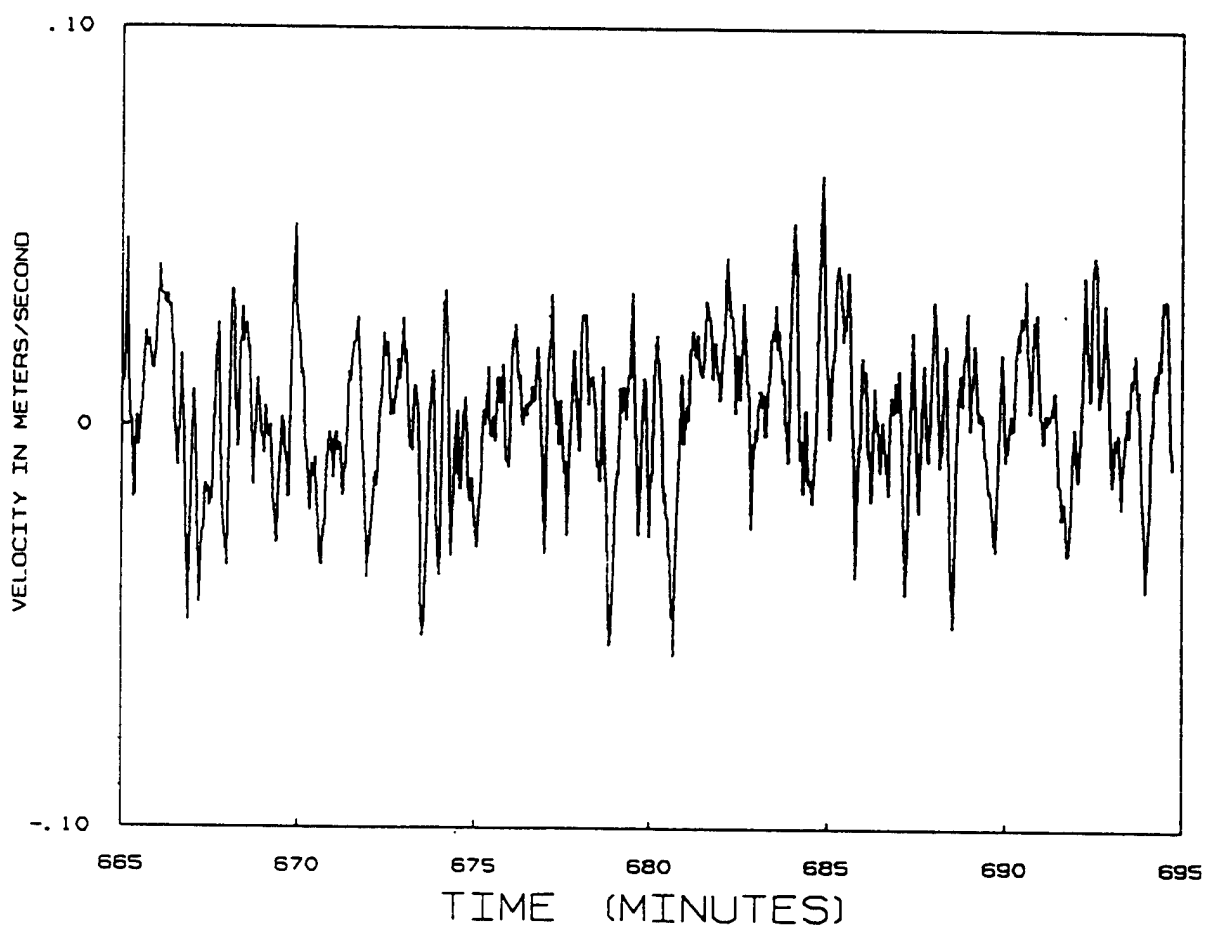
|               |          |            |                  |
|---------------|----------|------------|------------------|
| meter number  | B-642    | start-time | 1105             |
| tow name      | hugh c.  | end-time   | 1135             |
| configuration | 3x5      | mean =     | 0.49             |
| draft         | 8.5      | vmax =     | 0.00 tmax = 680. |
| speed         | 4.2 mph  | vmin =     | 0.00 tmin = 670. |
| direction     | upstream |            |                  |
| distance      | 310      |            |                  |

MARSH MCBIRNEY 511/527 PLOTTING ROUTINE X - COMPONENT



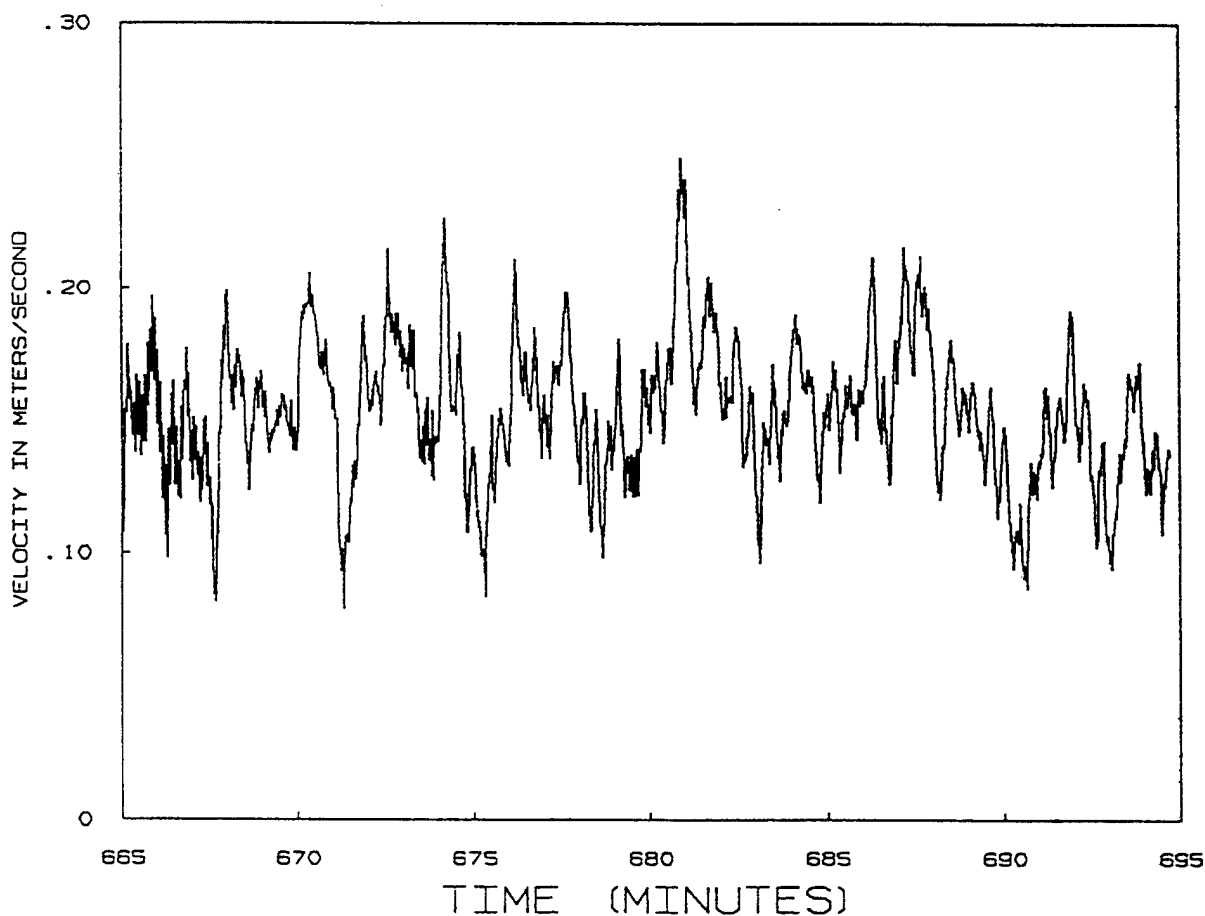
|               |          |            |                  |
|---------------|----------|------------|------------------|
| meter number  | B-642    | start-time | 1105             |
| tow name      | hugh c.  | end-time   | 1135             |
| configuration | 3x5      | mean =     | 0.00             |
| draft         | 8.5      | vmax =     | 0.00 tmax = 685. |
| speed         | 4.2 mph  | vmin =     | 0.00 tmin = 681. |
| direction     | upstream |            |                  |
| distance      | 310      |            |                  |

MARSH MCBIRNEY S11/527 PLOTTING ROUTINE Y - COMPONENT



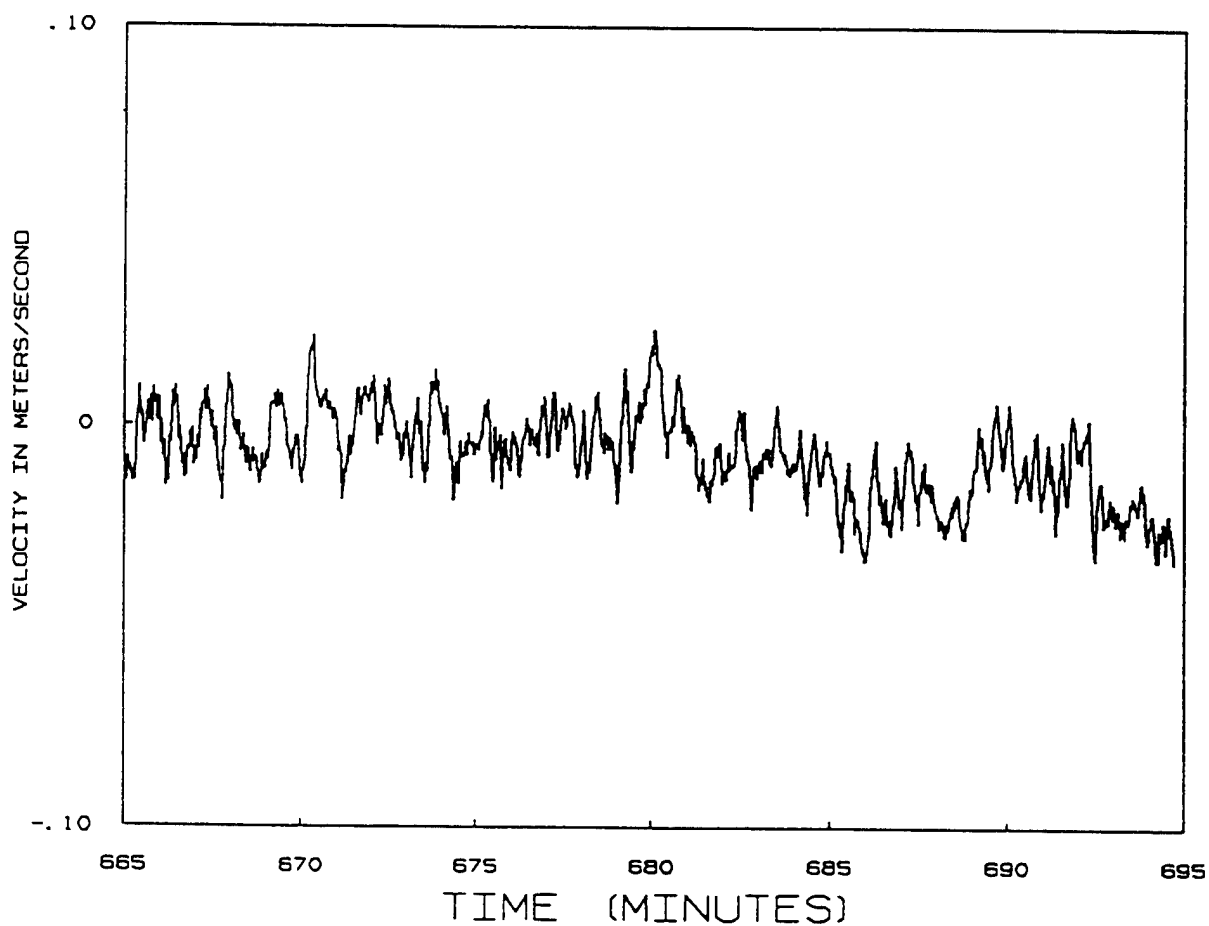
|               |          |            |                  |
|---------------|----------|------------|------------------|
| meter number  | B-332    | start-time | 1105             |
| tow name      | hugh c.  | end-time   | 1135             |
| configuration | 3x5      | mean =     | 0.15             |
| draft         | 8.5      | vmax =     | 0.00 tmax = 681. |
| speed         | 4.2 mph  | vmin =     | 0.00 tmin = 671. |
| direction     | upstream |            |                  |
| distance      | 310      |            |                  |

MARSH MCBIRNEY 511/527 PLOTTING ROUTINE X - COMPONENT



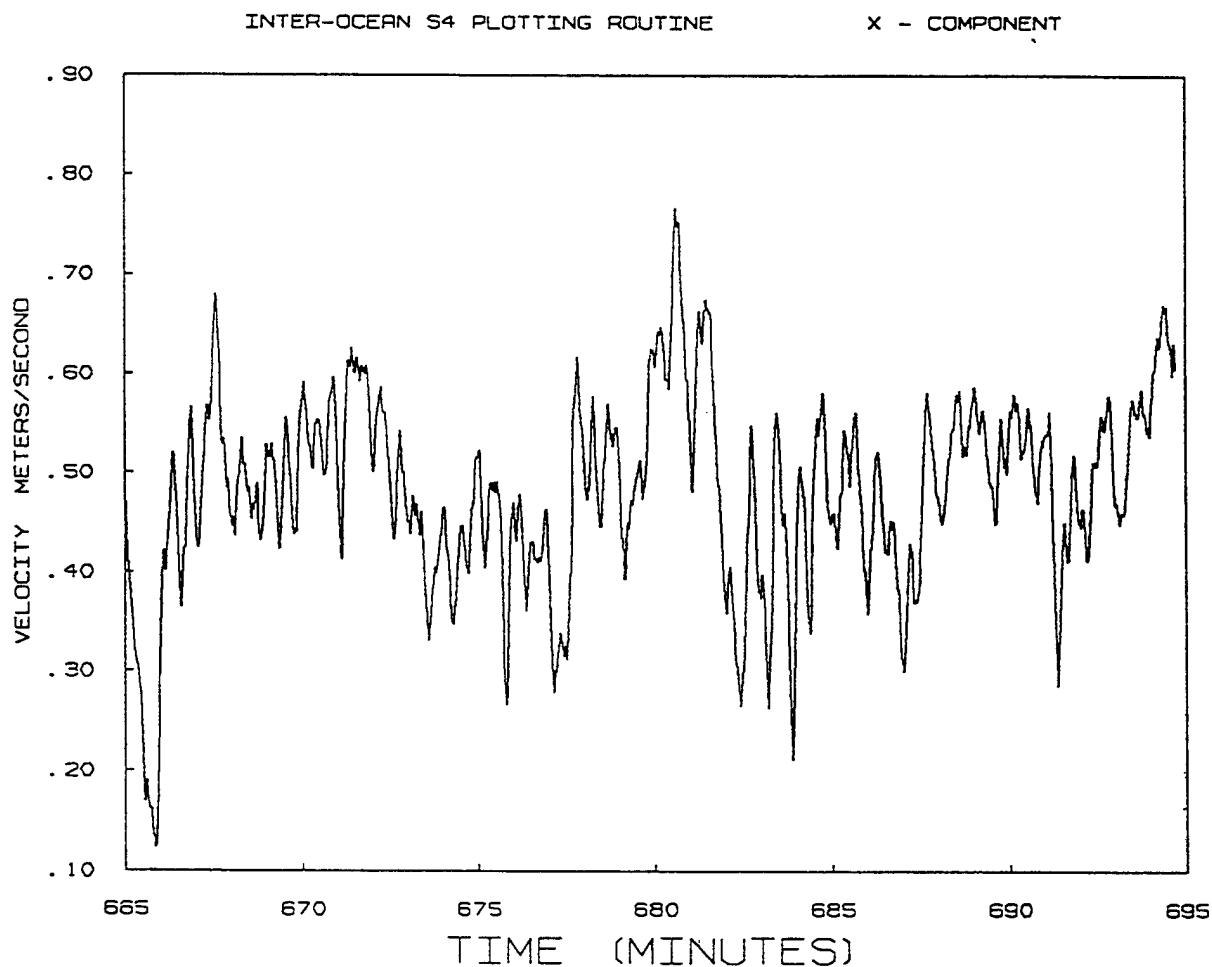
|               |          |            |                  |
|---------------|----------|------------|------------------|
| meter number  | B-332    | start-time | 1105             |
| tow name      | hugh c.  | end-time   | 1135             |
| configuration | 3x5      | mean =     | 0.00             |
| draft         | 8.5      | vmax =     | 0.00 tmax = 680. |
| speed         | 4.2 mph  | vmin =     | 0.00 tmin = 695. |
| direction     | upstream |            |                  |
| distance      | 310      |            |                  |

MARSH MCBIRNEY 511/527 PLOTTING ROUTINE Y - COMPONENT





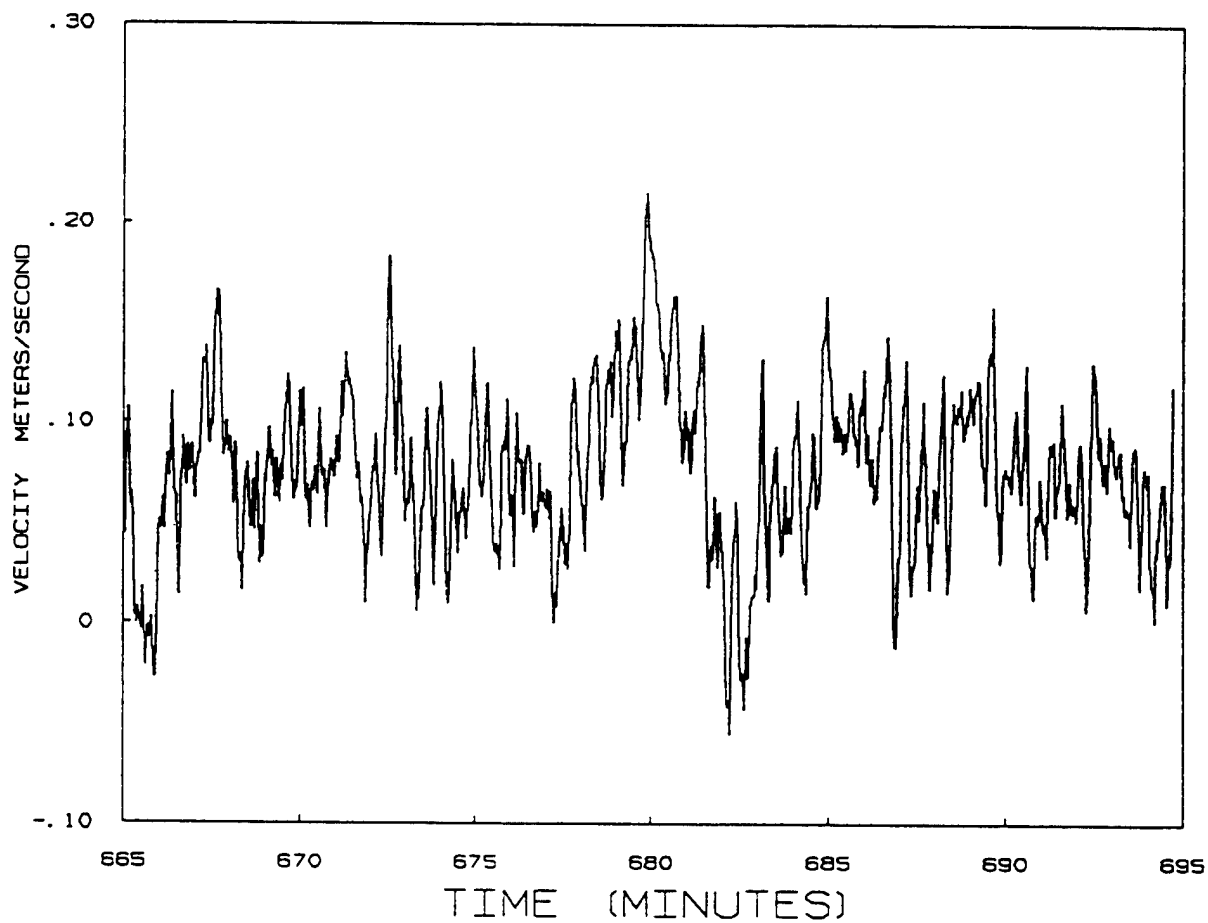
|               |          |            |                  |
|---------------|----------|------------|------------------|
| meter number  | 040      | distance   | 310              |
| tow name      | hugh c.  | start-time | 1105             |
| configuration | 3x5      | end-time   | 1135             |
| draft         | 8.5      | MEAN =     | 0.47             |
| speed         | 4.2 mph  | VMAX =     | 0.77 TMAX = 681. |
| direction     | upstream | VMIN =     | 0.12 TMIN = 666. |



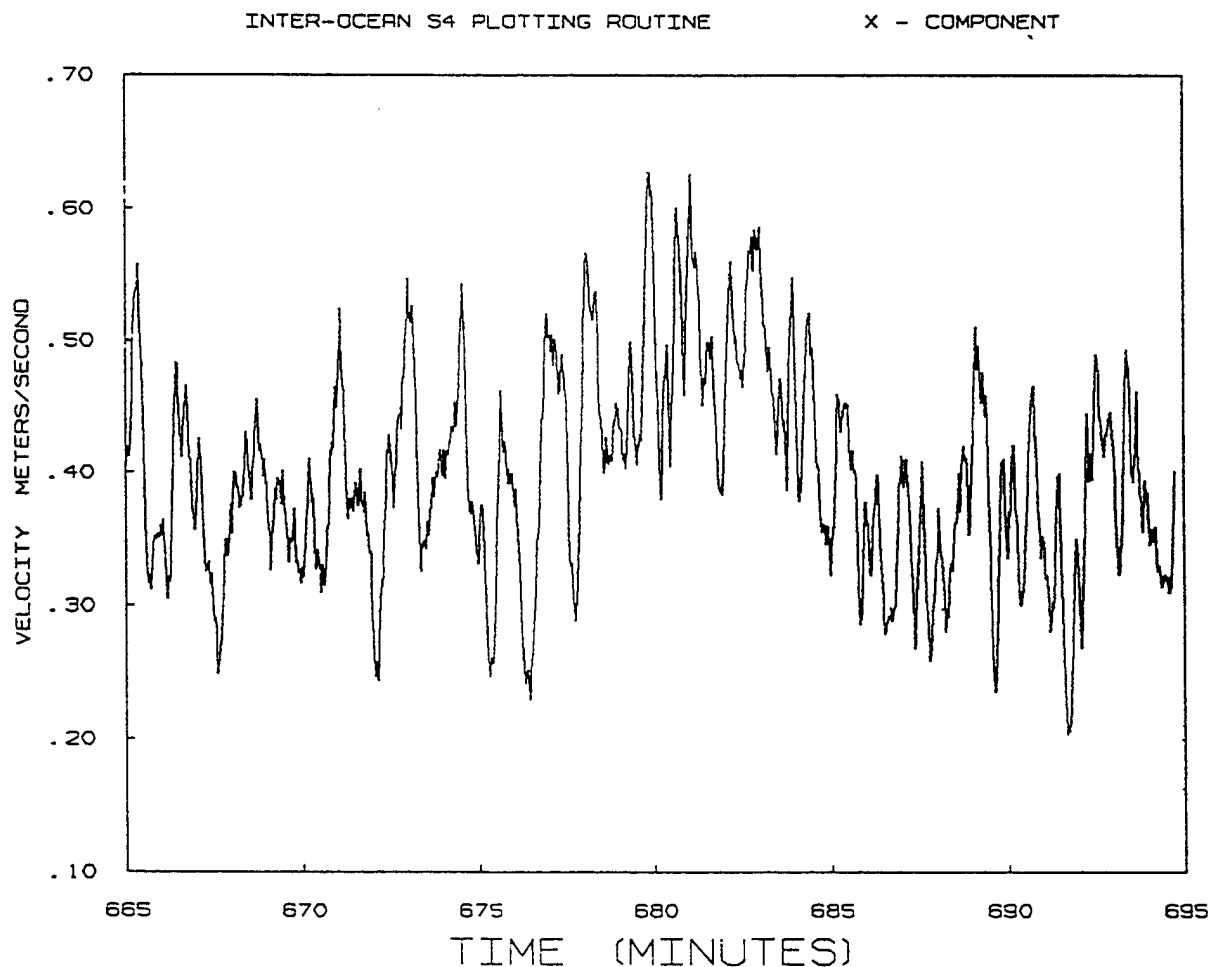
|               |          |            |                   |
|---------------|----------|------------|-------------------|
| meter number  | 040      | distance   | 310               |
| tow name      | hugh c.  | start-time | 1105              |
| configuration | 3x5      | end-time   | 1135              |
| draft         | 8.5      | MEAN =     | 0.07              |
| speed         | 4.2 mph  | VMAX =     | 0.22 TMAX = 680.  |
| direction     | upstream | VMIN =     | -0.06 TMIN = 682. |

INTER-OCEAN S4 PLOTTING ROUTINE

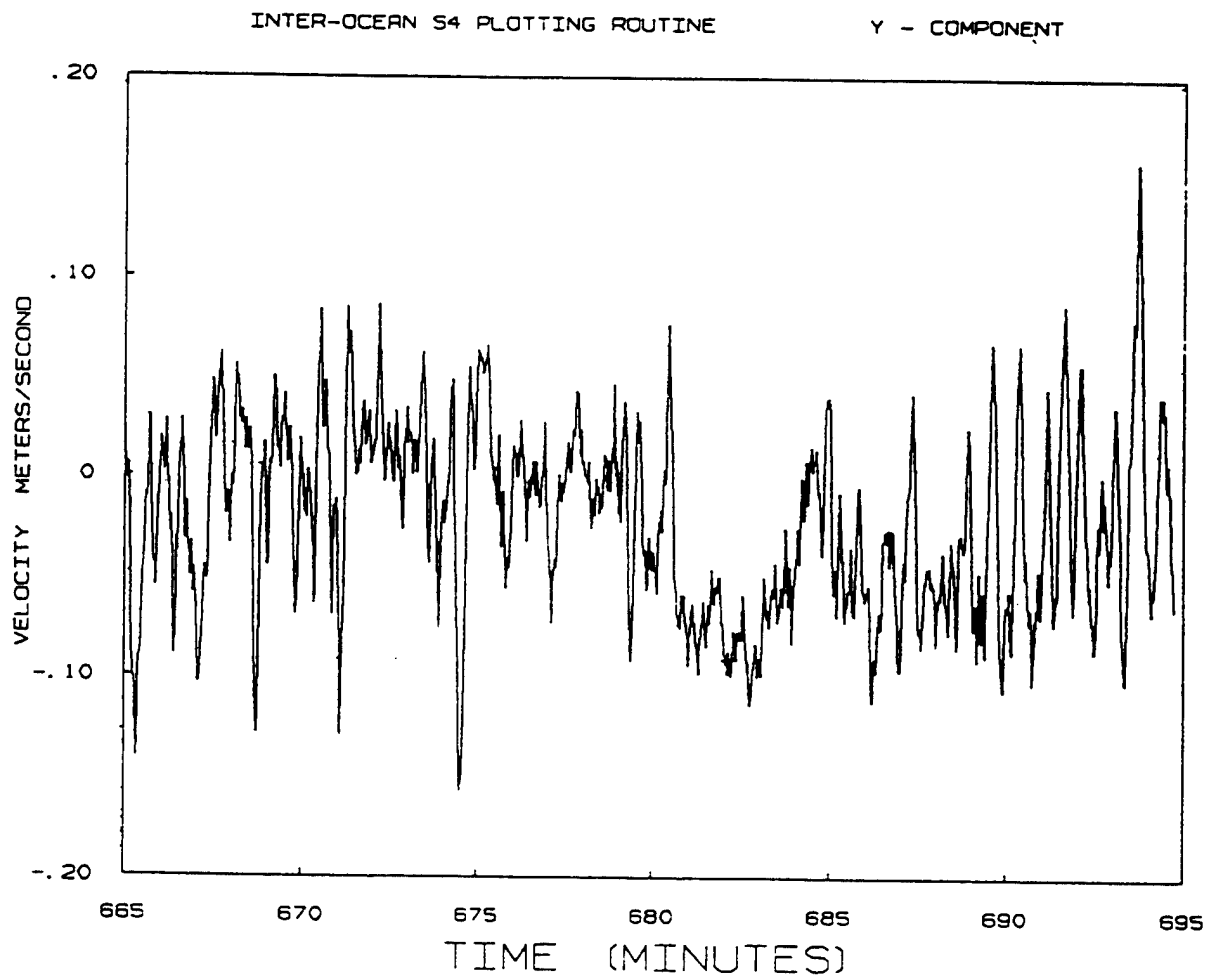
Y - COMPONENT



|               |          |            |                  |
|---------------|----------|------------|------------------|
| meter number  | 071      | distance   | 310              |
| tow name      | hugh c.  | start-time | 1105             |
| configuration | 3x5      | end-time   | 1135             |
| draft         | 8.5      | MEAN =     | 0.39             |
| speed         | 4.2 mph  | VMAX =     | 0.63 TMAX = 680. |
| direction     | upstream | VMIN =     | 0.20 TMIN = 692. |



|               |          |            |                     |
|---------------|----------|------------|---------------------|
| meter number  | 071      | distance   | 310                 |
| tow name      | hugh c.  | start-time | 1105                |
| configuration | 3x5      | end-time   | 1135                |
| draft         | 8.5      | MEAN       | = -0.01             |
| speed         | 4.2 mph  | VMAX       | = 0.16 TMAX = 694.  |
| direction     | upstream | VMIN       | = -0.16 TMIN = 674. |



XX-4. Velocity fluctuations measured by two-dimensional current meters  
for barge *Jeff Boat* at Kampsville, trip 1

Jeff Boat (10/14/90)

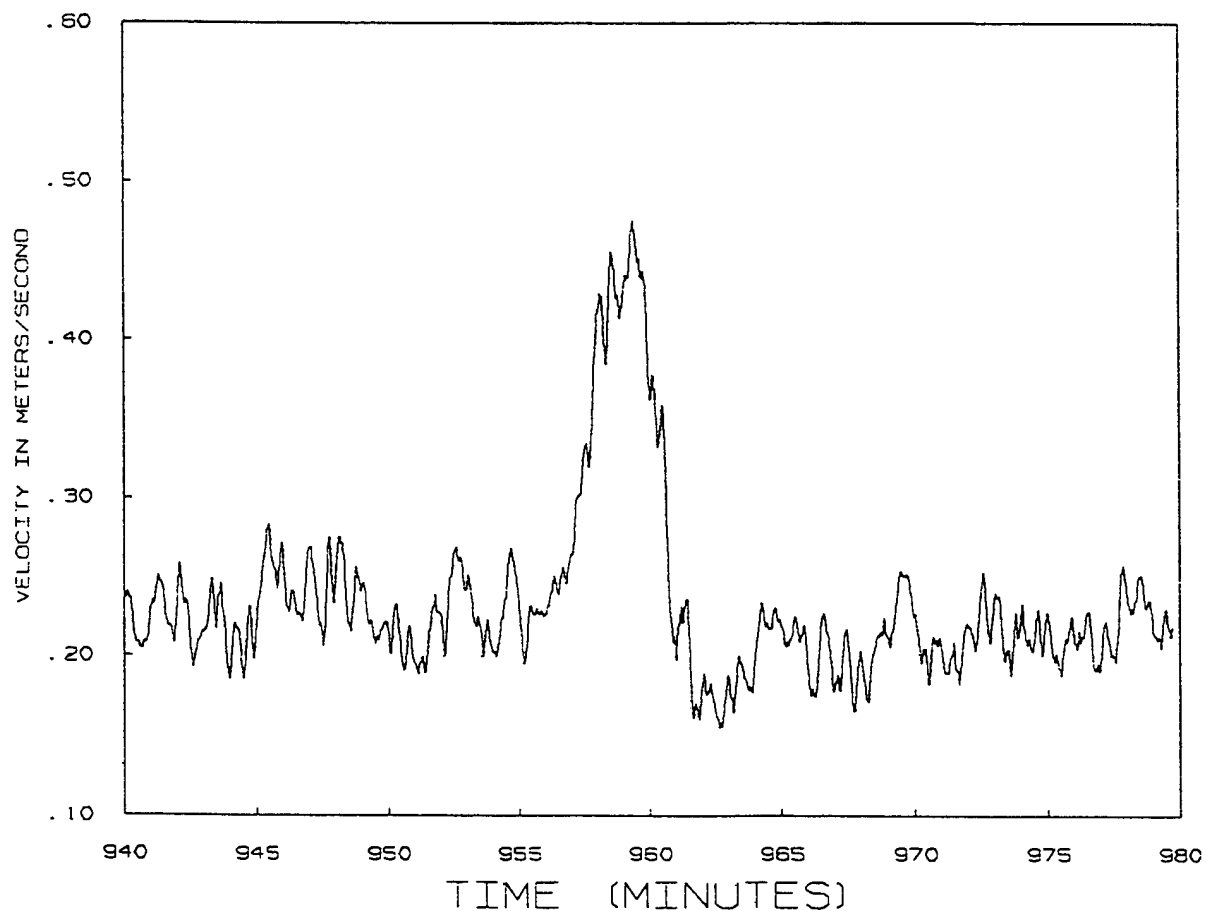
Status of Electromagnetic Current Meters:

|                       |                      |                      |                       |
|-----------------------|----------------------|----------------------|-----------------------|
| 1001<br>(MMB511)<br>✓ | 998<br>(MMB511)<br>✓ | 999<br>(MMB511)<br>✓ | 1000<br>(MMB511)<br>✓ |
| 332<br>(MMB527)<br>✓  | 642<br>(MMB527)<br>✓ |                      |                       |
| 040<br>(S4)<br>✓      | 071<br>(S4)<br>✓     |                      |                       |

Note: ✓ : Working  
\* : Not working

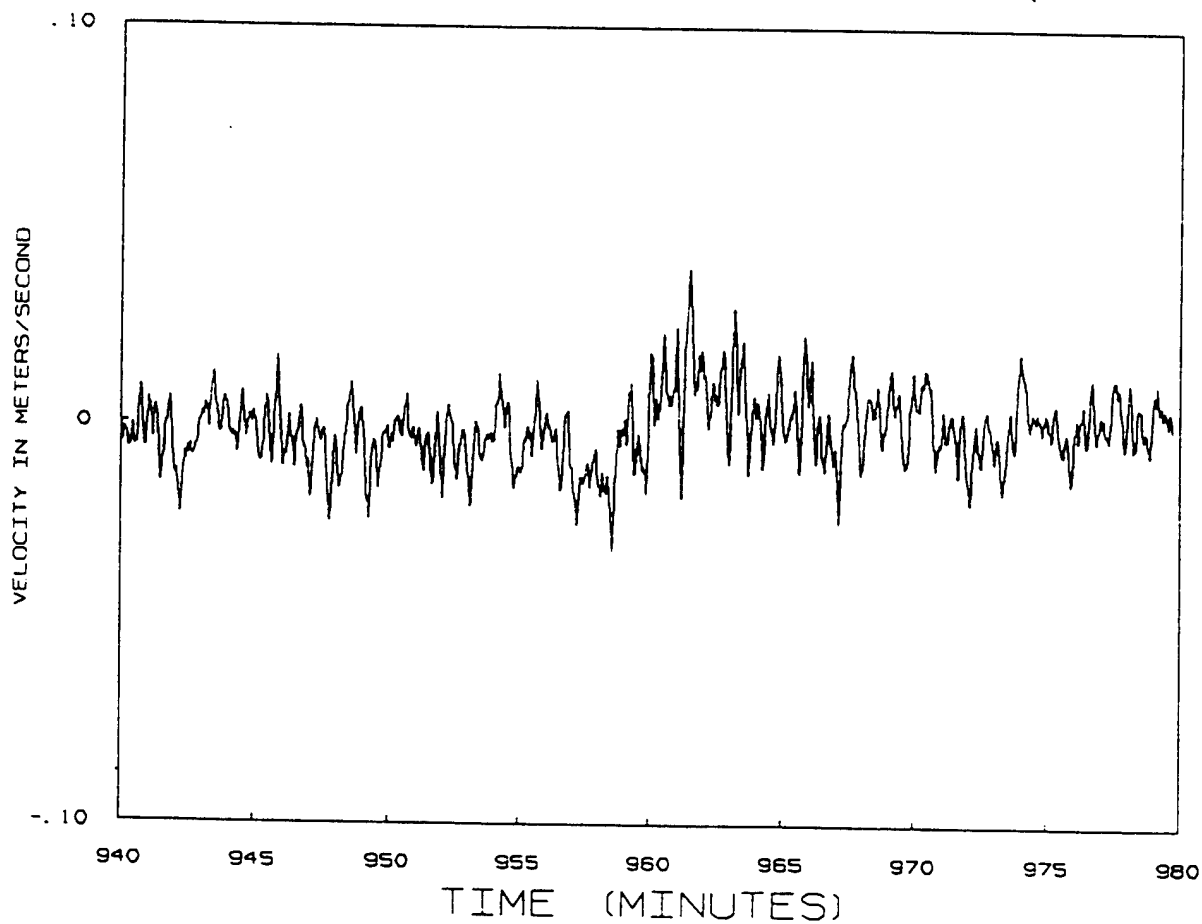
|               |           |            |                  |
|---------------|-----------|------------|------------------|
| meter number  | 511-1001  | start-time | 1540             |
| tow name      | jeff boat | end-time   | 1620             |
| configuration | 3x5       | mean =     | 0.23             |
| draft         | 9.0       | vmax =     | 0.00 tmax = 959. |
| speed         | 4.2 mph   | vmin =     | 0.00 tmin = 963. |
| direction     | upstream  |            |                  |
| distance      | 375       |            |                  |

MARSH MCBIRNEY 511/527 PLOTTING ROUTINE X - COMPONENT



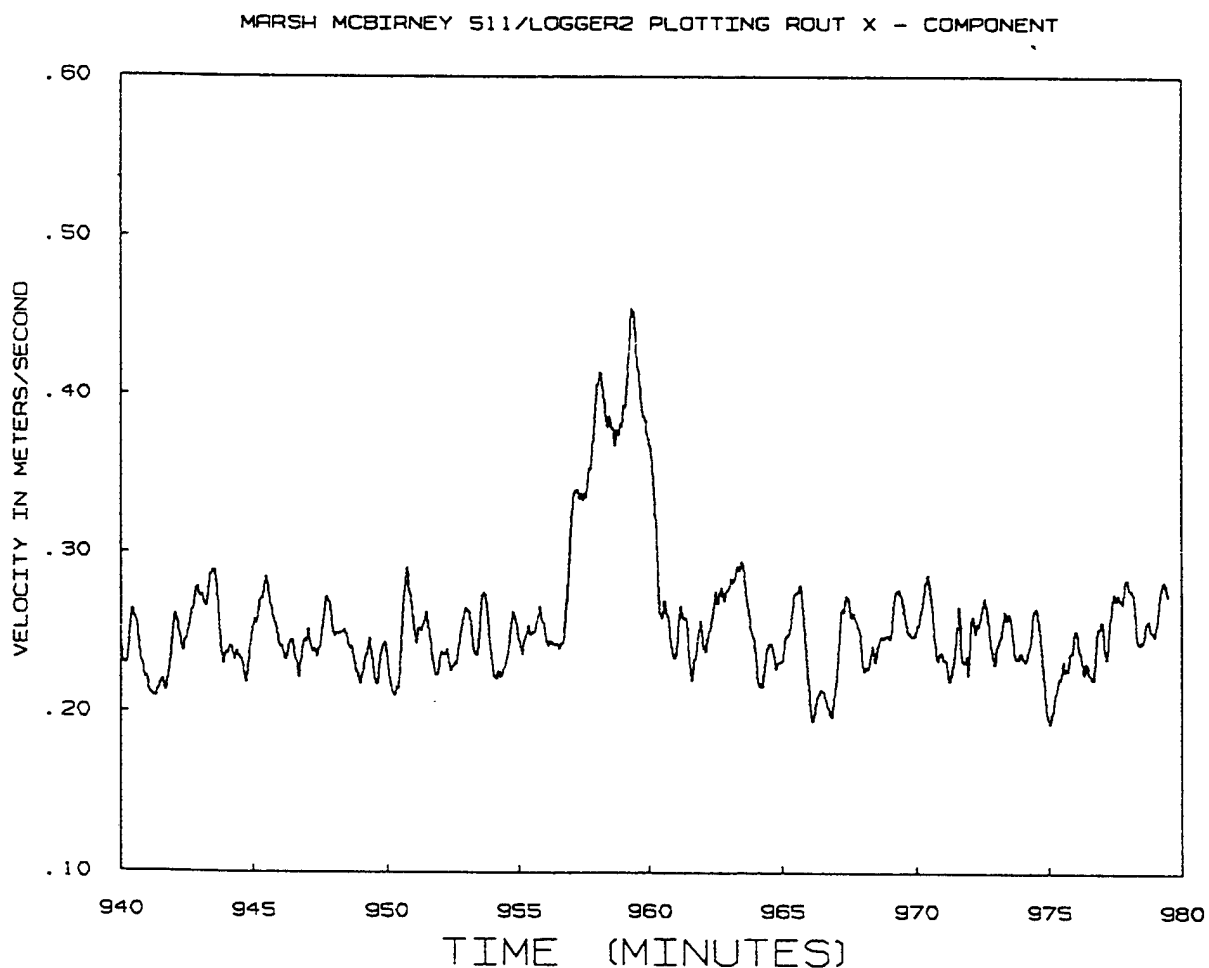
|               |           |            |                  |
|---------------|-----------|------------|------------------|
| meter number  | 511-1001  | start-time | 1540             |
| tow name      | jeff boat | end-time   | 1620             |
| configuration | 3x5       | mean =     | 0.00             |
| draft         | 9.0       | vmax =     | 0.00 tmax = 961. |
| speed         | 4.2 mph   | vmin =     | 0.00 tmin = 959. |
| direction     | upstream  |            |                  |
| distance      | 375       |            |                  |

MARSH MCBIRNEY 511/527 PLOTTING ROUTINE Y - COMPONENT



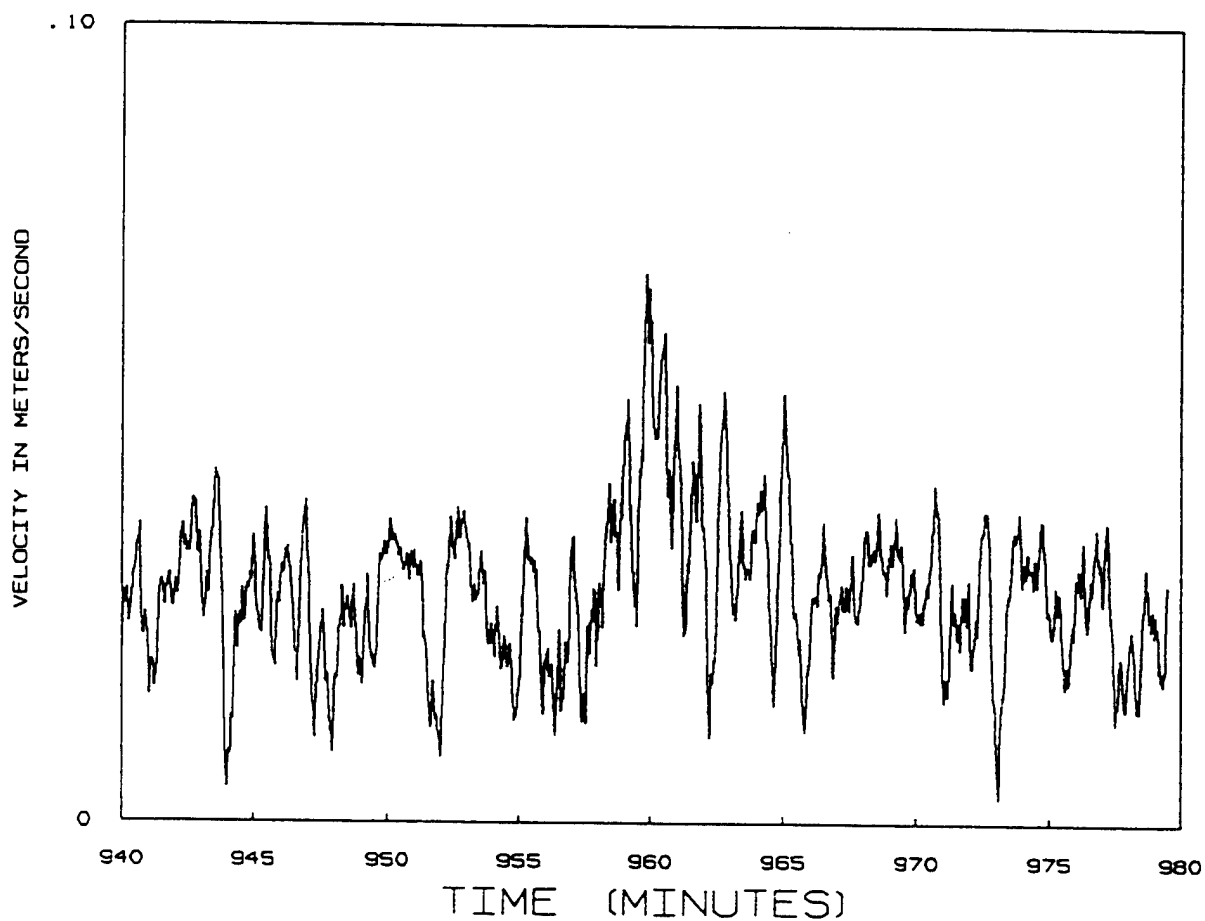


|               |           |            |                  |
|---------------|-----------|------------|------------------|
| meter number  | 998       | distance   | 375              |
| tow name      | jeff boat | start-time | 1540             |
| configuration | 3x5       | end-time   | 1620             |
| draft         | 9.0       | mean =     | 0.24             |
| speed         | 4.2 mph   | vmax =     | 0.45 tmax = 959. |
| direction     | upstream  | vmin =     | 0.19 tmin = 975. |

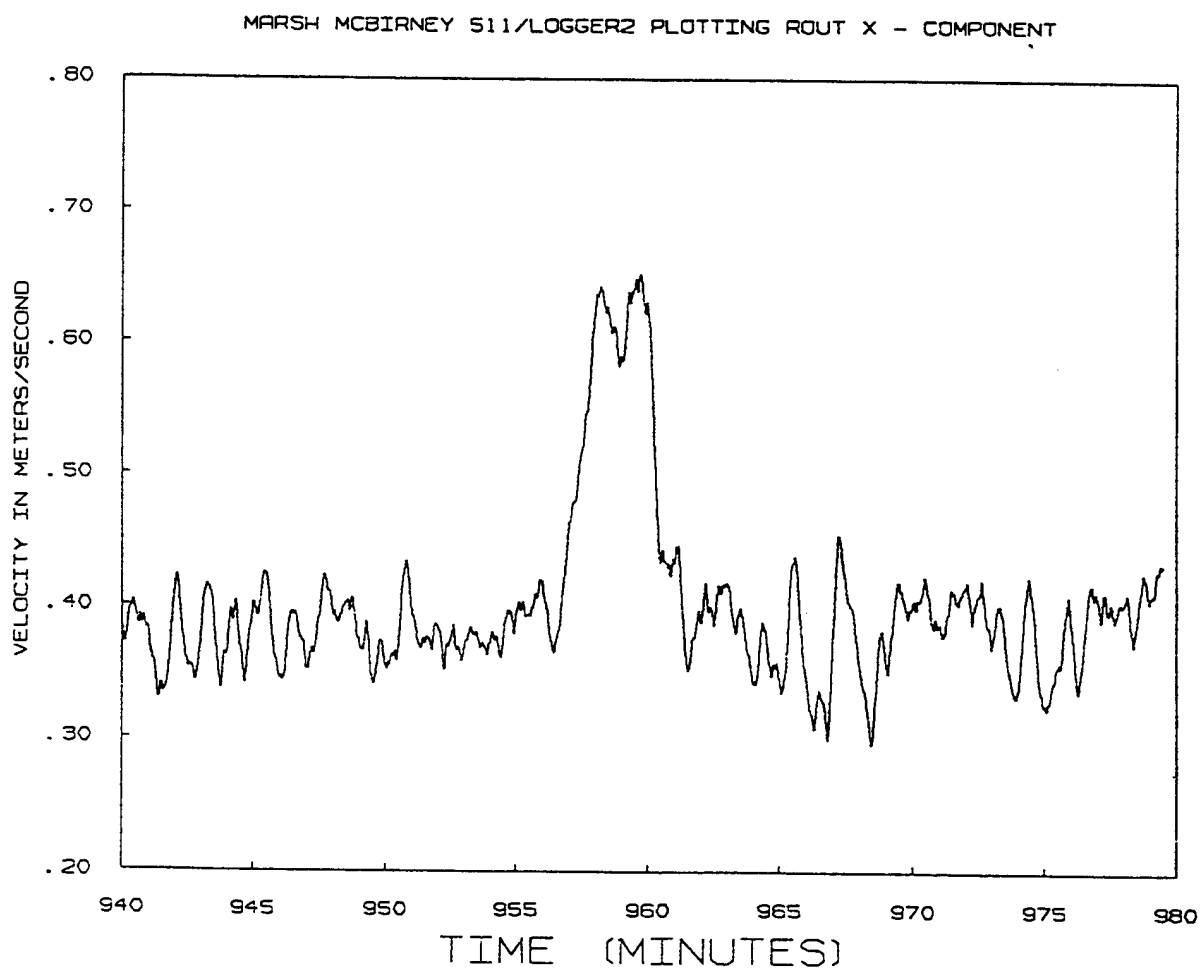


|               |           |            |                  |
|---------------|-----------|------------|------------------|
| meter number  | 998       | distance   | 375              |
| tow name      | jeff boat | start-time | 1540             |
| configuration | 3x5       | end-time   | 1620             |
| draft         | 9.0       | mean =     | 0.03             |
| speed         | 4.2 mph   | vmax =     | 0.07 tmax = 960. |
| direction     | upstream  | vmin =     | 0.00 tmin = 973. |

MARSH MCBIRNEY S11/LOGGER2 PLOTTING ROUT Y - COMPONENT

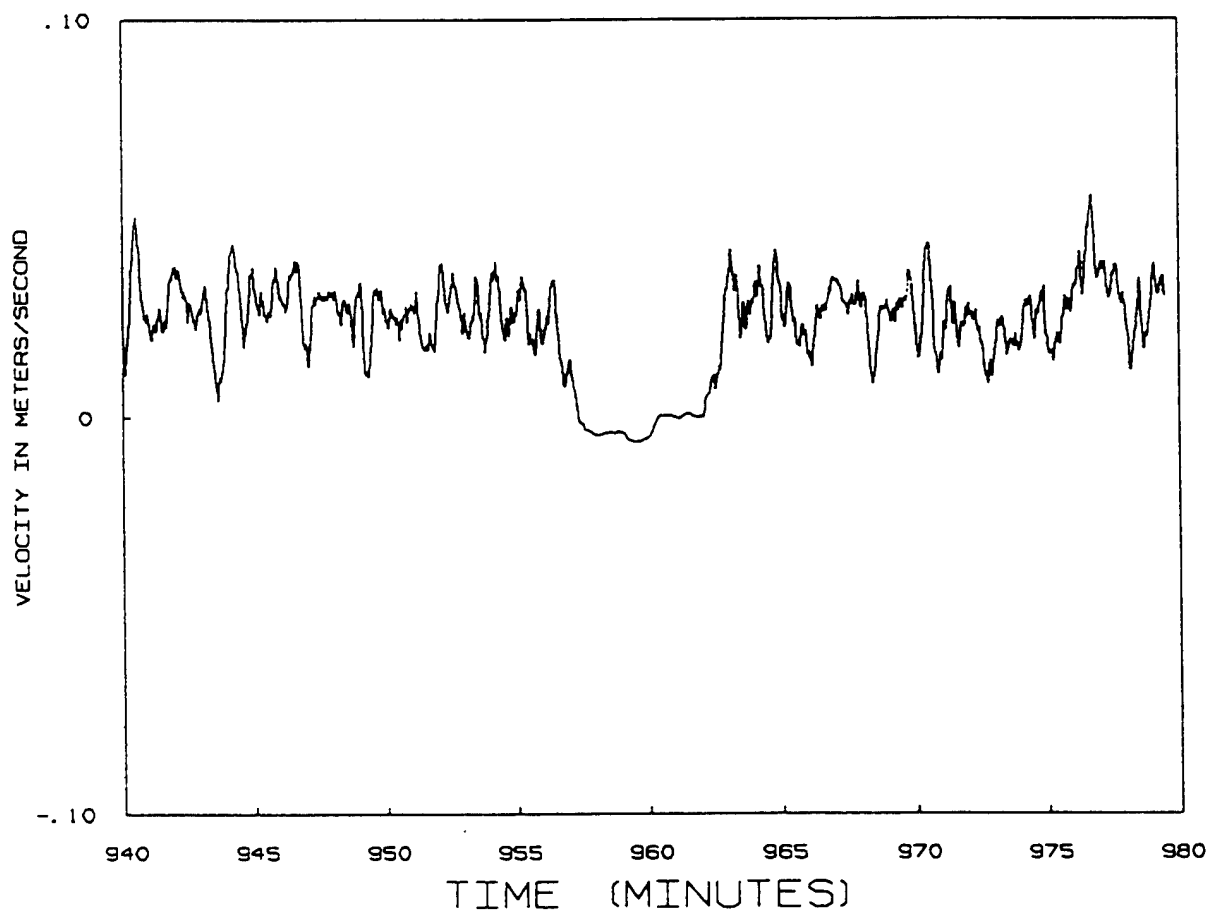


|               |           |            |                  |
|---------------|-----------|------------|------------------|
| meter number  | 999       | distance   | 375              |
| tow name      | jeff boat | start-time | 1540             |
| configuration | 3x5       | end-time   | 1620             |
| draft         | 9.0       | mean =     | 0.38             |
| speed         | 4.2 mph   | vmax =     | 0.65 tmax = 960. |
| direction     | upstream  | vmin =     | 0.30 tmin = 968. |



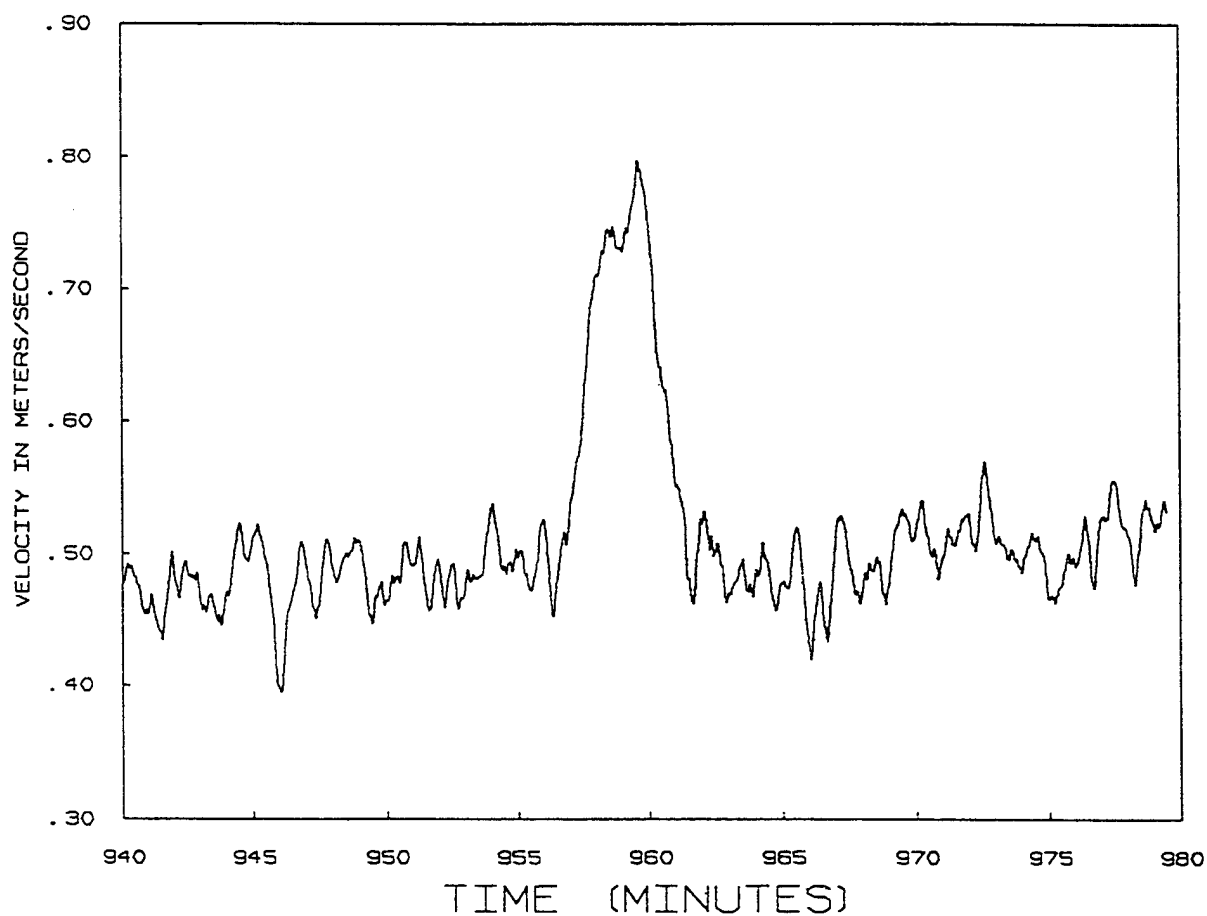
|               |           |            |                   |
|---------------|-----------|------------|-------------------|
| meter number  | 999       | distance   | 375               |
| tow name      | jeff boat | start-time | 1540              |
| configuration | 3x5       | end-time   | 1620              |
| draft         | 9.0       | mean =     | 0.03              |
| speed         | 4.2 mph   | vmax =     | 0.06 tmax = 977.  |
| direction     | upstream  | vmin =     | -0.01 tmin = 960. |

MARSH MCBIRNEY 511/LOGGER2 PLOTTING ROUT Y - COMPONENT

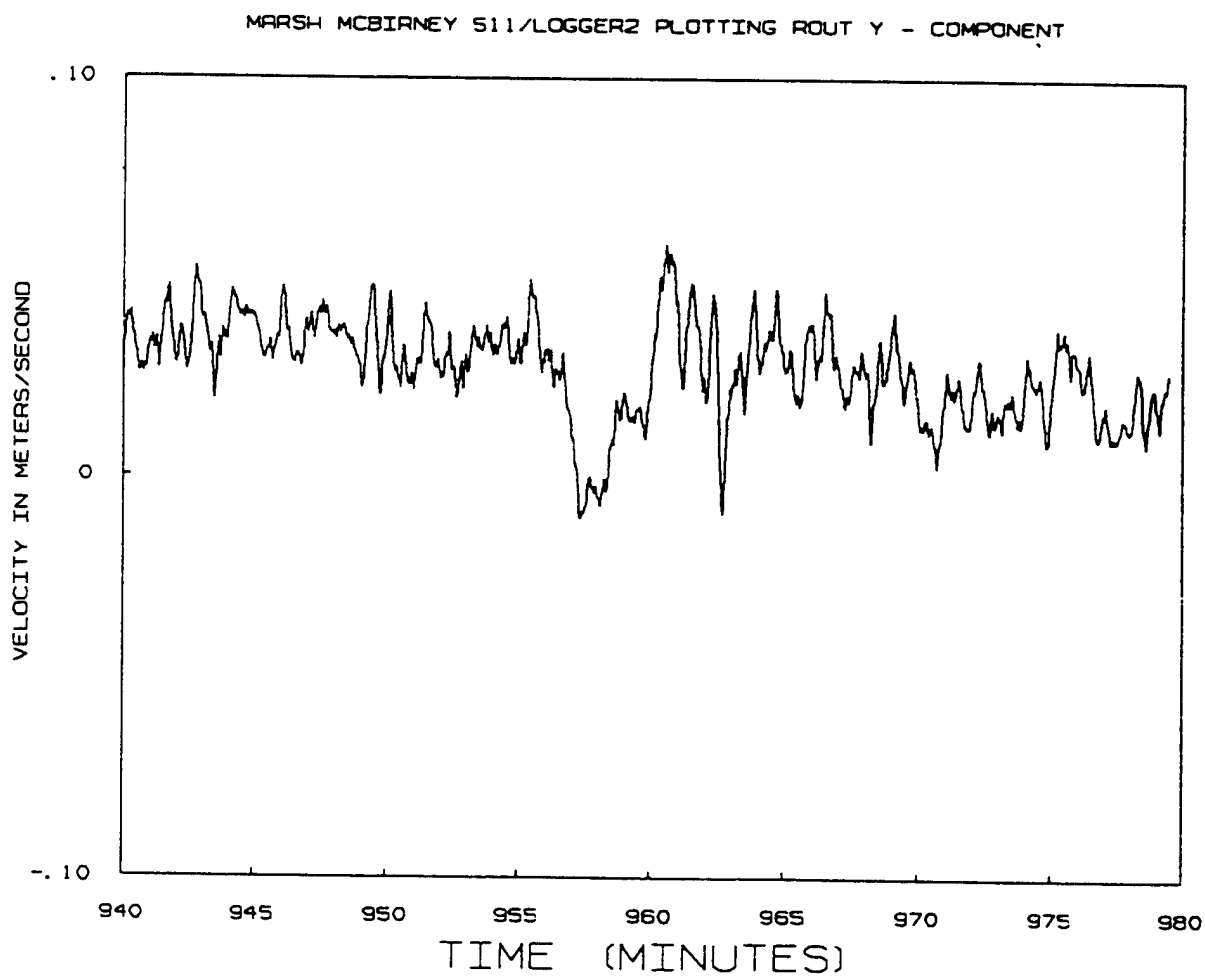


|               |           |            |                  |
|---------------|-----------|------------|------------------|
| meter number  | 1000      | distance   | 375              |
| tow name      | jeff boat | start-time | 1540             |
| configuration | 3x5       | end-time   | 1620             |
| draft         | 9.0       | mean =     | 0.48             |
| speed         | 4.2 mph   | vmax =     | 0.80 tmax = 960. |
| direction     | upstream  | vmin =     | 0.39 tmin = 946. |

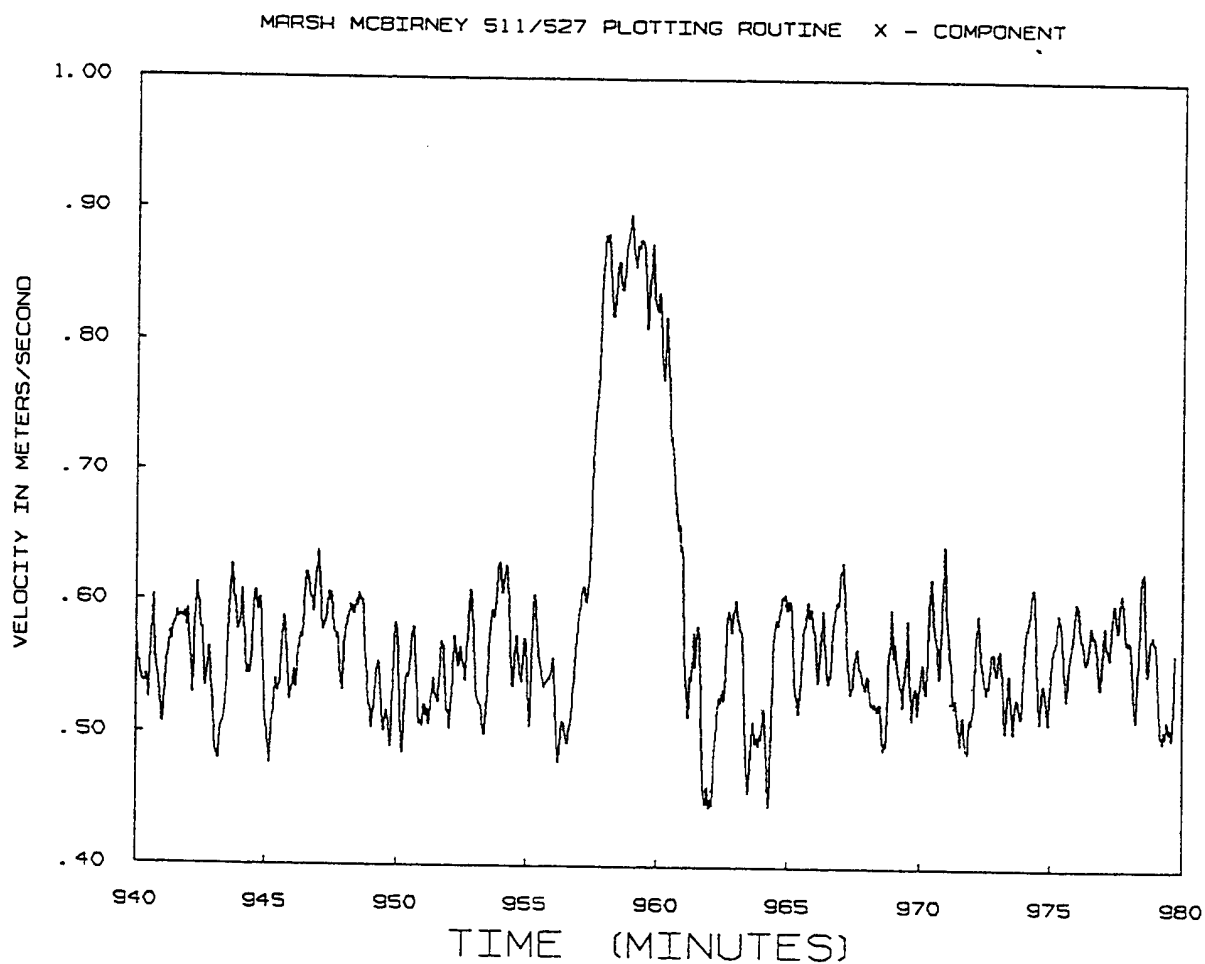
MARSH MCBIRNEY S11/LOGGER2 PLOTTING ROUT X - COMPONENT



|               |           |            |                   |
|---------------|-----------|------------|-------------------|
| meter number  | 1000      | distance   | 375               |
| tow name      | jeff boat | start-time | 1540              |
| configuration | 3x5       | end-time   | 1620              |
| draft         | 9.0       | mean =     | 0.04              |
| speed         | 4.2 mph   | vmax =     | 0.06 tmax = 961.  |
| direction     | upstream  | vmin =     | -0.01 tmin = 957. |

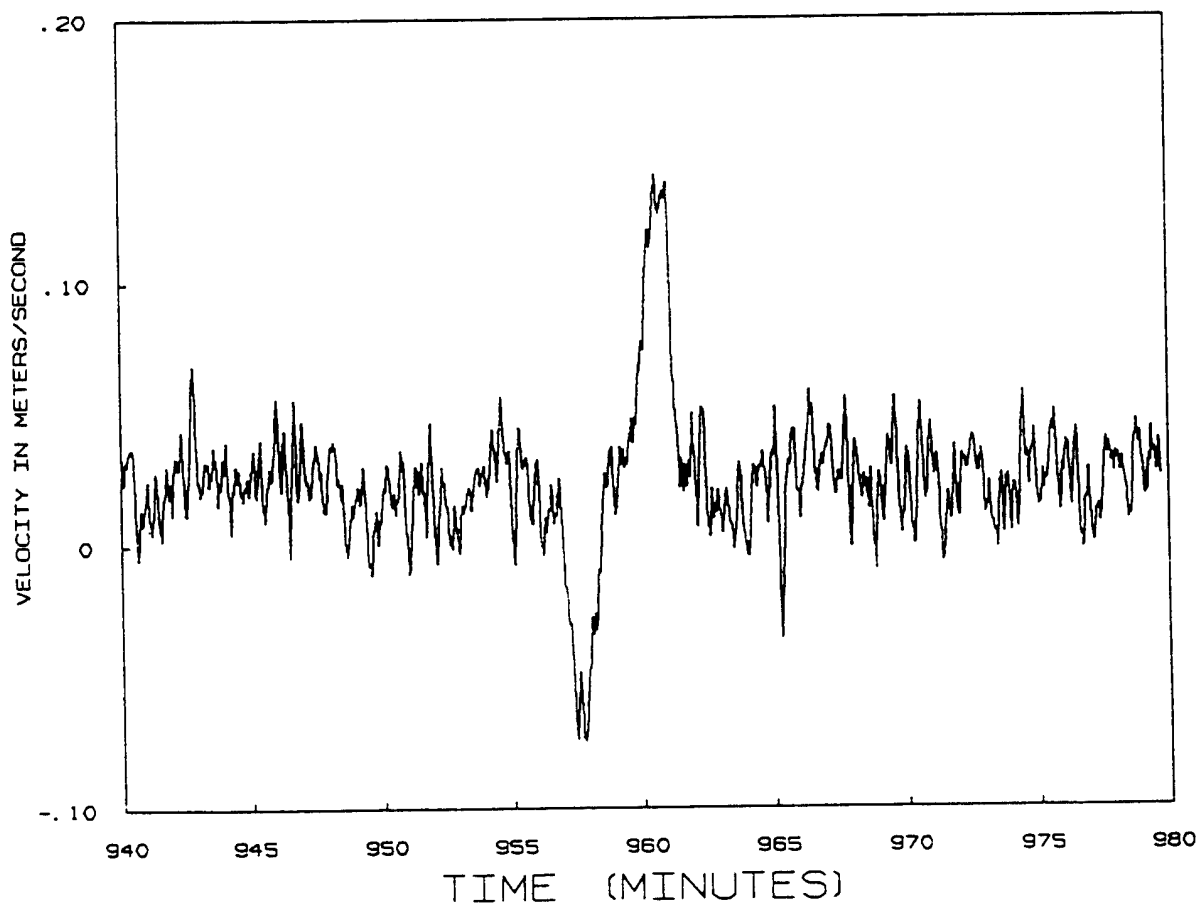


|               |           |            |                  |
|---------------|-----------|------------|------------------|
| meter number  | B-332     | start-time | 1540             |
| tow name      | jeff boat | end-time   | 1620             |
| configuration | 3x5       | mean =     | 0.56             |
| draft         | 9.0       | vmax =     | 0.00 tmax = 959. |
| speed         | 4.2 mph   | vmin =     | 0.00 tmin = 962. |
| direction     | upstream  |            |                  |
| distance      | 375       |            |                  |



|               |           |            |                  |
|---------------|-----------|------------|------------------|
| meter number  | B-332     | start-time | 1540             |
| tow name      | jeff boat | end-time   | 1620             |
| configuration | 3x5       | mean =     | 0.02             |
| draft         | 9.0       | vmax =     | 0.00 tmax = 961. |
| speed         | 4.2 mph   | vmin =     | 0.00 tmin = 958. |
| direction     | upstream  |            |                  |
| distance      | 375       |            |                  |

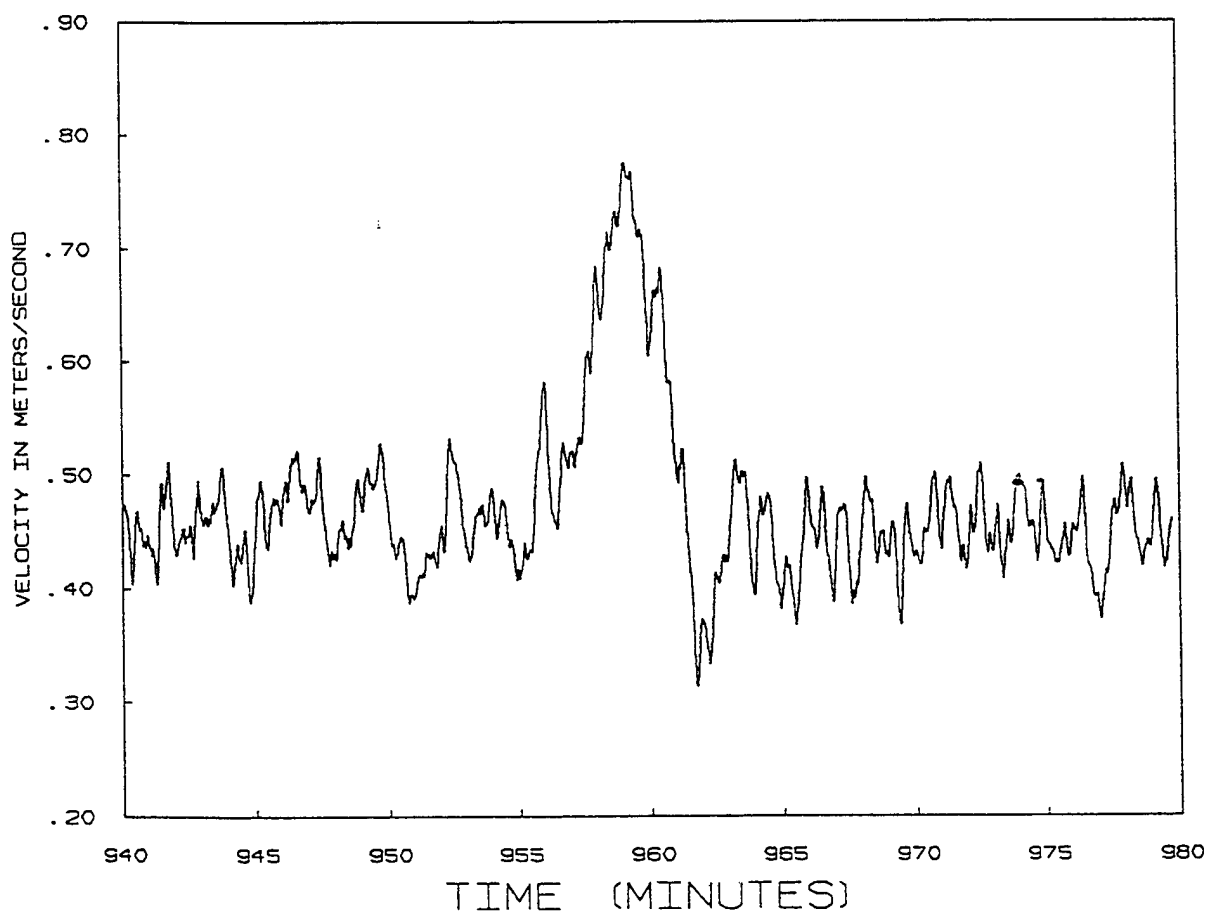
MARSH MCBIRNEY 511/527 PLOTTING ROUTINE Y - COMPONENT





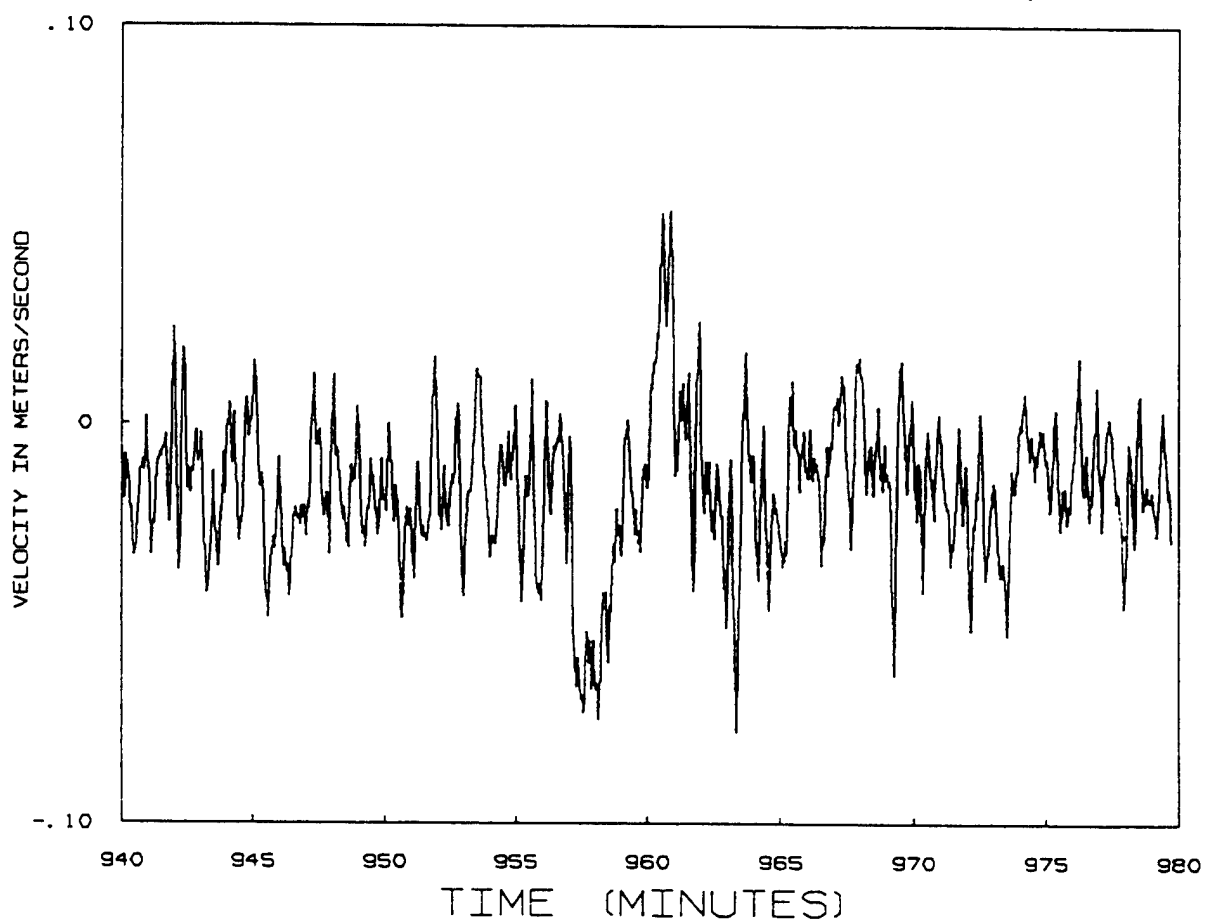
|               |           |            |                  |
|---------------|-----------|------------|------------------|
| meter number  | B-642     | start-time | 1540             |
| tow name      | jeff boat | end-time   | 1620             |
| configuration | 3x5       | mean =     | 0.46             |
| draft         | 9.0       | vmax =     | 0.00 tmax = 959. |
| speed         | 4.2 mph   | vmin =     | 0.00 tmin = 962. |
| direction     | upstream  |            |                  |
| distance      | 375       |            |                  |

MARSH MCBIRNEY S11/S27 PLOTTING ROUTINE X - COMPONENT

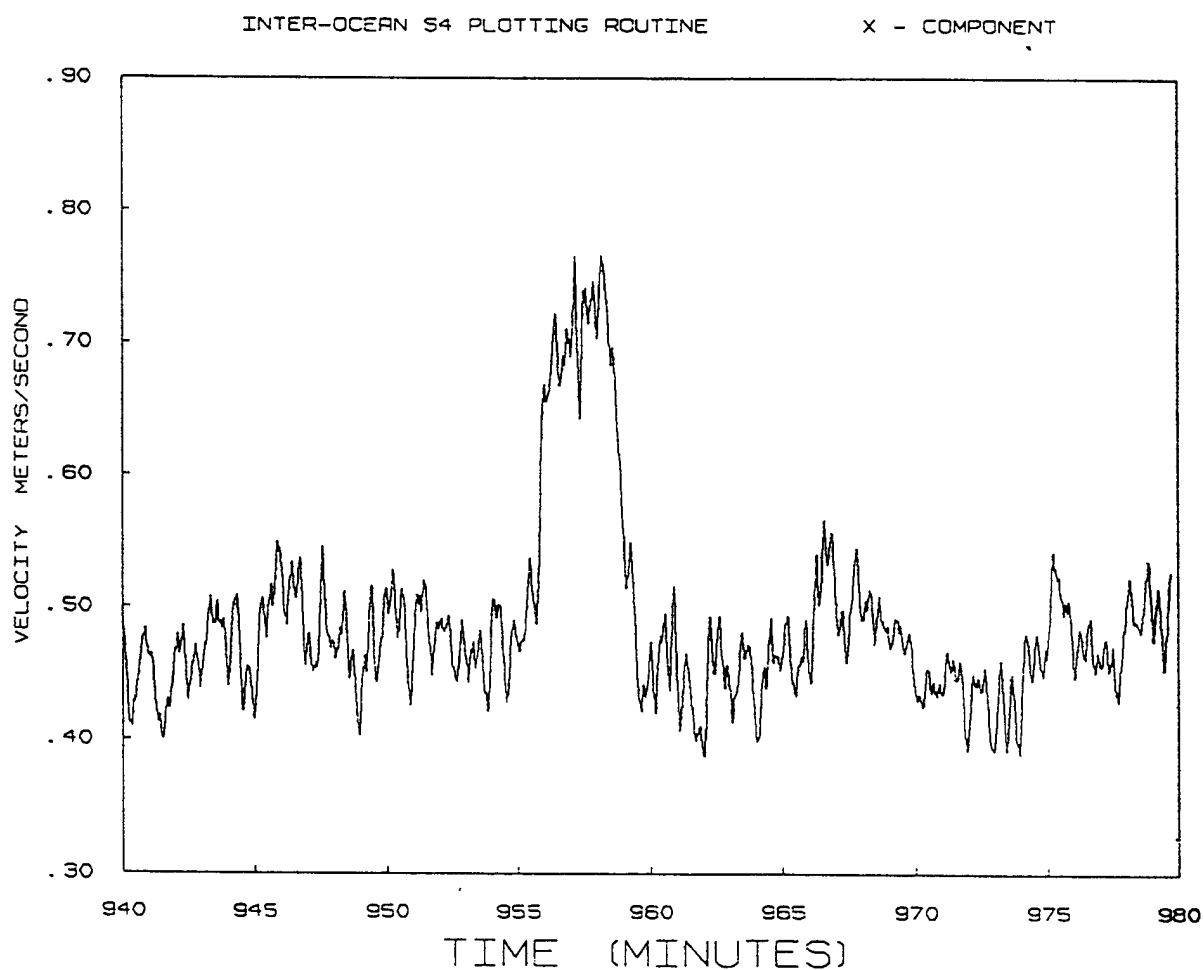


|               |           |            |                    |
|---------------|-----------|------------|--------------------|
| meter number  | B-642     | start-time | 1540               |
| tow name      | jeff boat | end-time   | 1620               |
| configuration | 3x5       | mean       | = -0.02            |
| draft         | 9.0       | vmax       | = 0.00 tmax = 961. |
| speed         | 4.2 mph   | vmin       | = 0.00 tmin = 963. |
| direction     | upstream  |            |                    |
| distance      | 375       |            |                    |

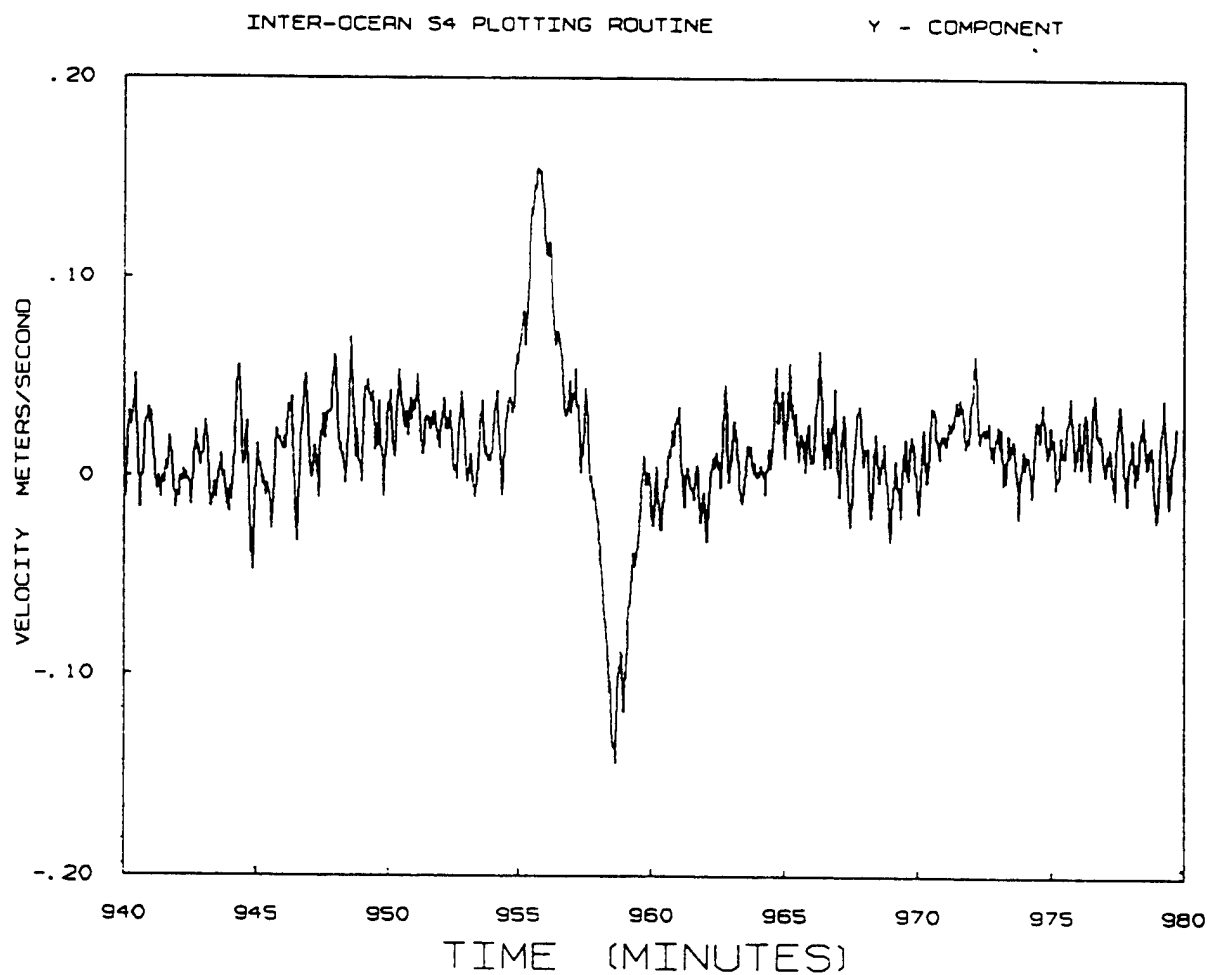
MARSH MCBIRNEY S11/S27 PLOTTING ROUTINE Y - COMPONENT



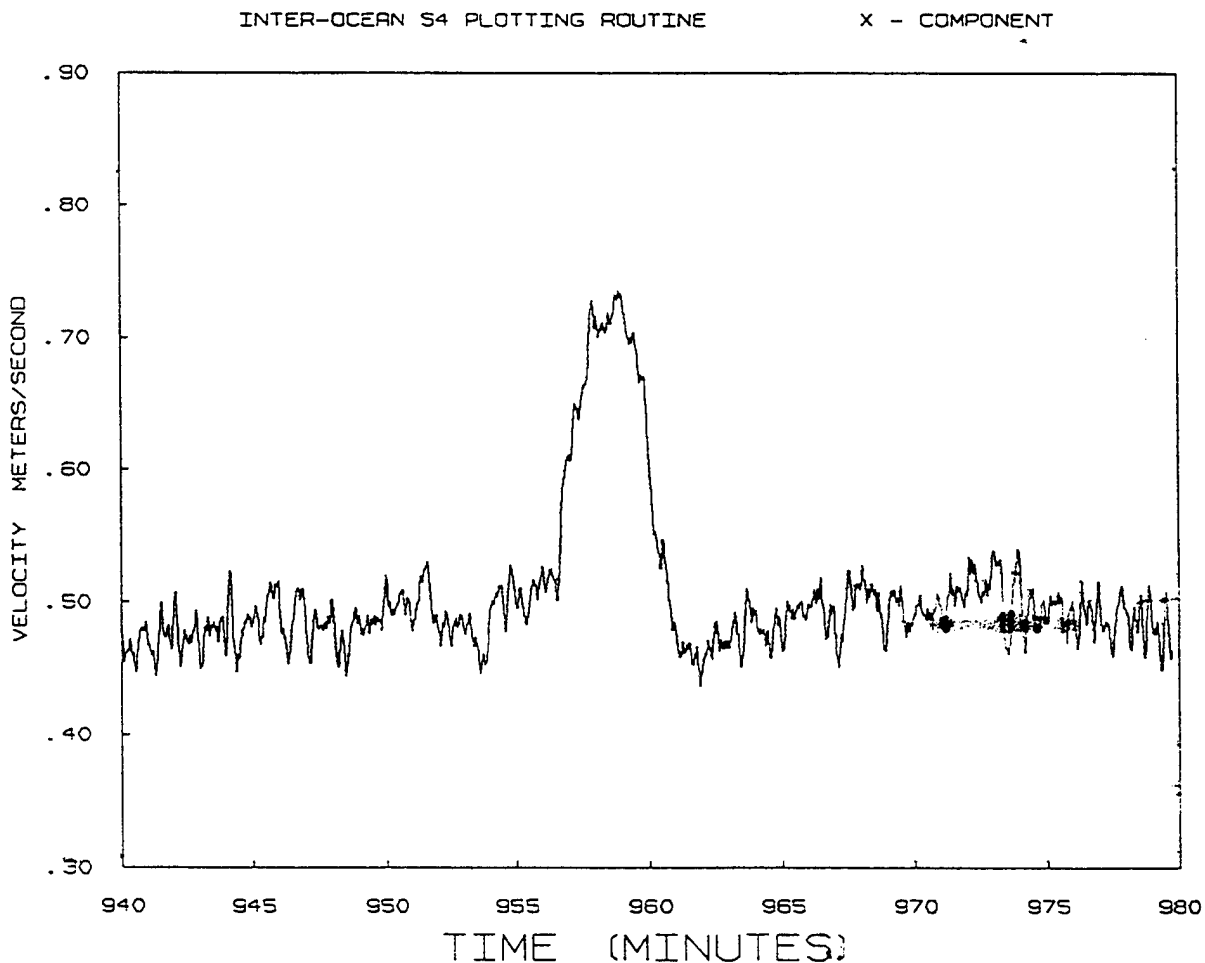
|               |           |            |                  |
|---------------|-----------|------------|------------------|
| meter number  | 040       | distance   | 375              |
| tow name      | jeff boat | start-time | 1540             |
| configuration | 3x5       | end-time   | 1620             |
| draft         | 9.0       | MEAN =     | 0.47             |
| speed         | 4.2 mph   | VMAX =     | 0.77 TMAX = 958. |
| direction     | upstream  | VMIN =     | 0.39 TMIN = 962. |



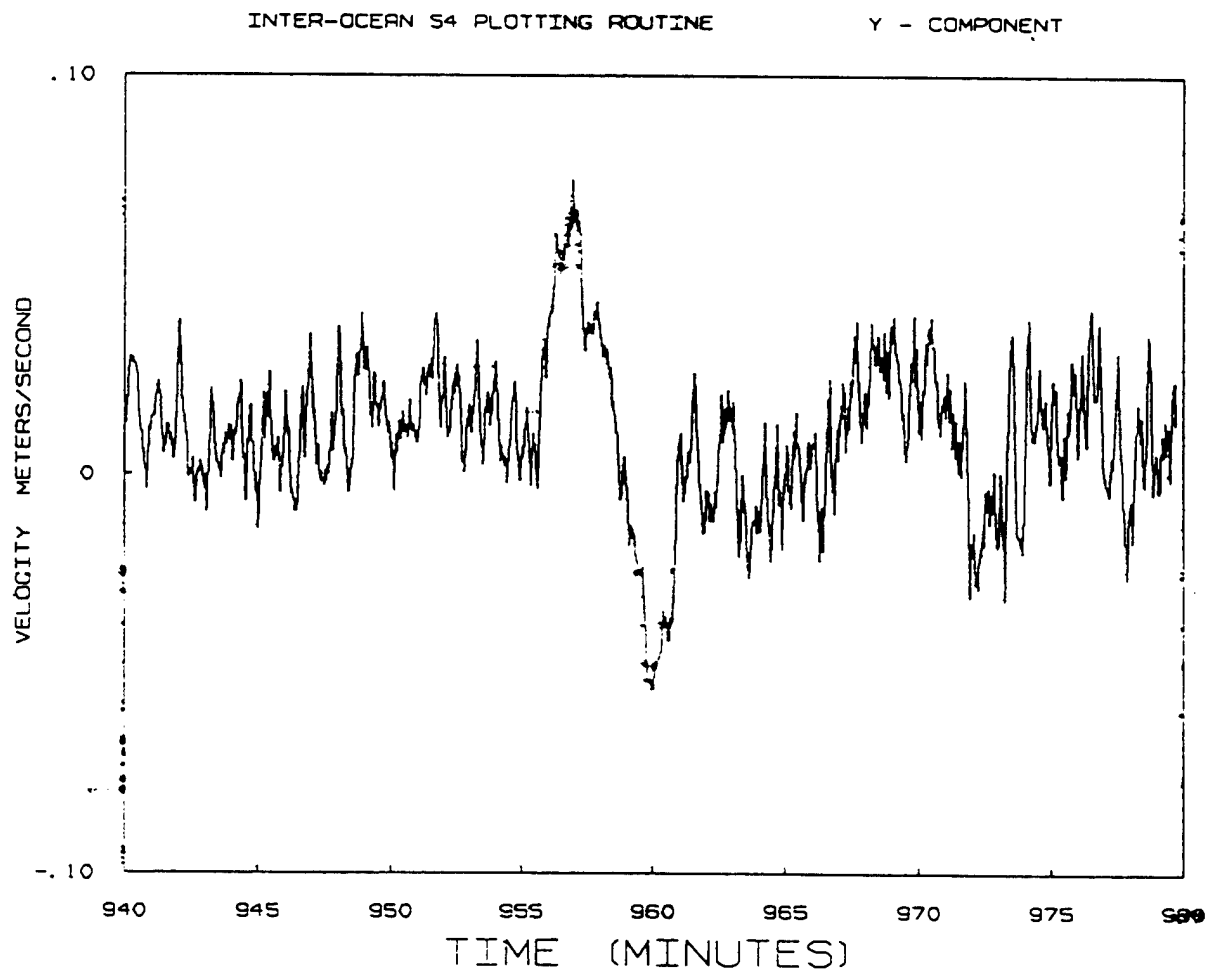
|               |           |            |                   |
|---------------|-----------|------------|-------------------|
| meter number  | 040       | distance   | 375               |
| tow name      | jeff boat | start-time | 1540              |
| configuration | 3x5       | end-time   | 1620              |
| draft         | 9.0       | MEAN =     | 0.01              |
| speed         | 4.2 mph   | VMAX =     | 0.16 TMAX = 956.  |
| direction     | upstream  | VMIN =     | -0.14 TMIN = 959. |



|               |           |            |                  |
|---------------|-----------|------------|------------------|
| meter number  | 071       | distance   | 375              |
| tow name      | jeff boat | start-time | 1540             |
| configuration | 3x5       | end-time   | 1620             |
| draft         | 9.0       | MEAN =     | 0.48             |
| speed         | 4.2 mph   | VMAX =     | 0.74 TMAX = 959. |
| direction     | upstream  | VMIN =     | 0.44 TMIN = 962. |



|               |           |            |                   |
|---------------|-----------|------------|-------------------|
| meter number  | 071       | distance   | 375               |
| tow name      | jeff boat | start-time | 1540              |
| configuration | 3x5       | end-time   | 1820              |
| draft         | 9.0       | MEAN =     | 0.01              |
| speed         | 4.2 mph   | VMAX =     | 0.07 TMAX = 957.  |
| direction     | upstream  | VMIN =     | -0.05 TMIN = 960. |



XX-5. Velocity fluctuations measured by two-dimensional current meters  
for barge *American Beauty* at Clarks Ferry, trip 1

American Beauty (1) (5/20/91)

Status of Electromagnetic Current Meters:

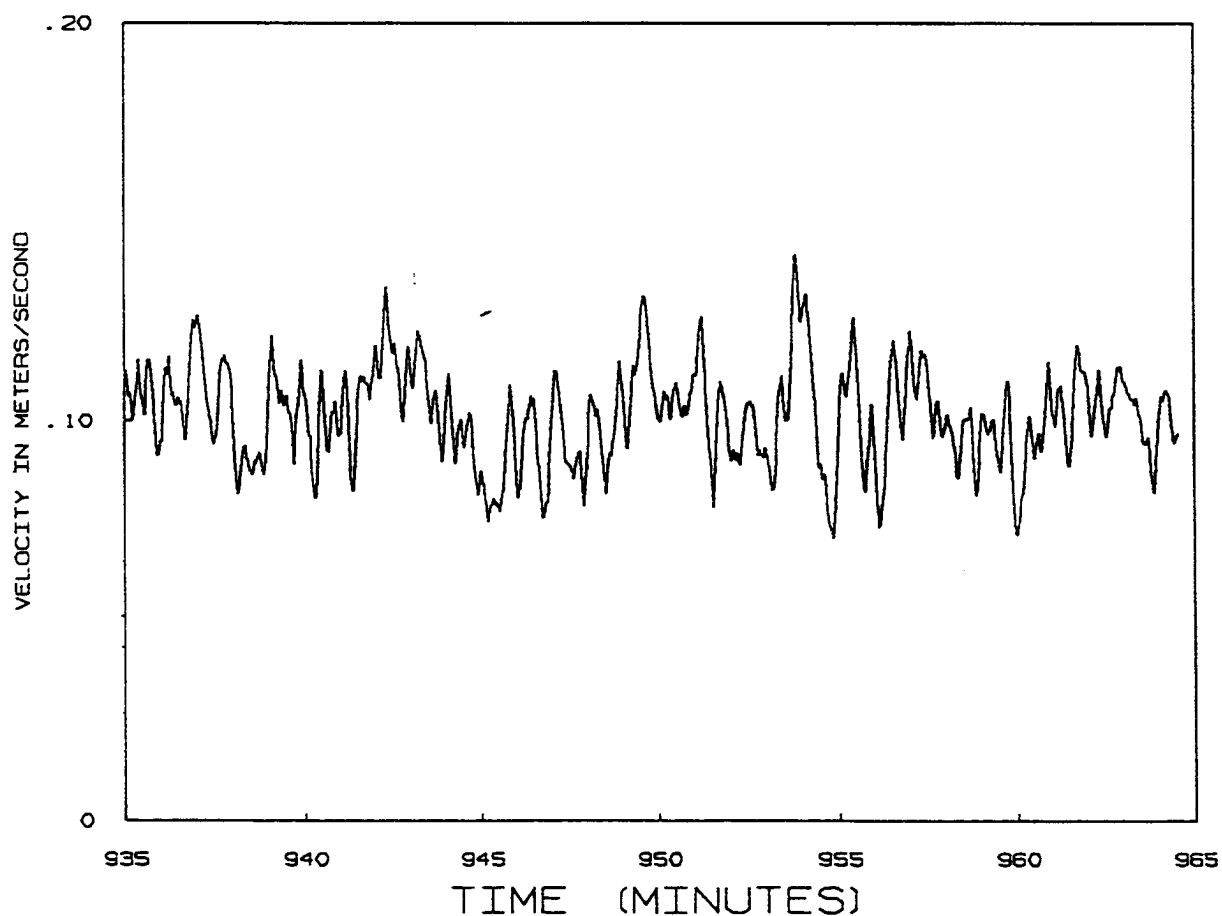
|                       |                       |                       |                      |                      |                       |
|-----------------------|-----------------------|-----------------------|----------------------|----------------------|-----------------------|
| 1001<br>(MMB511)<br>√ | 1330<br>(MMB511)<br>√ | 1331<br>(MMB511)<br>√ | 998<br>(MMB511)<br>√ | 999<br>(MMB511)<br>√ | 1000<br>(MMB511)<br>√ |
| 151<br>(S4)<br>*      | 834<br>(S4)<br>√      | 040<br>(S4)<br>√      | 832<br>(S4)<br>√     | 071<br>(S4)<br>*     |                       |
| 332<br>(MMB527)<br>√  | 642<br>(MMB527)<br>√  |                       |                      |                      |                       |

Note: √ : Working  
\* : Not working  
- : Not available



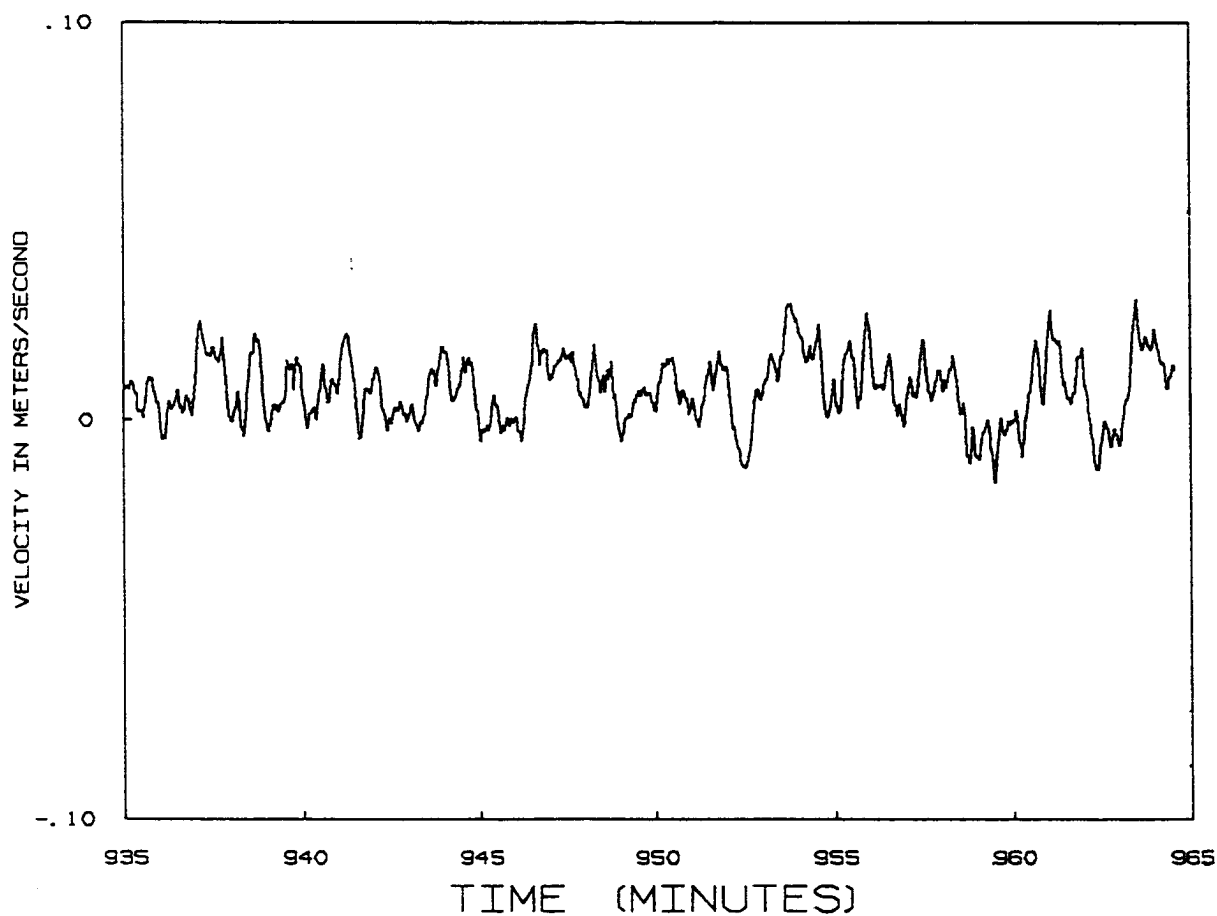
|               |          |            |                  |
|---------------|----------|------------|------------------|
| meter number  | 1001     | distance   | 275              |
| tow name      | American | start-time | 1535             |
| configuration | 3x5      | end-time   | 1605             |
| draft         | 2.0      | mean =     | 0.10             |
| speed         | 7.1 mph  | vmax =     | 0.14 tmax = 954. |
| direction     | upstream | vmin =     | 0.07 tmin = 955. |

MARSH MCBIRNEY 511/LOGGER2 PLOTTING ROUT X - COMPONENT



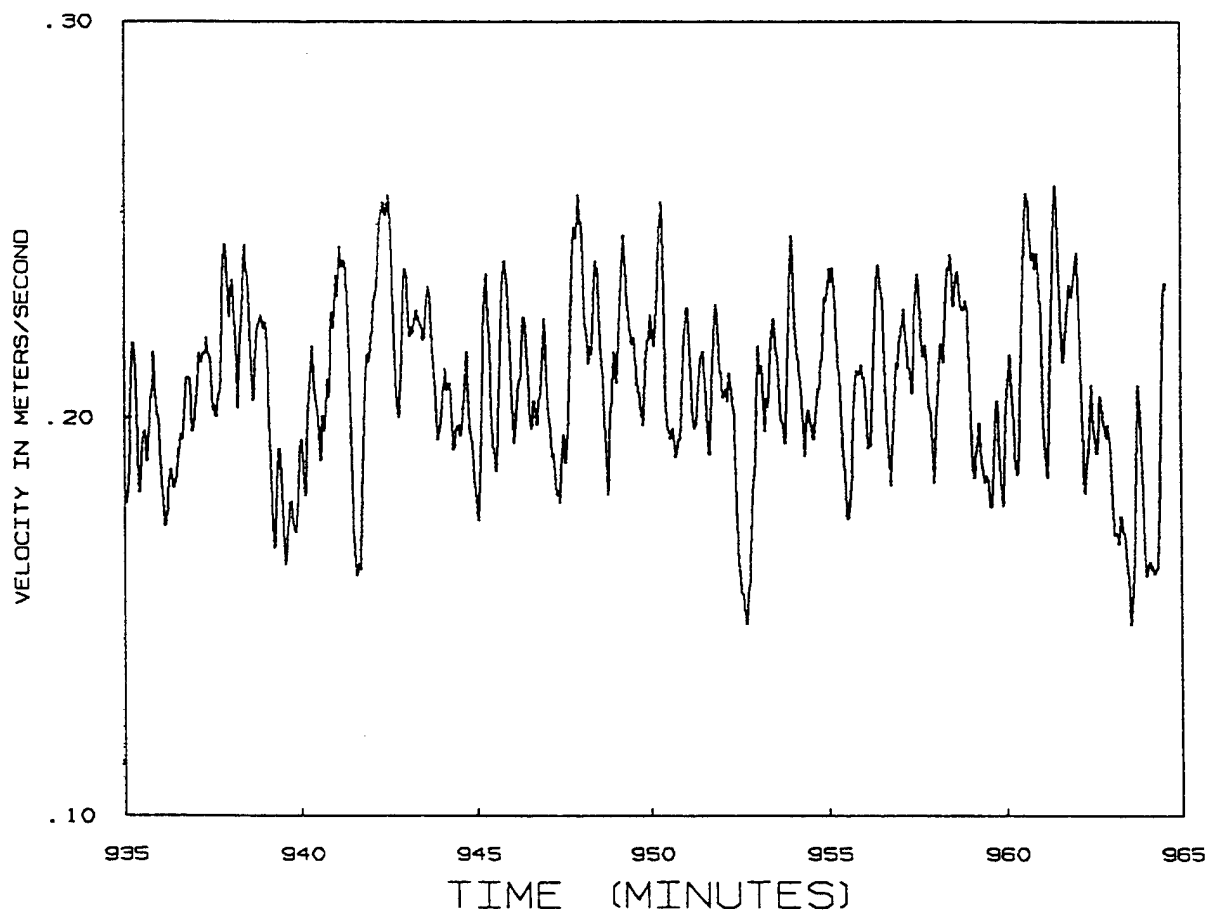
|               |          |            |                   |
|---------------|----------|------------|-------------------|
| meter number  | 1001     | distance   | 275               |
| tow name      | American | start-time | 1535              |
| configuration | 3x5      | end-time   | 1605              |
| draft         | 2.0      | mean =     | 0.01              |
| speed         | 7.1 mph  | vmax =     | 0.03 tmax = 963.  |
| direction     | upstream | vmin =     | -0.02 tmin = 960. |

MARSH MCBIRNEY S11/LOGGER2 PLOTTING ROUT Y - COMPONENT



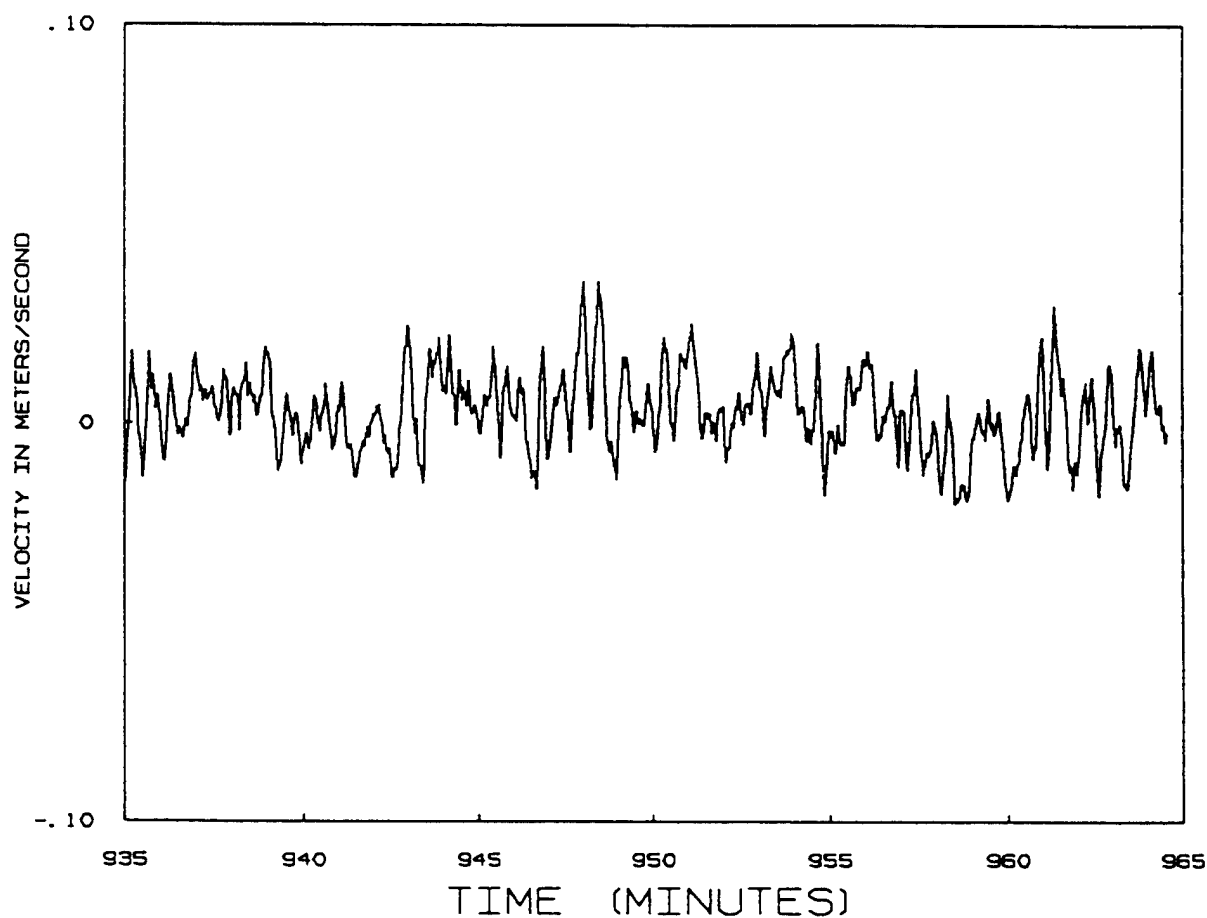
|               |          |            |                  |
|---------------|----------|------------|------------------|
| meter number  | 1130     | distance   | 275              |
| tow name      | American | start-time | 1535             |
| configuration | 3x5      | end-time   | 1605             |
| draft         | 2.0      | mean =     | 0.21             |
| speed         | 7.1 mph  | vmax =     | 0.26 tmax = 961. |
| direction     | upstream | vmmin =    | 0.15 tmin = 964. |

MARSH MCBIRNEY S11/LOGGER2 PLOTTING ROUT X - COMPONENT



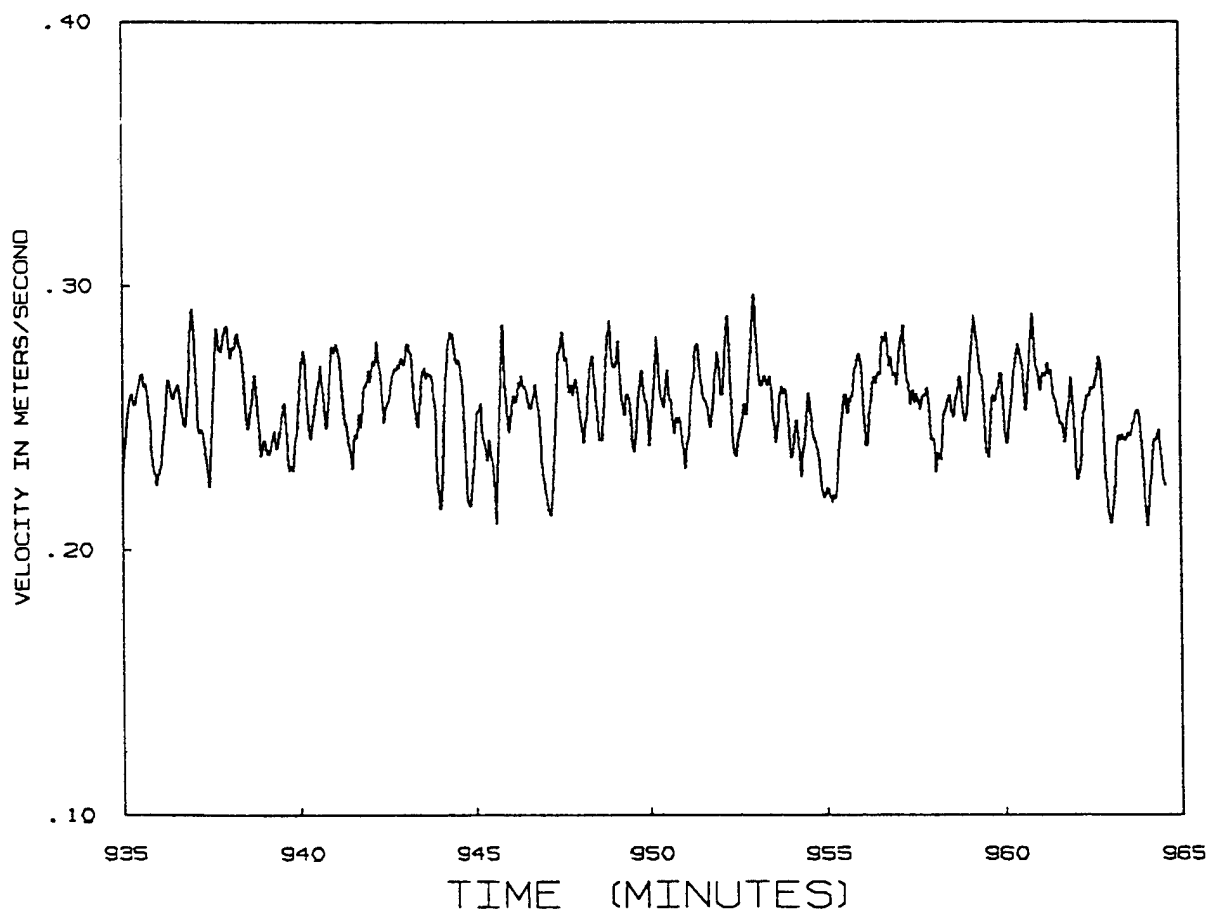
|               |          |            |                   |
|---------------|----------|------------|-------------------|
| meter number  | 1130     | distance   | 275               |
| tow name      | American | start-time | 1535              |
| configuration | 3x5      | end-time   | 1605              |
| draft         | 2.0      | mean =     | 0.00              |
| speed         | 7.1 mph  | vmax =     | 0.04 tmax = 948.  |
| direction     | upstream | vmin =     | -0.02 tmin = 959. |

MARSH MCBIRNEY S11/LOGGER2 PLOTTING ROUT Y - COMPONENT



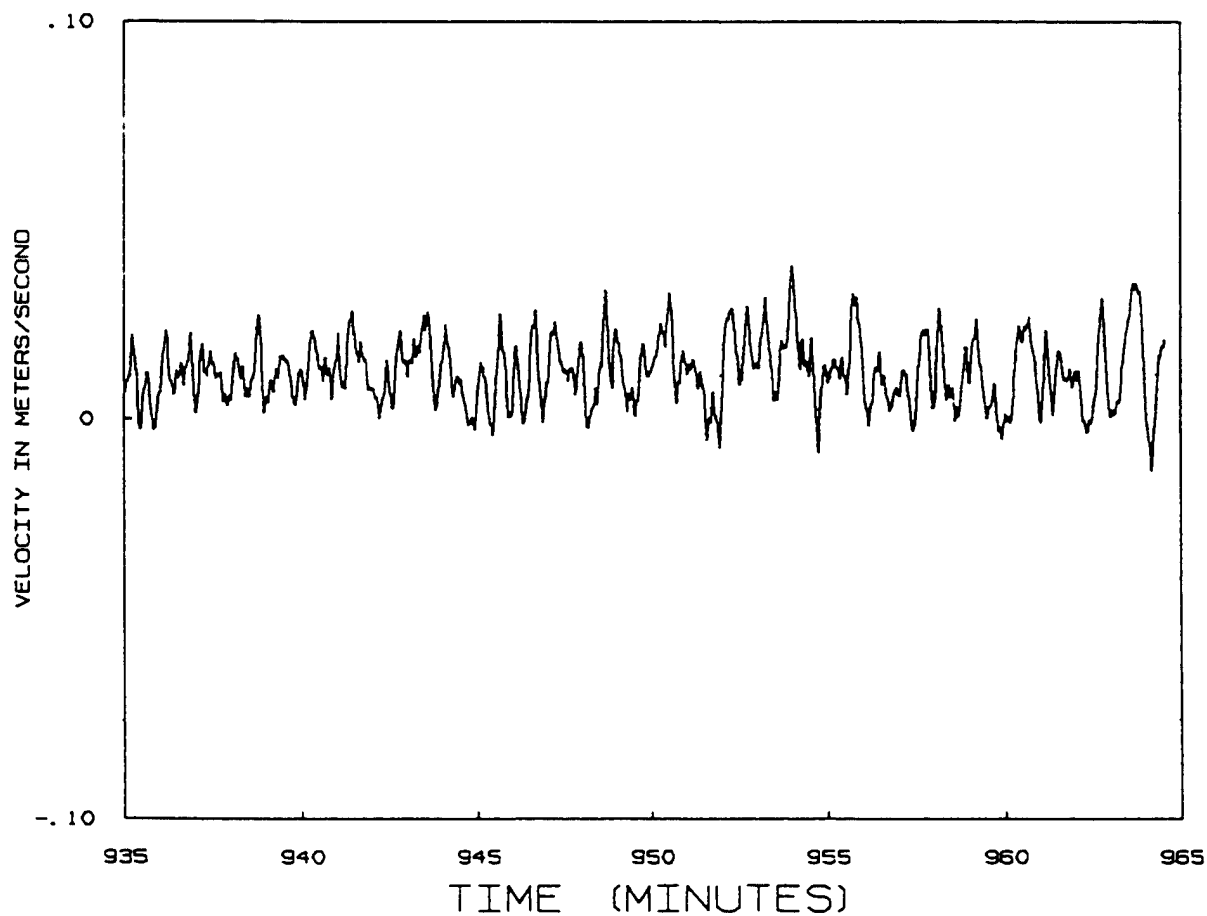
|               |          |            |                  |
|---------------|----------|------------|------------------|
| meter number  | 1131     | distance   | 275              |
| tow name      | American | start-time | 1535             |
| configuration | 3x5      | end-time   | 1605             |
| draft         | 2.0      | mean =     | 0.26             |
| speed         | 7.1 mph  | vmax =     | 0.30 tmax = 953. |
| direction     | upstream | vmin =     | 0.21 tmin = 964. |

MARSH MCBIRNEY 511/LOGGER2 PLOTTING ROUT X - COMPONENT



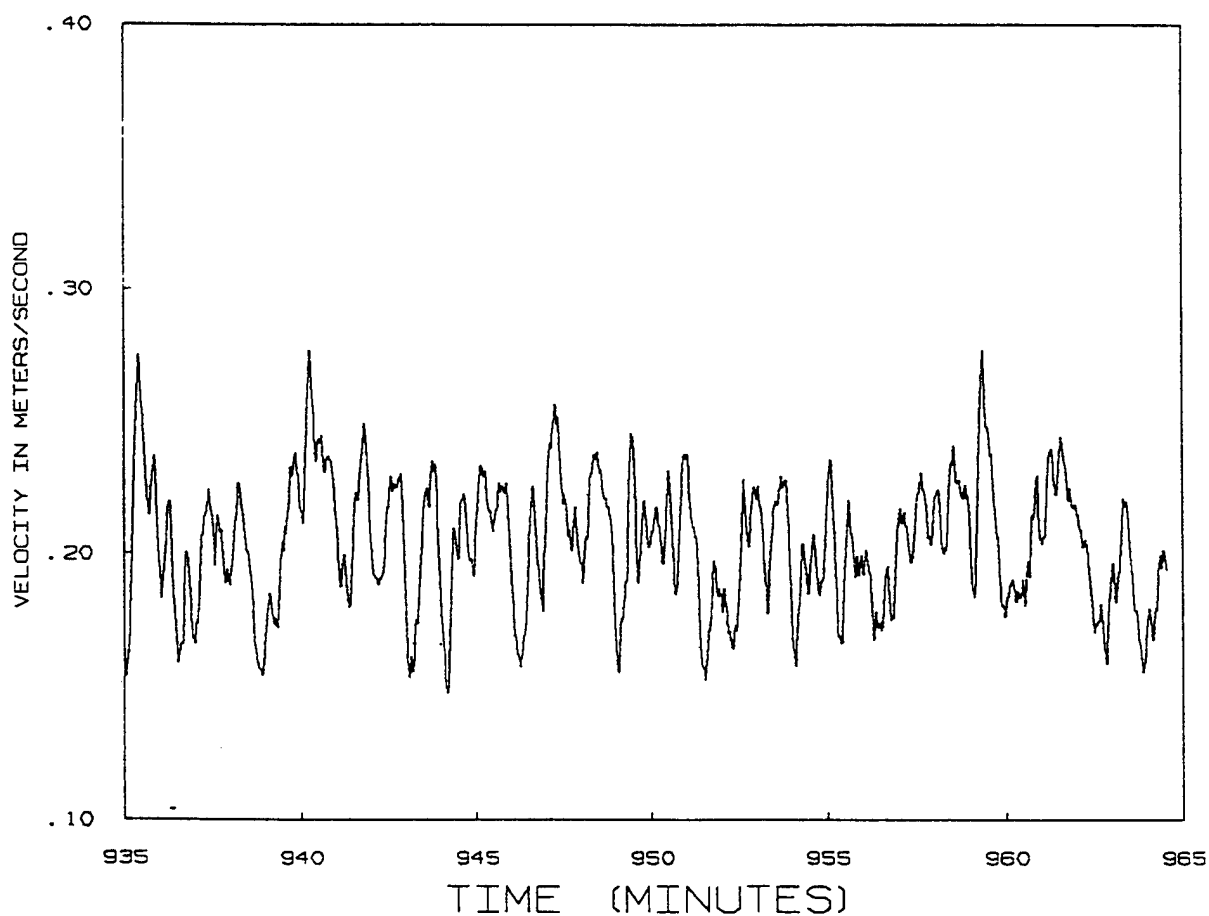
|               |          |            |                   |
|---------------|----------|------------|-------------------|
| meter number  | 1131     | distance   | 275               |
| tow name      | American | start-time | 1535              |
| configuration | 3x5      | end-time   | 1605              |
| draft         | 2.0      | mean =     | 0.01              |
| speed         | 7.1 mph  | vmax =     | 0.04 tmax = 954.  |
| direction     | upstream | vmin =     | -0.01 tmin = 964. |

MARSH MCBIRNEY S11/LOGGER2 PLOTTING ROUT Y - COMPONENT



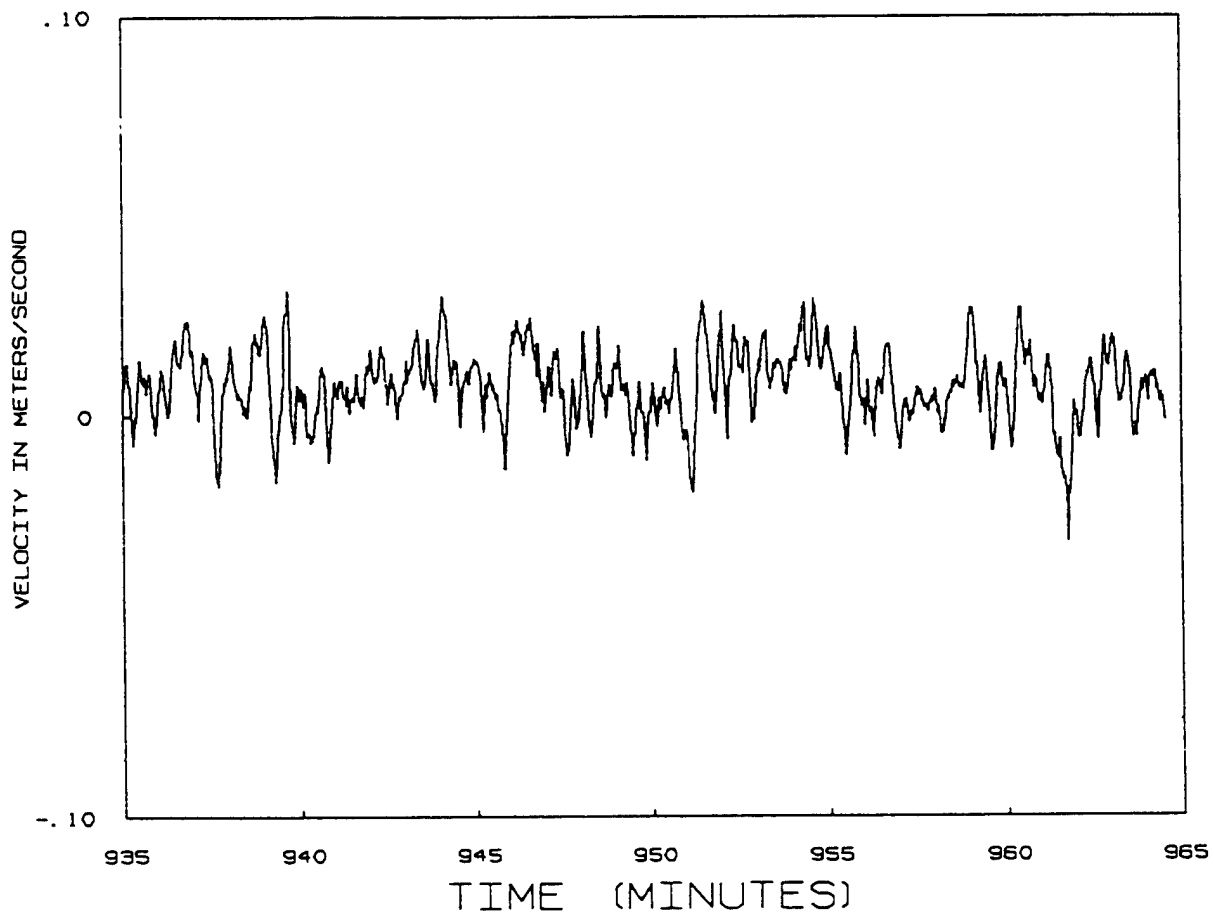
|               |          |            |                  |
|---------------|----------|------------|------------------|
| meter number  | 998      | distance   | 275              |
| tow name      | American | start-time | 1535             |
| configuration | 3x5      | end-time   | 1605             |
| draft         | 2.0      | mean =     | 0.20             |
| speed         | 7.1 mph  | vmax =     | 0.28 tmax = 959. |
| direction     | upstream | vmin =     | 0.15 tmin = 944. |

MARSH MCBIRNEY S11/LOGGER2 PLOTTING ROUT X - COMPONENT



|               |          |            |                   |
|---------------|----------|------------|-------------------|
| meter number  | 998      | distance   | 275               |
| tow name      | American | start-time | 1535              |
| configuration | 3x5      | end-time   | 1605              |
| draft         | 2.0      | mean =     | 0.01              |
| speed         | 7.1 mph  | vmax =     | 0.03 tmax = 940.  |
| direction     | upstream | vmin =     | -0.03 tmin = 962. |

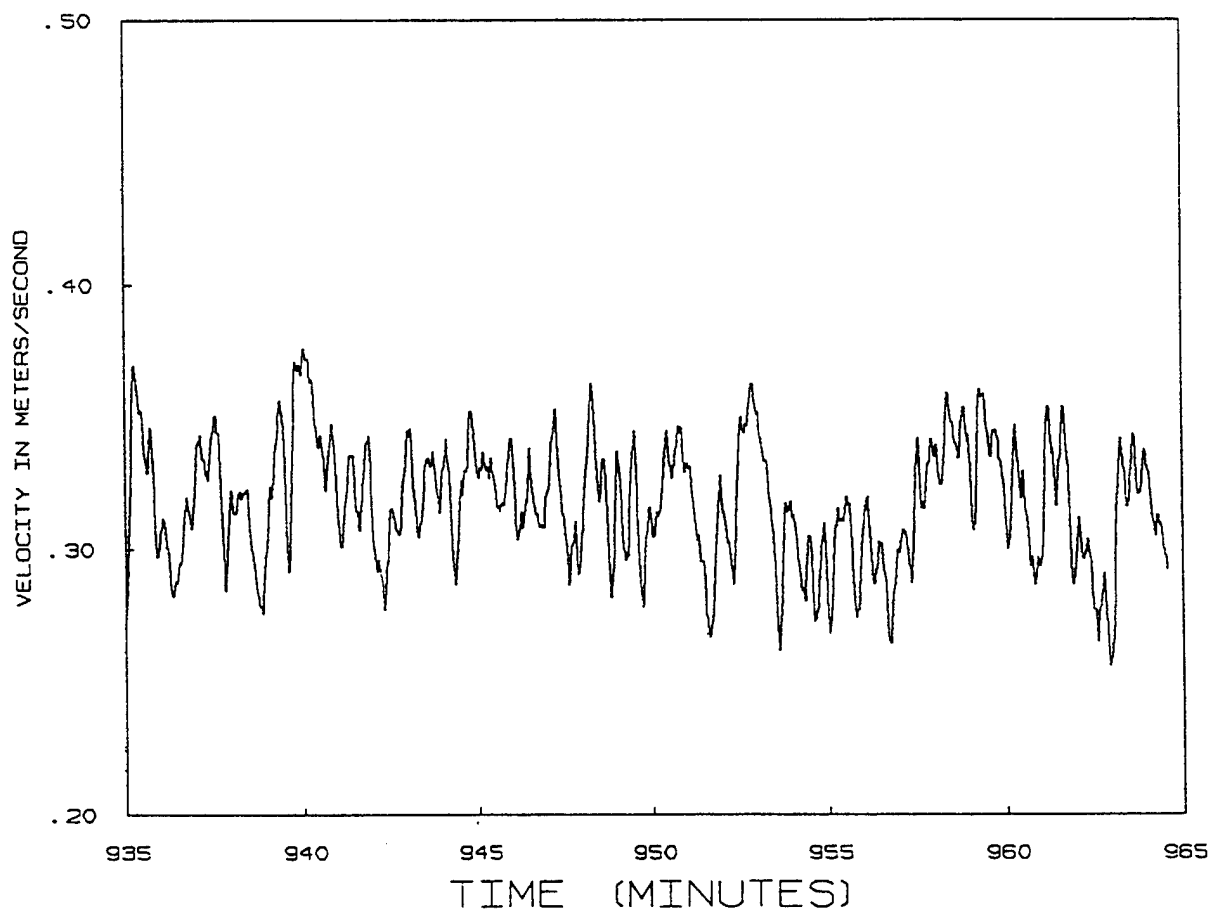
MARSH MCBIRNEY 511/LOGGER2 PLOTTING ROUT Y - COMPONENT





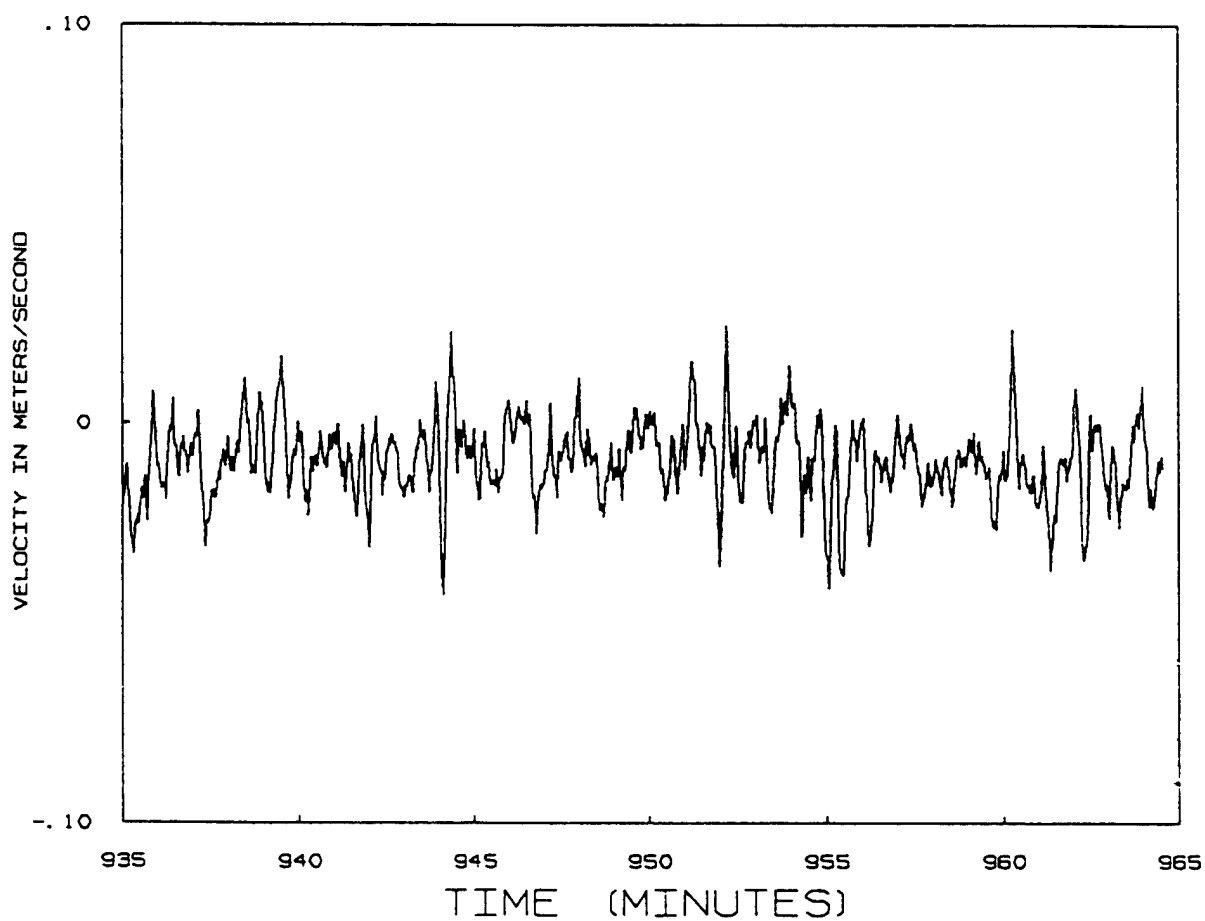
|               |          |            |                  |
|---------------|----------|------------|------------------|
| meter number  | 999      | distance   | 275              |
| tow name      | American | start-time | 1535             |
| configuration | 3x5      | end-time   | 1605             |
| draft         | 2.0      | mean =     | 0.32             |
| speed         | 7.1 mph  | vmax =     | 0.38 tmax = 940. |
| direction     | upstream | vmin =     | 0.26 tmin = 963. |

MARSH MCBIRNEY S11/LOGGER2 PLOTTING ROUT X - COMPONENT



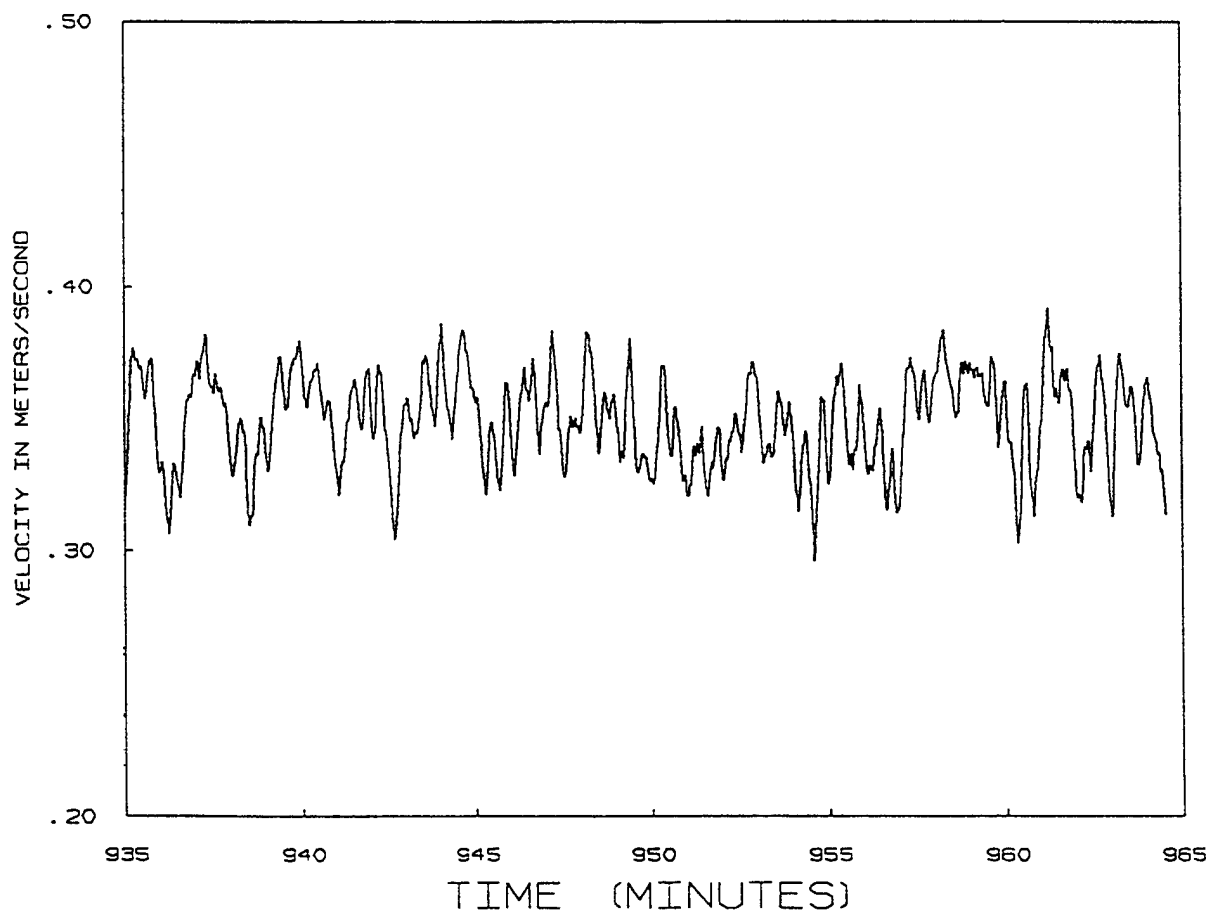
|               |          |            |                   |
|---------------|----------|------------|-------------------|
| meter number  | 999      | distance   | 275               |
| tow name      | American | start-time | 1535              |
| configuration | 3x5      | end-time   | 1605              |
| draft         | 2.0      | mean =     | -0.01             |
| speed         | 7.1 mph  | vmax =     | 0.02 tmax = 952.  |
| direction     | upstream | vmin =     | -0.04 tmin = 944. |

MARSH MCBIRNEY S11/LOGGER2 PLOTTING ROUT Y - COMPONENT



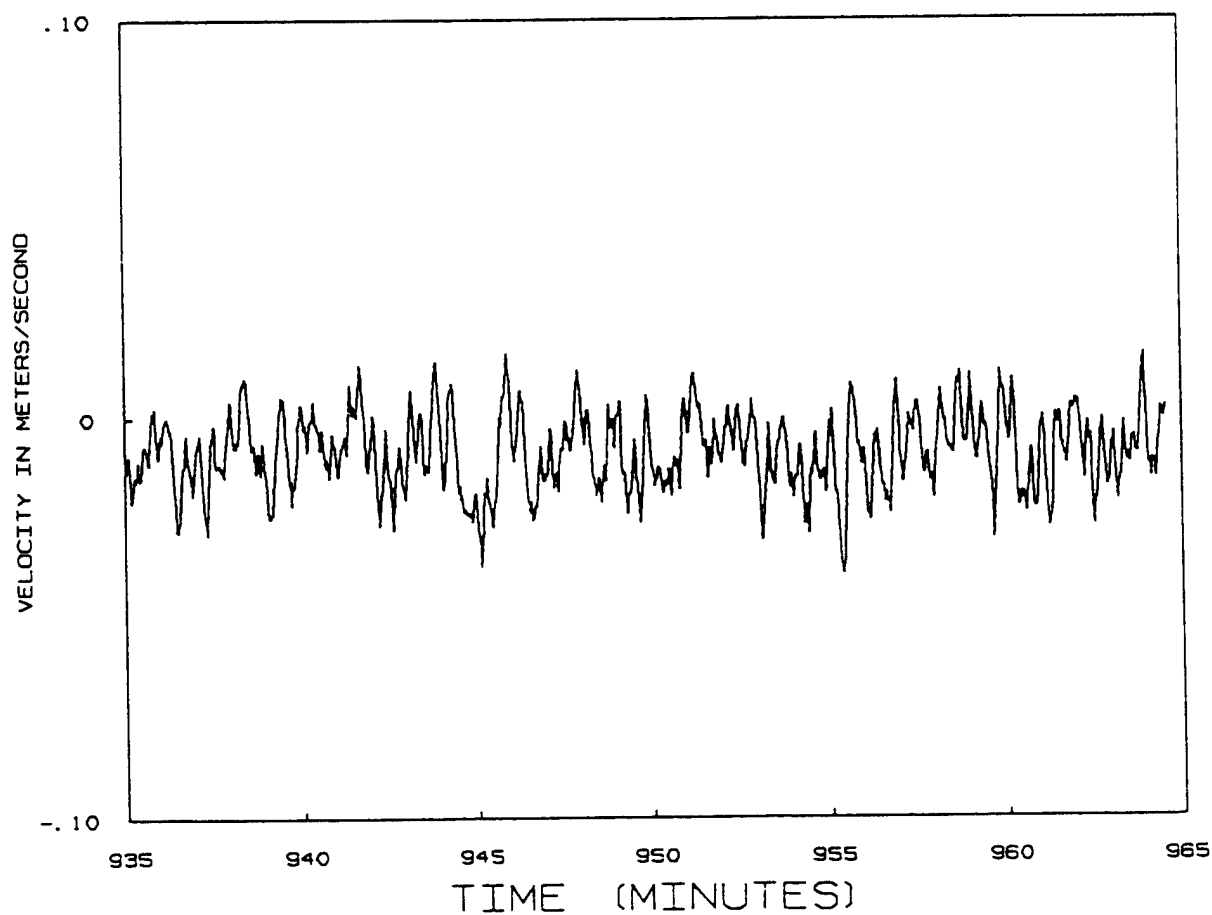
|               |          |            |                  |
|---------------|----------|------------|------------------|
| meter number  | 1000     | distance   | 275              |
| tow name      | American | start-time | 1535             |
| configuration | 3x5      | end-time   | 1605             |
| draft         | 2.0      | mean =     | 0.35             |
| speed         | 7.1 mph  | vmax =     | 0.39 tmax = 961. |
| direction     | upstream | vmin =     | 0.30 tmin = 955. |

MARSH MCBIRNEY S11/LOGGER2 PLOTTING ROUT X - COMPONENT

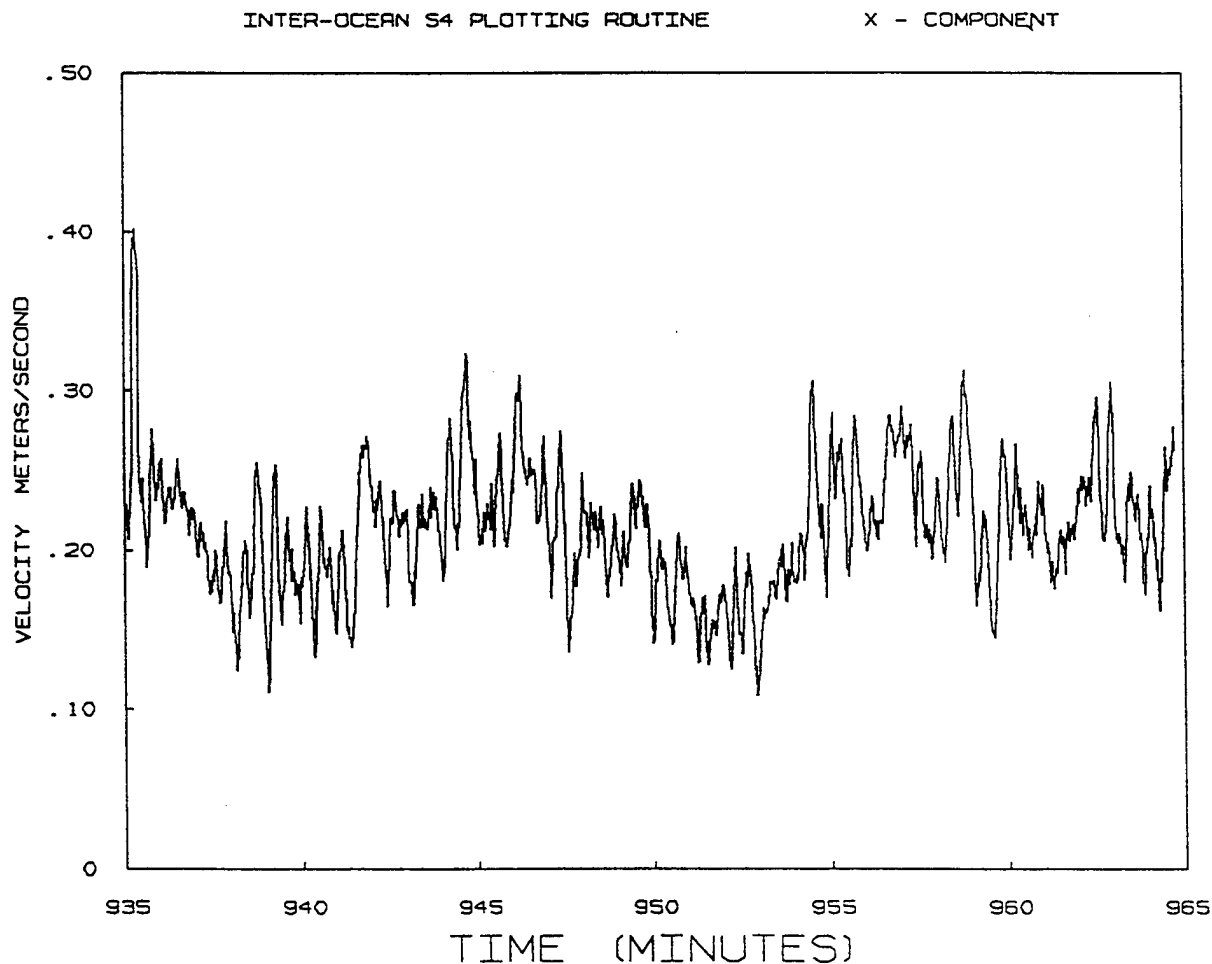


|               |          |            |                   |
|---------------|----------|------------|-------------------|
| meter number  | 1000     | distance   | 275               |
| tow name      | American | start-time | 1535              |
| configuration | 3x5      | end-time   | 1605              |
| draft         | 2.0      | mean =     | -0.01             |
| speed         | 7.1 mph  | vmax =     | 0.02 tmax = 946.  |
| direction     | upstream | vmin =     | -0.04 tmin = 955. |

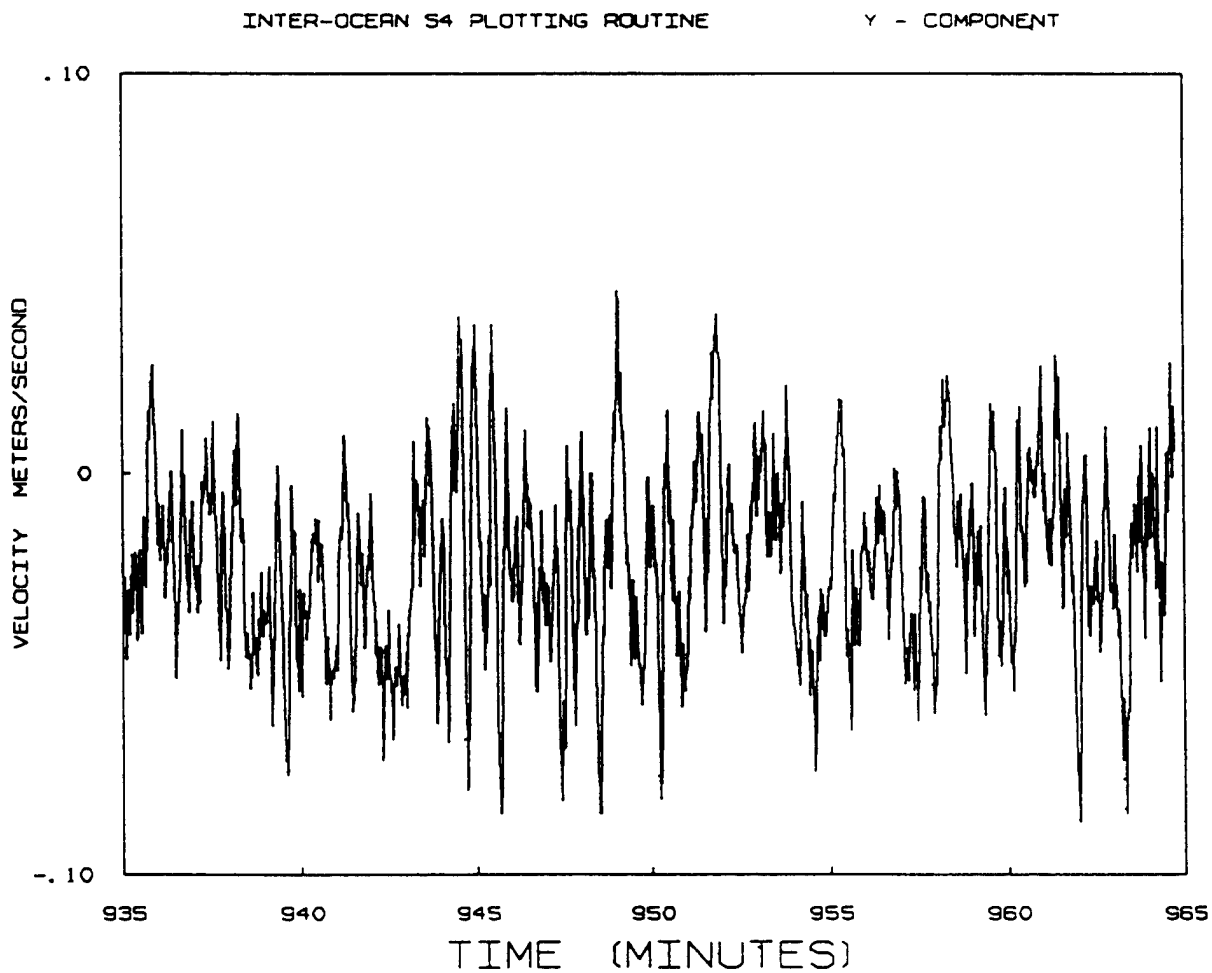
MARSH MCBIRNEY S11/LOGGER2 PLOTTING ROUT Y - COMPONENT



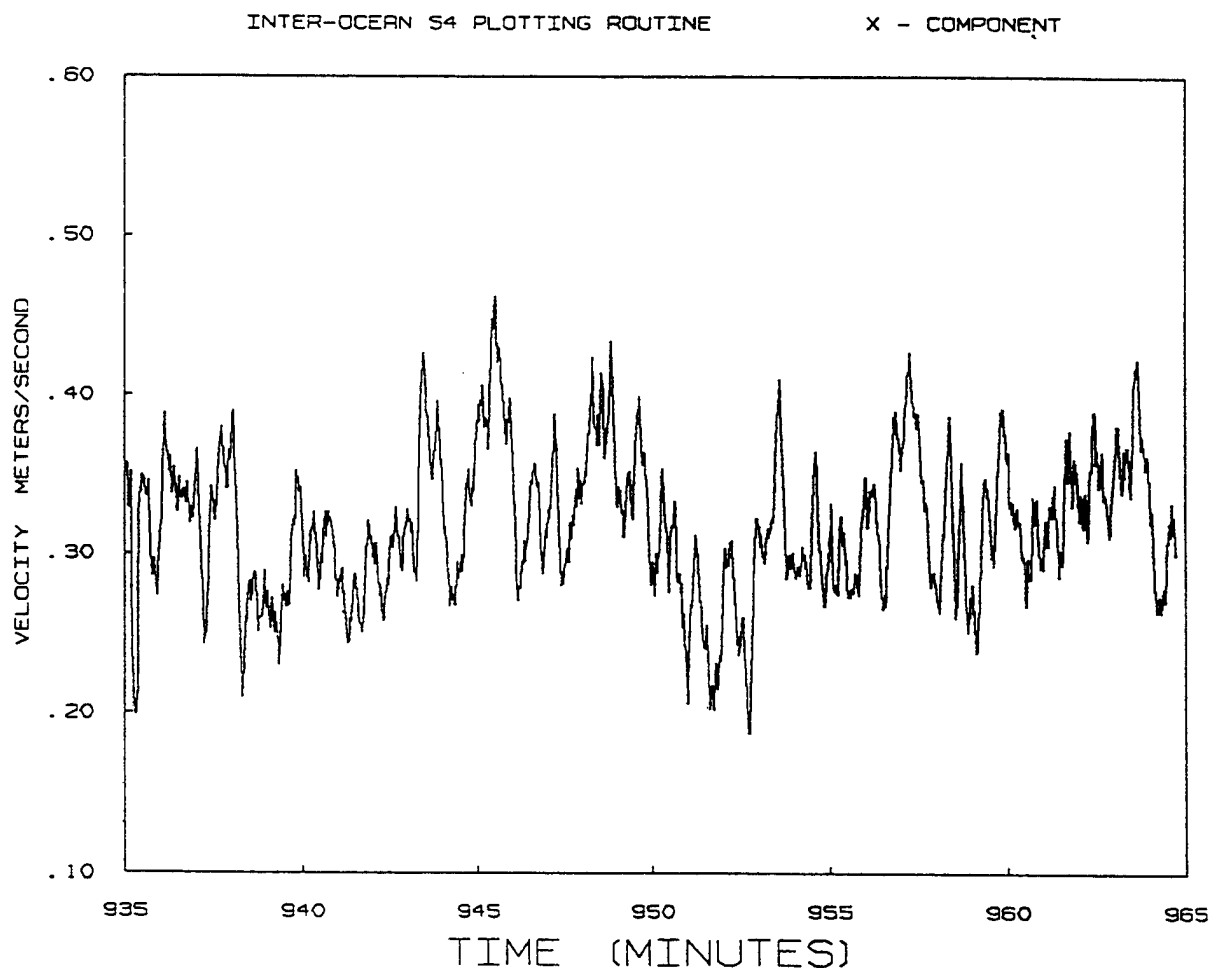
|               |          |            |                  |
|---------------|----------|------------|------------------|
| meter number  | 151      | distance   | 275              |
| tow name      | American | start-time | 1535             |
| configuration | 3x5      | end-time   | 1605             |
| draft         | 2.0      | MEAN =     | 0.21             |
| speed         | 7.1 mph  | VMAX =     | 0.40 TMAX = 935. |
| direction     | upstream | VMIN =     | 0.11 TMIN = 953. |



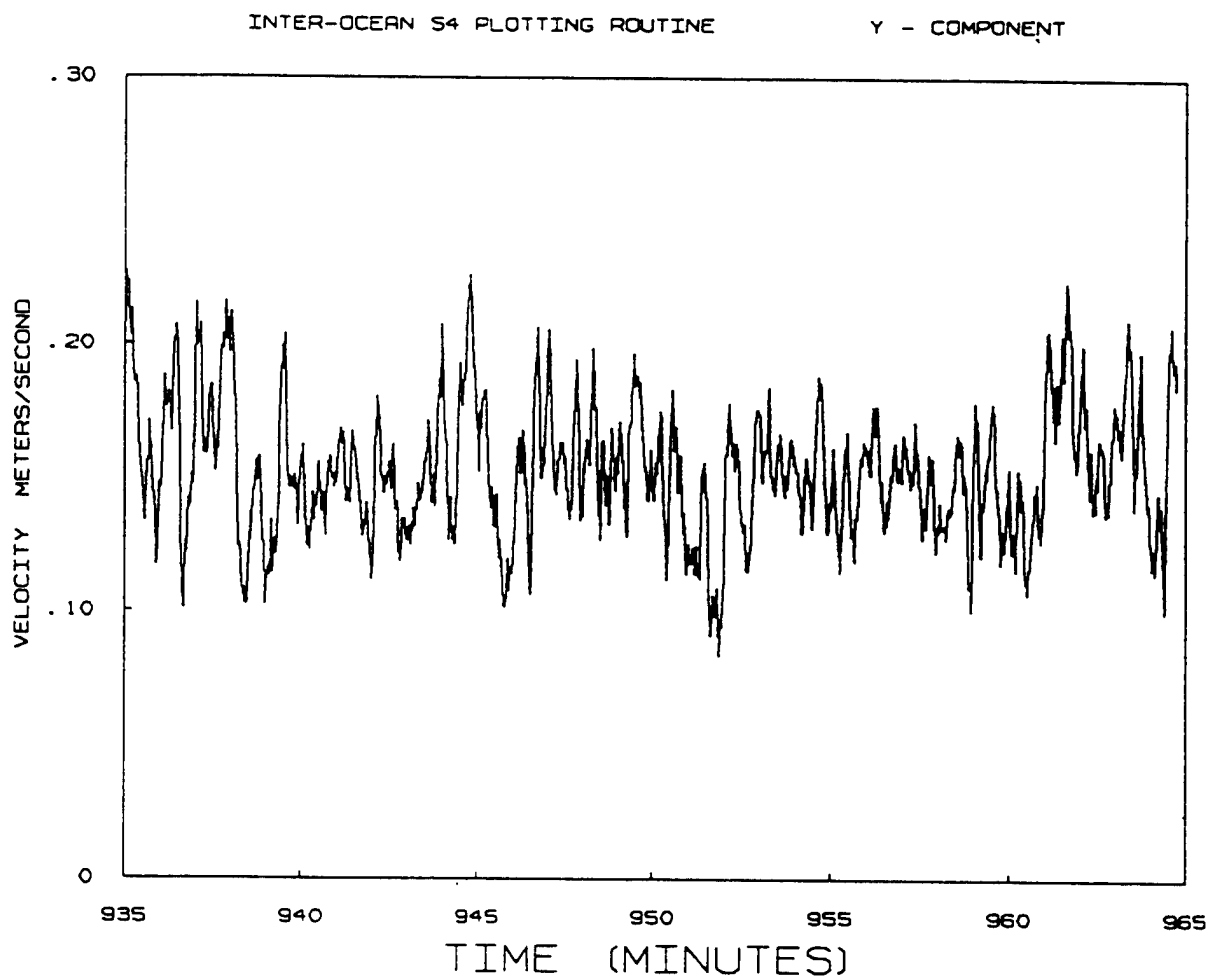
|               |          |            |                     |
|---------------|----------|------------|---------------------|
| meter number  | 151      | distance   | 275                 |
| tow name      | American | start-time | 1535                |
| configuration | 3x5      | end-time   | 1605                |
| draft         | 2.0      | MEAN       | = -0.03             |
| speed         | 7.1 mph  | VMAX       | = 0.05 TMAX = 949.  |
| direction     | upstream | VMIN       | = -0.09 TMIN = 962. |



|               |          |            |                  |
|---------------|----------|------------|------------------|
| meter number  | 834      | distance   | 275              |
| tow name      | American | start-time | 1535             |
| configuration | 3x5      | end-time   | 1605             |
| draft         | 2.0      | MEAN =     | 0.31             |
| speed         | 7.1 mph  | VMAX =     | 0.46 TMAX = 946. |
| direction     | upstream | VMIN =     | 0.19 TMIN = 953. |

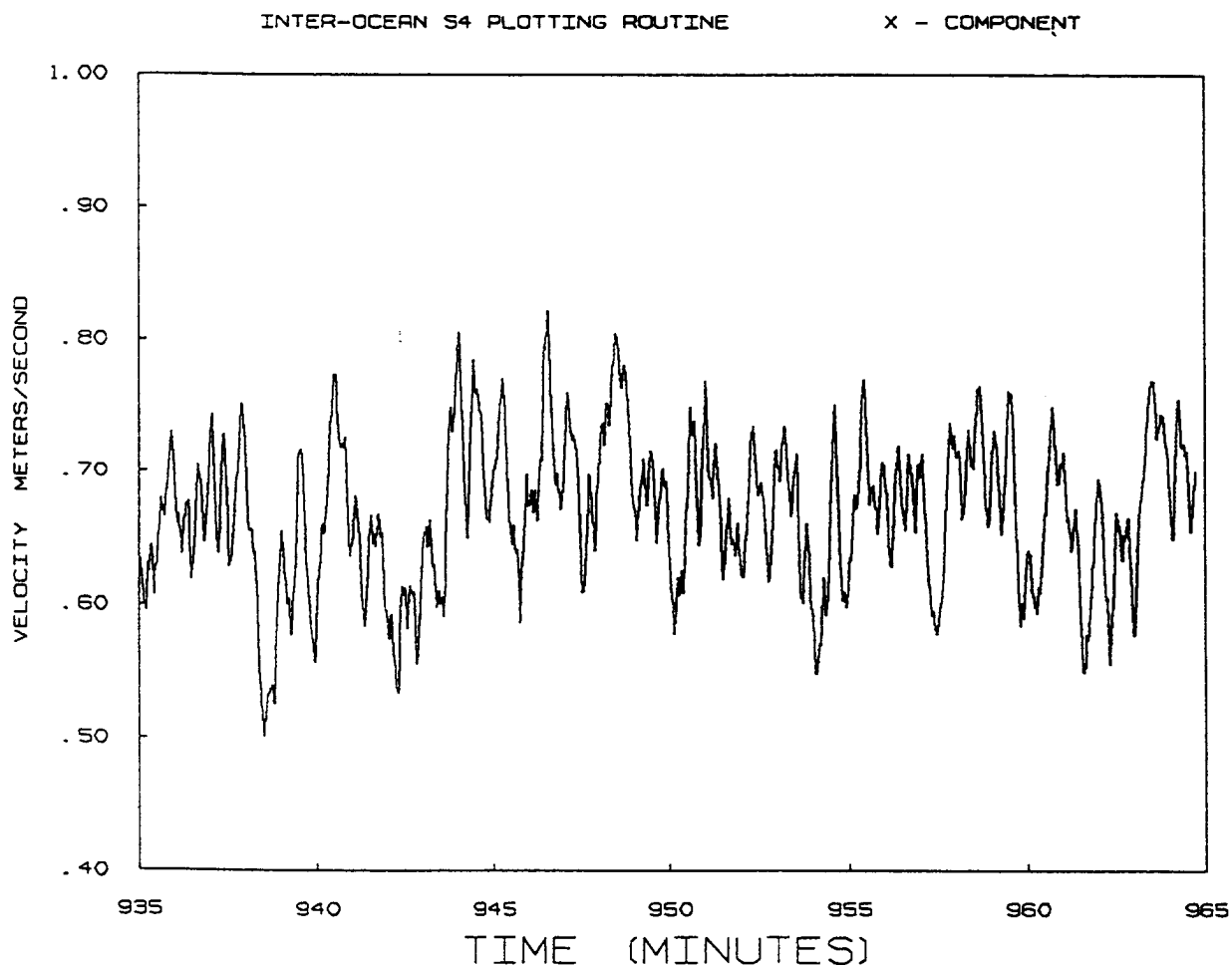


|               |          |            |                  |
|---------------|----------|------------|------------------|
| meter number  | 834      | distance   | 275              |
| tow name      | American | start-time | 1535             |
| configuration | 3x5      | end-time   | 1605             |
| draft         | 2.0      | MEAN =     | 0.16             |
| speed         | 7.1 mph  | VMAX =     | 0.23 TMAX = 935. |
| direction     | upstream | VMIN =     | 0.08 TMIN = 952. |





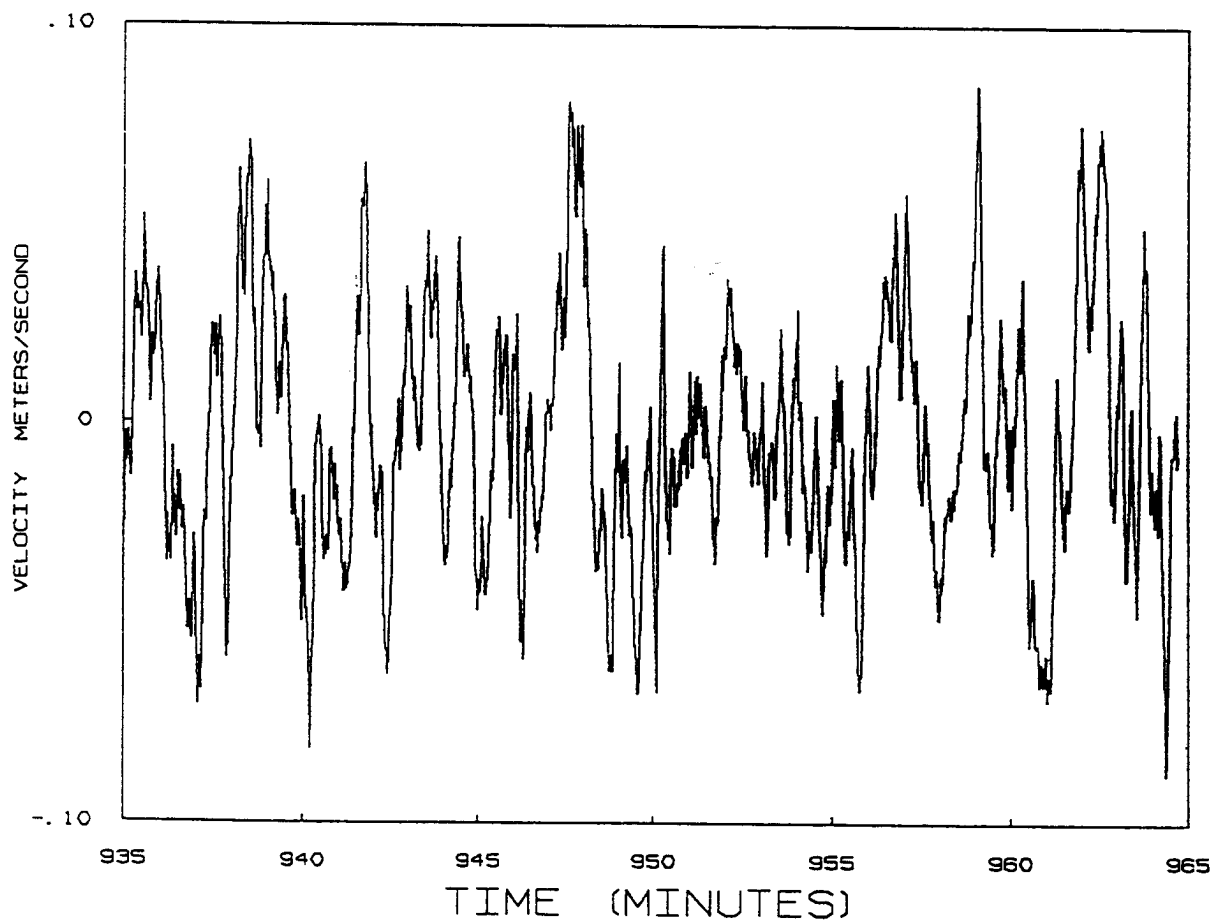
|               |          |            |                  |
|---------------|----------|------------|------------------|
| meter number  | 040      | distance   | 275              |
| tow name      | American | start-time | 1535             |
| configuration | 3x5      | end-time   | 1605             |
| draft         | 2.0      | MEAN =     | 0.65             |
| speed         | 7.1 mph  | VMAX =     | 0.82 TMAX = 947. |
| direction     | upstream | VMIN =     | 0.50 TMIN = 938. |



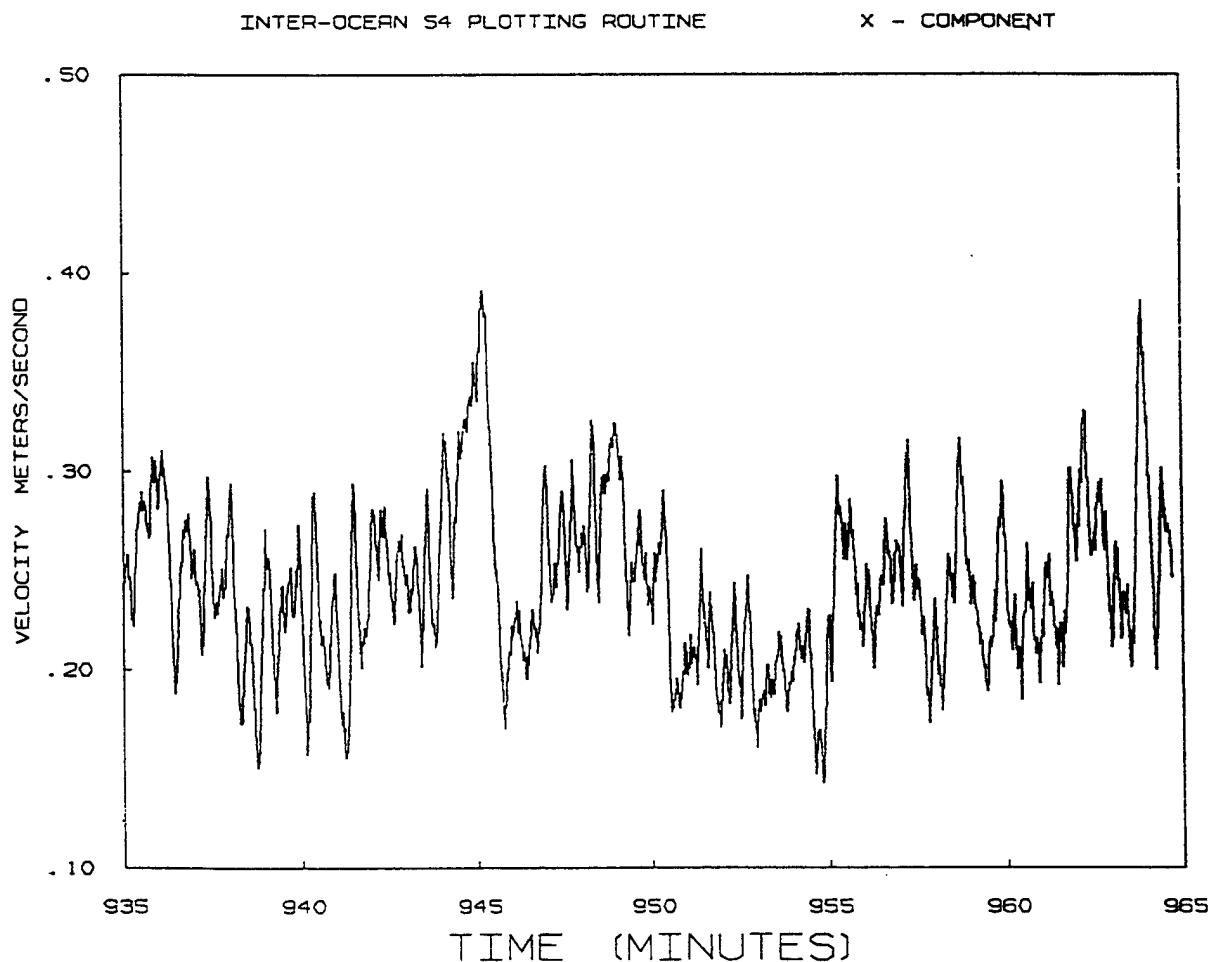
|               |          |            |                   |
|---------------|----------|------------|-------------------|
| meter number  | 040      | distance   | 275               |
| tow name      | American | start-time | 1535              |
| configuration | 3x5      | end-time   | 1605              |
| draft         | 2.0      | MEAN =     | 0.00              |
| speed         | 7.1 mph  | VMAX =     | 0.09 TMAX = 959.  |
| direction     | upstream | VMIN =     | -0.09 TMIN = 964. |

INTER-OCEAN S4 PLOTTING ROUTINE

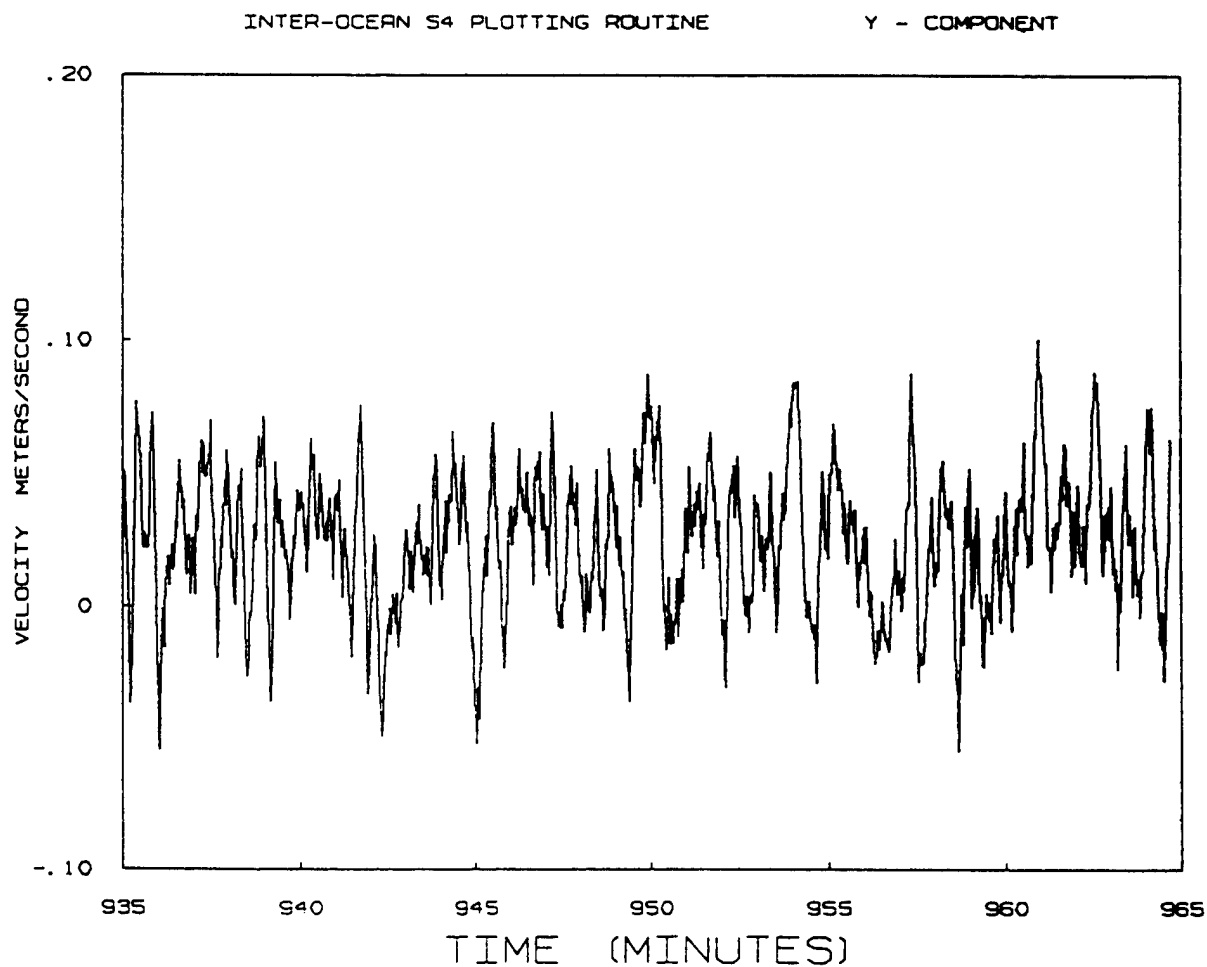
Y - COMPONENT



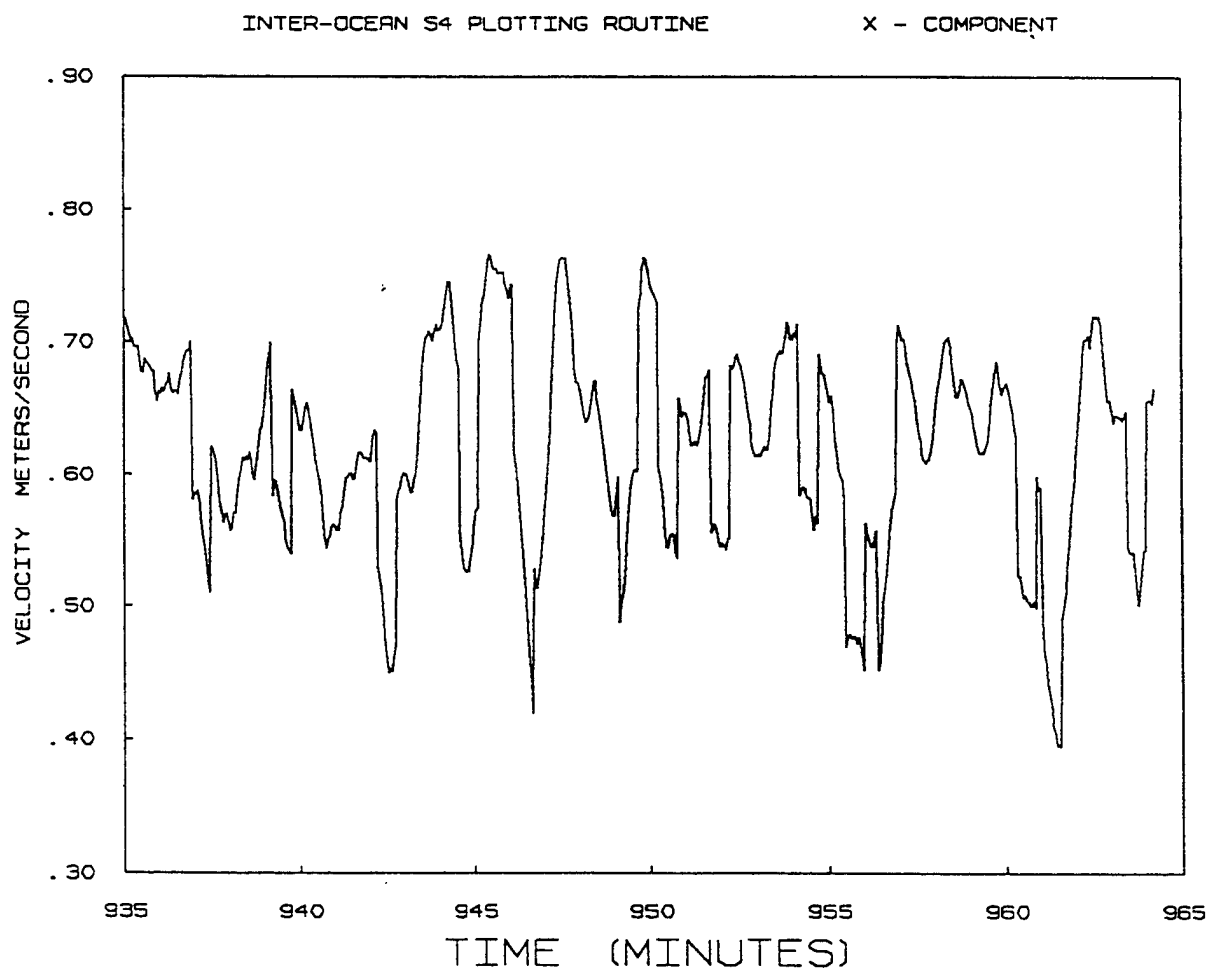
|               |          |            |                  |
|---------------|----------|------------|------------------|
| meter number  | 832      | distance   | 275              |
| tow name      | American | start-time | 1535             |
| configuration | 3x5      | end-time   | 1605             |
| draft         | 2.0      | MEAN =     | 0.25             |
| speed         | 7.1 mph  | VMAX =     | 0.39 TMAX = 945. |
| direction     | upstream | VMIN =     | 0.14 TMIN = 955. |



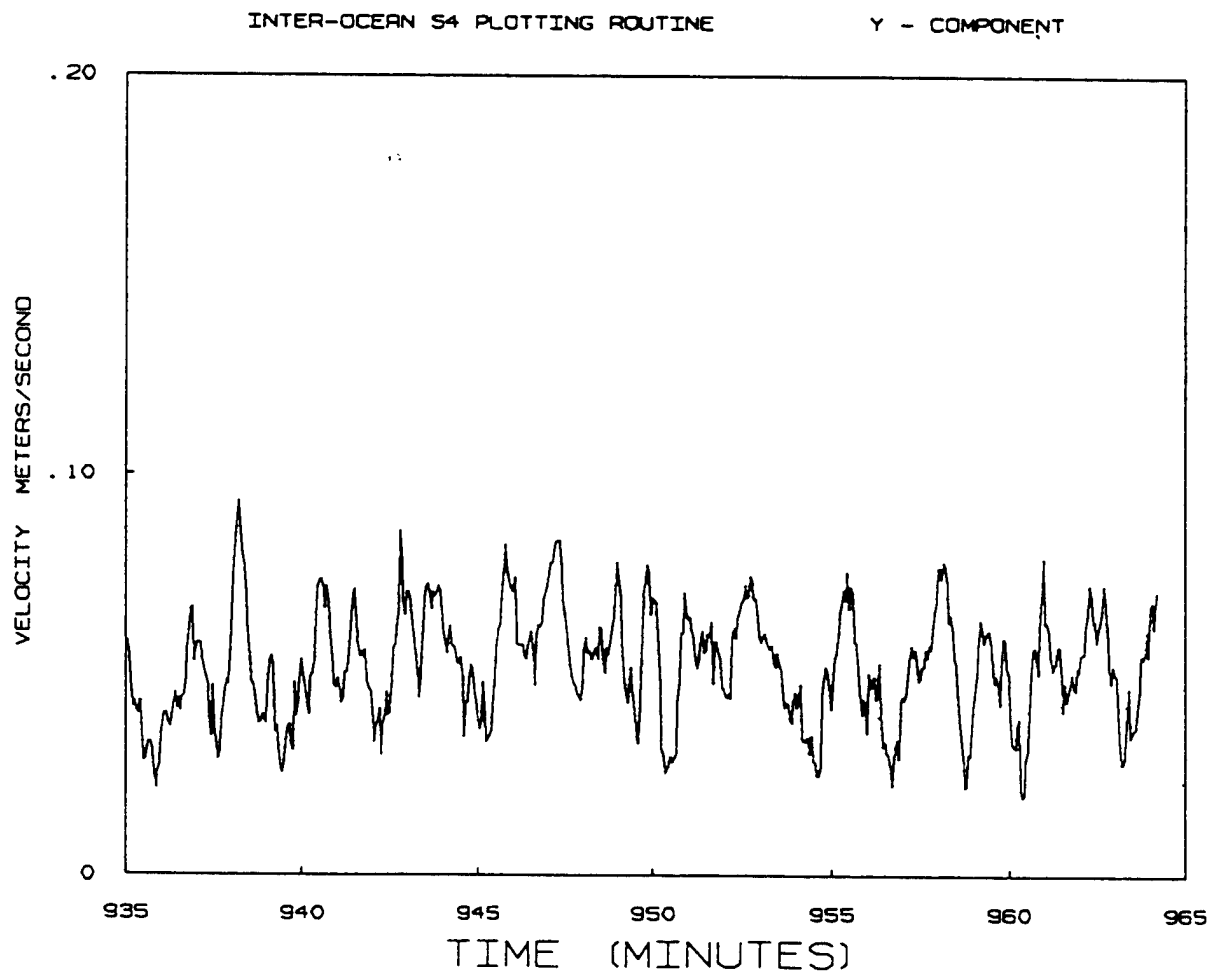
|               |          |            |                   |
|---------------|----------|------------|-------------------|
| meter number  | 832      | distance   | 275               |
| tow name      | American | start-time | 1535              |
| configuration | 3x5      | end-time   | 1605              |
| draft         | 2.0      | MEAN =     | 0.02              |
| speed         | 7.1 mph  | VMAX =     | 0.10 TMAX = 961.  |
| direction     | upstream | VMIN =     | -0.06 TMIN = 959. |



|               |          |            |                  |
|---------------|----------|------------|------------------|
| meter number  | 071      | distance   | 275              |
| tow name      | American | start-time | 1535             |
| configuration | 3x5      | end-time   | 1605             |
| draft         | 2.0      | MEAN =     | 0.60             |
| speed         | 7.1 mph  | VMAX =     | 0.77 TMAX = 945. |
| direction     | upstream | VMIN =     | 0.39 TMIN = 962. |

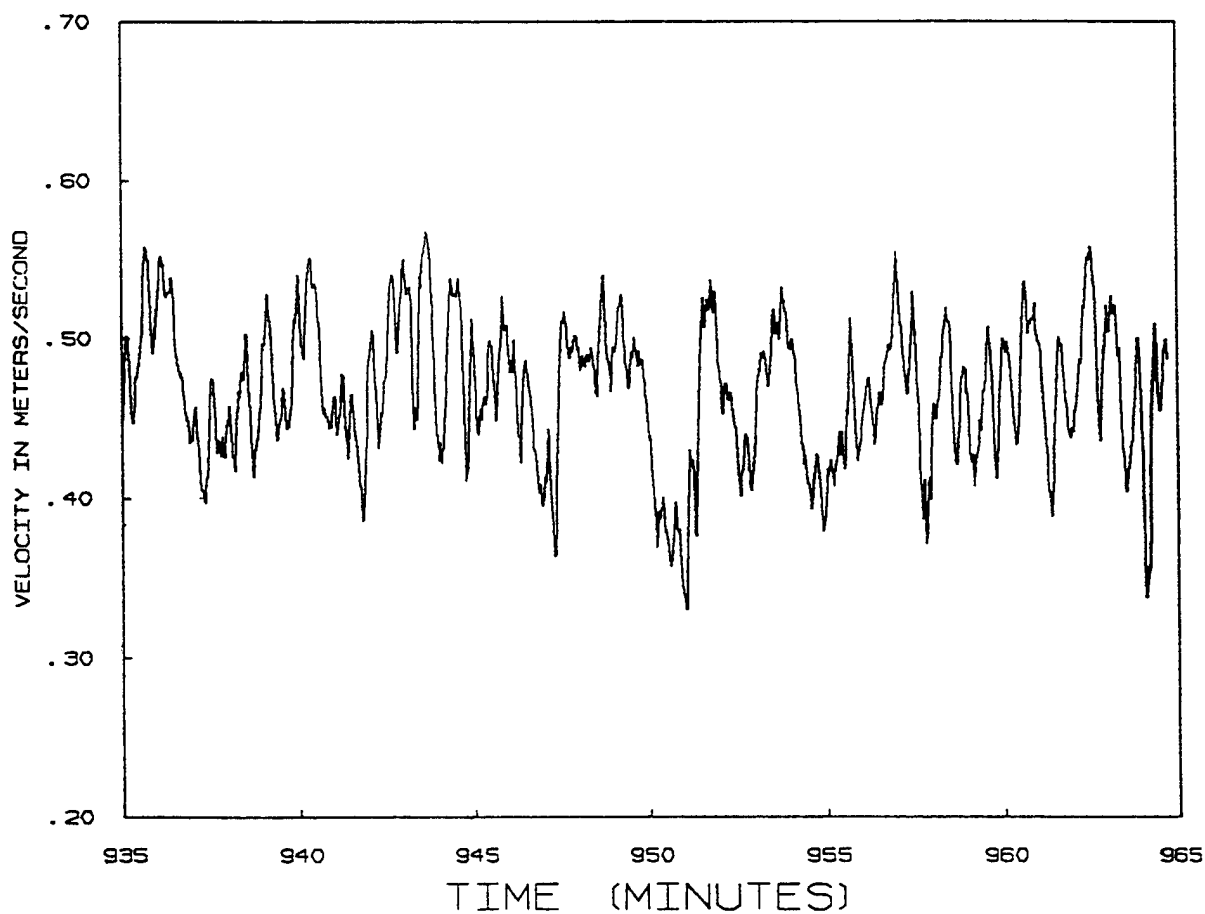


|               |          |            |                  |
|---------------|----------|------------|------------------|
| meter number  | 071      | distance   | 275              |
| tow name      | American | start-time | 1535             |
| configuration | 3x5      | end-time   | 1605             |
| draft         | 2.0      | MEAN =     | 0.05             |
| speed         | 7.1 mph  | VMAX =     | 0.09 TMAX = 938. |
| direction     | upstream | VMIN =     | 0.02 TMIN = 960. |



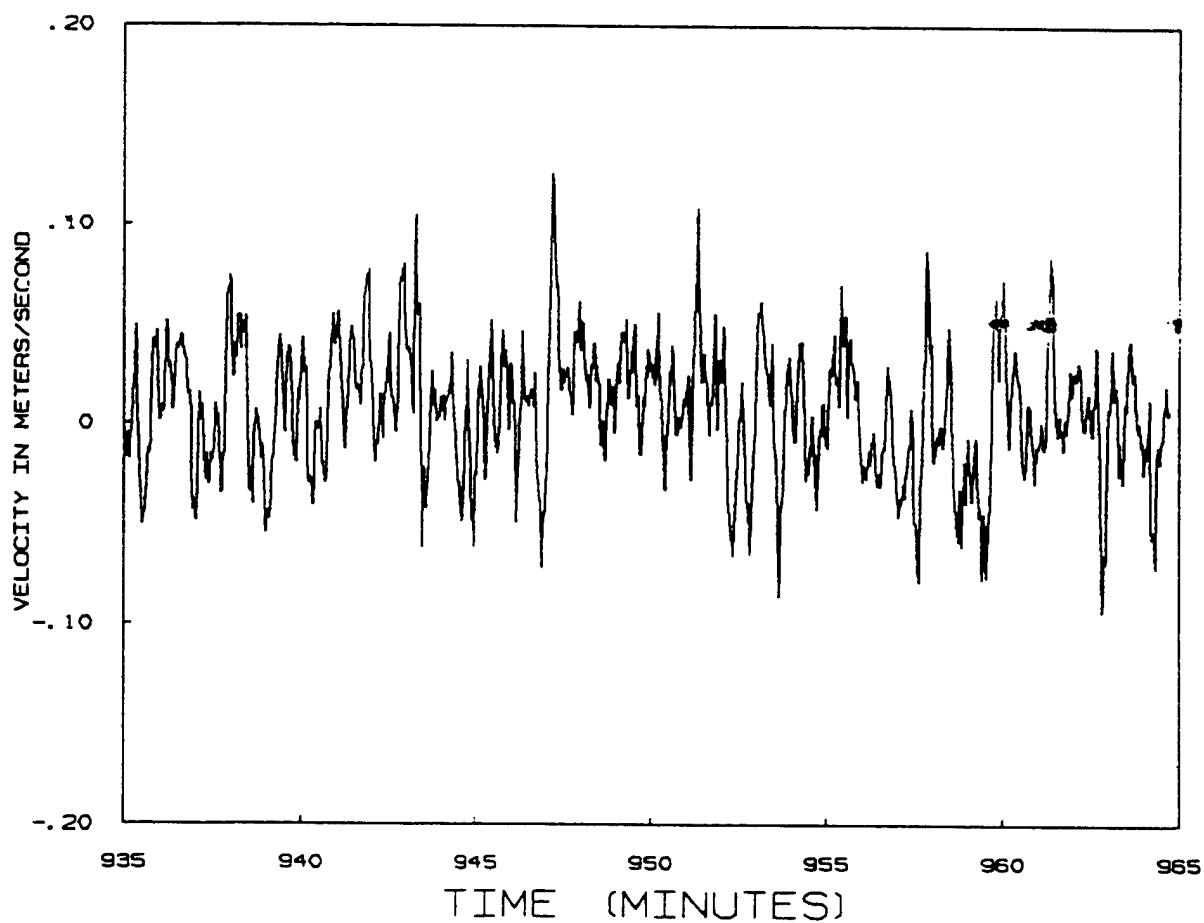
|               |          |            |                  |
|---------------|----------|------------|------------------|
| meter number  | B-332    | start-time | 1535             |
| tow name      | American | end-time   | 1605             |
| configuration | 3x5      | mean =     | 0.48             |
| draft         | 2.0      | vmax =     | 0.00 tmax = 944. |
| speed         | 7.1 mph  | vmin =     | 0.00 tmin = 951. |
| direction     | upstream |            |                  |
| distance      | 275      |            |                  |

MARSH MCBIRNEY S11/527 PLOTTING ROUTINE X - COMPONENT



|               |          |            |                  |
|---------------|----------|------------|------------------|
| meter number  | B-332    | start-time | 1535             |
| tow name      | American | end-time   | 1605             |
| configuration | 3x5      | mean =     | 0.01             |
| draft         | 2.0      | vmax =     | 0.00 tmax = 947. |
| speed         | 7.1 mph  | vmin =     | 0.00 tmin = 963. |
| direction     | upstream |            |                  |
| distance      | 275      |            |                  |

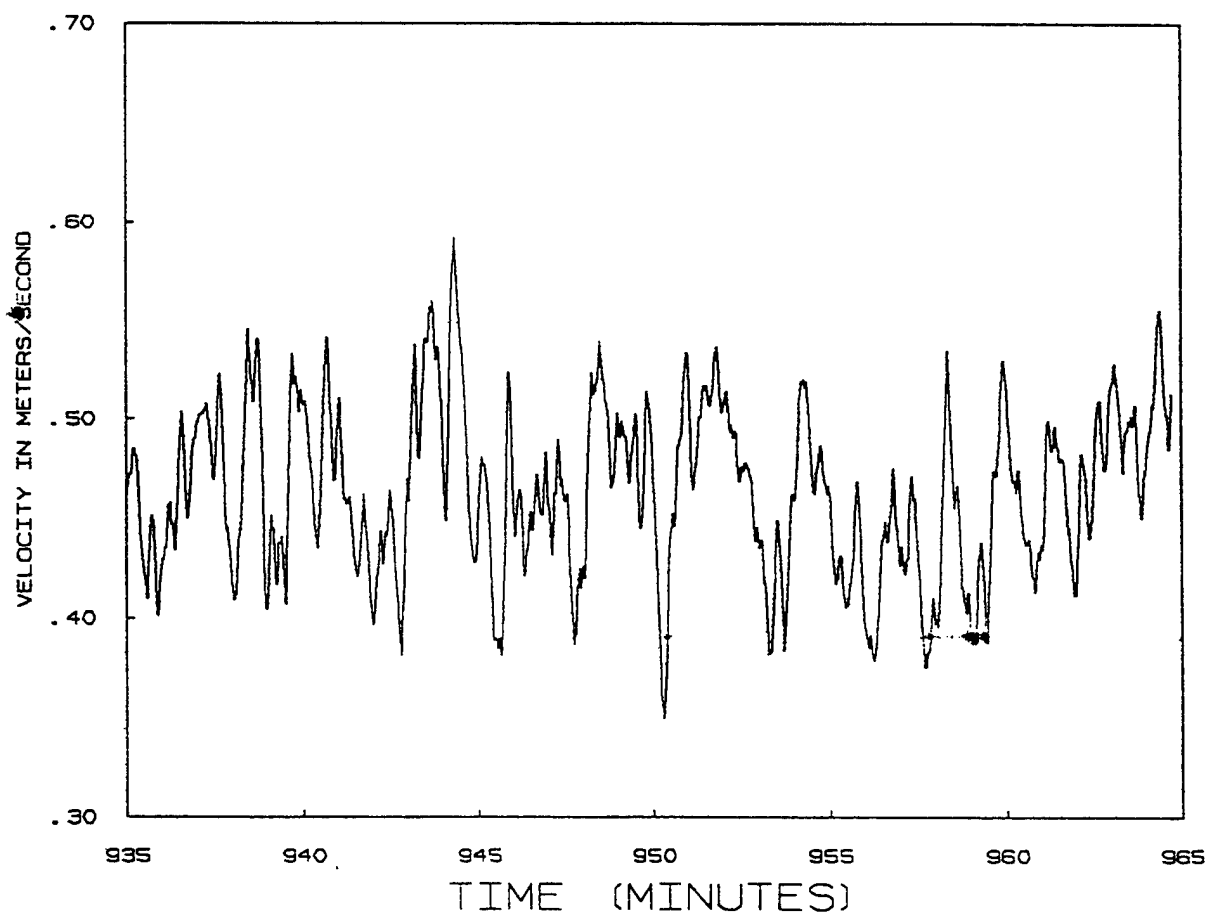
MARSH MCBIRNEY 511/527 PLOTTING ROUTINE Y - COMPONENT





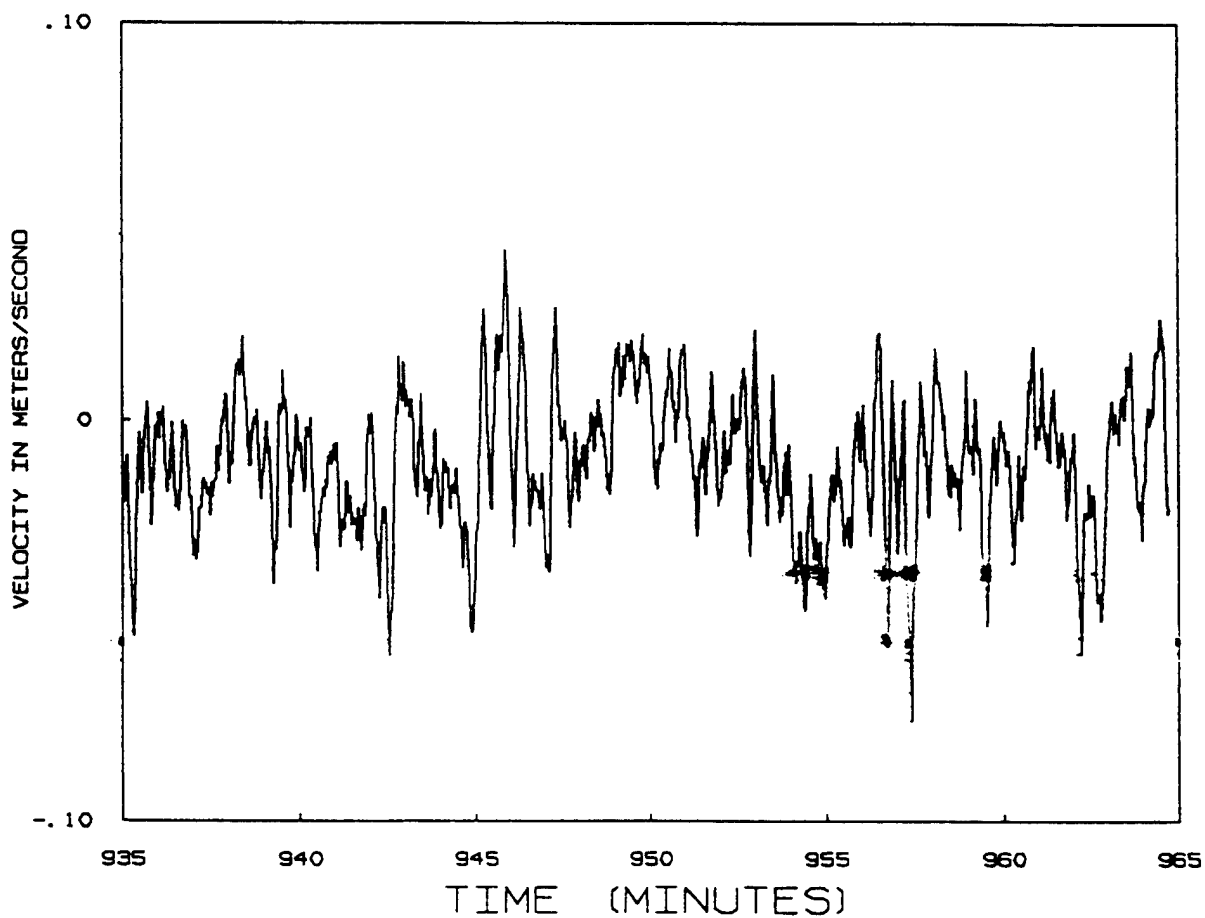
|               |          |            |                  |
|---------------|----------|------------|------------------|
| meter number  | B-642    | start-time | 1535             |
| tow name      | American | end-time   | 1605             |
| configuration | 3x5      | mean =     | 0.47             |
| draft         | 2.0      | vmax =     | 0.00 tmax = 944. |
| speed         | 7.1 mph  | vmin =     | 0.00 tmin = 950. |
| direction     | upstream |            |                  |
| distance      | 275      |            |                  |

MARSH MCBIRNEY 511/527 PLOTTING ROUTINE X - COMPONENT



|               |          |            |                  |
|---------------|----------|------------|------------------|
| meter number  | B-642    | start-time | 1535             |
| tow name      | American | end-time   | 1605             |
| configuration | 3x5      | mean =     | -0.01            |
| draft         | 2.0      | vmax =     | 0.00 tmax = 946. |
| speed         | 7.1 mph  | vmin =     | 0.00 tmin = 957. |
| direction     | upstream |            |                  |
| distance      | 275      |            |                  |

MARSH MCBIRNEY S11/527 PLOTTING ROUTINE Y - COMPONENT



XX-6. Velocity fluctuations measured by two-dimensional current meters  
for barge *James F. Neal* at Goose Island, trip 2

James F. Neal (7/18/91)

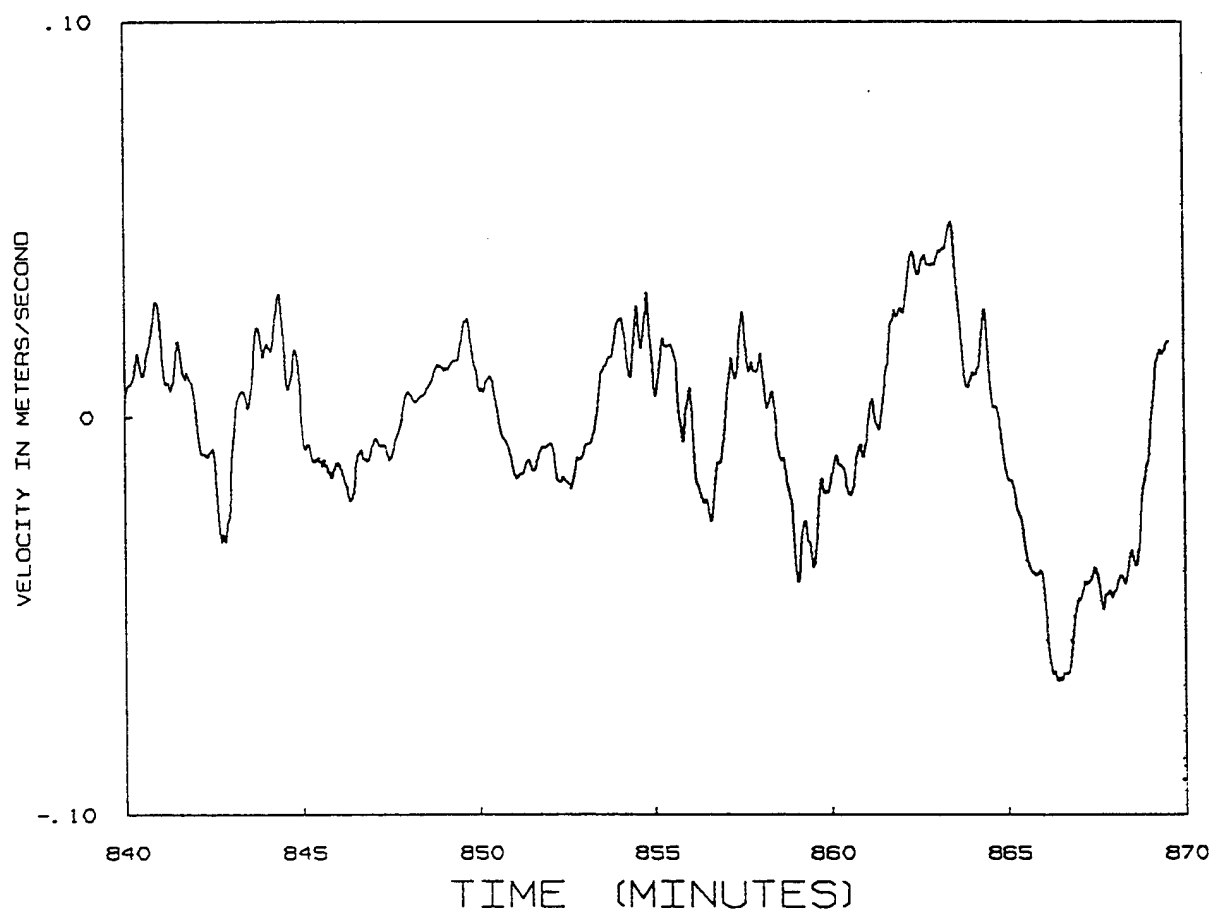
Status of Electromagnetic Current Meters:

|                      |                       |                      |                       |                       |                       |
|----------------------|-----------------------|----------------------|-----------------------|-----------------------|-----------------------|
| 998<br>(MMB511)<br>✓ | 1000<br>(MMB511)<br>✓ | 999<br>(MMB511)<br>✓ | 1130<br>(MMB511)<br>✓ | 1131<br>(MMB511)<br>✓ | 1001<br>(MMB511)<br>✓ |
| 642<br>(MMB527)<br>✓ | 332<br>(MMB527)<br>✓  |                      |                       |                       |                       |
| 071<br>(S4)<br>✓     | 834<br>(S4)<br>✓      | 040<br>(S4)<br>✓     | 832<br>(S4)<br>-      | 151<br>(S4)<br>✓      |                       |

Note: ✓ : Working  
\* : Not working  
- : Unavailable

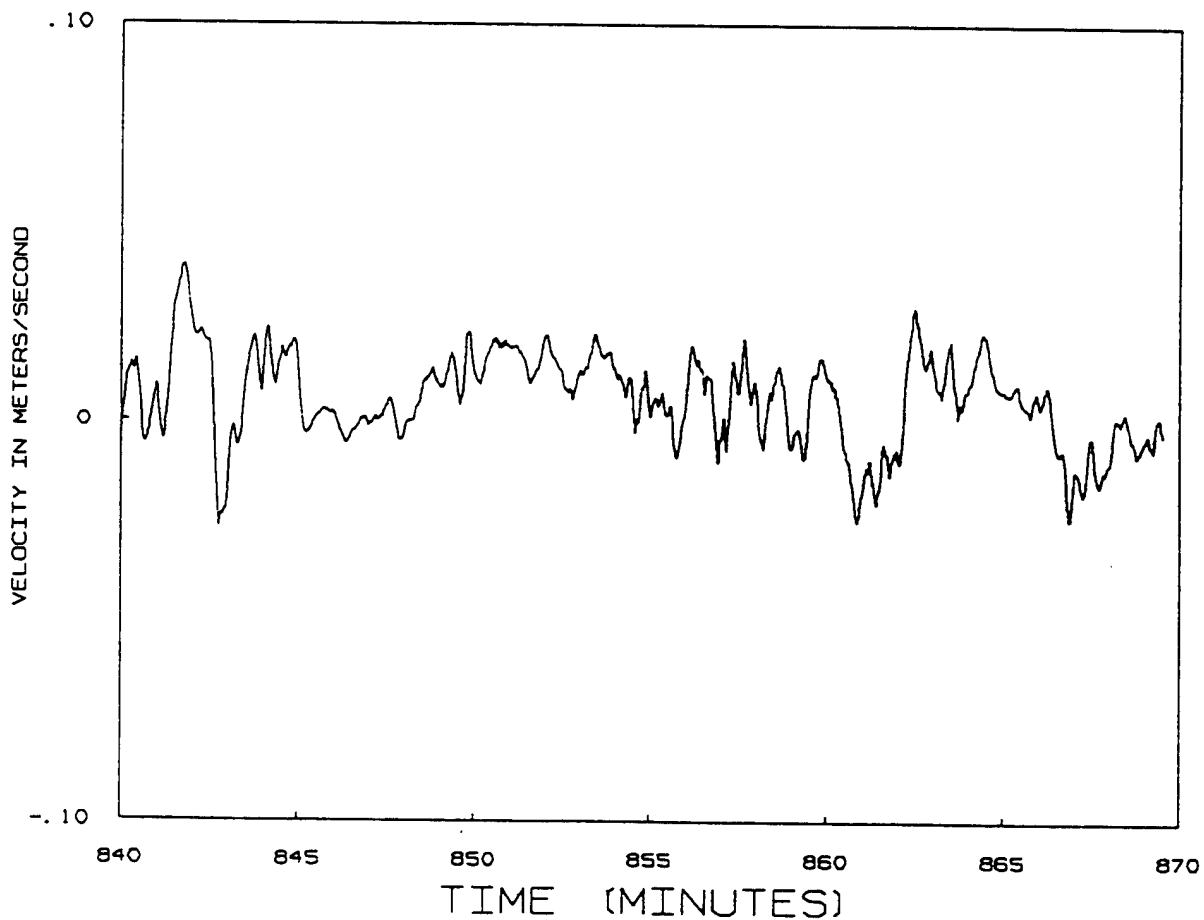
|               |            |            |                   |
|---------------|------------|------------|-------------------|
| meter number  | 998        | distance   | 310               |
| tow name      | james F.   | start-time | 1400              |
| configuration | 3x5        | end-time   | 1430              |
| draft         | 9.0        | mean =     | 0.00              |
| speed         | 9.1 mph    | vmax =     | 0.05 tmax = 863.  |
| direction     | downstream | vmin =     | -0.07 tmin = 866. |

MARSH MCBIRNEY 511/LOGGER2 PLOTTING ROUT X - COMPONENT



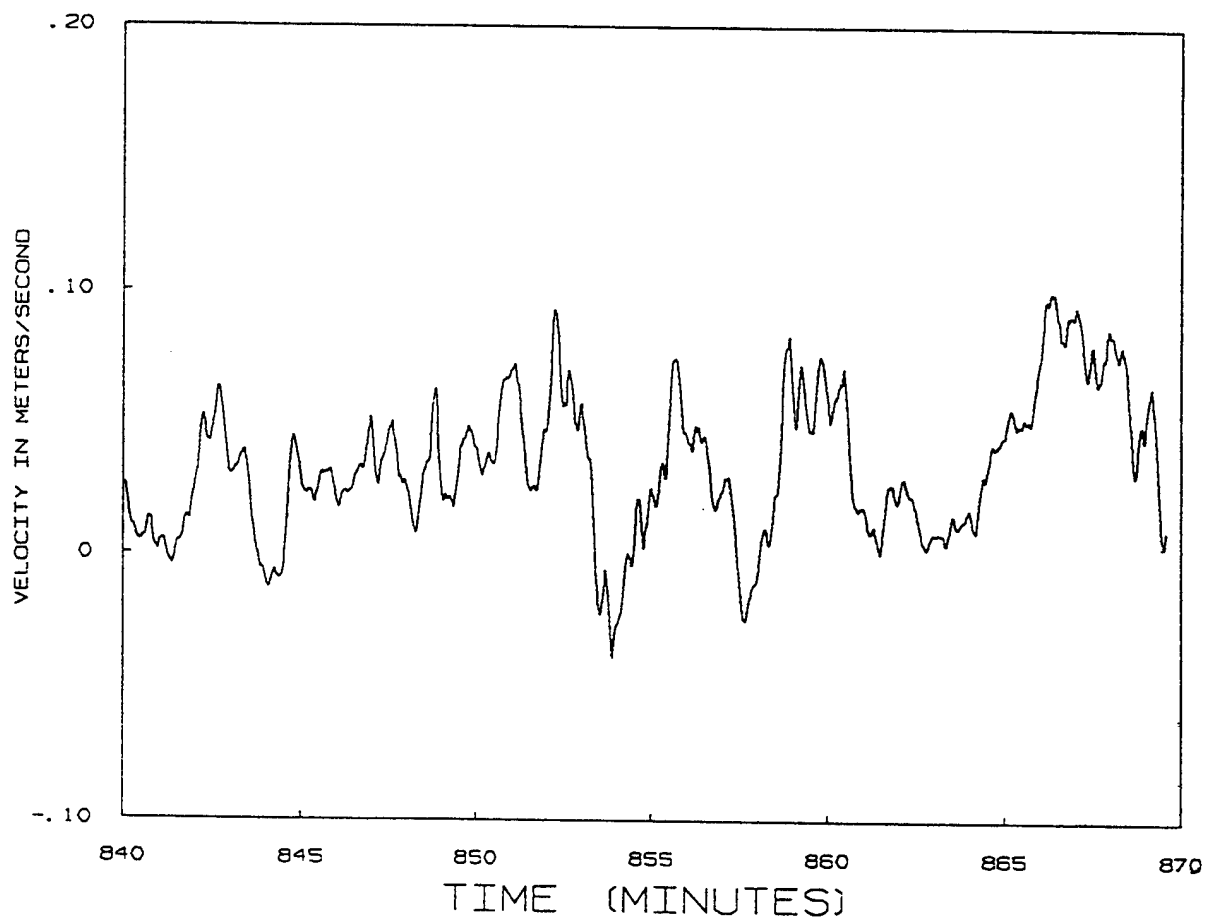
|               |            |            |                   |
|---------------|------------|------------|-------------------|
| meter number  | 998        | distance   | 310               |
| tow name      | james F.   | start-time | 1400              |
| configuration | 3x5        | end-time   | 1430              |
| draft         | 9.0        | mean =     | 0.01              |
| speed         | 9.1 mph    | vmax =     | 0.04 tmax = 842.  |
| direction     | downstream | vmin =     | -0.03 tmin = 843. |

MARSH MCBIRNEY S11/LOGGER2 PLOTTING ROUT Y - COMPONENT



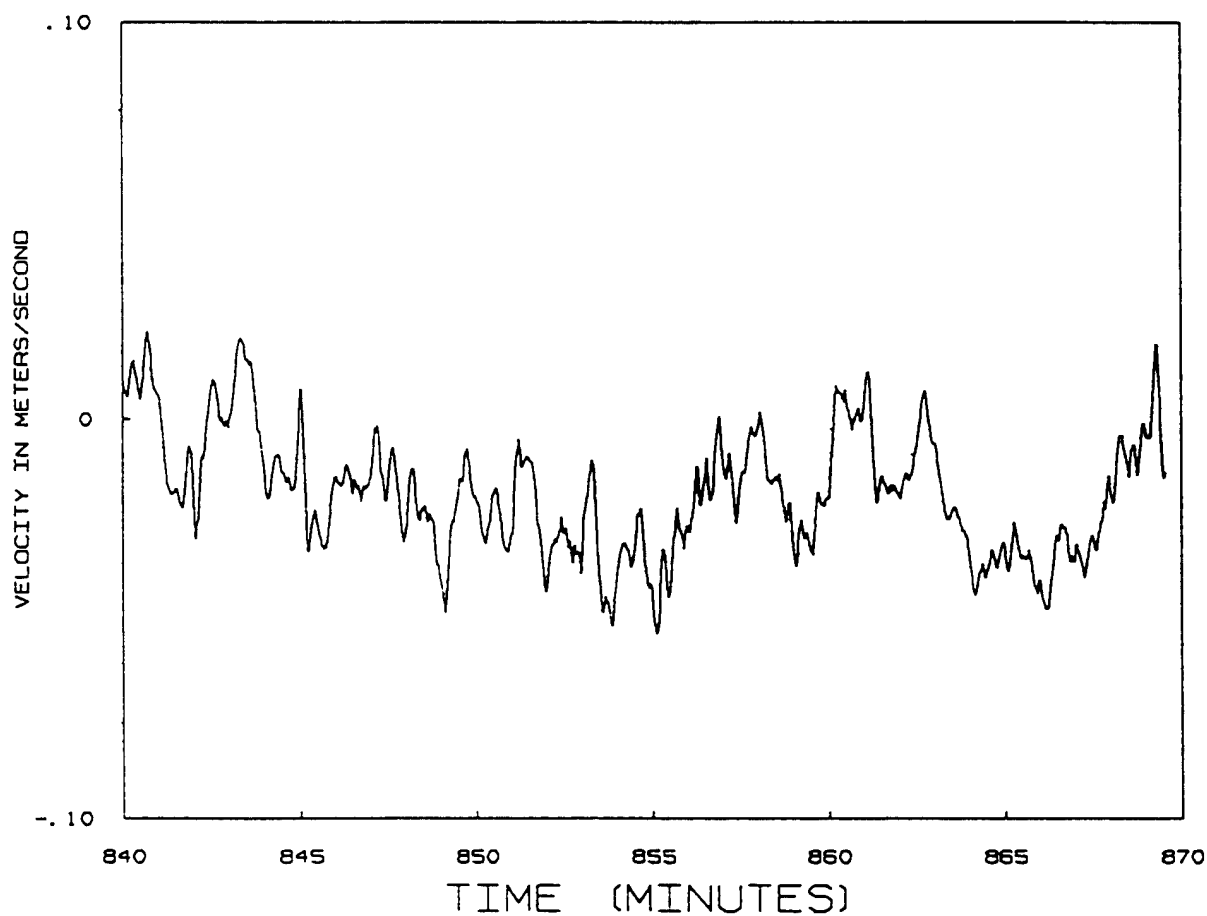
|               |            |            |                   |
|---------------|------------|------------|-------------------|
| meter number  | 1000       | distance   | 310               |
| tow name      | james F.   | start-time | 1400              |
| configuration | 3x5        | end-time   | 1430              |
| draft         | 9.0        | mean =     | 0.02              |
| speed         | 9.1 mph    | vmax =     | 0.10 tmax = 866.  |
| direction     | downstream | vmin =     | -0.04 tmin = 854. |

MARSH MCBIRNEY 511/LOGGER2 PLOTTING ROUT X - COMPONENT



|               |            |            |                     |
|---------------|------------|------------|---------------------|
| meter number  | 1000       | distance   | 310                 |
| tow name      | james F.   | start-time | 1400                |
| configuration | 3x5        | end-time   | 1430                |
| draft         | 9.0        | mean       | = -0.01             |
| speed         | 9.1 mph    | vmax       | = 0.02 tmax = 841.  |
| direction     | downstream | vmin       | = -0.05 tmin = 855. |

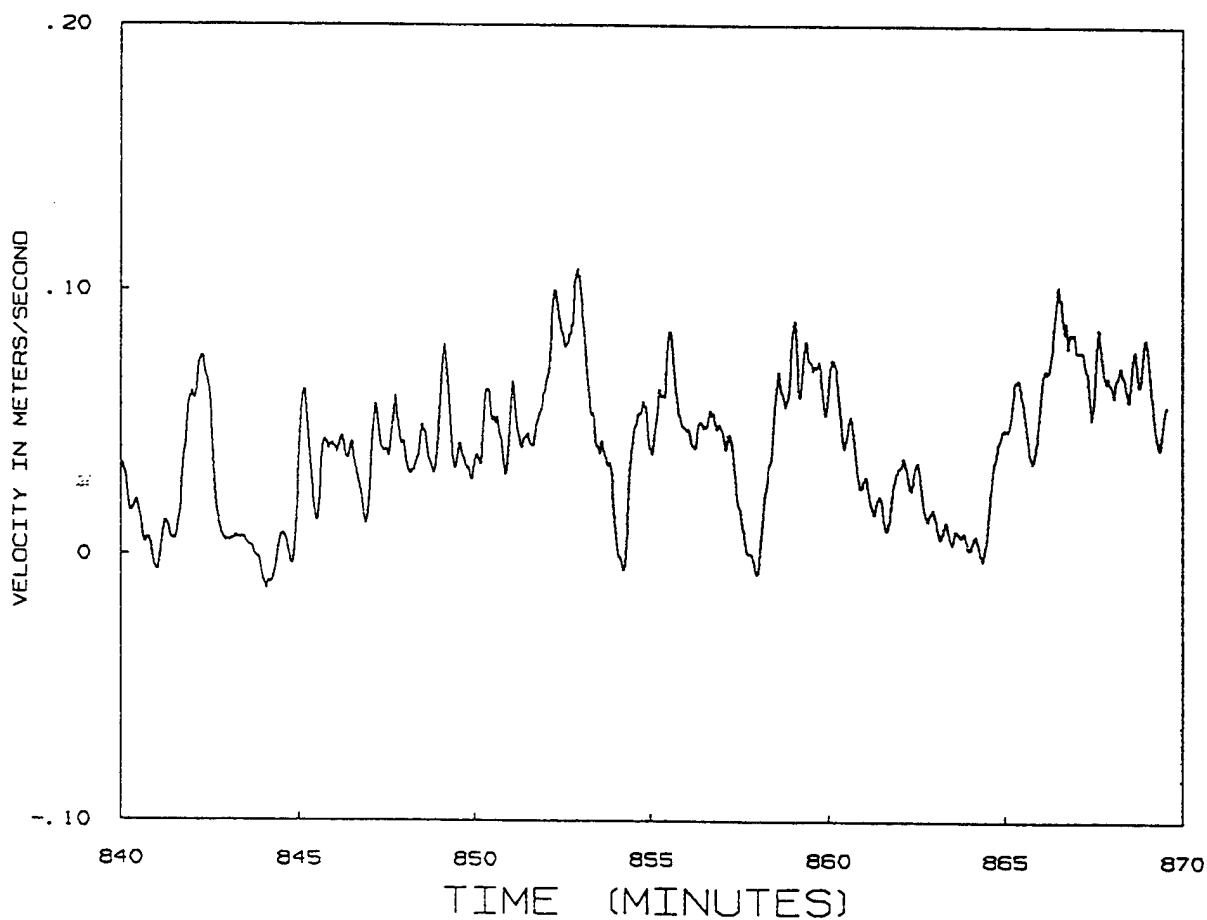
MARSH MCBIRNEY S11/LOGGER2 PLOTTING ROUT Y - COMPONENT





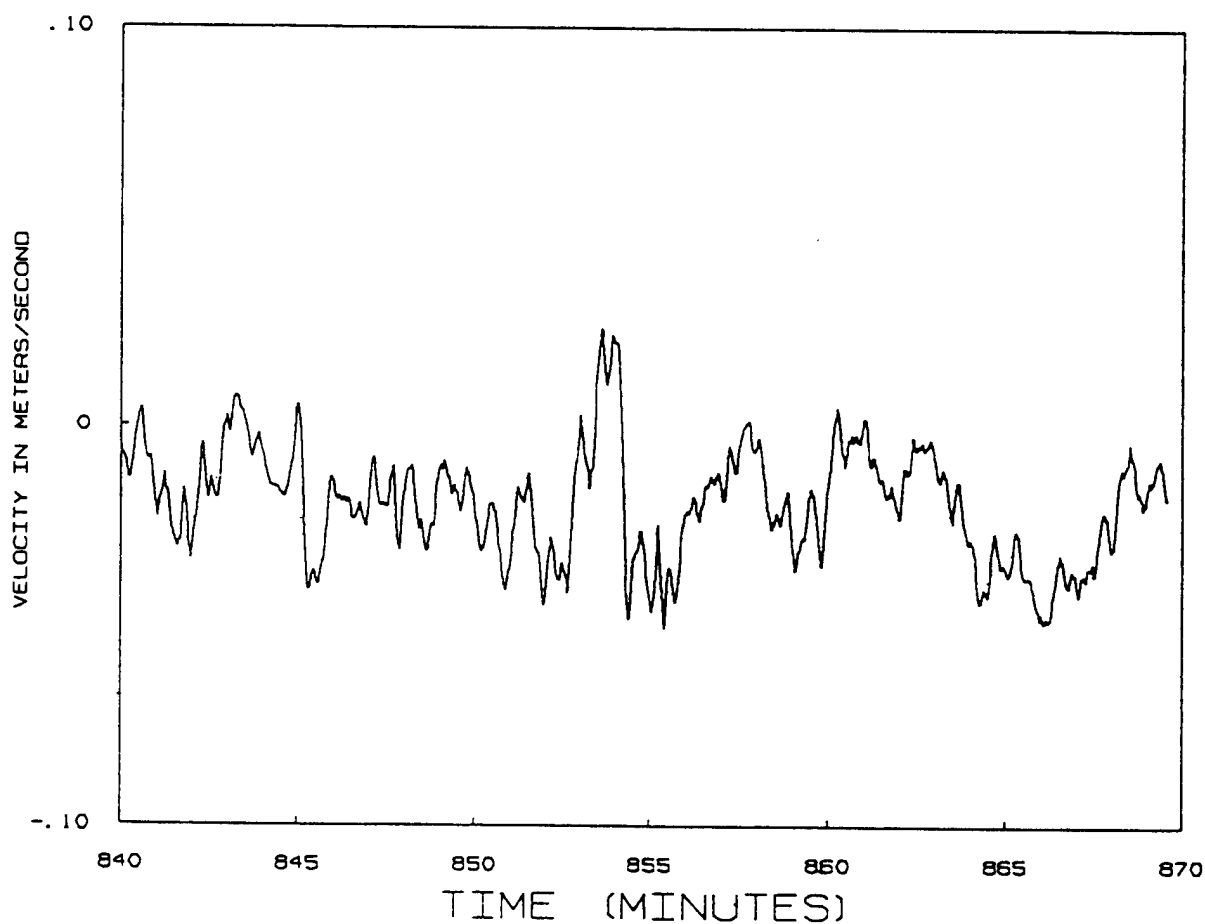
|               |            |            |                   |
|---------------|------------|------------|-------------------|
| meter number  | 999        | distance   | 310               |
| tow name      | james F.   | start-time | 1400              |
| configuration | 3x5        | end-time   | 1430              |
| draft         | 9.0        | mean =     | 0.03              |
| speed         | 9.1 mph    | vmax =     | 0.11 tmax = 853.  |
| direction     | downstream | vmin =     | -0.01 tmin = 844. |

MARSH MCBIRNEY S11/LOGGER2 PLOTTING ROUT X - COMPONENT



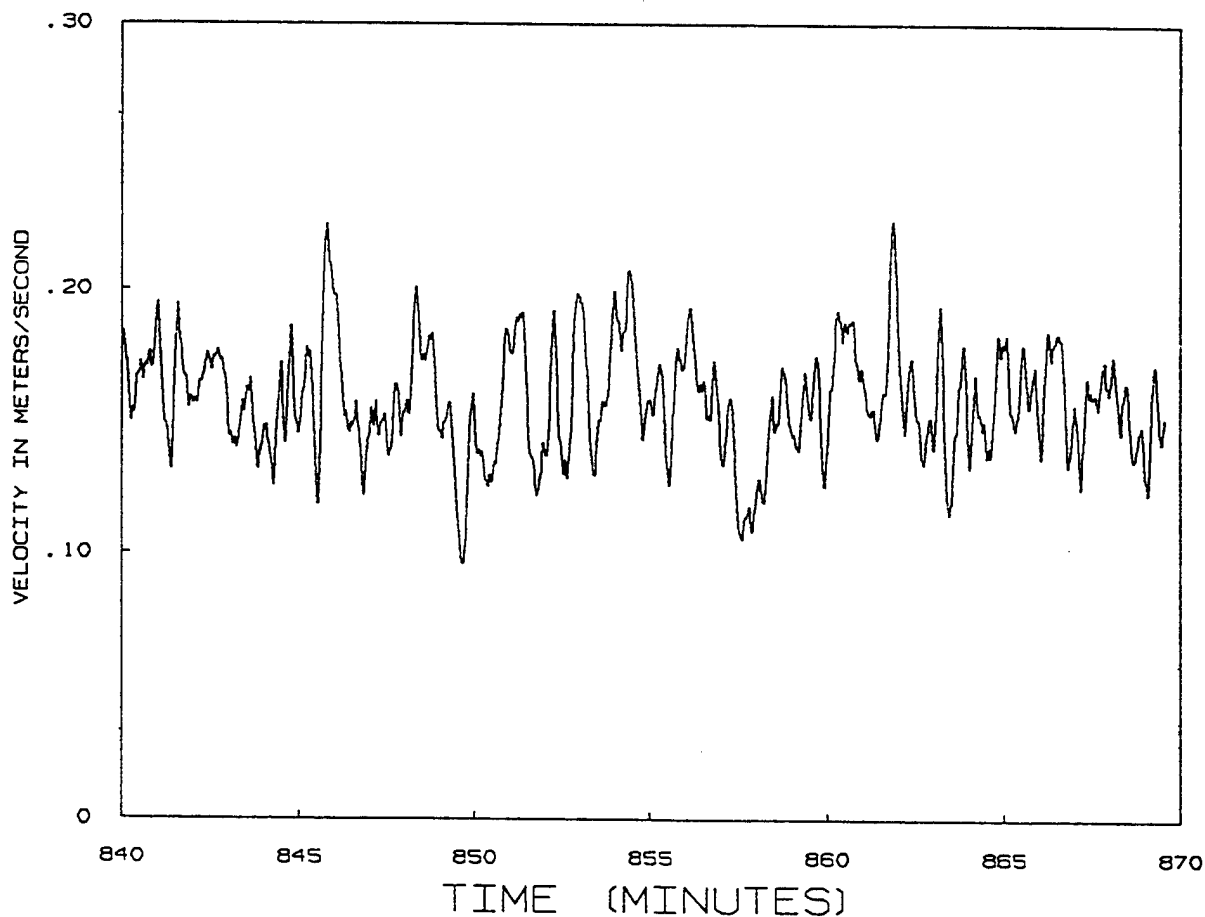
|               |            |            |                     |
|---------------|------------|------------|---------------------|
| meter number  | 999        | distance   | 310                 |
| tow name      | james F.   | start-time | 1400                |
| configuration | 3x5        | end-time   | 1430                |
| draft         | 9.0        | mean       | = -0.02             |
| speed         | 9.1 mph    | vmax       | = 0.02 tmax = 854.  |
| direction     | downstream | vmin       | = -0.05 tmin = 855. |

MARSH MCBIRNEY S11/LOGGER2 PLOTTING ROUT Y - COMPONENT



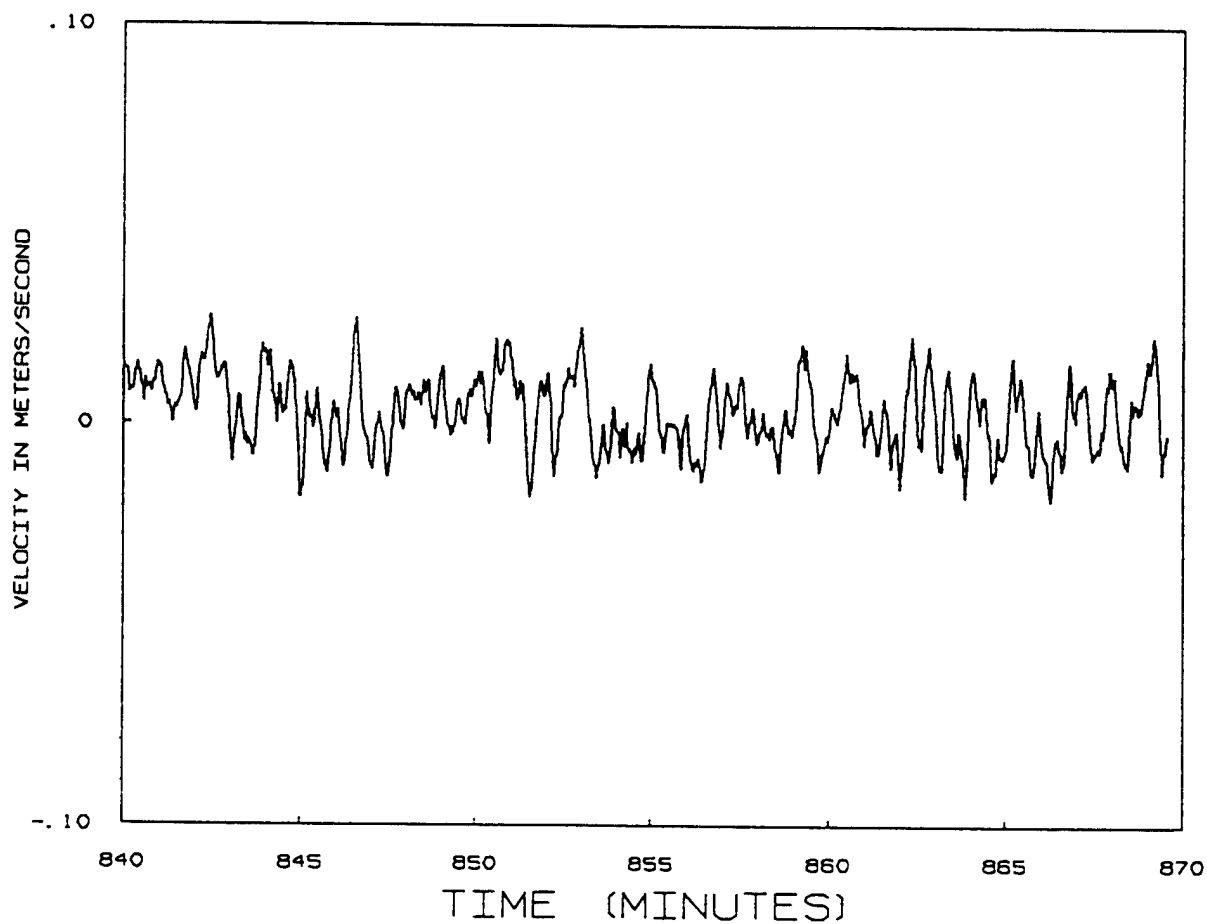
|               |            |            |                  |
|---------------|------------|------------|------------------|
| meter number  | 1130       | distance   | 310              |
| tow name      | james F.   | start-time | 1400             |
| configuration | 3x5        | end-time   | 1430             |
| draft         | 9.0        | mean =     | 0.16             |
| speed         | 9.1 mph    | vmax =     | 0.23 tmax = 862. |
| direction     | downstream | vmin =     | 0.10 tmin = 850. |

MARSH MCBIRNEY S11/LOGGER2 PLOTTING ROUT X - COMPONENT



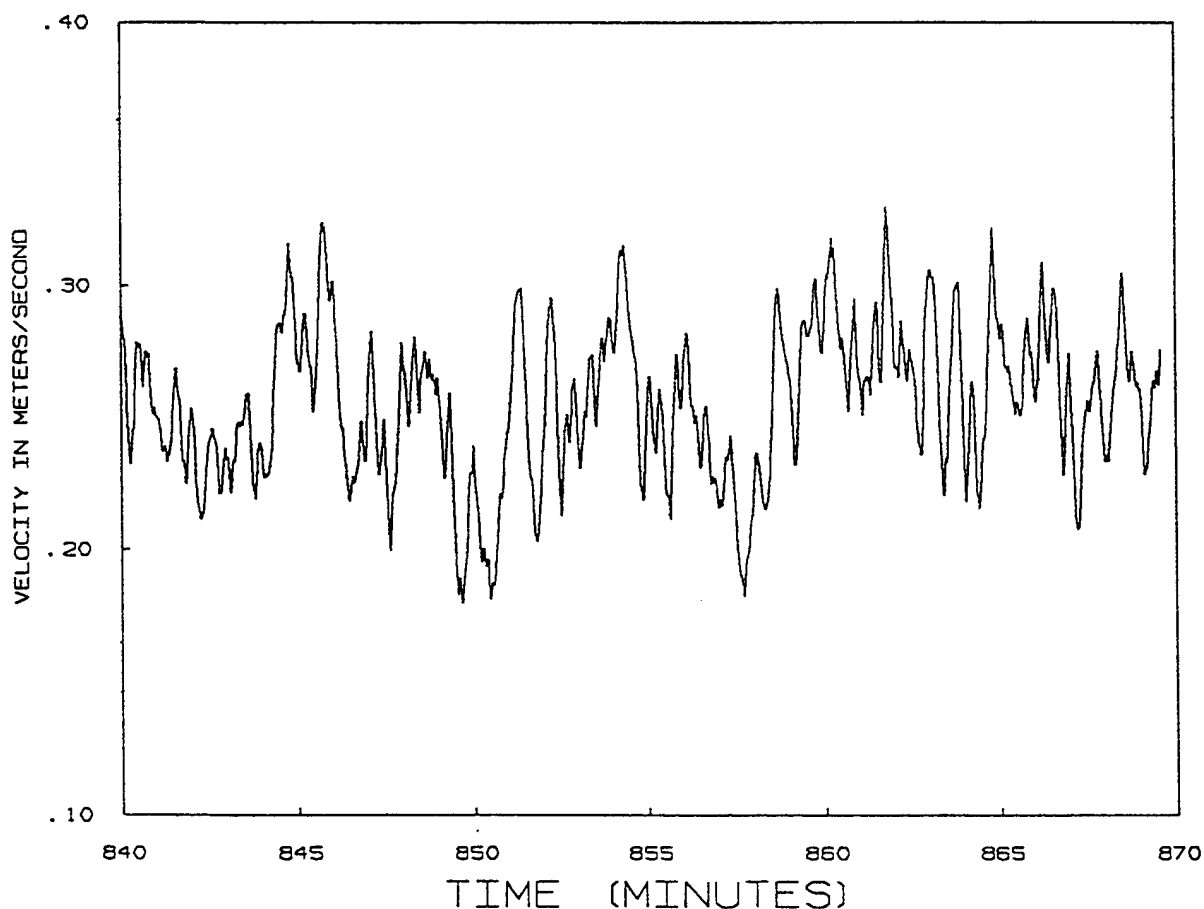
|               |            |            |                   |
|---------------|------------|------------|-------------------|
| meter number  | 1130       | distance   | 310               |
| tow name      | james F.   | start-time | 1400              |
| configuration | 3x5        | end-time   | 1430              |
| draft         | 9.0        | mean =     | 0.01              |
| speed         | 9.1 mph    | vmax =     | 0.03 tmax = 842.  |
| direction     | downstream | vmin =     | -0.02 tmin = 866. |

MARSH MCBIRNEY S11/LOGGER2 PLOTTING ROUT Y - COMPONENT



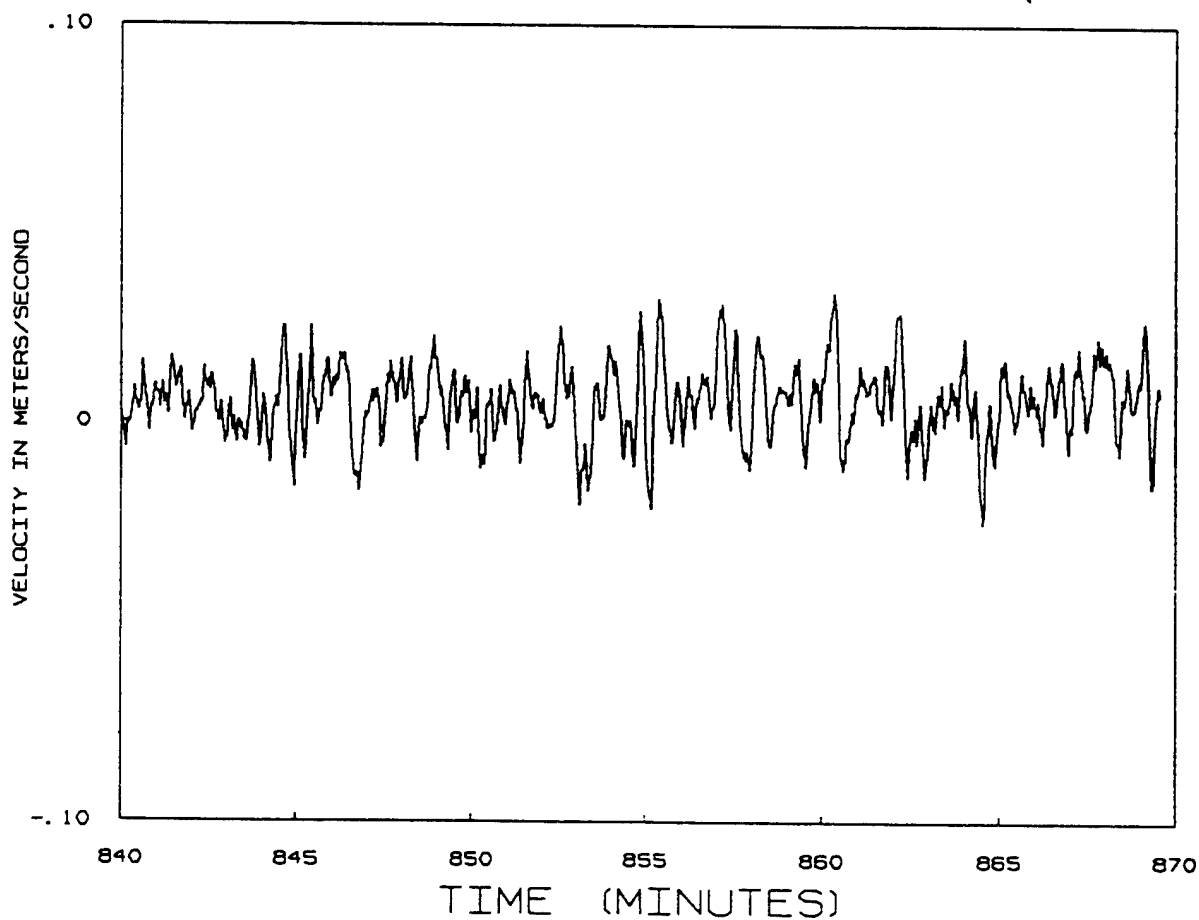
|               |            |            |                  |
|---------------|------------|------------|------------------|
| meter number  | 1131       | distance   | 310              |
| tow name      | james F.   | start-time | 1400             |
| configuration | 3x5        | end-time   | 1430             |
| draft         | 9.0        | mean =     | 0.25             |
| speed         | 9.1 mph    | vmax =     | 0.33 tmax = 862. |
| direction     | downstream | vmmin =    | 0.18 tmin = 850. |

MARSH MCBIRNEY S11/LOGGER2 PLOTTING ROUT X - COMPONENT



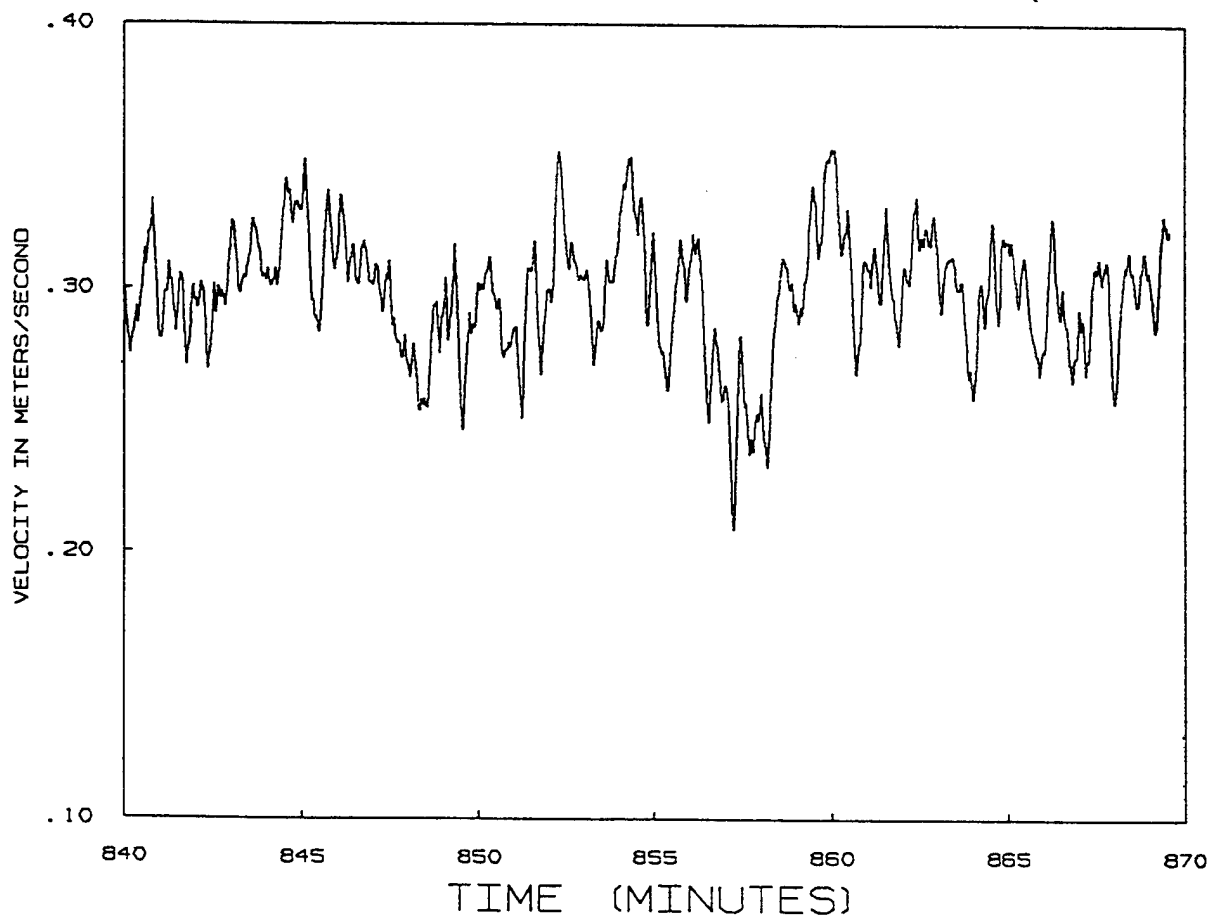
|               |            |            |                   |
|---------------|------------|------------|-------------------|
| meter number  | 1131       | distance   | 310               |
| tow name      | james F.   | start-time | 1400              |
| configuration | 3x5        | end-time   | 1430              |
| draft         | 9.0        | mean =     | 0.00              |
| speed         | 9.1 mph    | vmax =     | 0.03 tmax = 860.  |
| direction     | downstream | vmin =     | -0.03 tmin = 865. |

MARSH MCBIRNEY S11/LOGGER2 PLOTTING ROUT Y - COMPONENT

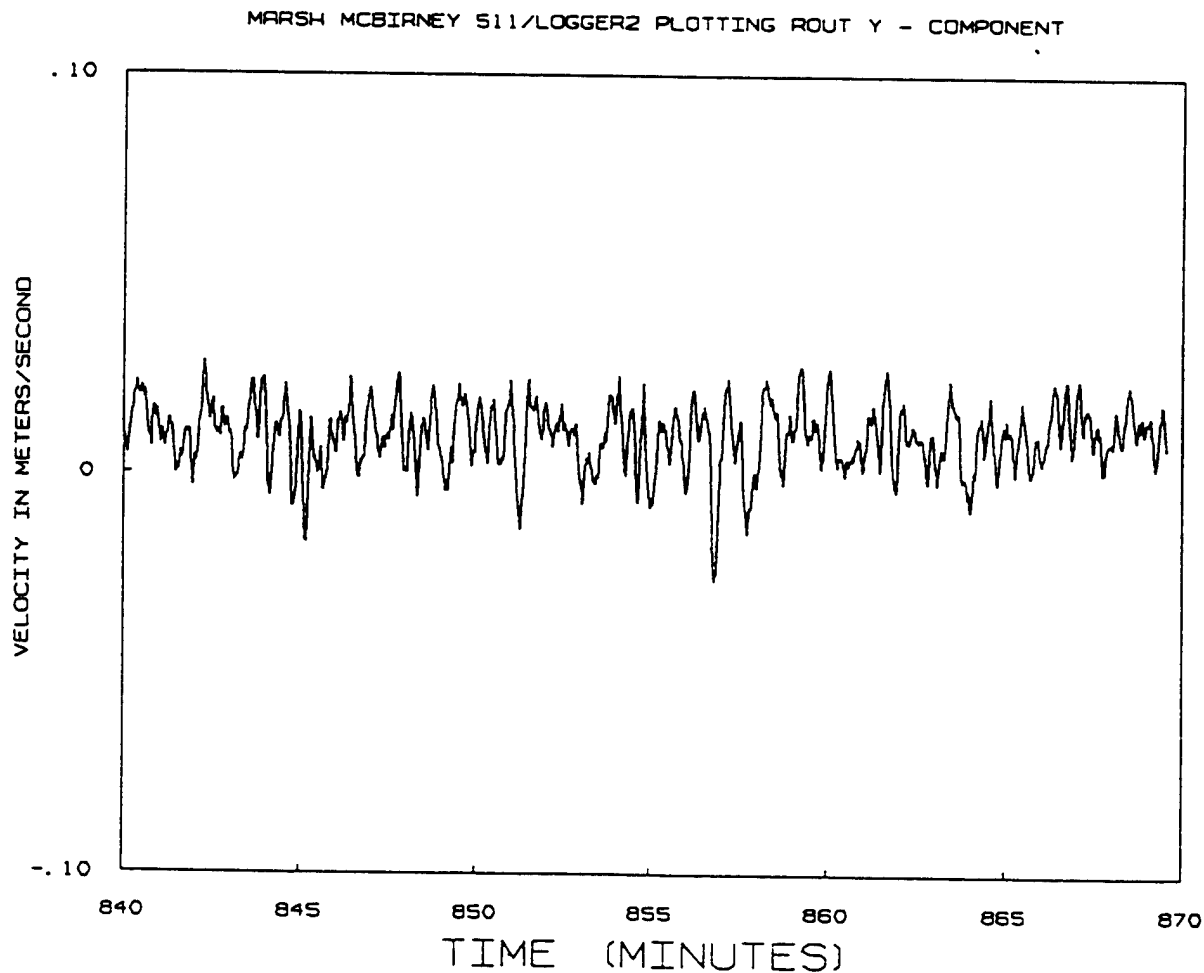


|               |            |            |                  |
|---------------|------------|------------|------------------|
| meter number  | 1001       | distance   | 310              |
| tow name      | james F.   | start-time | 1400             |
| configuration | 3x5        | end-time   | 1430             |
| draft         | 9.0        | mean =     | 0.30             |
| speed         | 9.1 mph    | vmax =     | 0.35 tmax = 860. |
| direction     | downstream | vmin =     | 0.21 tmin = 857. |

MARSH MCBIRNEY S11/LOGGER2 PLOTTING ROUT X - COMPONENT



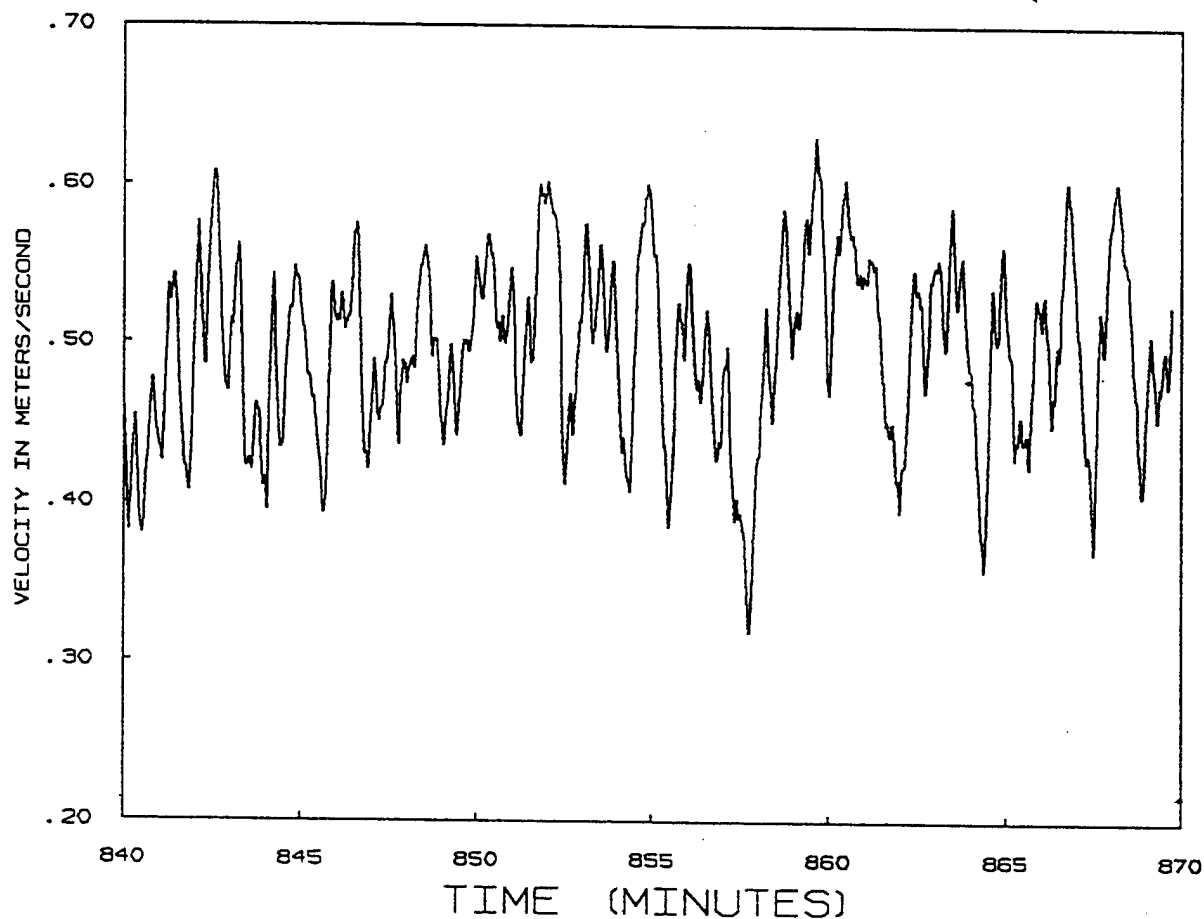
|               |            |            |                   |
|---------------|------------|------------|-------------------|
| meter number  | 1001       | distance   | 310               |
| tow name      | james F.   | start-time | 1400              |
| configuration | 3x5        | end-time   | 1430              |
| draft         | 9.0        | mean =     | 0.01              |
| speed         | 9.1 mph    | vmax =     | 0.03 tmax = 842.  |
| direction     | downstream | vmin =     | -0.03 tmin = 857. |





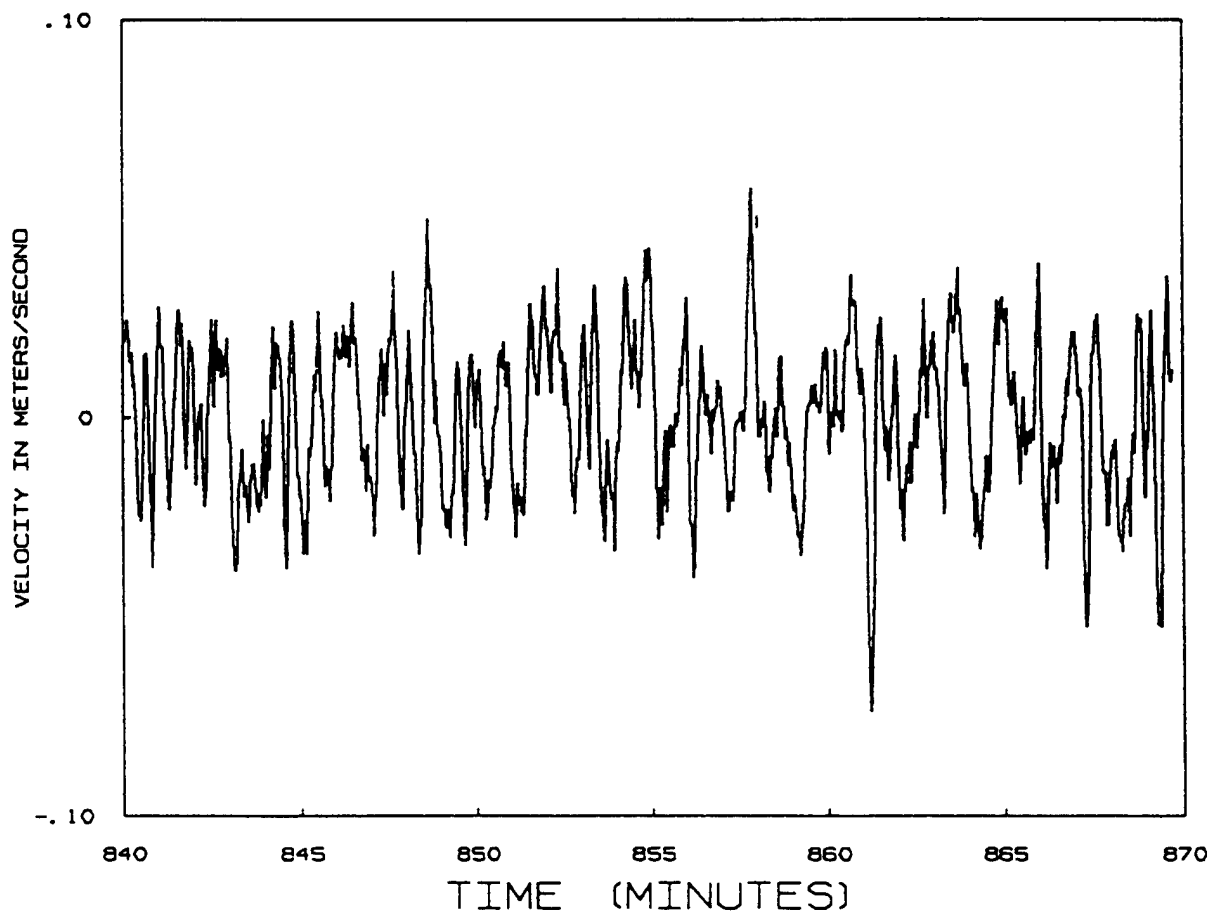
|               |            |            |                  |
|---------------|------------|------------|------------------|
| meter number  | B-642      | start-time | 1400             |
| tow name      | james F.   | end-time   | 1430             |
| configuration | 3x5        | mean =     | 0.48             |
| draft         | 9.0        | vmax =     | 0.00 tmax = 860. |
| speed         | 9.1 mph    | vmin =     | 0.00 tmin = 858. |
| direction     | downstream |            |                  |
| distance      | 310        |            |                  |

MARSH MCBIRNEY 511/527 PLOTTING ROUTINE X - COMPONENT



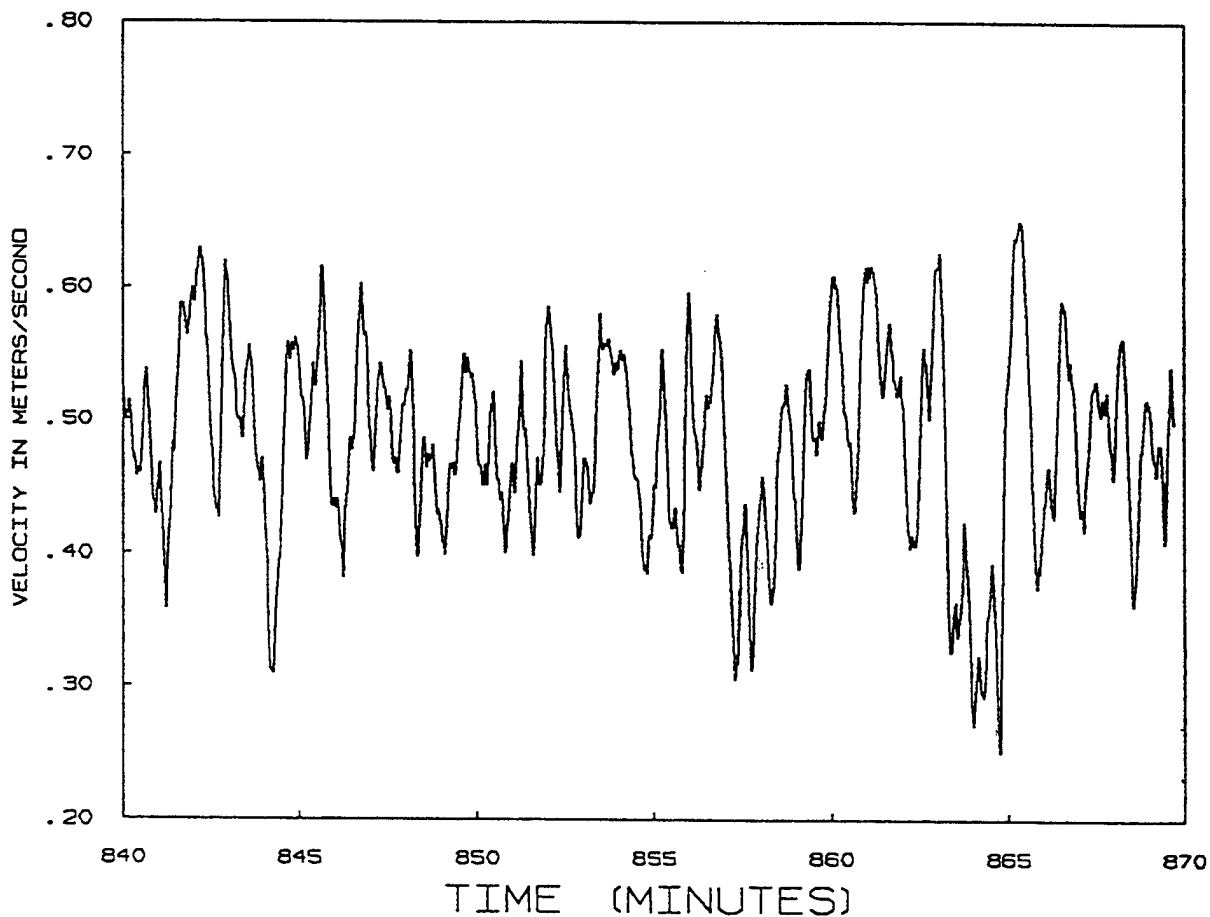
|               |            |            |                  |
|---------------|------------|------------|------------------|
| meter number  | B-642      | start-time | 1400             |
| tow name      | james F.   | end-time   | 1430             |
| configuration | 3x5        | mean =     | 0.00             |
| draft         | 9.0        | vmax =     | 0.00 tmax = 858. |
| speed         | 9.1 mph    | vmin =     | 0.00 tmin = 861. |
| direction     | downstream |            |                  |
| distance      | 310        |            |                  |

MARSH MCBIRNEY S11/527 PLOTTING ROUTINE Y - COMPONENT



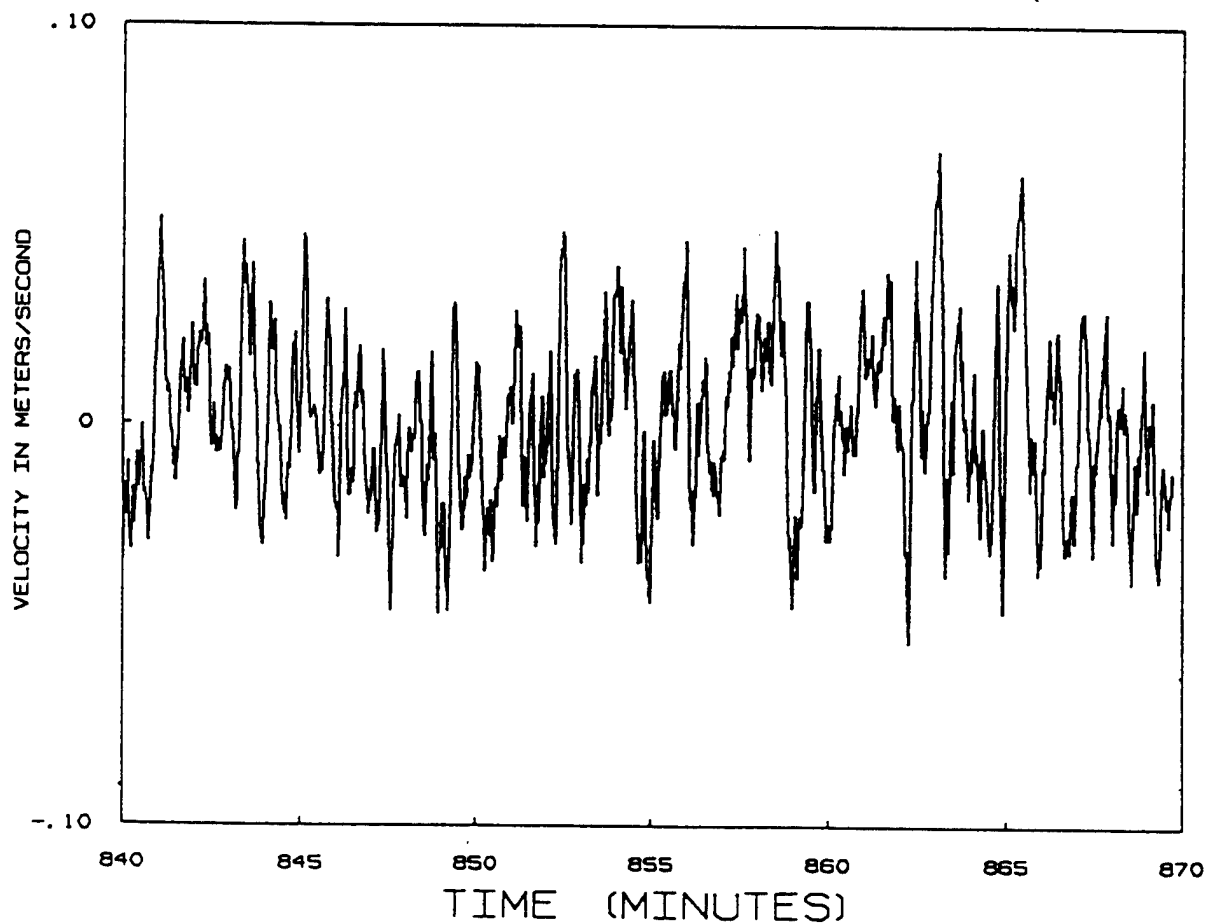
|               |            |            |                  |
|---------------|------------|------------|------------------|
| meter number  | B-332      | start-time | 1400             |
| tow name      | james F.   | end-time   | 1430             |
| configuration | 3x5        | mean =     | 0.50             |
| draft         | 9.0        | vmax =     | 0.00 tmax = 865. |
| speed         | 9.1 mph    | vmin =     | 0.00 tmin = 865. |
| direction     | downstream |            |                  |
| distance      | 310        |            |                  |

MARSH MCBIRNEY S11/S27 PLOTTING ROUTINE X - COMPONENT

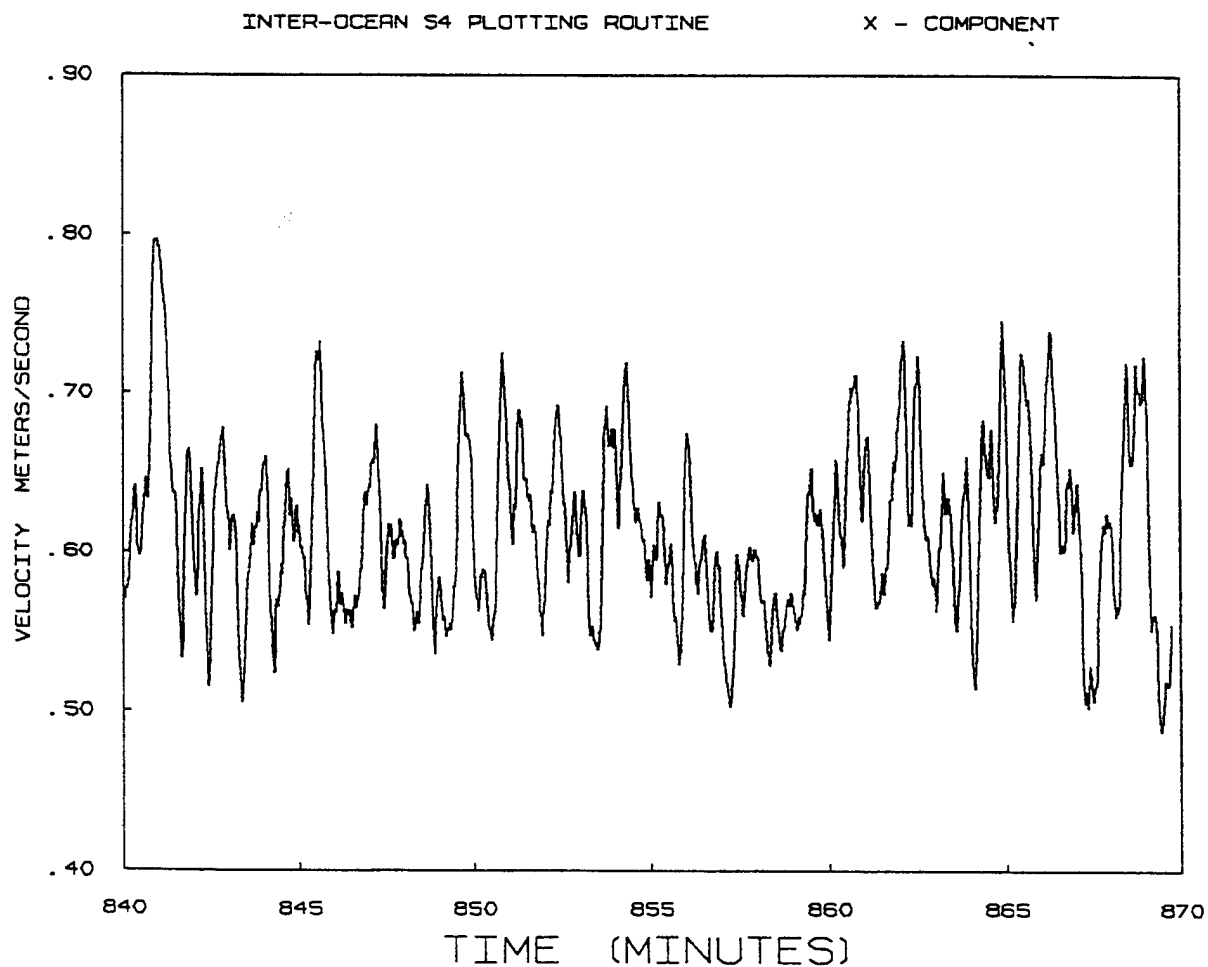


|               |            |            |                  |
|---------------|------------|------------|------------------|
| meter number  | B-332      | start-time | 1400             |
| tow name      | james F.   | end-time   | 1430             |
| configuration | 3x5        | mean =     | 0.00             |
| draft         | 9.0        | vmax =     | 0.00 tmax = 863. |
| speed         | 9.1 mph    | vmin =     | 0.00 tmin = 862. |
| direction     | downstream |            |                  |
| distance      | 310        |            |                  |

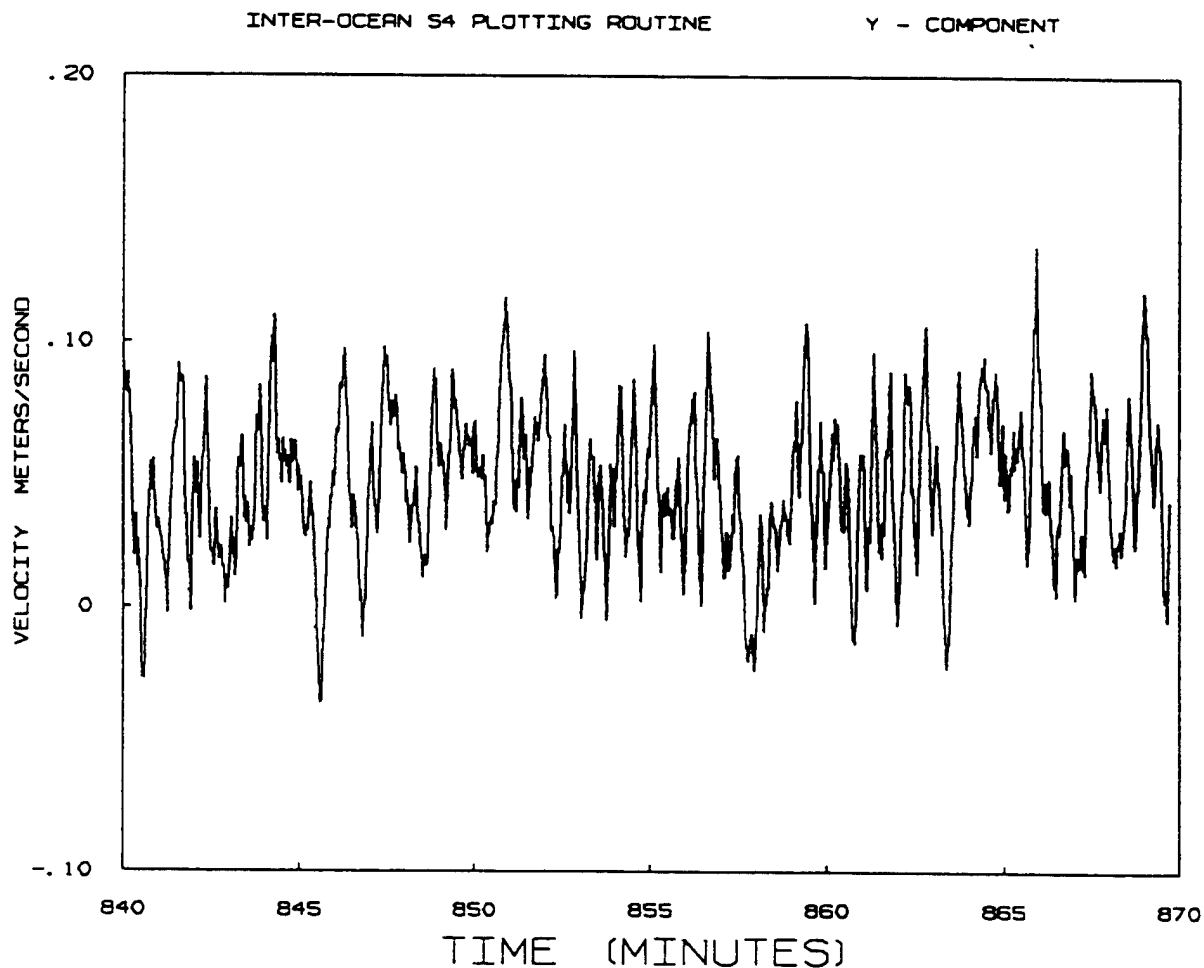
MARSH MCBIRNEY S11/527 PLOTTING ROUTINE Y - COMPONENT



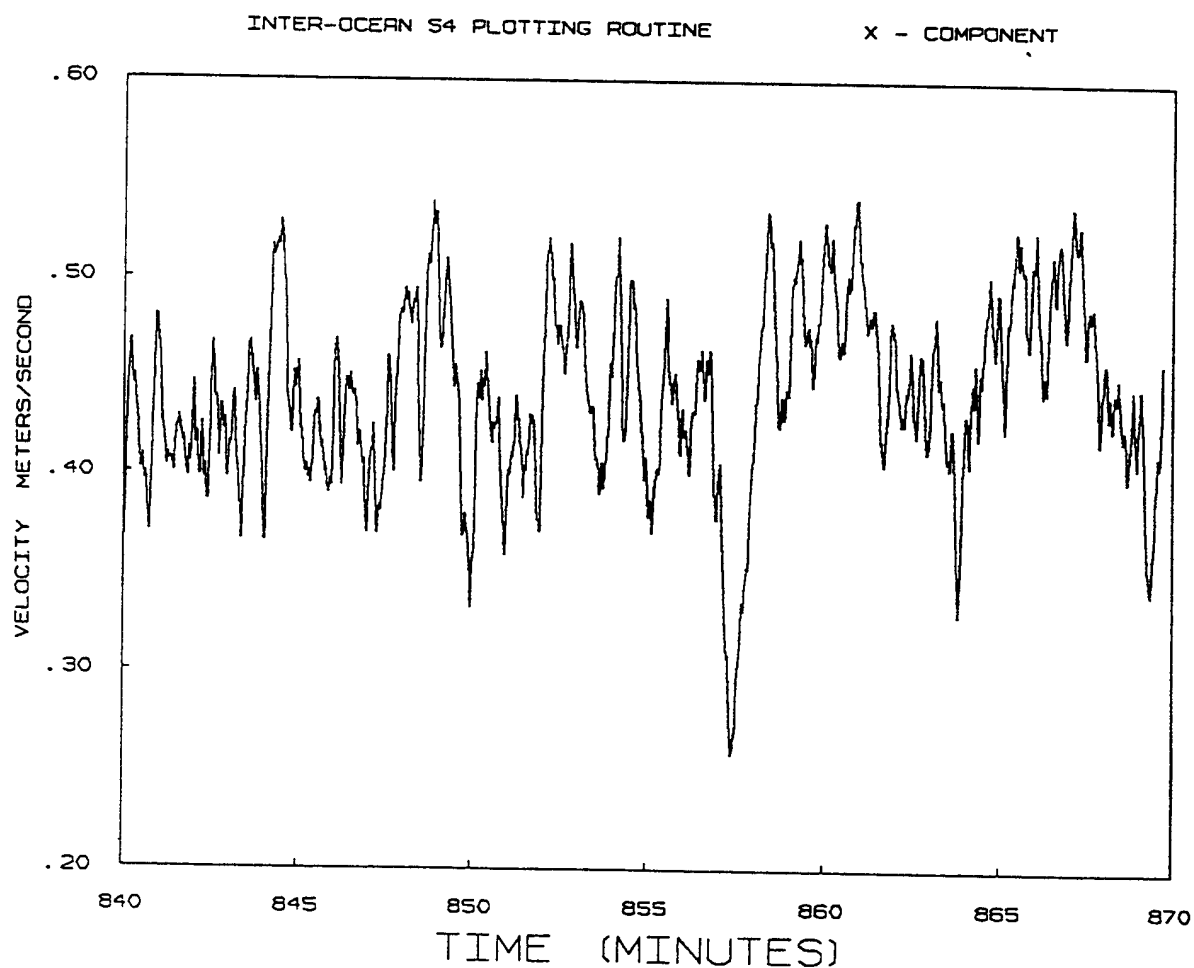
|               |            |            |                  |
|---------------|------------|------------|------------------|
| meter number  | 071        | distance   | 310              |
| tow name      | james F.   | start-time | 1400             |
| configuration | 3x5        | end-time   | 1430             |
| draft         | 9.0        | MEAN =     | 0.61             |
| speed         | 9.1 mph    | VMAX =     | 0.80 TMAX = 841. |
| direction     | downstream | VMIN =     | 0.49 TMIN = 869. |



|               |            |            |                   |
|---------------|------------|------------|-------------------|
| meter number  | 071        | distance   | 310               |
| tow name      | james F.   | start-time | 1400              |
| configuration | 3x5        | end-time   | 1430              |
| draft         | 9.0        | MEAN =     | 0.04              |
| speed         | 9.1 mph    | VMAX =     | 0.14 TMAX = 866.  |
| direction     | downstream | VMIN =     | -0.04 TMIN = 846. |



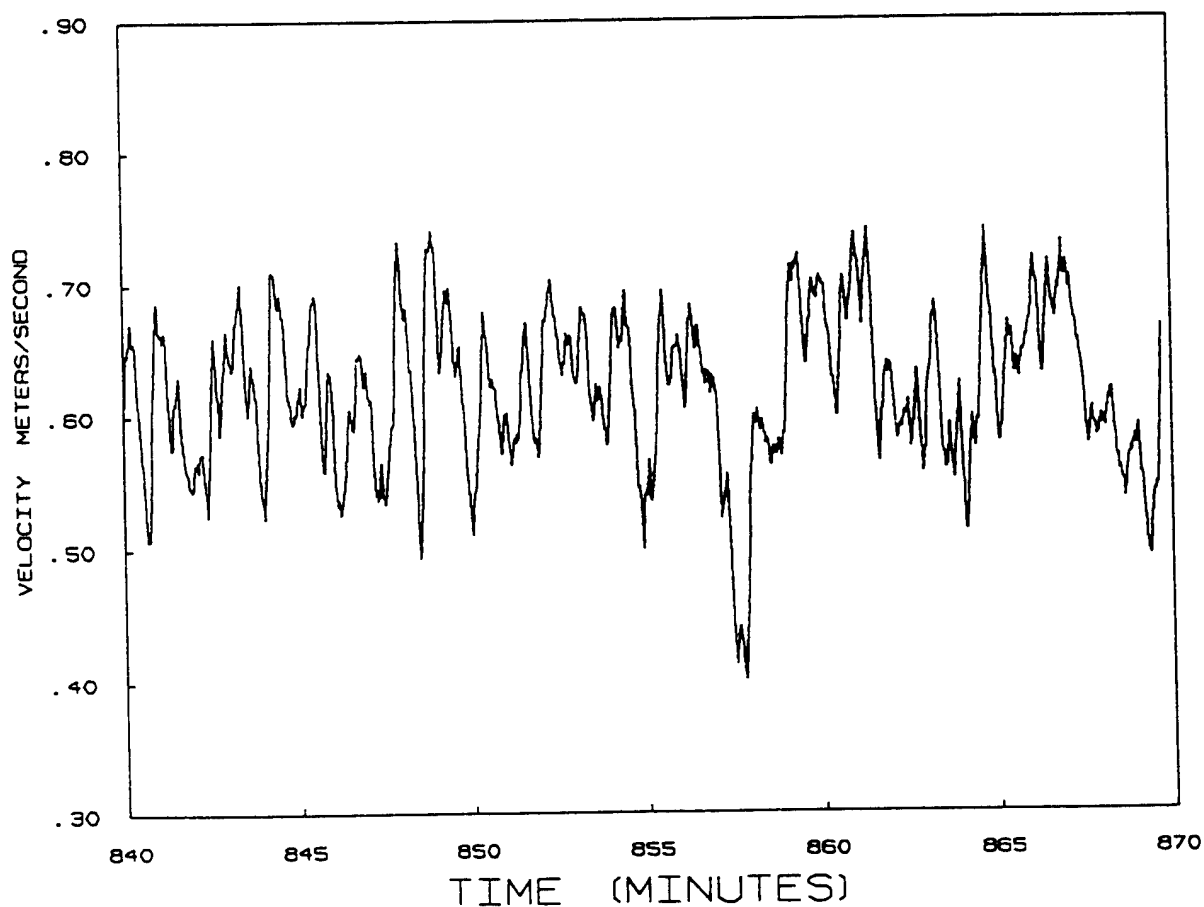
|               |            |            |                  |
|---------------|------------|------------|------------------|
| meter number  | 834        | distance   | 310              |
| tow name      | james F.   | start-time | 1400             |
| configuration | 3x5        | end-time   | 1430             |
| draft         | 9.0        | MEAN =     | 0.43             |
| speed         | 9.1 mph    | VMAX =     | 0.54 TMAX = 861. |
| direction     | downstream | VMIN =     | 0.26 TMIN = 857. |



|               |            |            |                  |
|---------------|------------|------------|------------------|
| meter number  | 834        | distance   | 310              |
| tow name      | james F.   | start-time | 1400             |
| configuration | 3x5        | end-time   | 1430             |
| draft         | 9.0        | MEAN =     | 0.62             |
| speed         | 9.1 mph    | VMAX =     | 0.74 TMAX = 861. |
| direction     | downstream | VMIN =     | 0.40 TMIN = 858. |

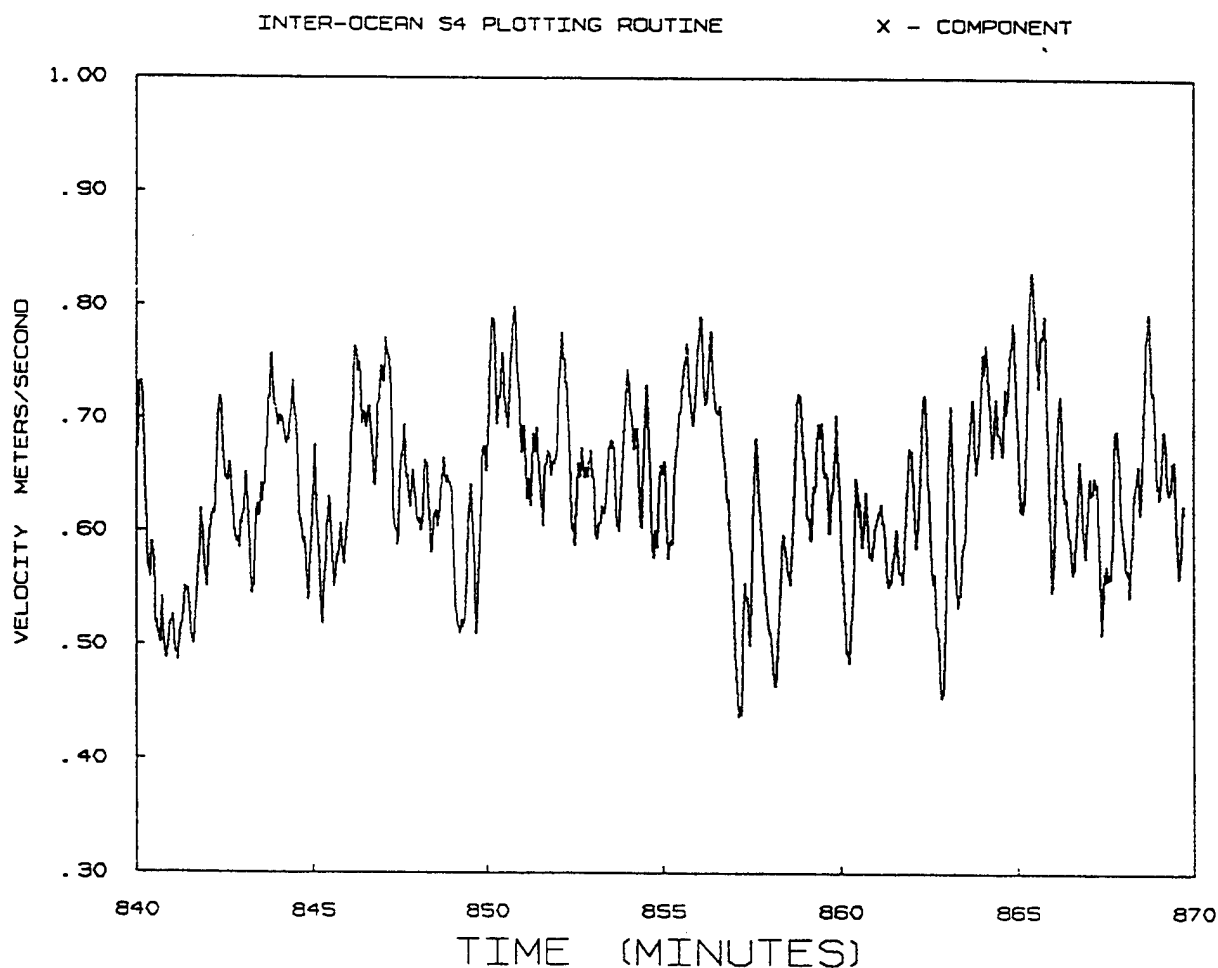
INTER-OCEAN S4 PLOTTING ROUTINE

Y - COMPONENT





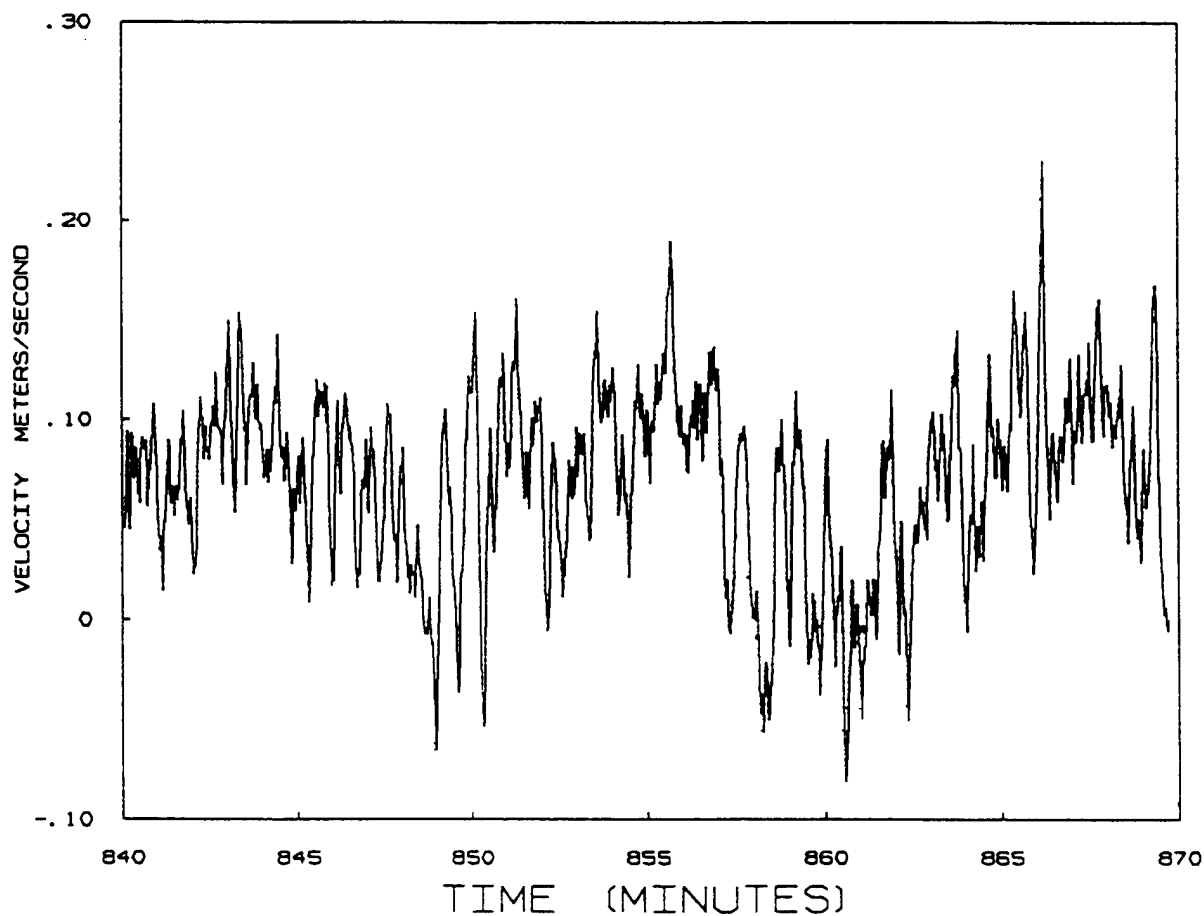
|               |            |            |                  |
|---------------|------------|------------|------------------|
| meter number  | 040        | distance   | 310              |
| tow name      | james F.   | start-time | 1400             |
| configuration | 3x5        | end-time   | 1430             |
| draft         | 9.0        | MEAN =     | 0.62             |
| speed         | 9.1 mph    | VMAX =     | 0.83 TMAX = 865. |
| direction     | downstream | VMIN =     | 0.44 TMIN = 857. |



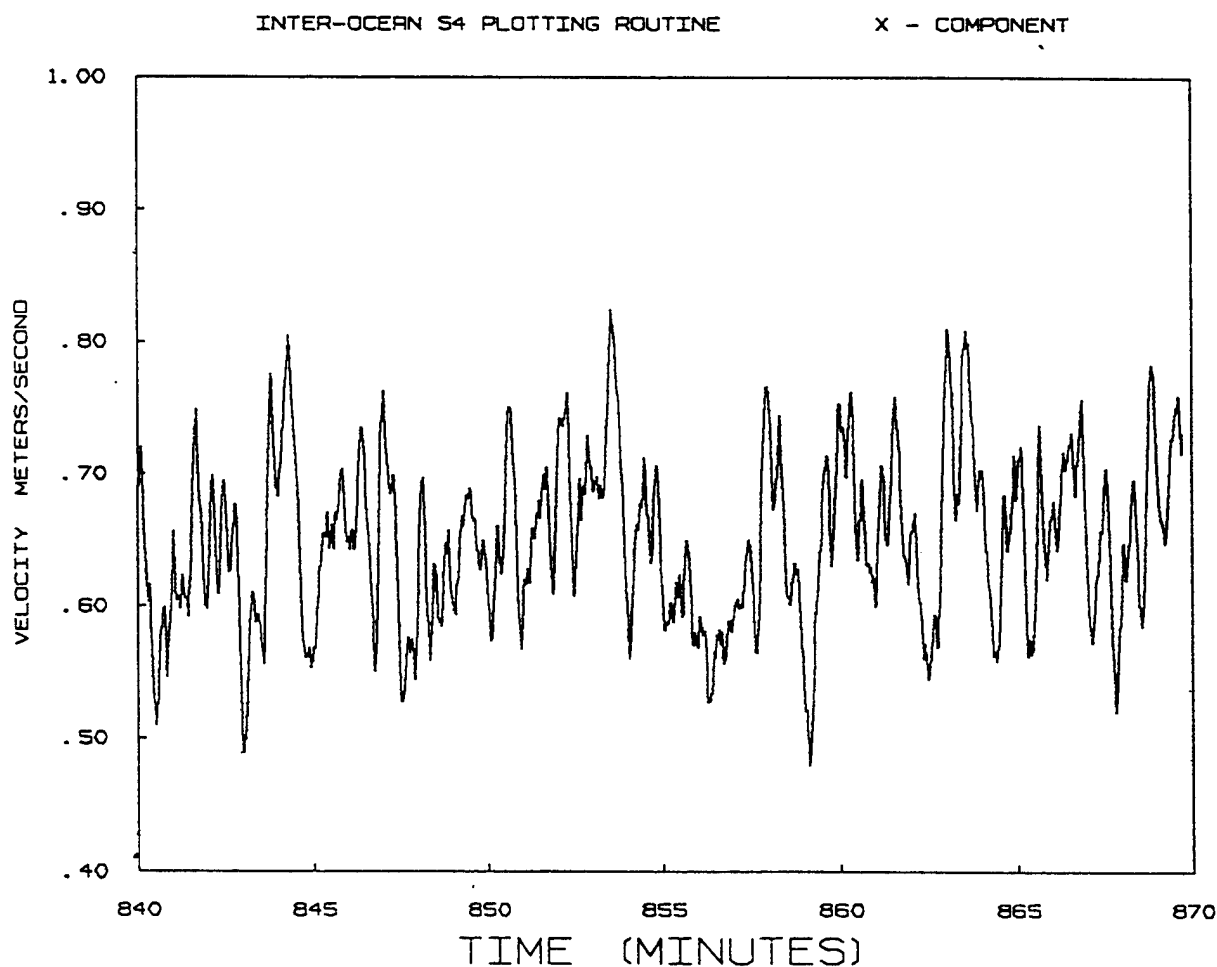
|               |            |            |                   |
|---------------|------------|------------|-------------------|
| meter number  | 040        | distance   | 310               |
| tow name      | james F.   | start-time | 1400              |
| configuration | 3x5        | end-time   | 1430              |
| draft         | 9.0        | MEAN =     | 0.07              |
| speed         | 9.1 mph    | VMAX =     | 0.23 TMAX = 866.  |
| direction     | downstream | VMIN =     | -0.08 TMIN = 861. |

INTER-OCEAN S4 PLOTTING ROUTINE

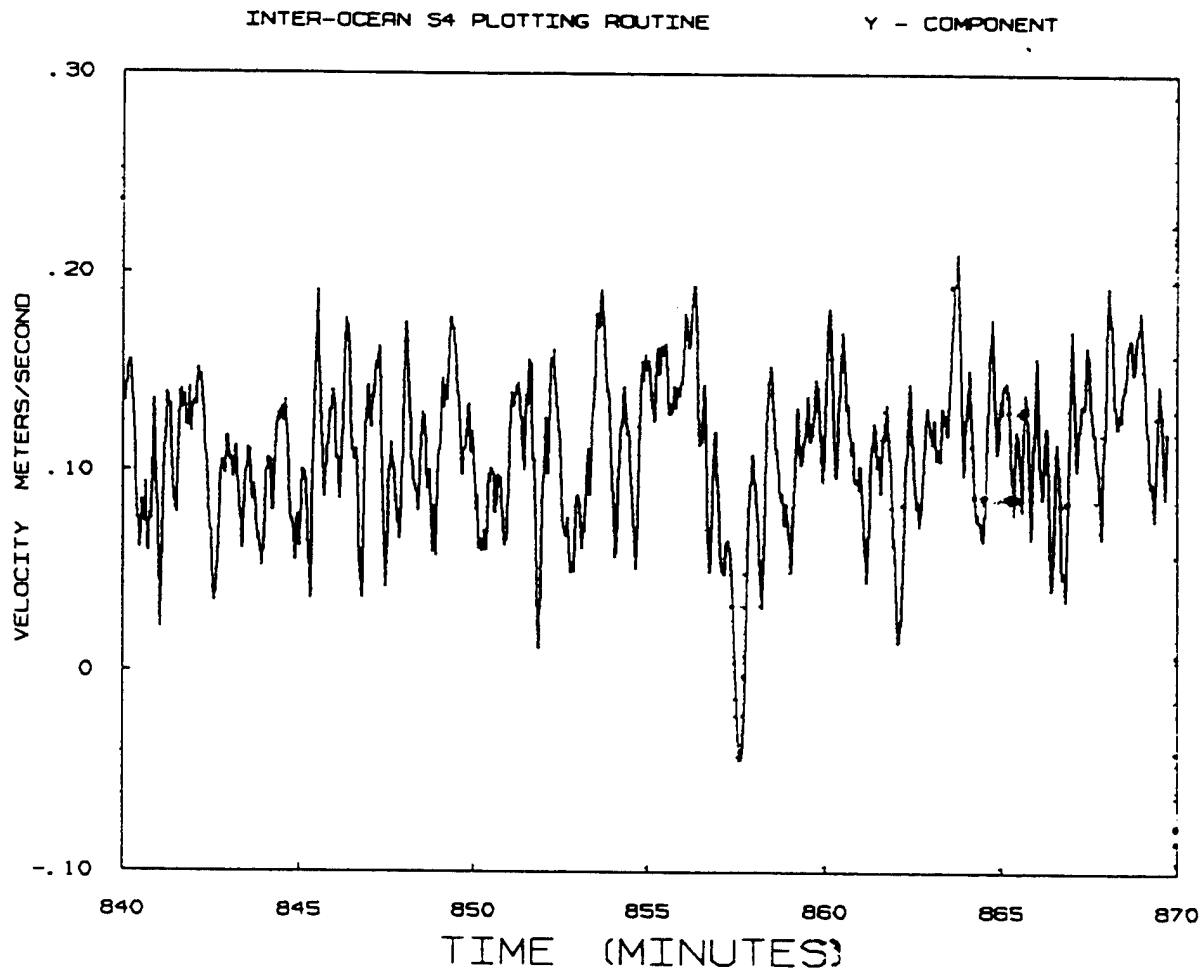
Y - COMPONENT



|               |            |            |                  |
|---------------|------------|------------|------------------|
| meter number  | 151        | distance   | 310              |
| tow name      | james F.   | start-time | 1400             |
| configuration | 3x5        | end-time   | 1430             |
| draft         | 9.0        | MEAN =     | 0.64             |
| speed         | 9.1 mph    | VMAX =     | 0.82 TMAX = 854. |
| direction     | downstream | VMIN =     | 0.48 TMIN = 859. |



|               |            |            |                   |
|---------------|------------|------------|-------------------|
| meter number  | 151        | distance   | 310               |
| tow name      | james F.   | start-time | 1400              |
| configuration | 3x5        | end-time   | 1430              |
| draft         | 9.0        | MEAN =     | 0.11              |
| speed         | 9.1 mph    | VMAX =     | 0.21 TMAX = 864.  |
| direction     | downstream | VMIN =     | -0.04 TMIN = 858. |



XX-7. Velocity fluctuations measured by two-dimensional current meters  
for barge *Irving Crown* at Kampsville, trip 2

Irving Crown (8/14/91)

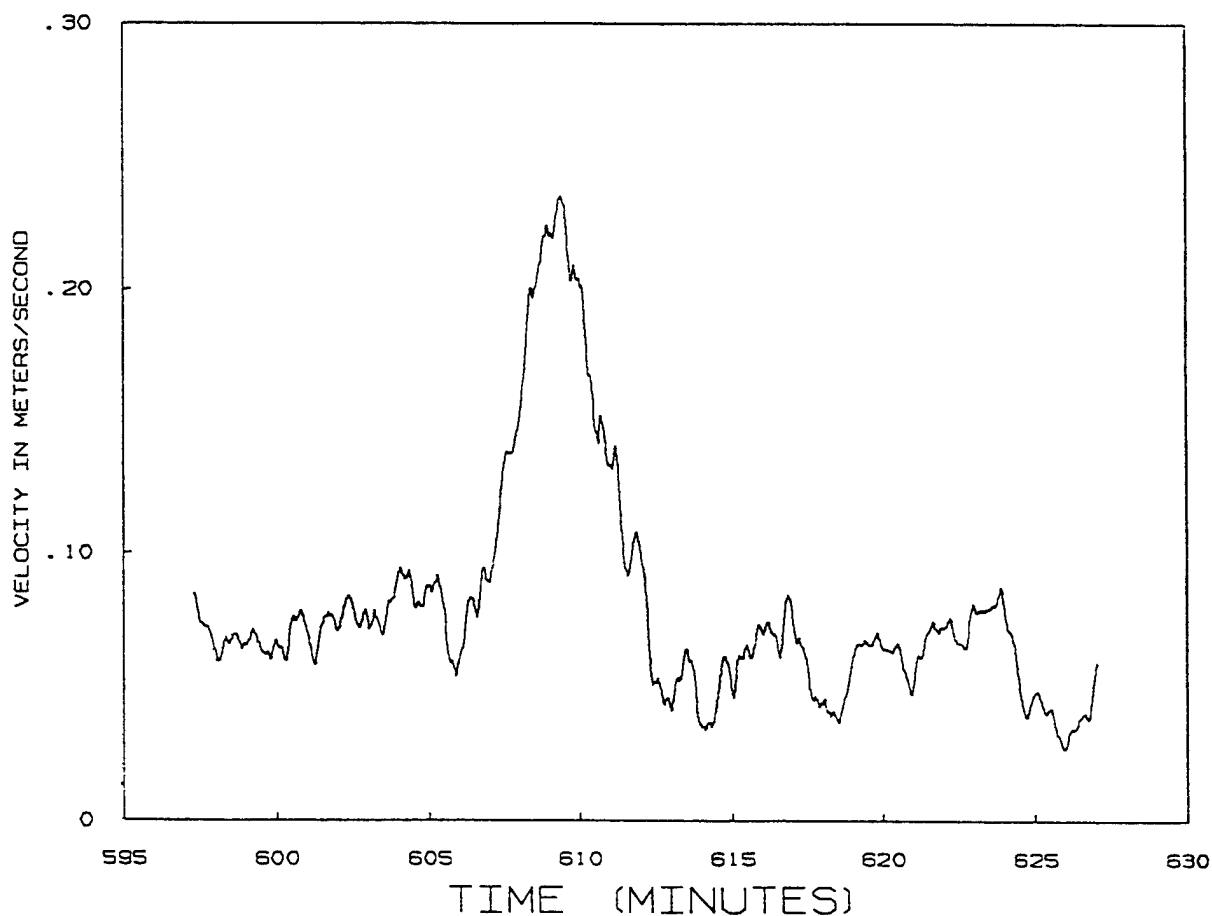
Status of Electromagnetic Current Meters:

|                       |                      |                      |                       |
|-----------------------|----------------------|----------------------|-----------------------|
| 1001<br>(MMB511)<br>✓ | 998<br>(MMB511)<br>✓ | 999<br>(MMB511)<br>✓ | 1000<br>(MMB511)<br>* |
| 332<br>(MMB527)<br>✓  | 642<br>(MMB527)<br>✓ |                      |                       |

Note: ✓ : Working  
\* : Not working

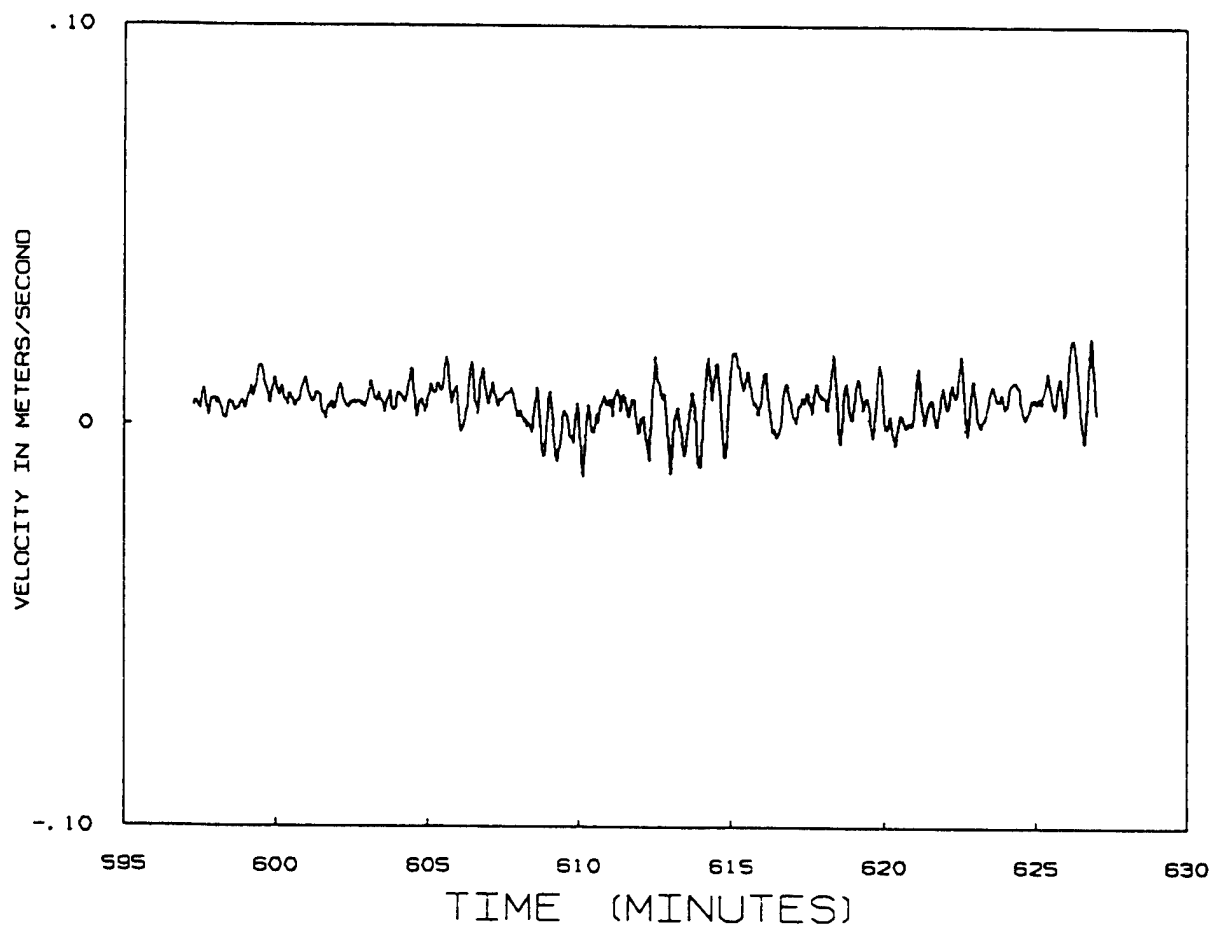
|               |          |            |                  |
|---------------|----------|------------|------------------|
| meter number  | 511-1001 | start-time | 0955             |
| tow name      | Icrown   | end-time   | 1025             |
| configuration | 2x2 + 3  | mean =     | 0.07             |
| draft         | 9.0      | vmax =     | 0.00 tmax = 609. |
| speed         | 3.6 mph  | vmin =     | 0.00 tmin = 626. |
| direction     | upstream |            |                  |
| distance      | 722      |            |                  |

MARSH MCBIRNEY 511/527 PLOTTING ROUTINE X - COMPONENT



|               |          |            |                  |
|---------------|----------|------------|------------------|
| meter number  | 511-1001 | start-time | 0955             |
| tow name      | lcrown   | end-time   | 1025             |
| configuration | 2x2 + 3  | mean =     | 0.01             |
| draft         | 9.0      | vmax =     | 0.00 tmax = 627. |
| speed         | 3.6 mph  | vmin =     | 0.00 tmin = 610. |
| direction     | upstream |            |                  |
| distance      | 722      |            |                  |

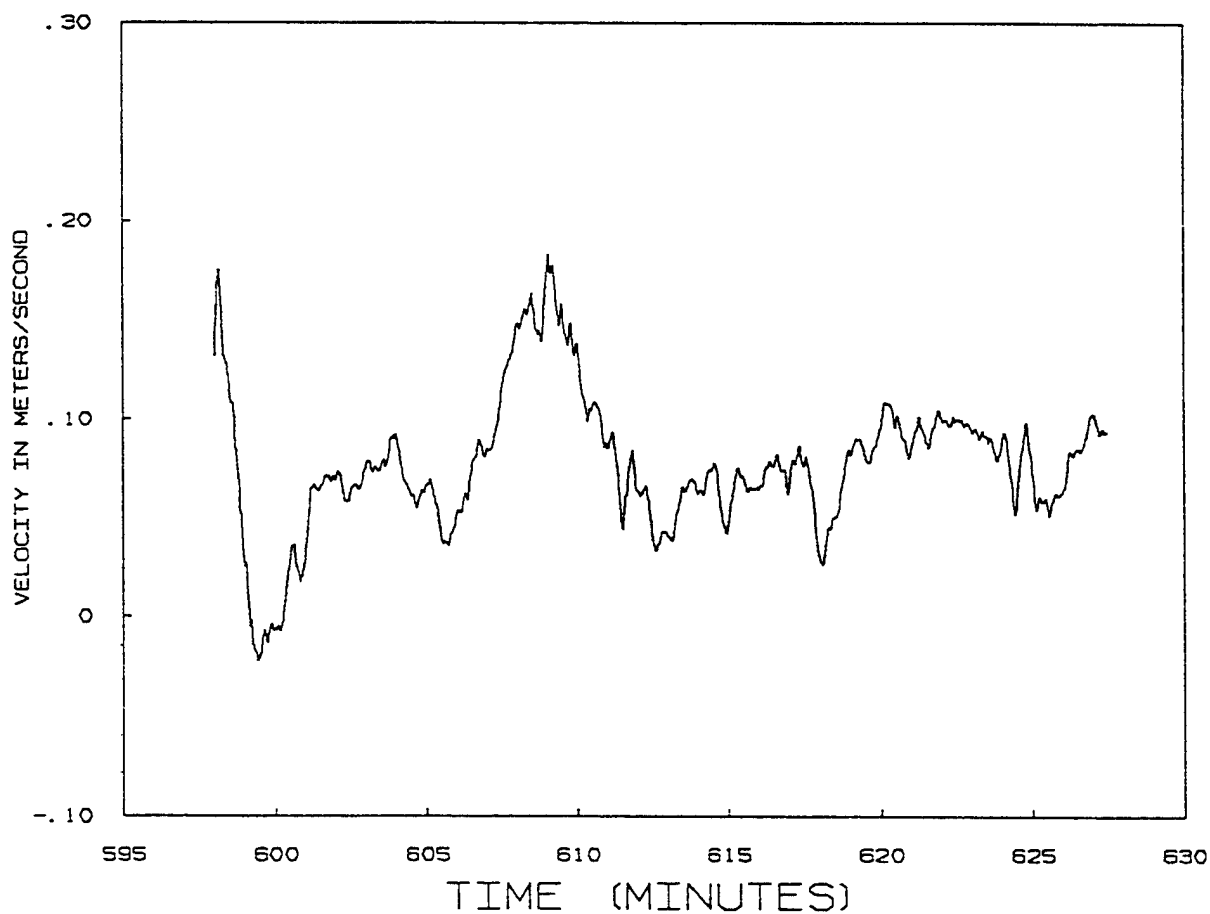
MARSH MCBIRNEY 511/527 PLOTTING ROUTINE Y - COMPONENT





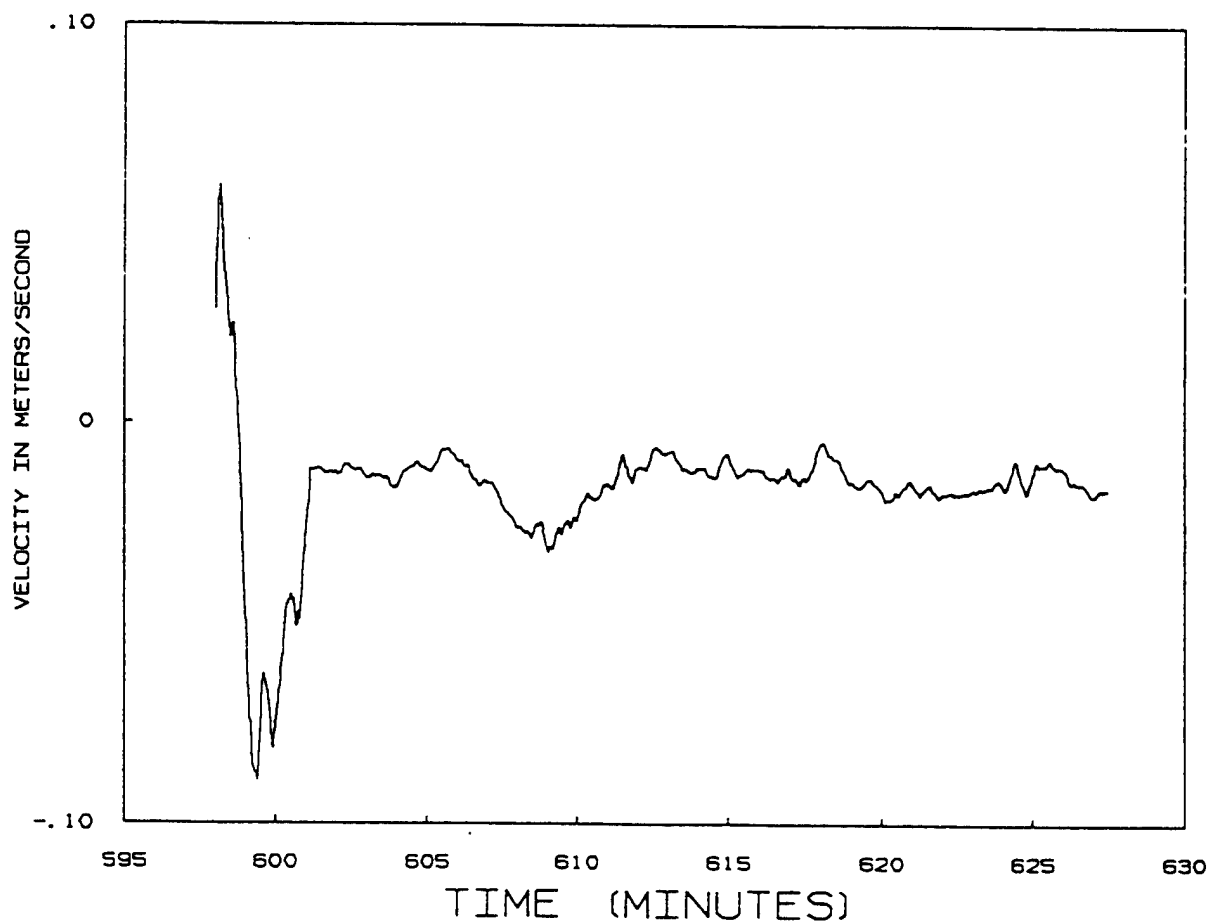
|               |          |            |                   |
|---------------|----------|------------|-------------------|
| meter number  | 998      | distance   | 722               |
| tow name      | Icrown   | start-time | 0958              |
| configuration | 2x2 + 3  | end-time   | 1028              |
| draft         | 9.0      | mean =     | 0.06              |
| speed         | 3.6 mph  | vmax =     | 0.18 tmax = 609.  |
| direction     | upstream | vmin =     | -0.02 tmin = 599. |

MARSH MCBIRNEY 511/LOGGER2 PLOTTING ROUT X - COMPONENT



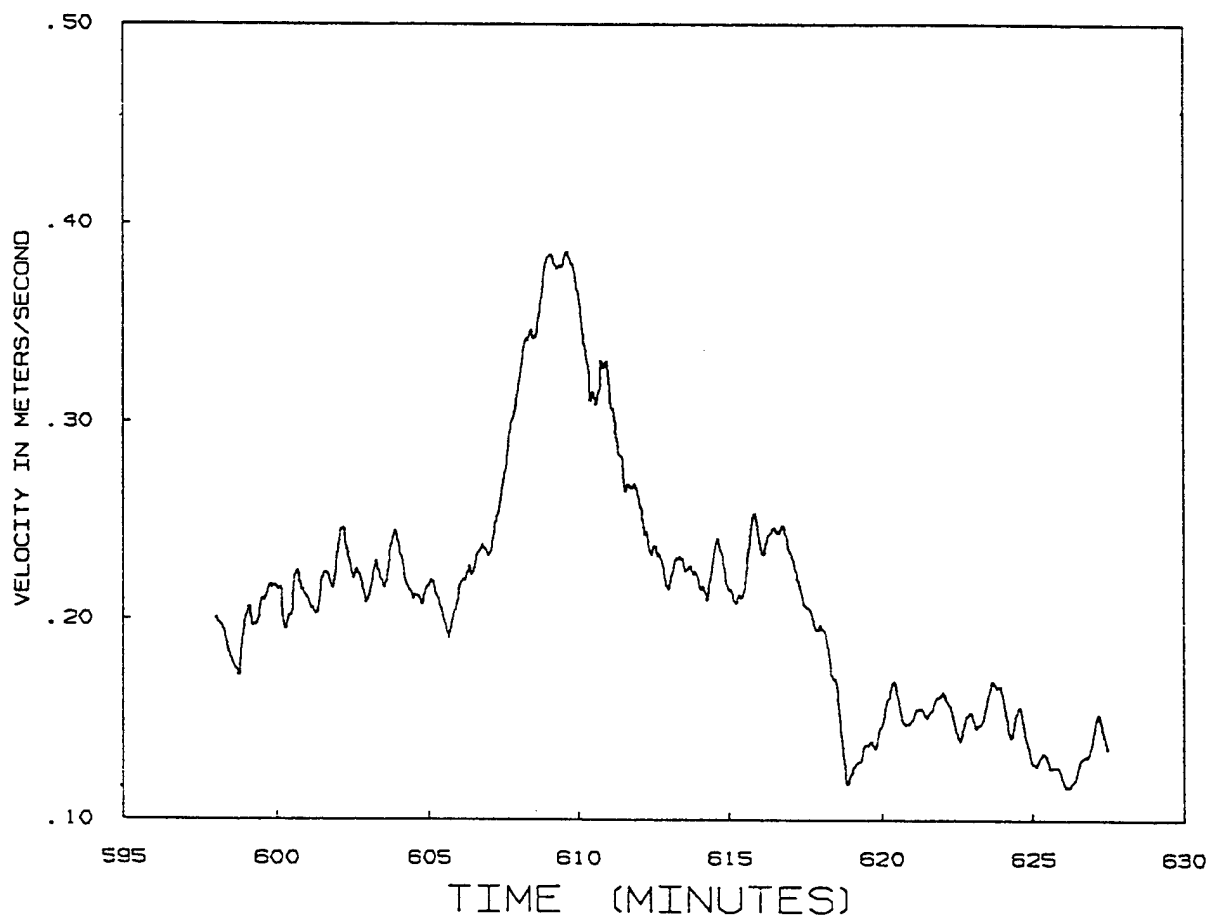
|               |          |            |                   |
|---------------|----------|------------|-------------------|
| meter number  | 998      | distance   | 722               |
| tow name      | Icrown   | start-time | 0958              |
| configuration | 2x2 + 3  | end-time   | 1028              |
| draft         | 9.0      | mean =     | -0.02             |
| speed         | 3.6 mph  | vmax =     | 0.06 tmax = 598.  |
| direction     | upstream | vmin =     | -0.09 tmin = 599. |

MARSH MCBIRNEY S11/LOGGER2 PLOTTING ROUT Y - COMPONENT



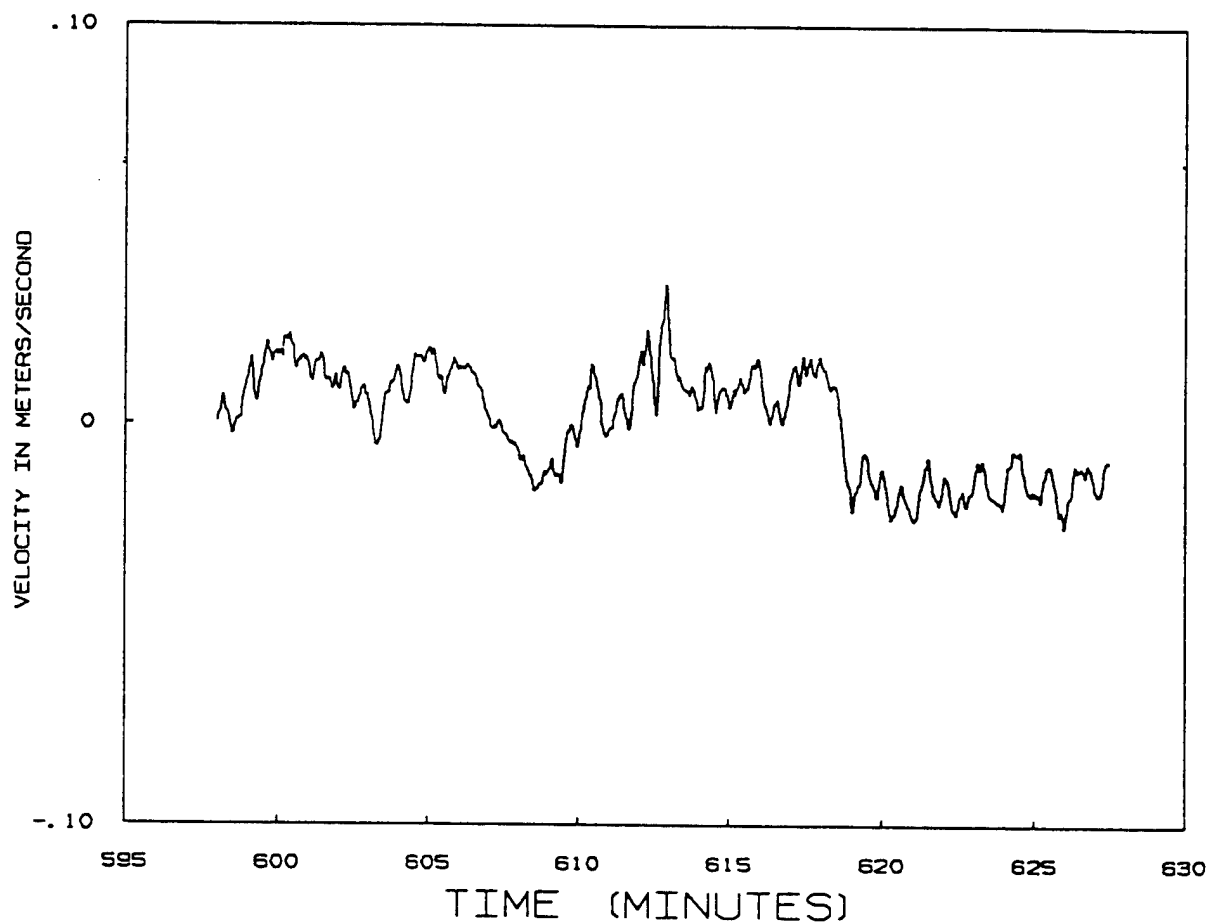
|               |          |            |                  |
|---------------|----------|------------|------------------|
| meter number  | 999      | distance   | 722              |
| tow name      | lcrown   | start-time | 0958             |
| configuration | 2x2 + 3  | end-time   | 1028             |
| draft         | 9.0      | mean =     | 0.22             |
| speed         | 3.6 mph  | vmax =     | 0.39 tmax = 610. |
| direction     | upstream | vmin =     | 0.12 tmin = 626. |

MARSH MCBIRNEY 511/LOGGER2 PLOTTING ROUT X - COMPONENT



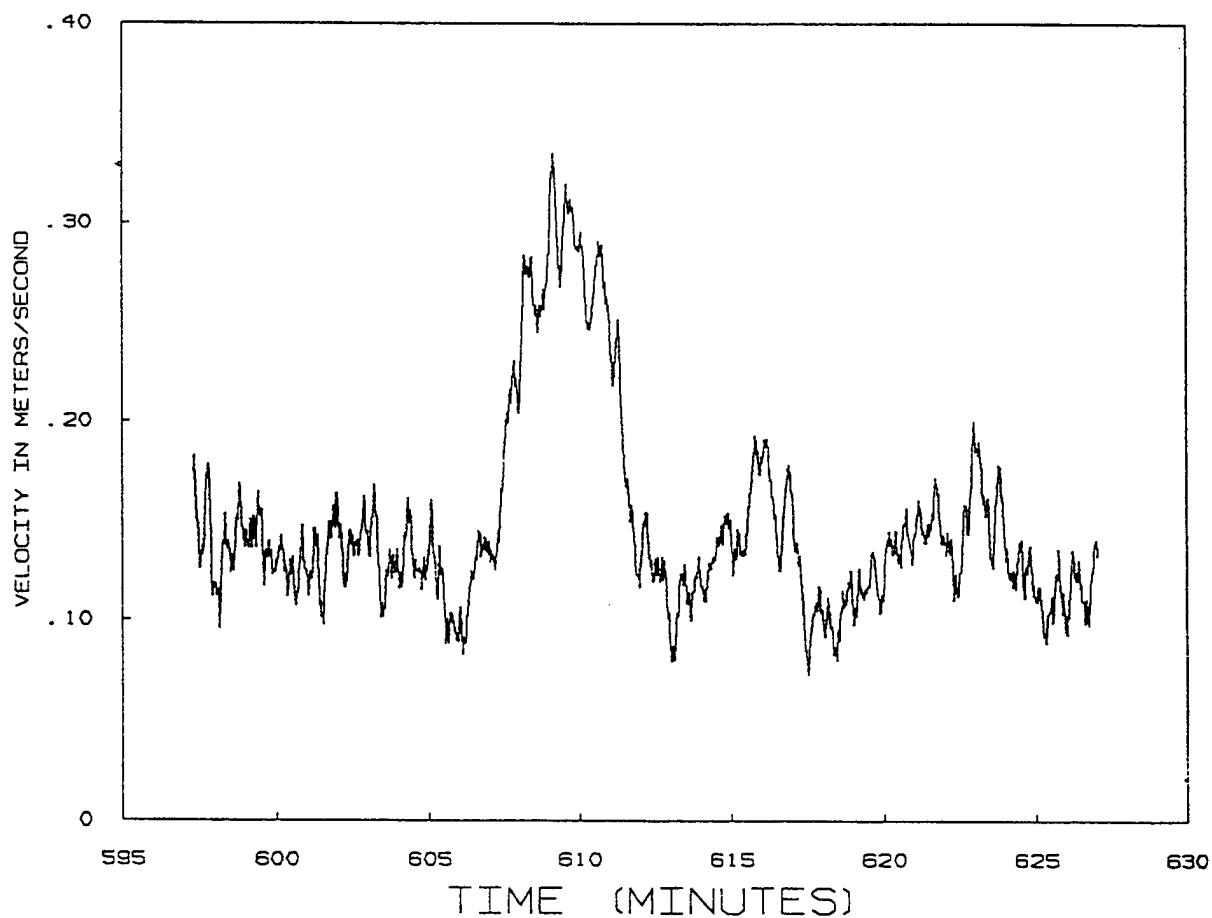
|               |          |            |                   |
|---------------|----------|------------|-------------------|
| meter number  | 999      | distance   | 722               |
| tow name      | lcrown   | start-time | 0958              |
| configuration | 2x2 + 3  | end-time   | 1028              |
| draft         | 9.0      | mean =     | 0.01              |
| speed         | 3.6 mph  | vmax =     | 0.04 tmax = 613.  |
| direction     | upstream | vmin =     | -0.03 tmin = 626. |

MARSH MCBIRNEY S11/LOGGER2 PLOTTING ROUT Y - COMPONENT



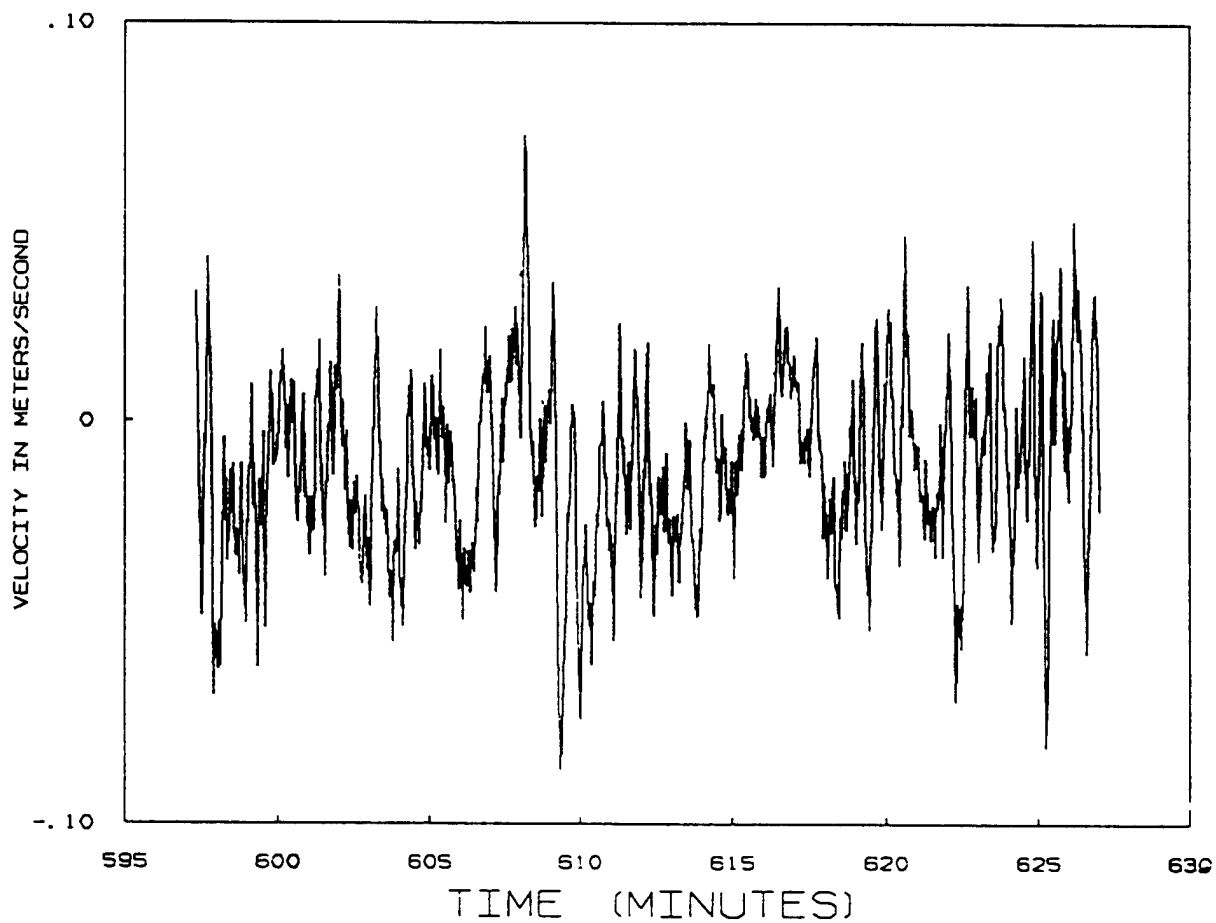
|               |          |            |                  |
|---------------|----------|------------|------------------|
| meter number  | B-642    | start-time | 0955             |
| tow name      | Icrown   | end-time   | 1025             |
| configuration | 2x2 + 3  | mean =     | 0.13             |
| draft         | 9.0      | vmax =     | 0.00 tmax = 609. |
| speed         | 3.6 mph  | vmin =     | 0.00 tmin = 618. |
| direction     | upstream |            |                  |
| distance      | 722      |            |                  |

MARSH MCBIRNEY S11/527 PLOTTING ROUTINE X - COMPONENT



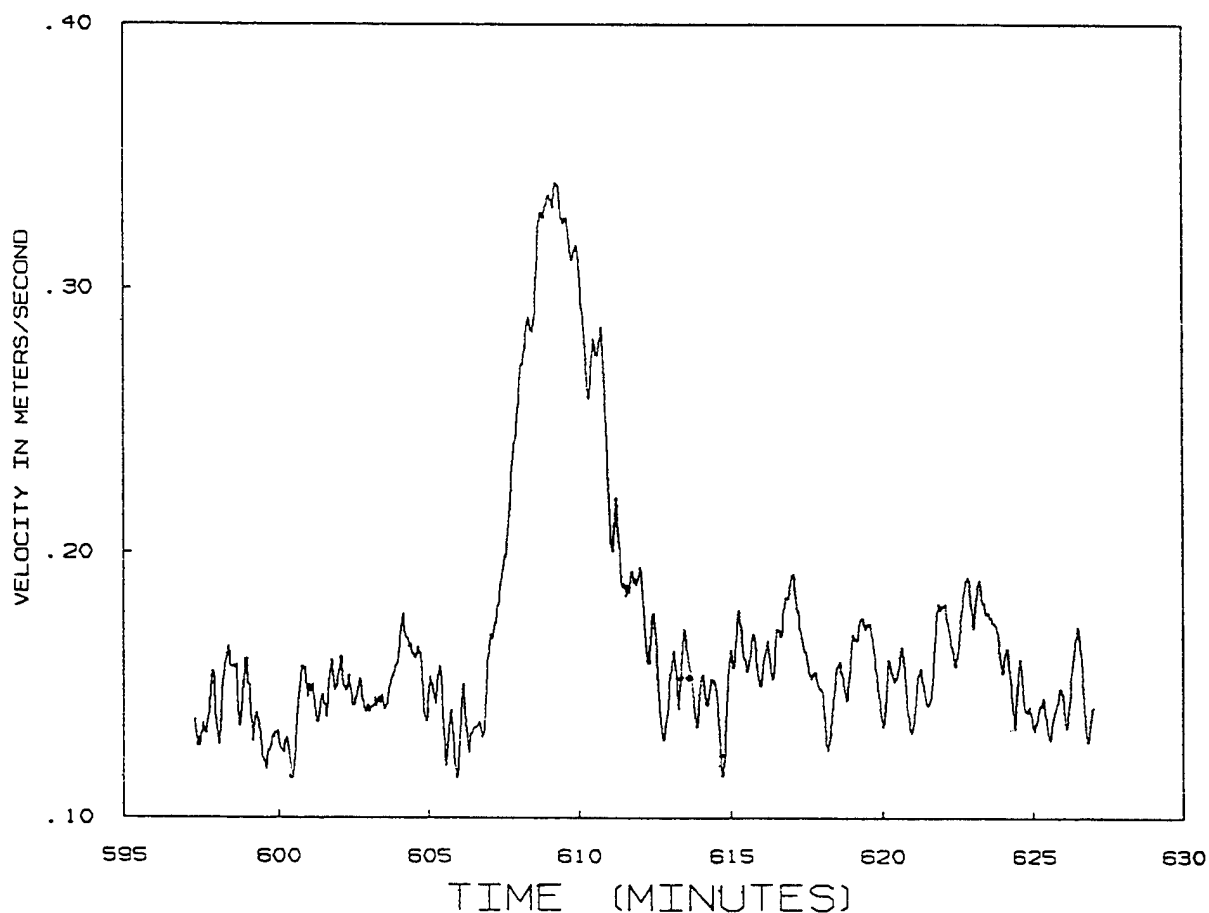
|               |          |            |                  |
|---------------|----------|------------|------------------|
| meter number  | B-642    | start-time | 0955             |
| tow name      | Icrown   | end-time   | 1025             |
| configuration | 2x2 + 3  | mean =     | -0.02            |
| draft         | 9.0      | vmax =     | 0.00 tmax = 608. |
| speed         | 3.6 mph  | vmin =     | 0.00 tmin = 609. |
| direction     | upstream |            |                  |
| distance      | 722      |            |                  |

MARSH MCBIRNEY 511/527 PLOTTING ROUTINE Y - COMPONENT



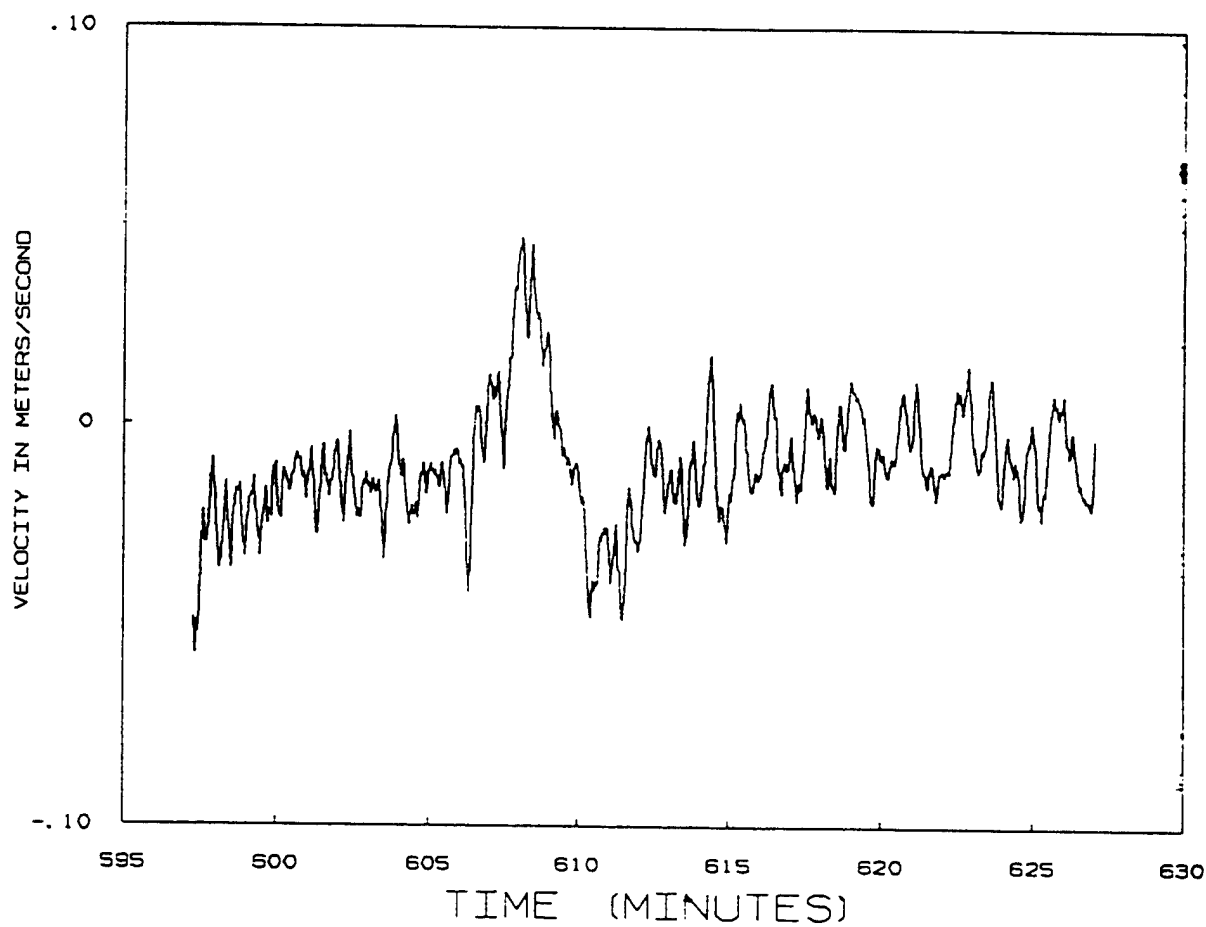
|               |          |            |                  |
|---------------|----------|------------|------------------|
| meter number  | B-332    | start-time | 0955             |
| tow name      | Icrown   | end-time   | 1025             |
| configuration | 2x2 + 3  | mean =     | 0.14             |
| draft         | 9.0      | vmax =     | 0.00 tmax = 609. |
| speed         | 3.6 mph  | vmin =     | 0.00 tmin = 600. |
| direction     | upstream |            |                  |
| distance      | 722      |            |                  |

MARSH MCBIRNEY S11/S27 PLOTTING ROUTINE X - COMPONENT



|               |          |            |                  |
|---------------|----------|------------|------------------|
| meter number  | B-332    | start-time | 0955             |
| tow name      | lcrown   | end-time   | 1025             |
| configuration | 2x2 + 3  | mean =     | -0.02            |
| draft         | 9.0      | vmax =     | 0.00 tmax = 608. |
| speed         | 3.6 mph  | vmin =     | 0.00 tmin = 597. |
| direction     | upstream |            |                  |
| distance      | 722      |            |                  |

MARSH MCBIRNEY 511/527 PLOTTING ROUTINE Y - COMPONENT





XX-8. Velocity fluctuations measured by two-dimensional current meters  
for barge *Jack Bullard* at Clarks Ferry, trip 2

Jack Bullard (10/19/91)

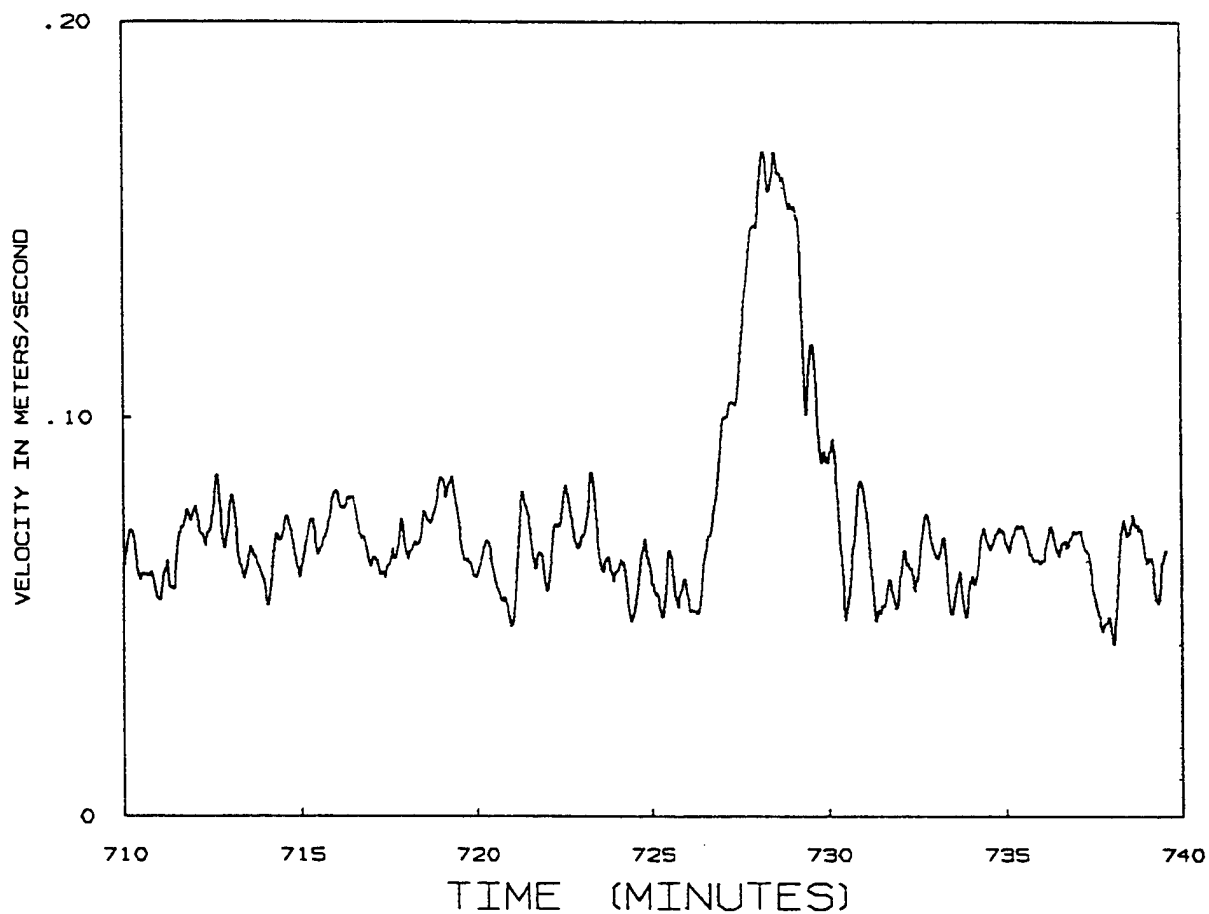
Status of Electromagnetic Current Meters:

|                       |                      |                      |                       |                       |                       |
|-----------------------|----------------------|----------------------|-----------------------|-----------------------|-----------------------|
| 1001<br>(MMB511)<br>✓ | 998<br>(MMB511)<br>✓ | 999<br>(MMB511)<br>✓ | 1000<br>(MMB511)<br>✓ | 1330<br>(MMB511)<br>✓ | 1331<br>(MMB511)<br>✓ |
| 834<br>(S4)<br>✓      | 151<br>(S4)<br>✓     | 832<br>(S4)<br>*     | 040<br>(S4)<br>✓      |                       |                       |
| 332<br>(MMB527)<br>✓  | 642<br>(MMB527)<br>✓ |                      |                       |                       |                       |

Note: ✓ : Working  
\* : Not working  
- : Not available

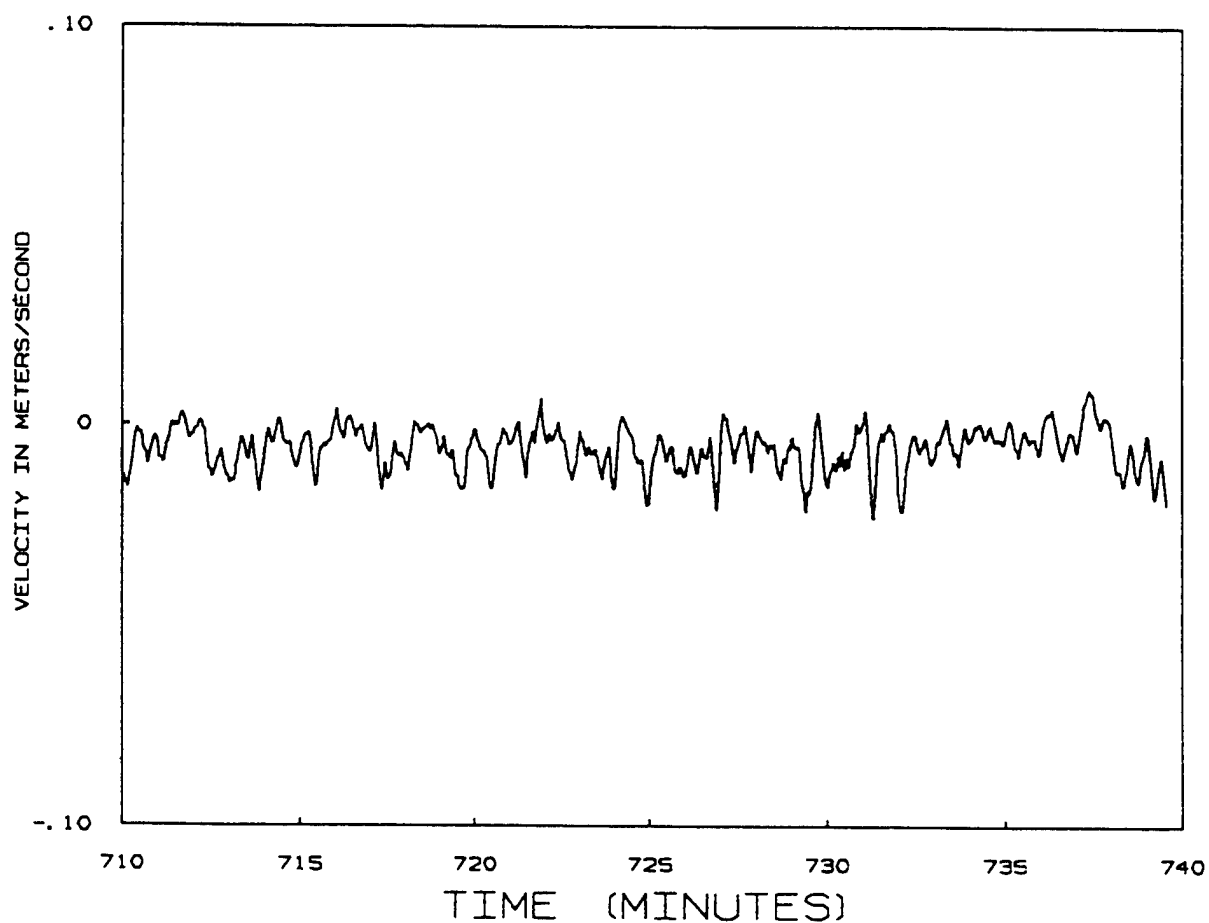
|               |              |            |                  |
|---------------|--------------|------------|------------------|
| meter number  | 1001         | distance   | 215              |
| tow name      | Jack Bullard | start-time | 1150             |
| configuration | 2x1+3x4      | end-time   | 1220             |
| draft         | 9.0          | mean =     | 0.07             |
| speed         | 5.3 mph      | vmax =     | 0.17 tmax = 728. |
| direction     | upstream     | vmin =     | 0.04 tmin = 738. |

MARSH MCBIRNEY 511/LOGGER2 PLOTTING ROUT X - COMPONENT



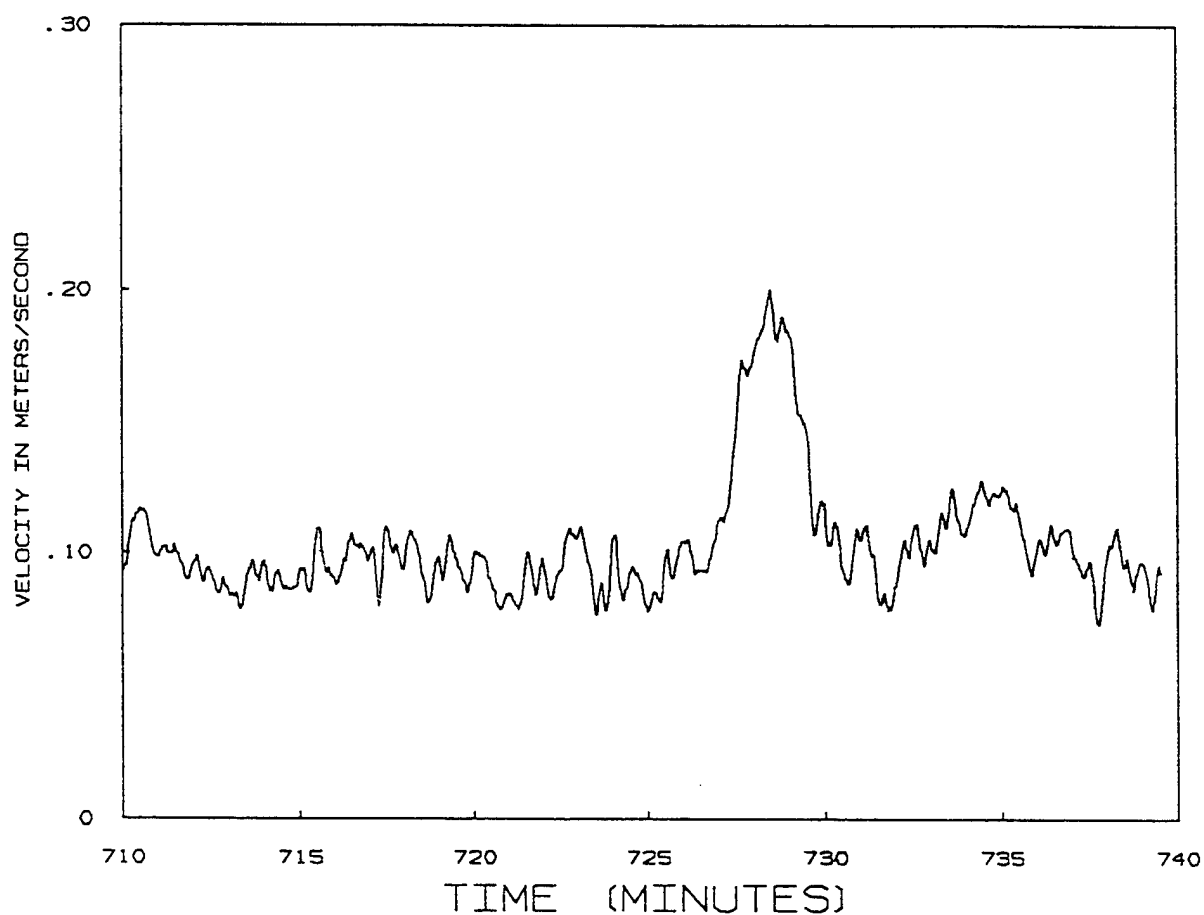
|               |              |            |                   |
|---------------|--------------|------------|-------------------|
| meter number  | 1001         | distance   | 215               |
| tow name      | Jack Bullard | start-time | 1150              |
| configuration | 2x1+3x4      | end-time   | 1220              |
| draft         | 9.0          | mean =     | -0.01             |
| speed         | 5.3 mph      | vmax =     | 0.01 tmax = 737.  |
| direction     | upstream     | vmin =     | -0.02 tmin = 731. |

MARSH MCBIRNEY S11/LOGGER2 PLOTTING ROUT Y - COMPONENT



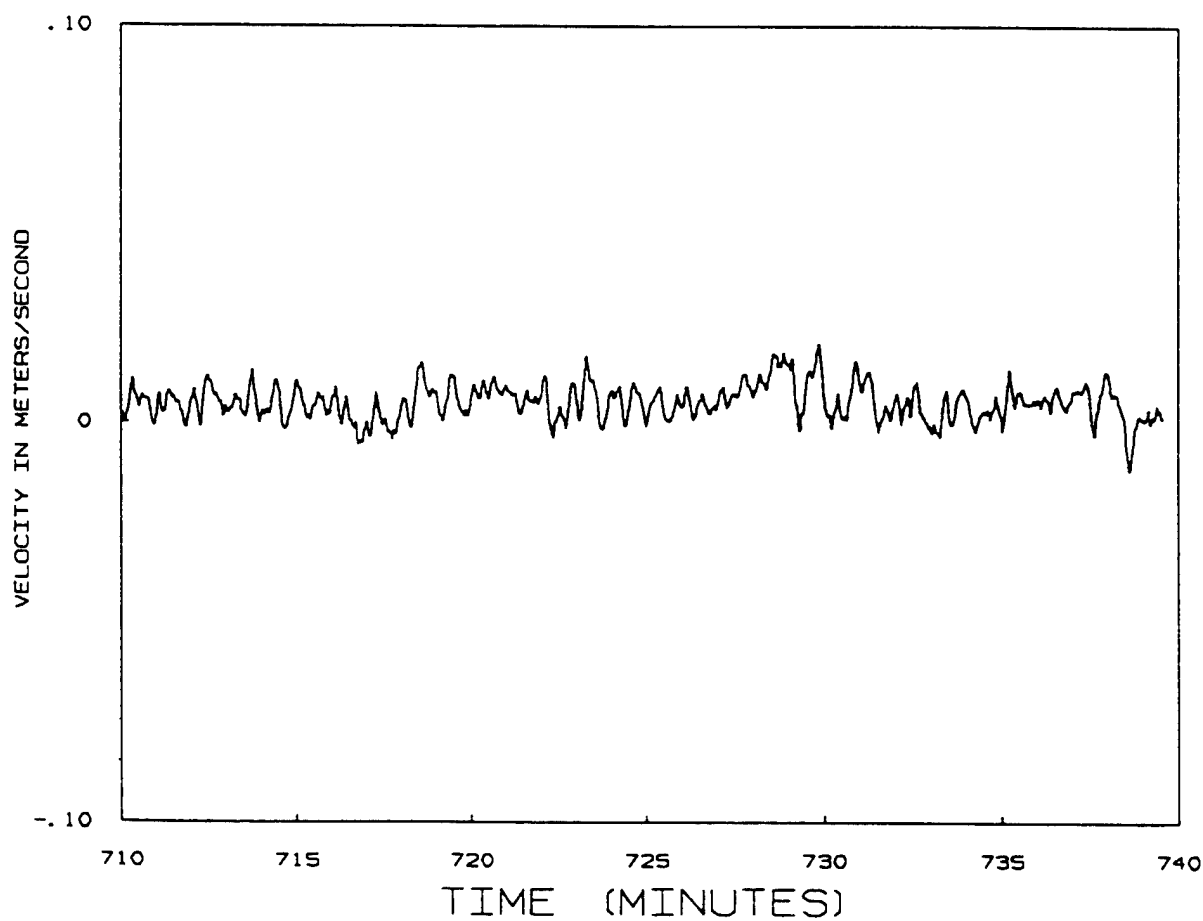
|               |              |            |                  |
|---------------|--------------|------------|------------------|
| meter number  | 998          | distance   | 215              |
| tow name      | Jack Bullard | start-time | 1150             |
| configuration | 2x1+3x4      | end-time   | 1220             |
| draft         | 9.0          | mean =     | 0.10             |
| speed         | 5.3 mph      | vmax =     | 0.20 tmax = 729. |
| direction     | upstream     | vmin =     | 0.07 tmin = 738. |

MARSH MCBIRNEY S11/LOGGER2 PLOTTING ROUT X - COMPONENT



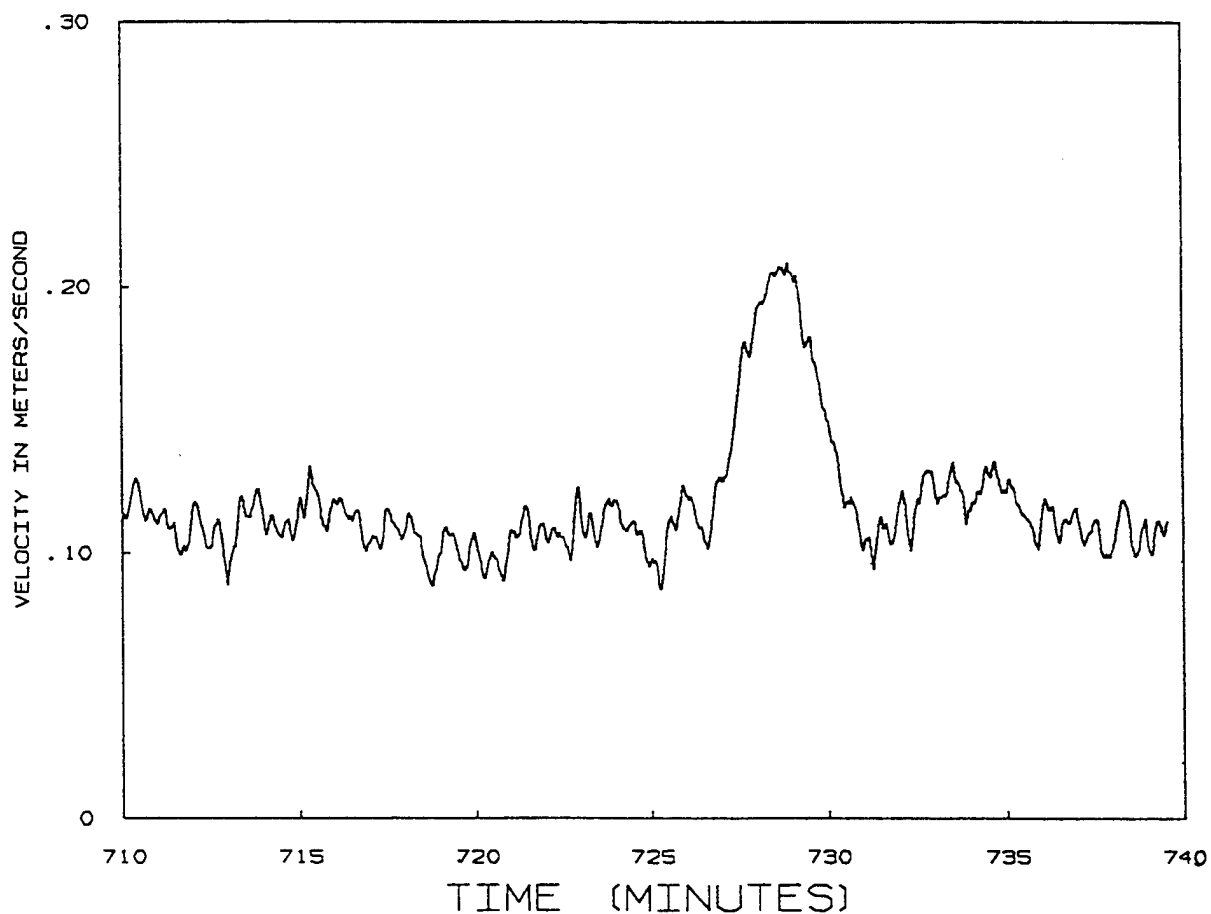
|               |              |            |                   |
|---------------|--------------|------------|-------------------|
| meter number  | 998          | distance   | 215               |
| tow name      | Jack Bullard | start-time | 1150              |
| configuration | 2x1+3x4      | end-time   | 1220              |
| draft         | 9.0          | mean =     | 0.00              |
| speed         | 5.3 mph      | vmax =     | 0.02 tmax = 730.  |
| direction     | upstream     | vmin =     | -0.01 tmin = 739. |

MARSH MCBIRNEY S11/LOGGER2 PLOTTING ROUT Y - COMPONENT



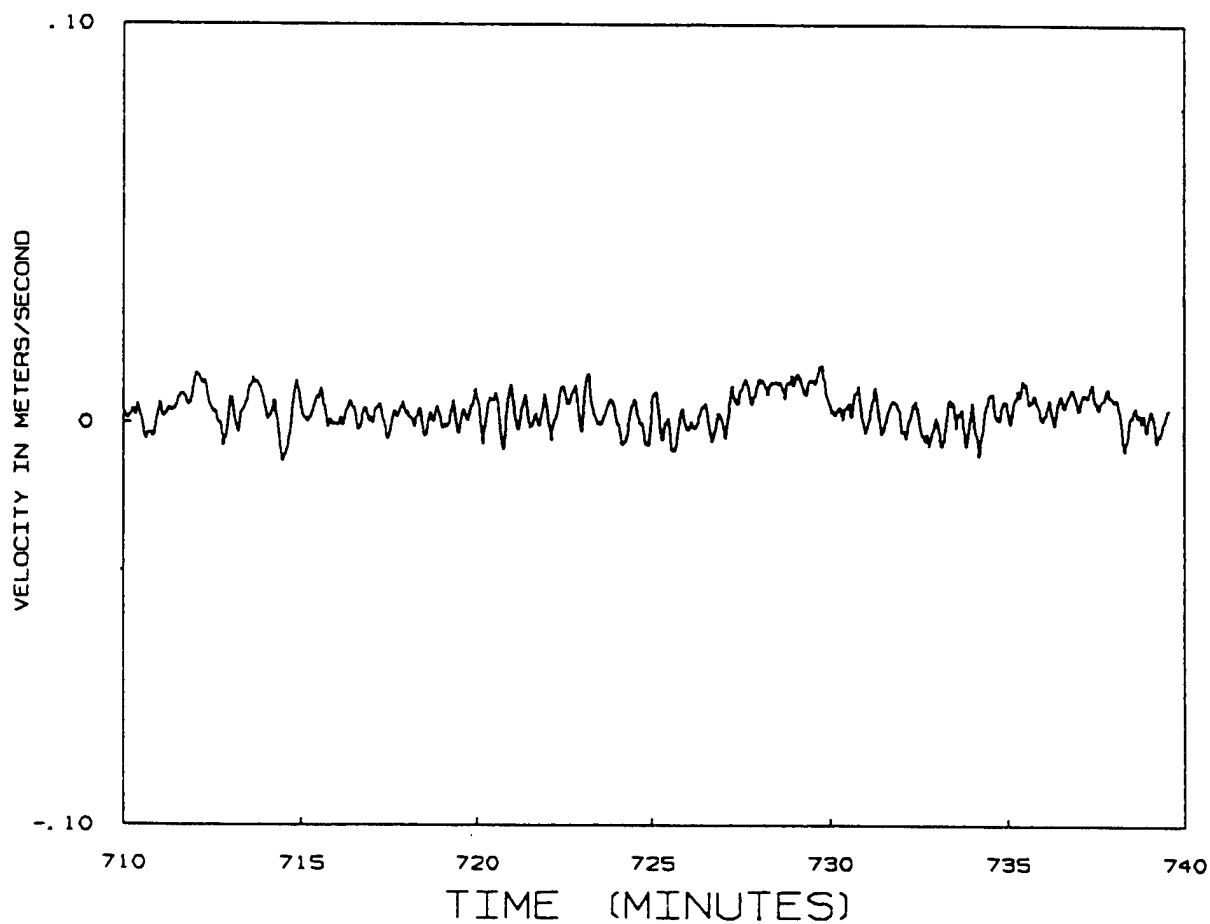
|               |              |            |                  |
|---------------|--------------|------------|------------------|
| meter number  | 999          | distance   | 215              |
| tow name      | Jack Bullard | start-time | 1150             |
| configuration | 2x1+3x4      | end-time   | 1220             |
| draft         | 9.0          | mean =     | 0.11             |
| speed         | 5.3 mph      | vmax =     | 0.21 tmax = 729. |
| direction     | upstream     | vmin =     | 0.09 tmin = 725. |

MARSH MCBIRNEY 511/LOGGER2 PLOTTING ROUT X - COMPONENT



|               |              |            |                   |
|---------------|--------------|------------|-------------------|
| meter number  | 999          | distance   | 215               |
| tow name      | Jack Bullard | start-time | 1150              |
| configuration | 2x1+3x4      | end-time   | 1220              |
| draft         | 9.0          | mean =     | 0.00              |
| speed         | 5.3 mph      | vmax =     | 0.01 tmax = 730.  |
| direction     | upstream     | vmin =     | -0.01 tmin = 714. |

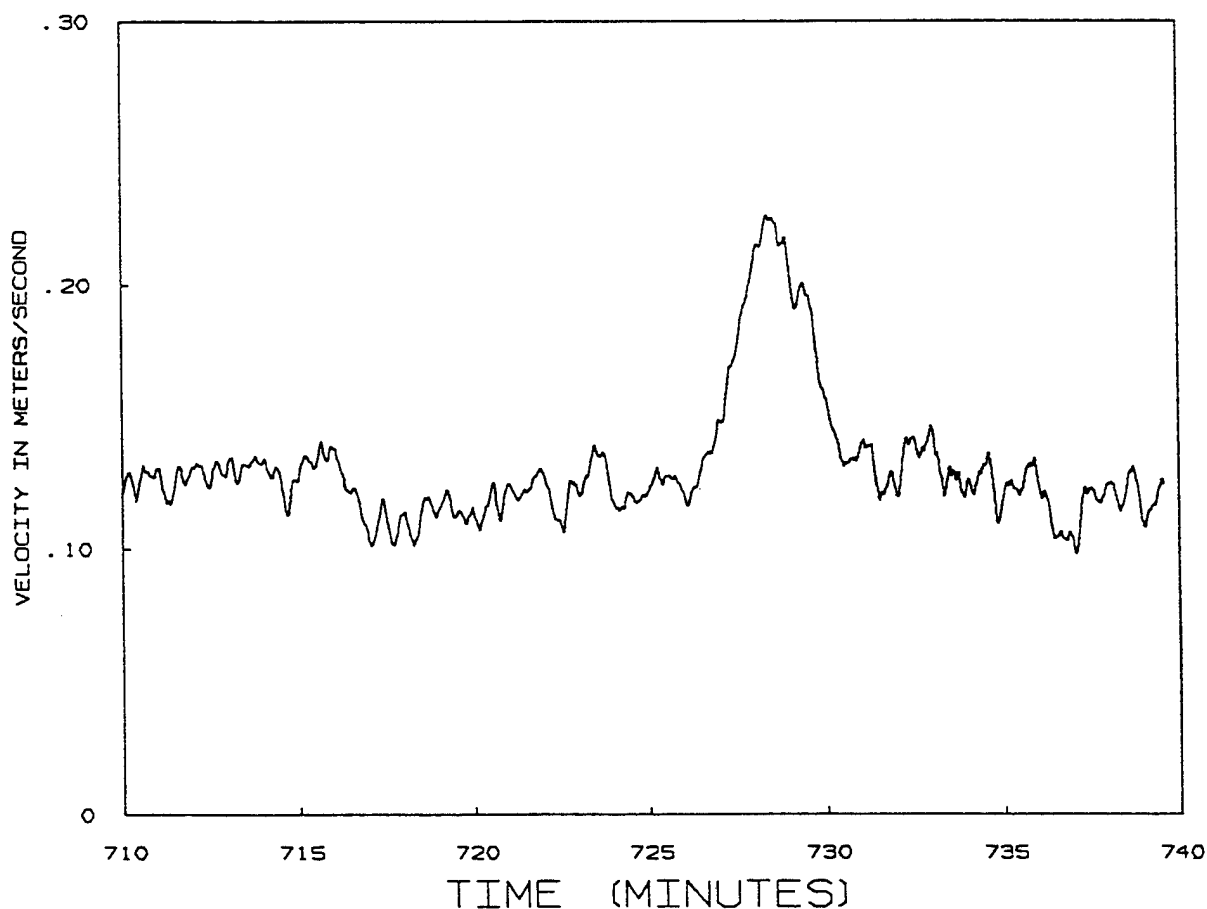
MARSH MCBIRNEY 511/LOGGER2 PLOTTING ROUT Y - COMPONENT





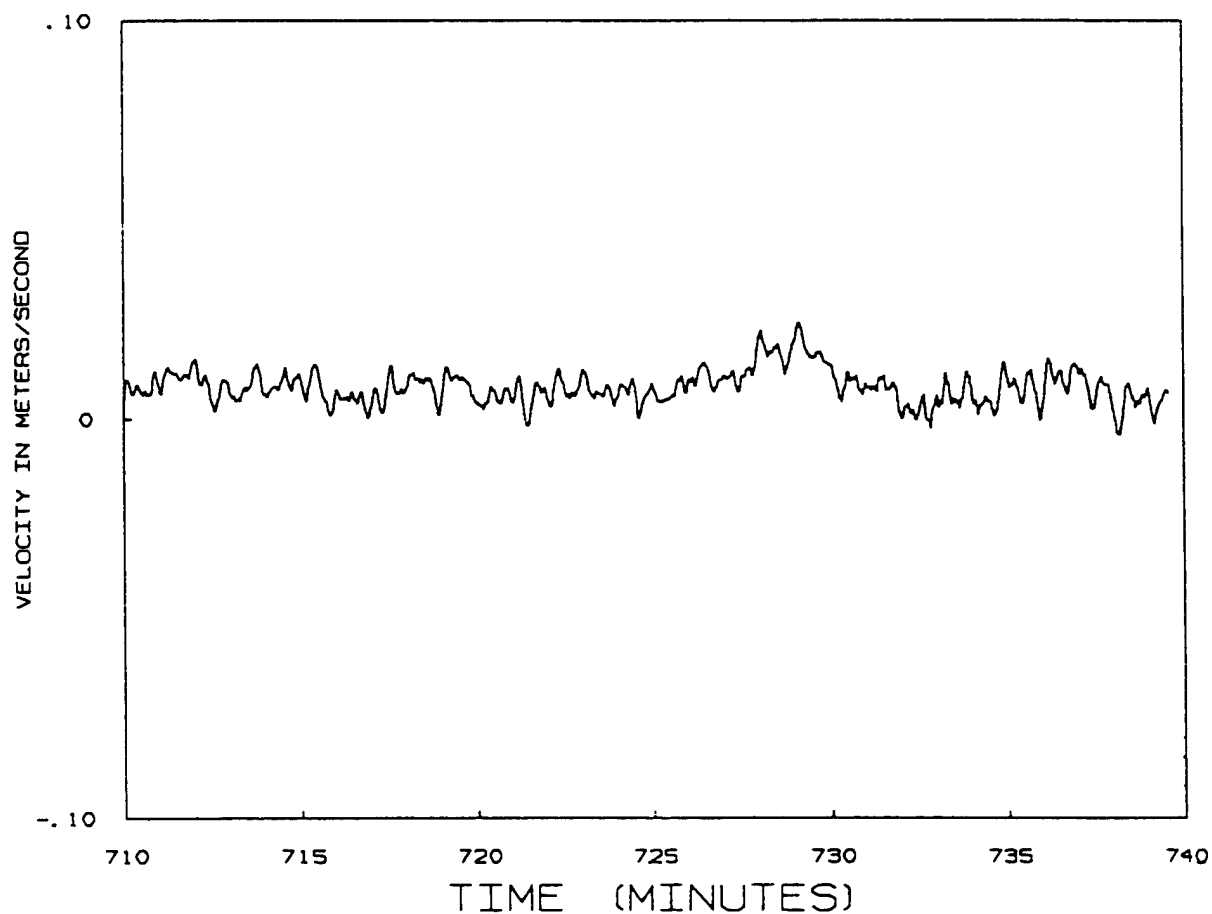
|               |              |            |                  |
|---------------|--------------|------------|------------------|
| meter number  | 1000         | distance   | 215              |
| tow name      | Jack Bullard | start-time | 1150             |
| configuration | 2x1+3x4      | end-time   | 1220             |
| draft         | 9.0          | mean =     | 0.12             |
| speed         | 5.3 mph      | vmax =     | 0.23 tmax = 728. |
| direction     | upstream     | vmin =     | 0.10 tmin = 737. |

MARSH MCBIRNEY 511/LOGGER2 PLOTTING ROUT X - COMPONENT



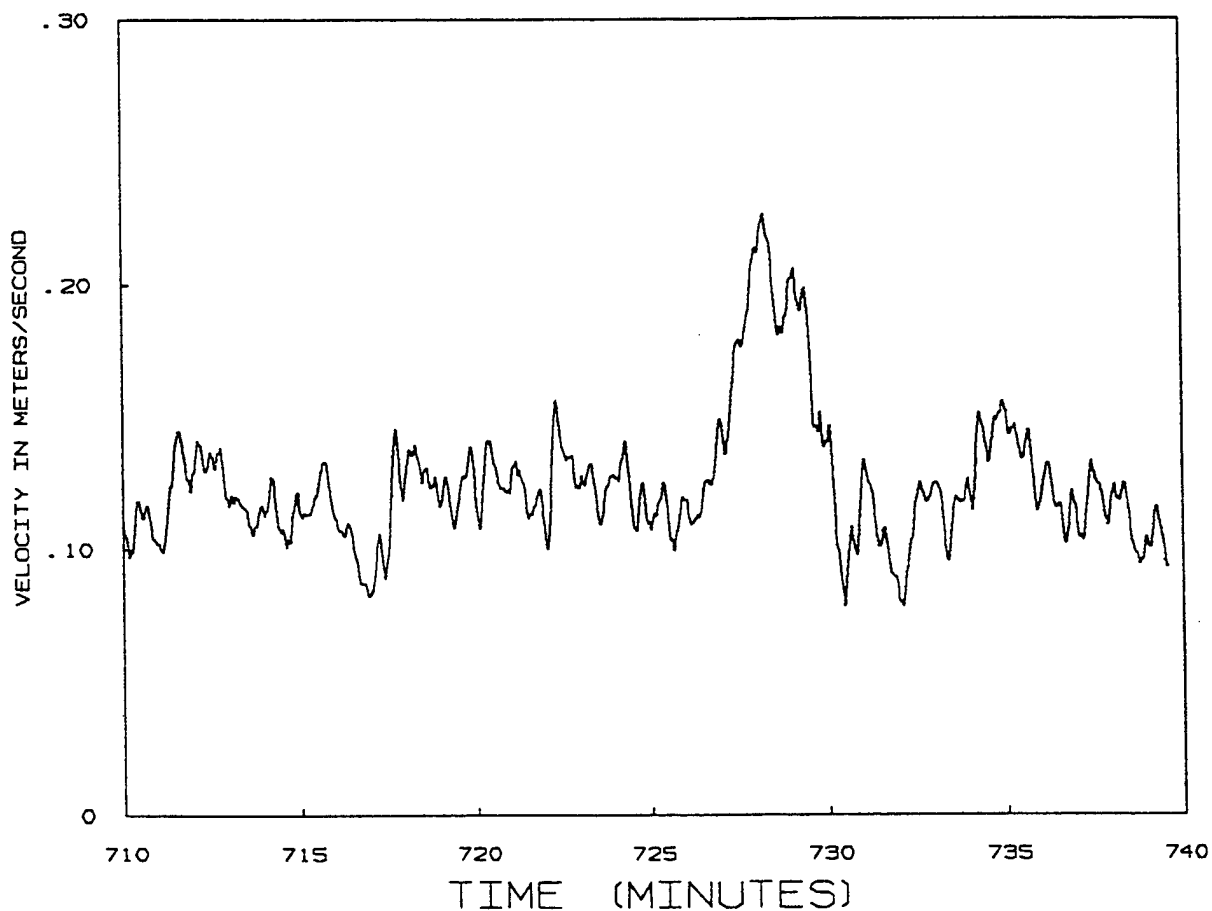
|               |              |            |                  |
|---------------|--------------|------------|------------------|
| meter number  | 1000         | distance   | 215              |
| tow name      | Jack Bullard | start-time | 1150             |
| configuration | 2x1+3x4      | end-time   | 1220             |
| draft         | 9.0          | mean =     | 0.01             |
| speed         | 5.3 mph      | vmax =     | 0.02 tmax = 729. |
| direction     | upstream     | vmin =     | 0.00 tmin = 738. |

MARSH MCBIRNEY S11/LOGGER2 PLOTTING ROUT Y - COMPONENT



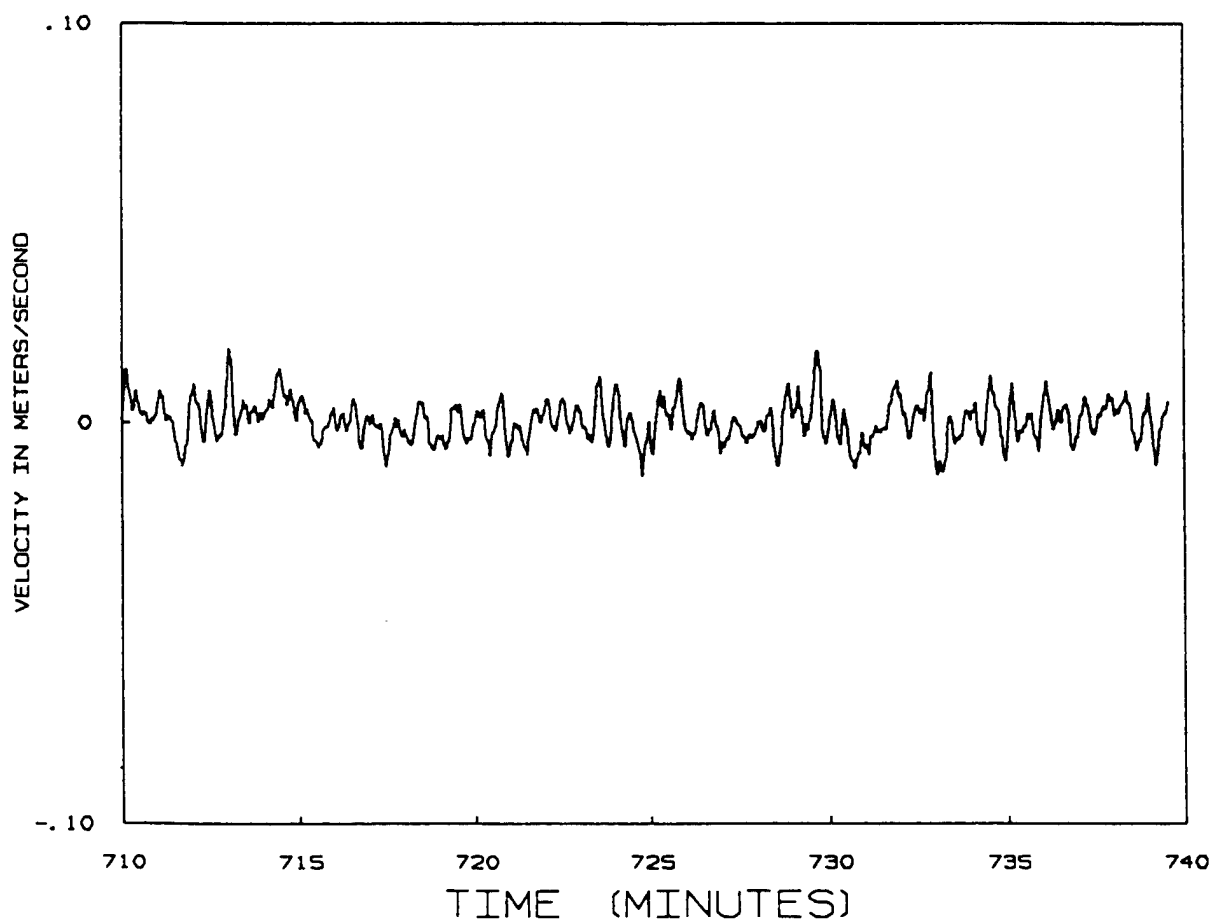
|               |              |            |                  |
|---------------|--------------|------------|------------------|
| meter number  | 1130         | distance   | 215              |
| tow name      | Jack Bullard | start-time | 1150             |
| configuration | 2x1+3x4      | end-time   | 1220             |
| draft         | 9.0          | mean =     | 0.12             |
| speed         | 5.3 mph      | vmax =     | 0.23 tmax = 728. |
| direction     | upstream     | vmin =     | 0.08 tmin = 732. |

MARSH MCBIRNEY 511/LOGGER2 PLOTTING ROUT X - COMPONENT



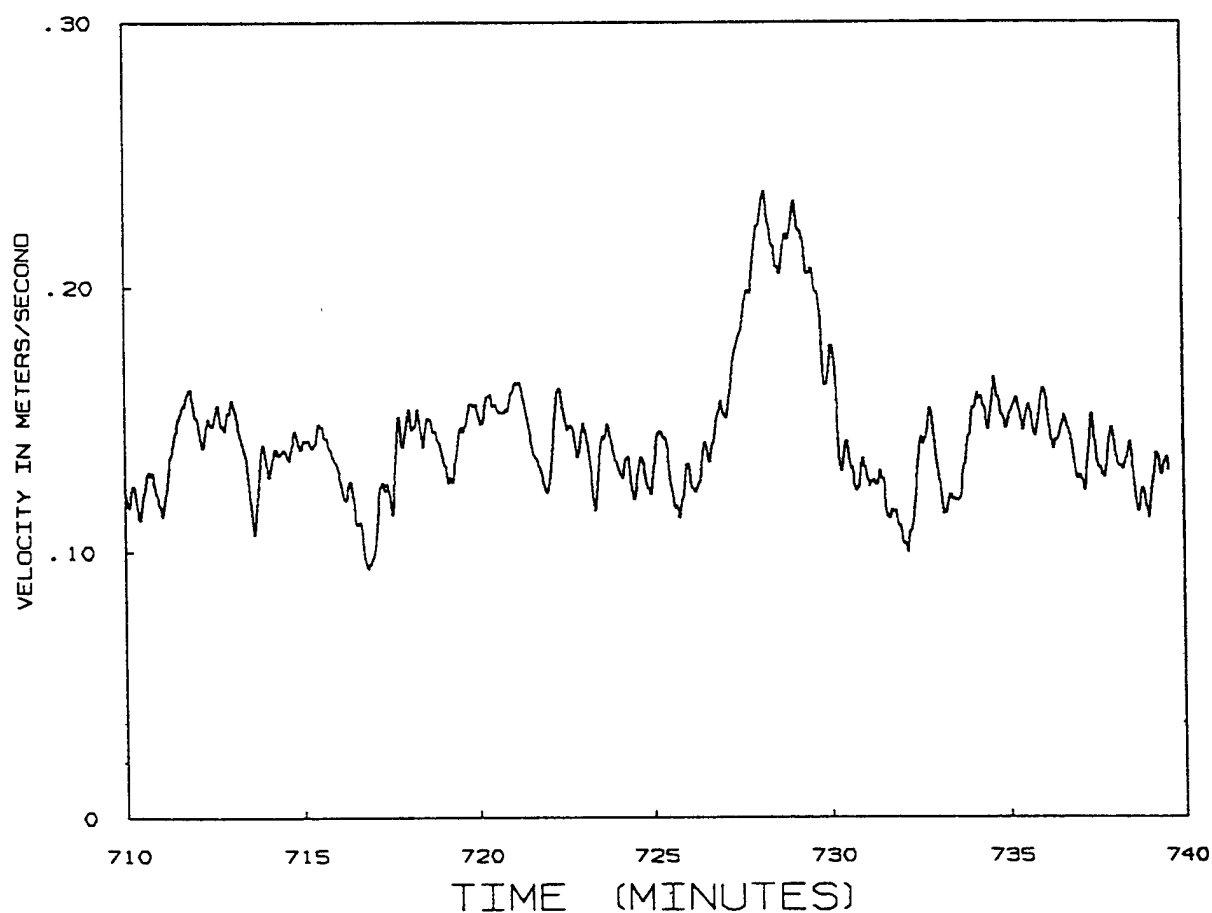
|               |              |            |                   |
|---------------|--------------|------------|-------------------|
| meter number  | 1130         | distance   | 215               |
| tow name      | Jack Bullard | start-time | 1150              |
| configuration | 2x1+3x4      | end-time   | 1220              |
| draft         | 9.0          | mean =     | 0.00              |
| speed         | 5.3 mph      | vmax =     | 0.02 tmax = 713.  |
| direction     | upstream     | vmin =     | -0.01 tmin = 725. |

MARSH MCBIRNEY S11/LOGGER2 PLOTTING ROUT Y - COMPONENT



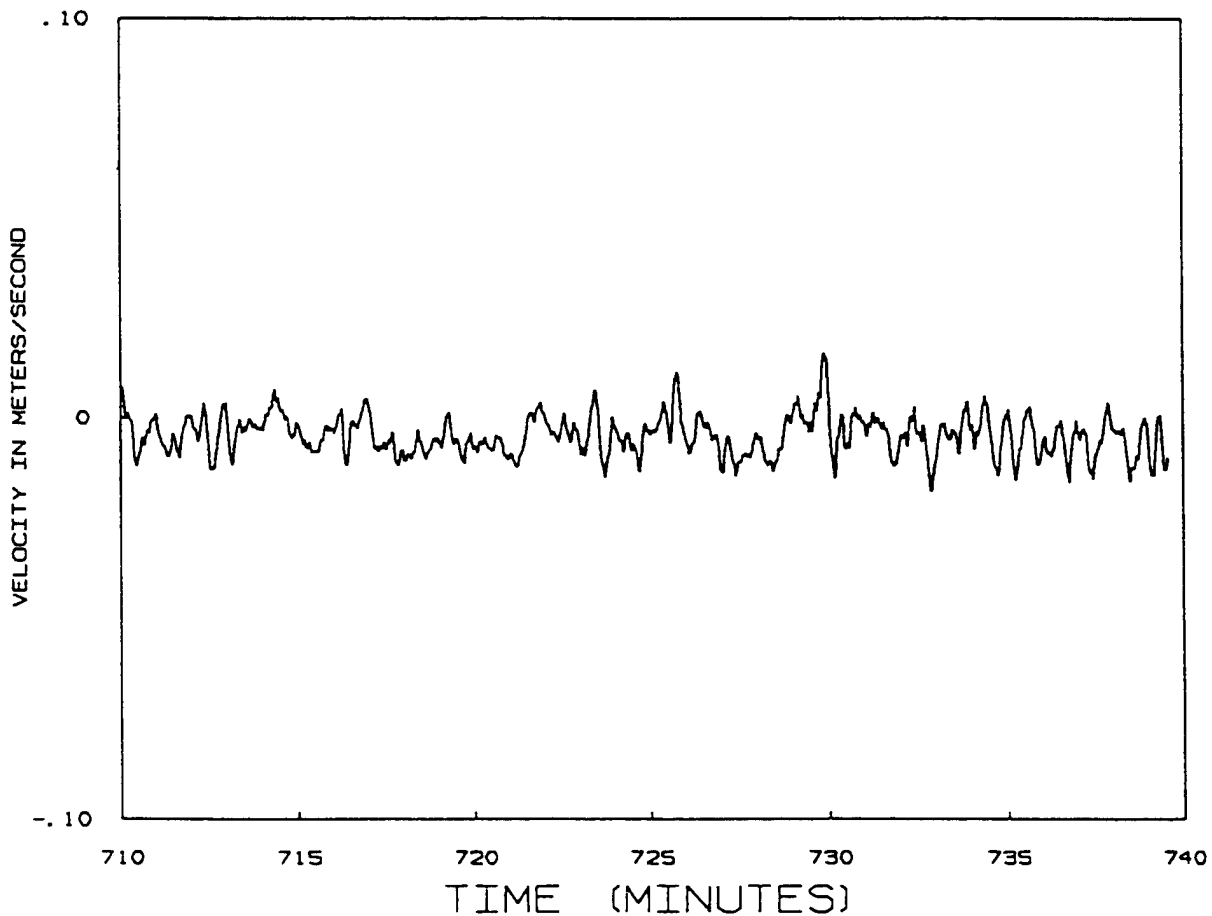
|               |              |            |                  |
|---------------|--------------|------------|------------------|
| meter number  | 1131         | distance   | 215              |
| tow name      | Jack Bullard | start-time | 1150             |
| configuration | 2x1+3x4      | end-time   | 1220             |
| draft         | 9.0          | mean =     | 0.14             |
| speed         | 5.3 mph      | vmax =     | 0.24 tmax = 728. |
| direction     | upstream     | vmin =     | 0.09 tmin = 717. |

MARSH MCBIRNEY S11/LOGGER2 PLOTTING ROUT X - COMPONENT

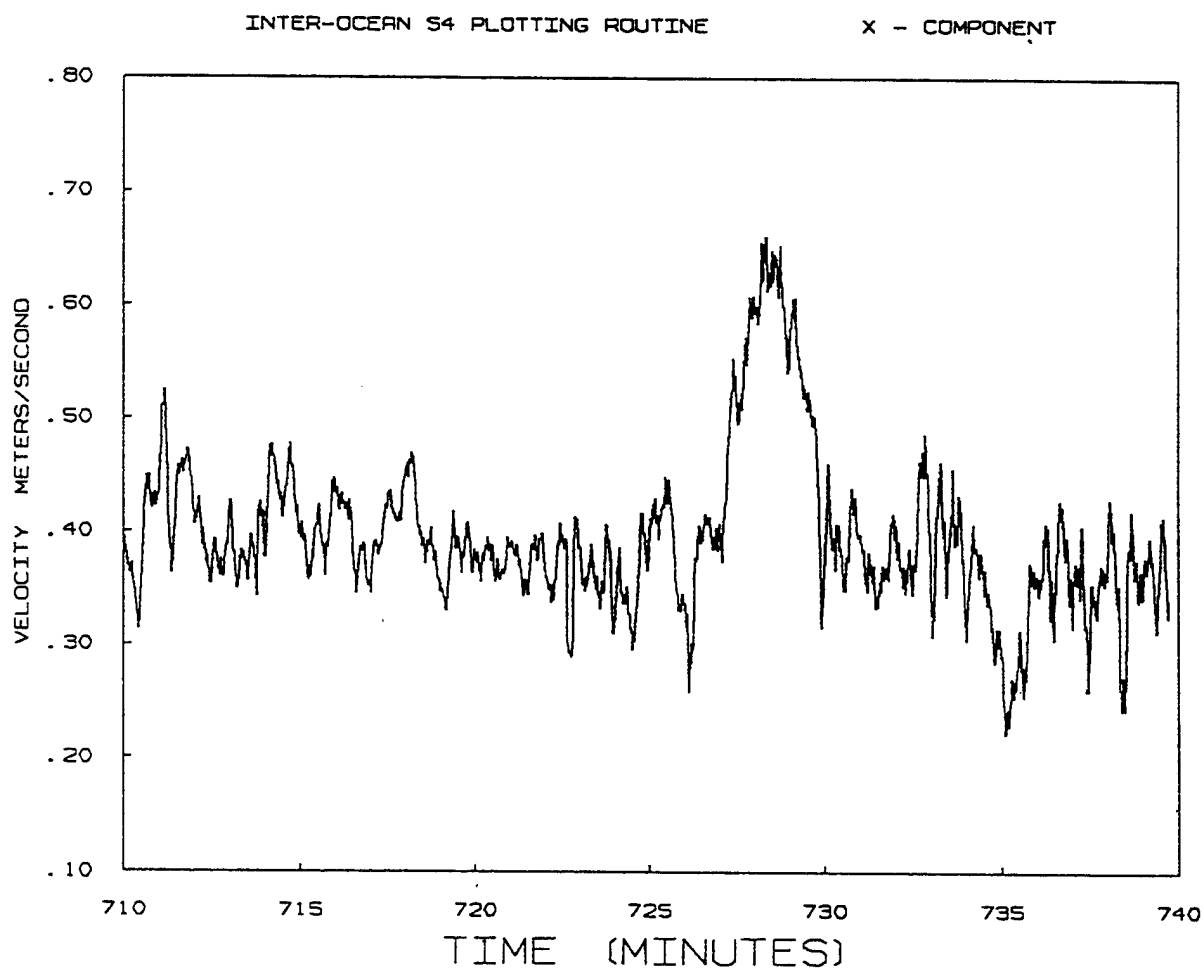


|               |              |            |                   |
|---------------|--------------|------------|-------------------|
| meter number  | 1131         | distance   | 215               |
| tow name      | Jack Bullard | start-time | 1150              |
| configuration | 2x1+3x4      | end-time   | 1220              |
| draft         | 9.0          | mean =     | 0.00              |
| speed         | 5.3 mph      | vmax =     | 0.02 tmax = 730.  |
| direction     | upstream     | vmin =     | -0.02 tmin = 733. |

MARSH MCBIRNEY S11/LOGGER2 PLOTTING ROUT Y - COMPONENT



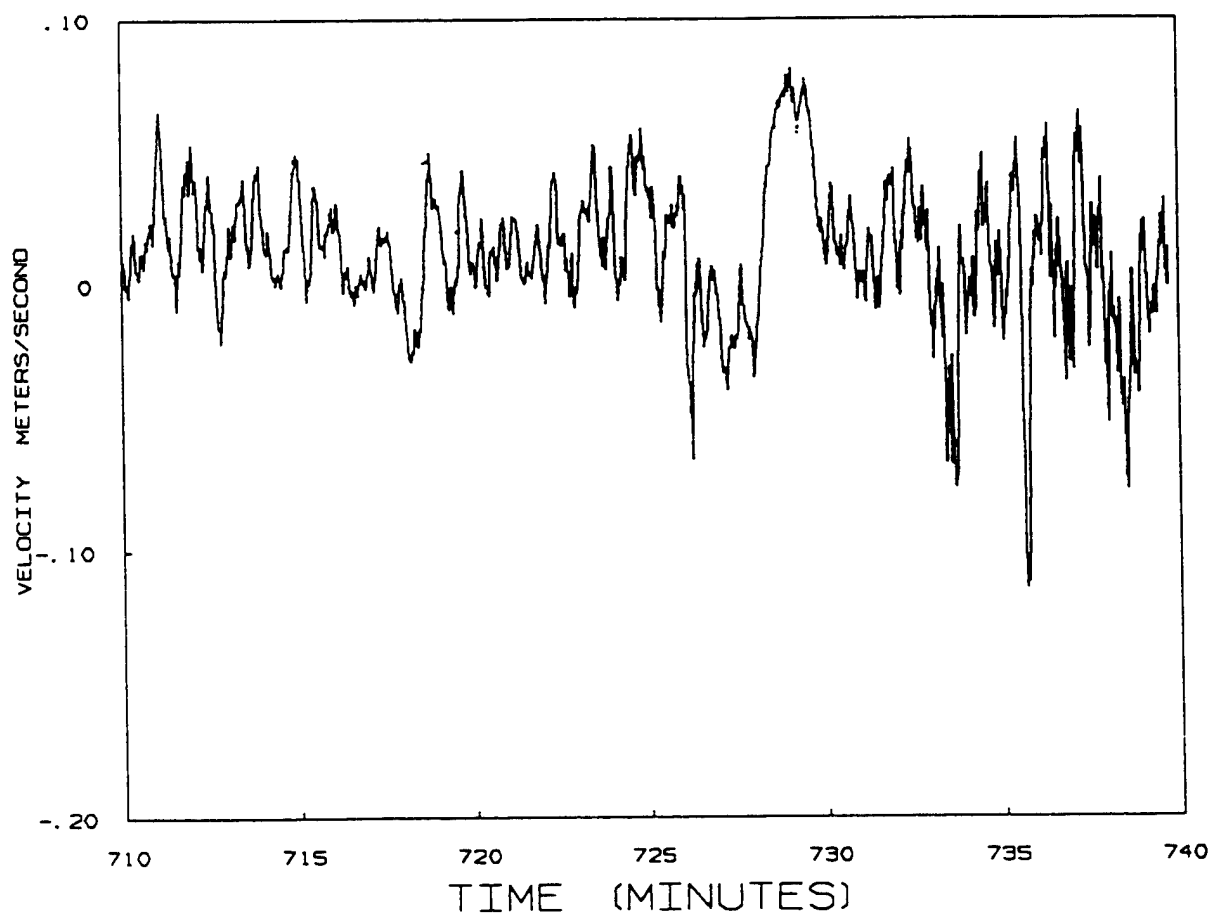
|               |              |            |                  |
|---------------|--------------|------------|------------------|
| meter number  | 834          | distance   | 215              |
| tow name      | Jack Bullard | start-time | 1150             |
| configuration | 2x1+3x4      | end-time   | 1220             |
| draft         | 9.0          | MEAN =     | 0.40             |
| speed         | 5.3 mph      | VMAX =     | 0.66 TMAX = 728. |
| direction     | upstream     | VMIN =     | 0.22 TMIN = 735. |



|               |              |            |                   |
|---------------|--------------|------------|-------------------|
| meter number  | 834          | distance   | 215               |
| tow name      | Jack Bullard | start-time | 1150              |
| configuration | 2x1+3x4      | end-time   | 1220              |
| draft         | 9.0          | MEAN =     | 0.01              |
| speed         | 5.3 mph      | VMAX =     | 0.08 TMAX = 729.  |
| direction     | upstream     | VMIN =     | -0.11 TMIN = 736. |

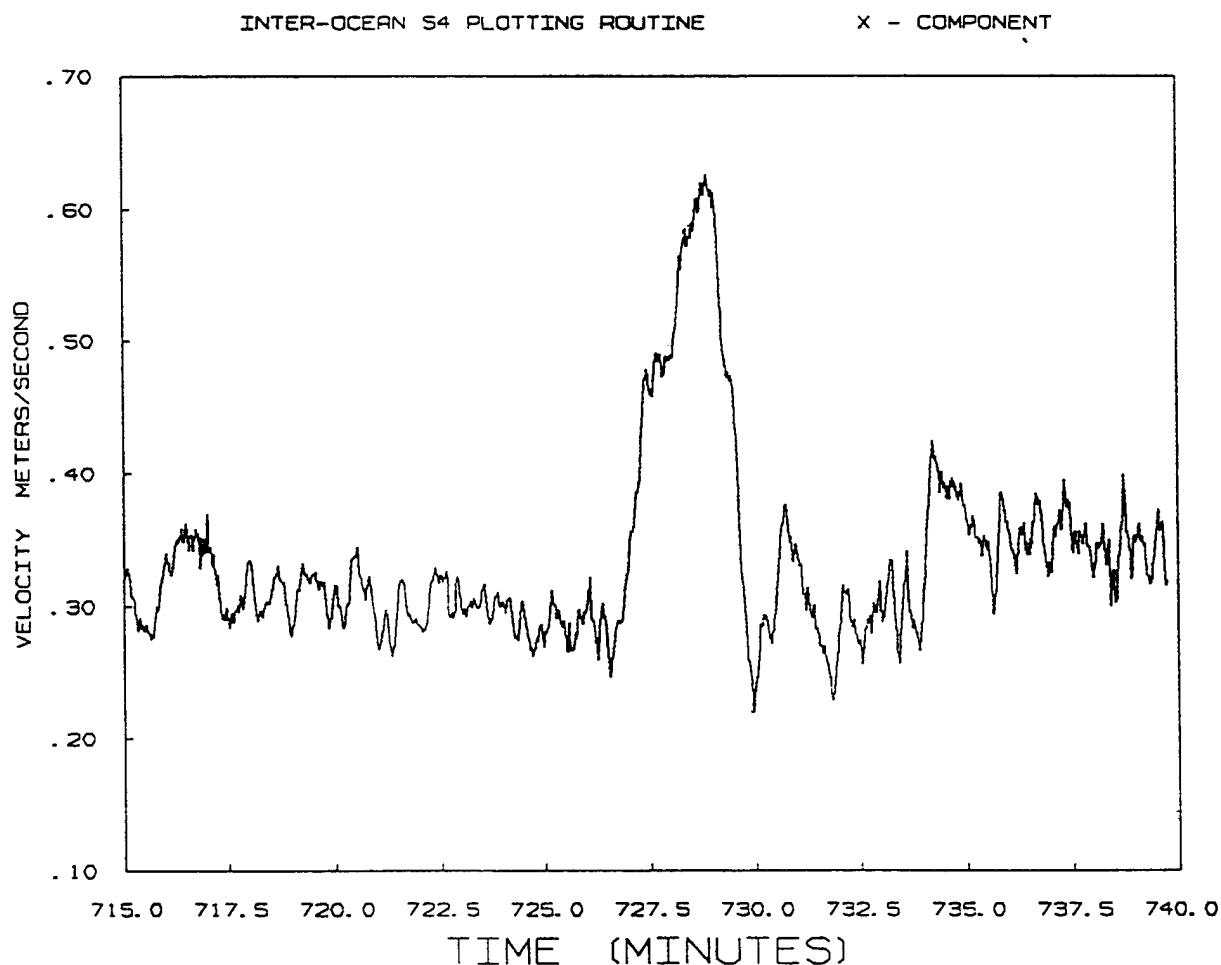
INTER-OCEAN S4 PLOTTING ROUTINE

Y - COMPONENT

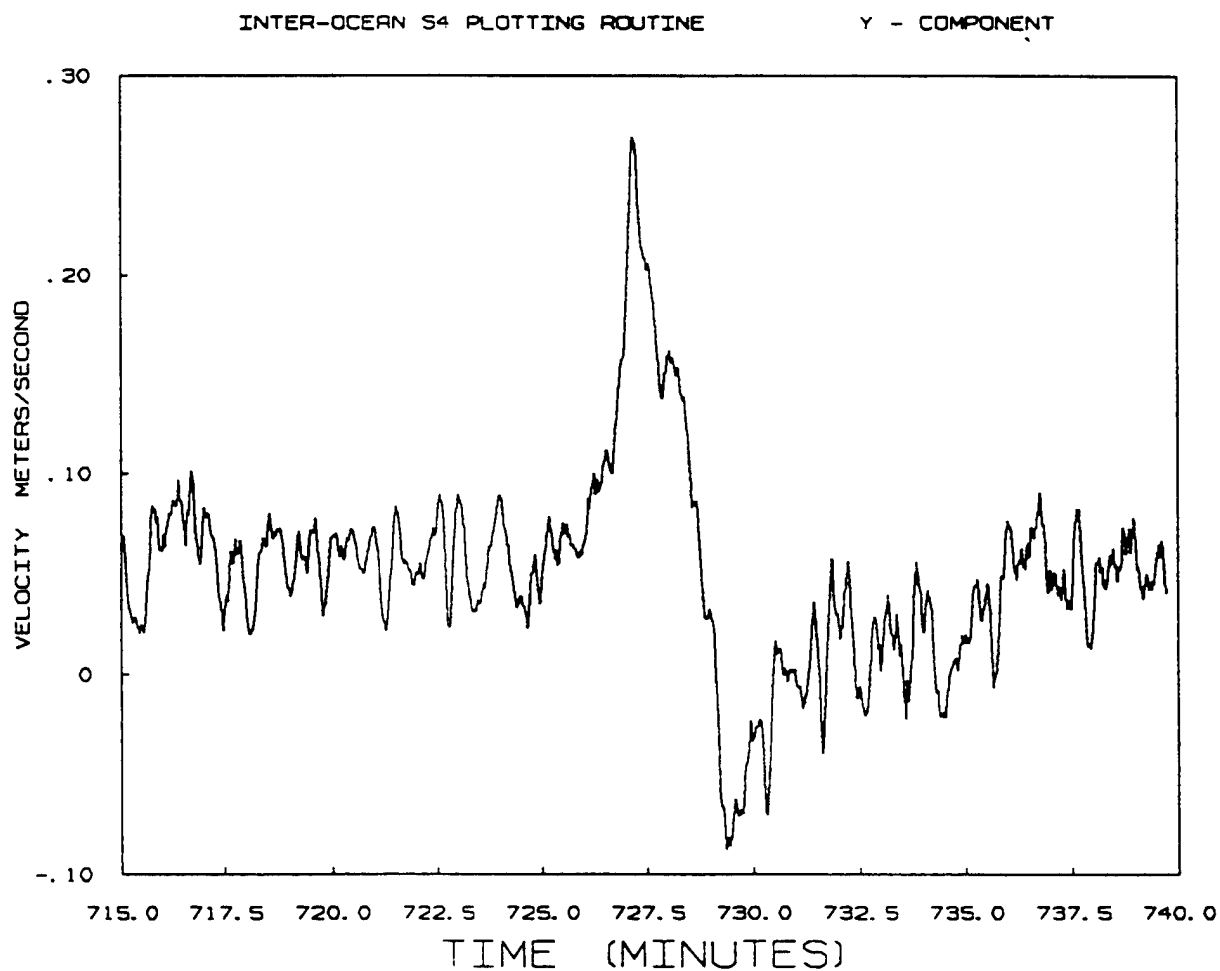




|               |              |            |                  |
|---------------|--------------|------------|------------------|
| meter number  | 151          | distance   | 215              |
| tow name      | Jack Bullard | start-time | 1150             |
| configuration | 2x1+3x4      | end-time   | 1220             |
| draft         | 9.0          | MEAN =     | 0.31             |
| speed         | 5.3 mph      | VMAX =     | 0.63 TMAX = 729. |
| direction     | upstream     | VMIN =     | 0.22 TMIN = 730. |



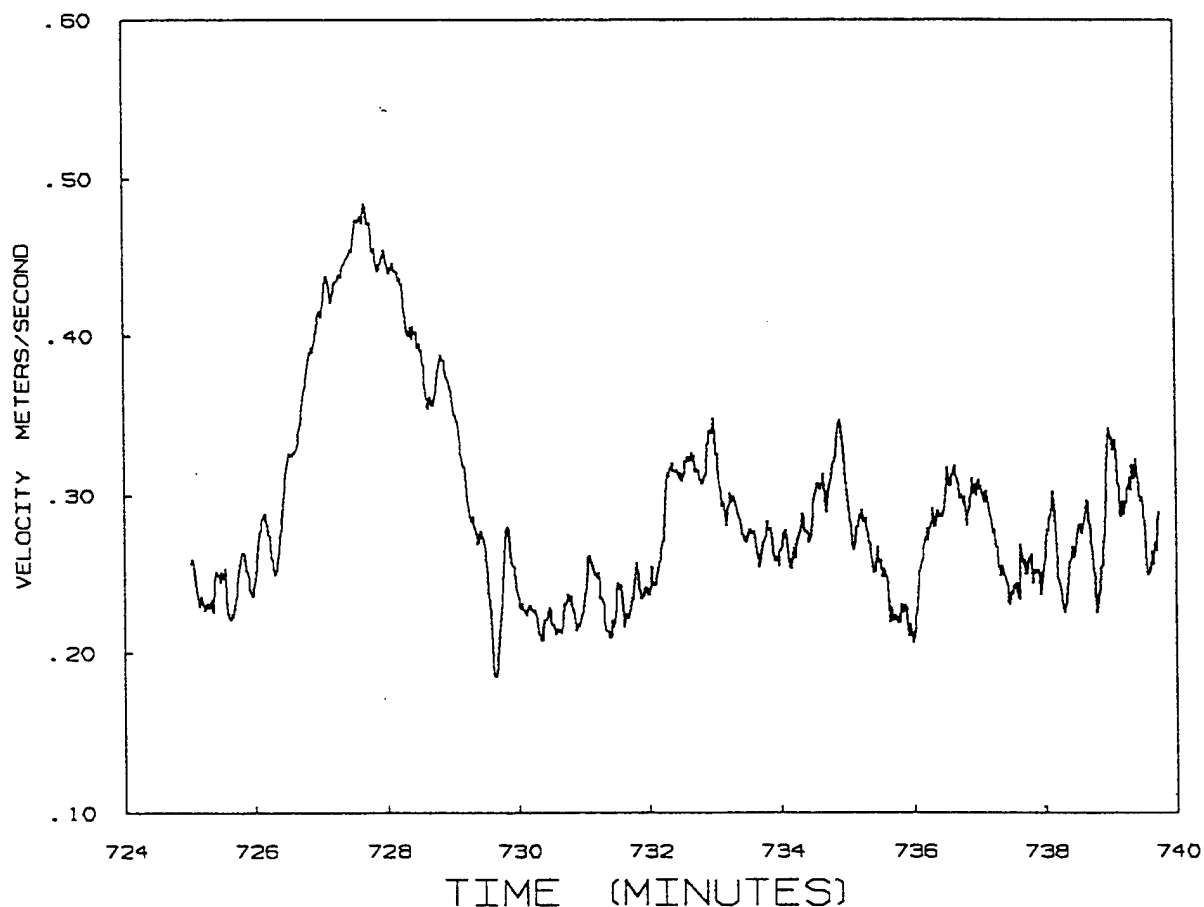
|               |              |            |                   |
|---------------|--------------|------------|-------------------|
| meter number  | 151          | distance   | 215               |
| tow name      | Jack Bullard | start-time | 1150              |
| configuration | 2x1+3x4      | end-time   | 1220              |
| draft         | 9.0          | MEAN =     | 0.06              |
| speed         | 5.3 mph      | VMAX =     | 0.27 TMAX = 727.  |
| direction     | upstream     | VMIN =     | -0.09 TMIN = 729. |



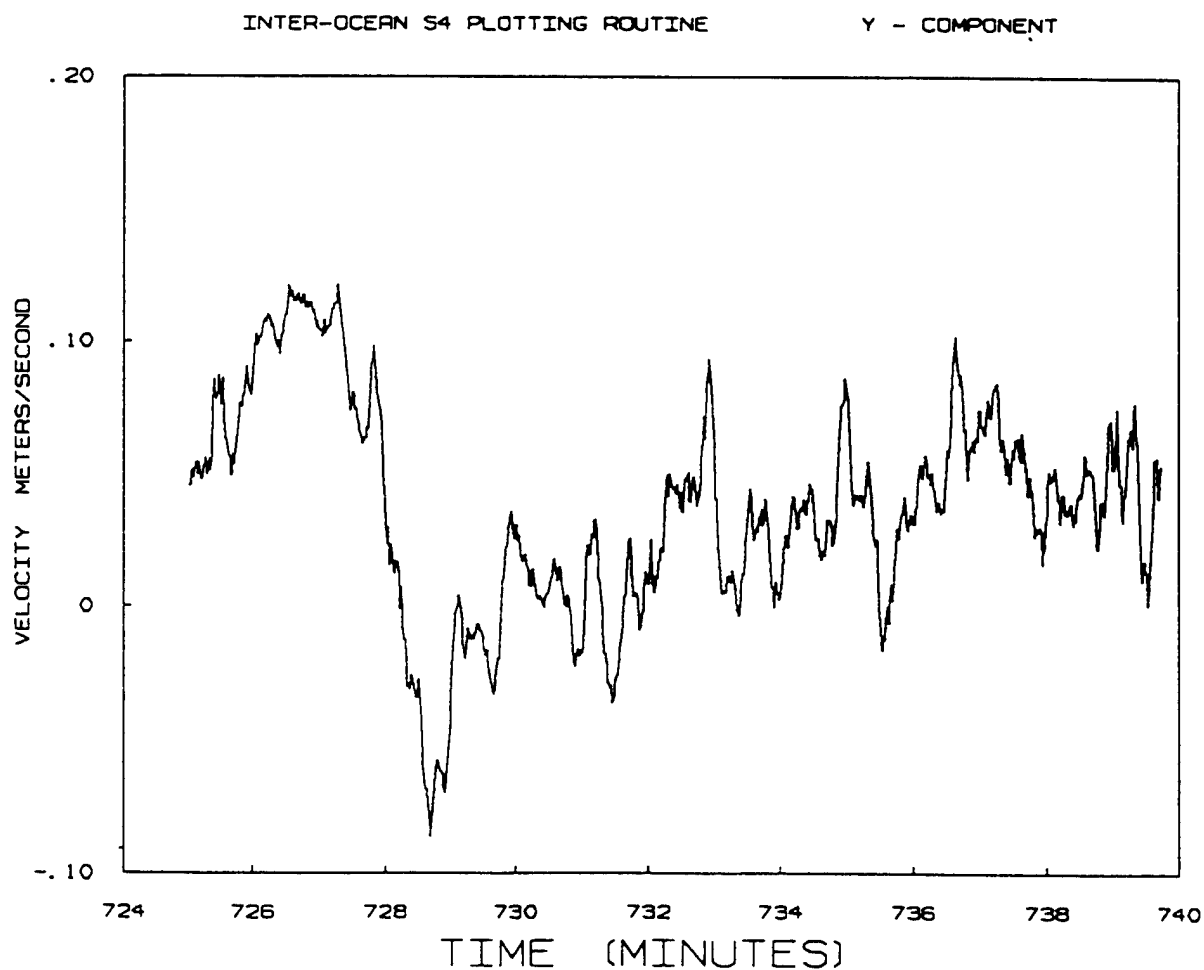
|               |              |            |                  |
|---------------|--------------|------------|------------------|
| meter number  | 832          | distance   | 215              |
| tow name      | Jack Bullard | start-time | 1150             |
| configuration | 2x1+3x4      | end-time   | 1220             |
| draft         | 9.0          | MEAN =     | 0.30             |
| speed         | 5.3 mph      | VMAX =     | 0.48 TMAX = 728. |
| direction     | upstream     | VMIN =     | 0.18 TMIN = 730. |

INTER-OCEAN S4 PLOTTING ROUTINE

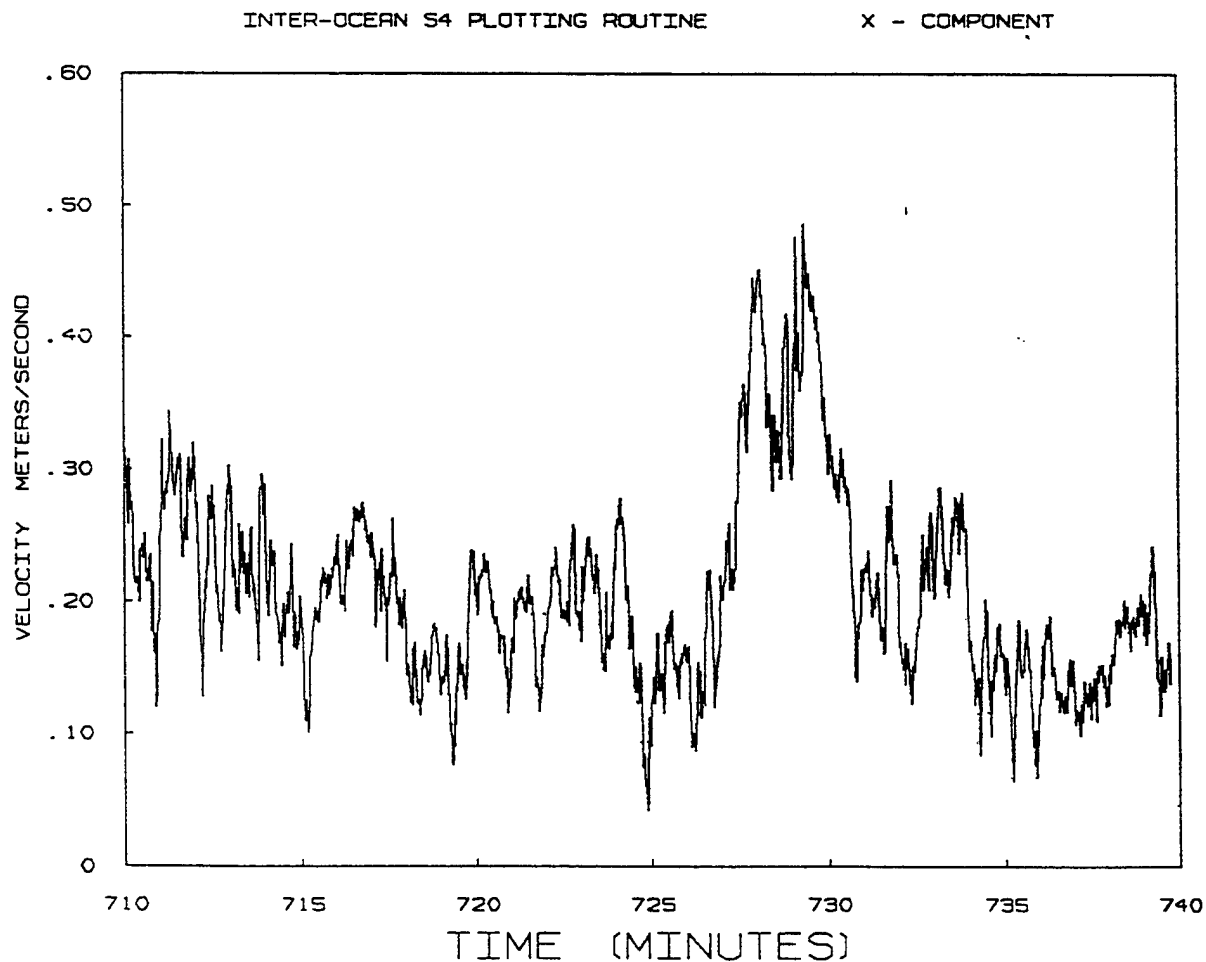
X - COMPONENT



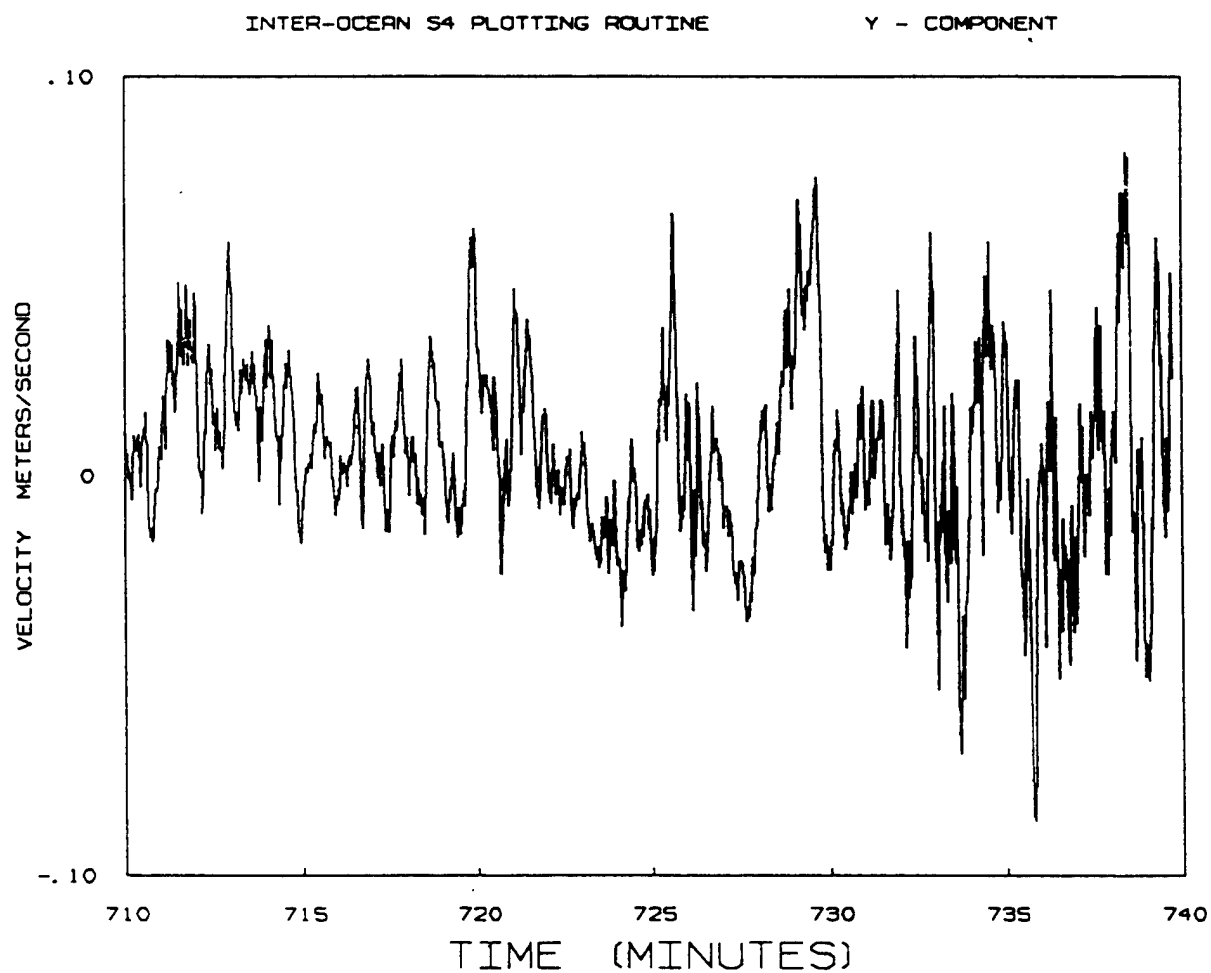
|               |              |            |                   |
|---------------|--------------|------------|-------------------|
| meter number  | 832          | distance   | 215               |
| tow name      | Jack Bullard | start-time | 1150              |
| configuration | 2x1+3x4      | end-time   | 1220              |
| draft         | 9.0          | MEAN =     | 0.03              |
| speed         | 5.3 mph      | VMAX =     | 0.12 TMAX = 727.  |
| direction     | upstream     | VMIN =     | -0.09 TMIN = 729. |



|               |              |            |                  |
|---------------|--------------|------------|------------------|
| meter number  | 040          | distance   | 215              |
| tow name      | Jack Bullard | start-time | 1150             |
| configuration | 2x1+3x4      | end-time   | 1220             |
| draft         | 9.0          | MEAN =     | 0.21             |
| speed         | 5.3 mph      | VMAX =     | 0.49 TMAX = 729. |
| direction     | upstream     | VMIN =     | 0.04 TMIN = 725. |

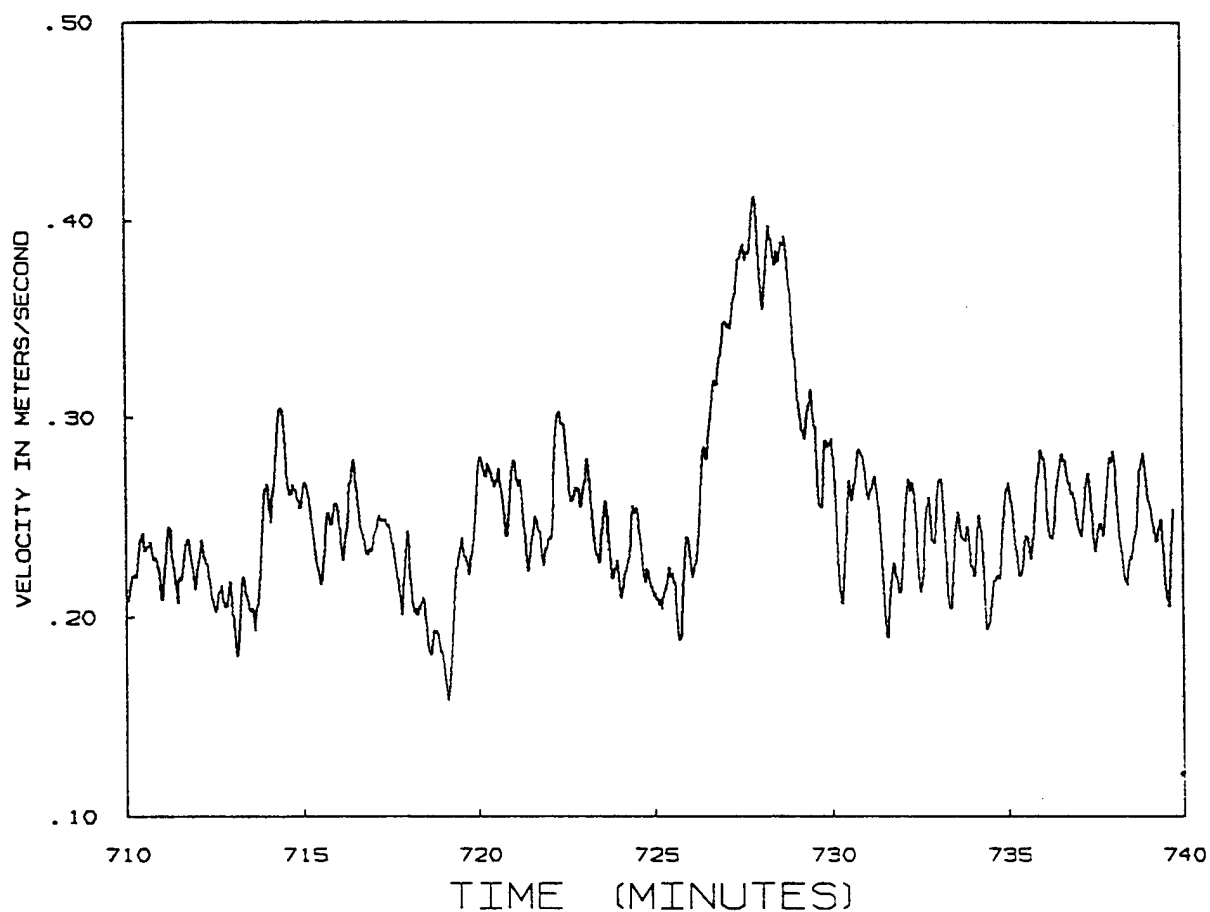


|               |              |            |                   |
|---------------|--------------|------------|-------------------|
| meter number  | 040          | distance   | 215               |
| tow name      | Jack Bullard | start-time | 1150              |
| configuration | 2x1+3x4      | end-time   | 1220              |
| draft         | 9.0          | MEAN =     | 0.01              |
| speed         | 5.3 mph      | VMAX =     | 0.08 TMAX = 738.  |
| direction     | upstream     | VMIN =     | -0.09 TMIN = 736. |



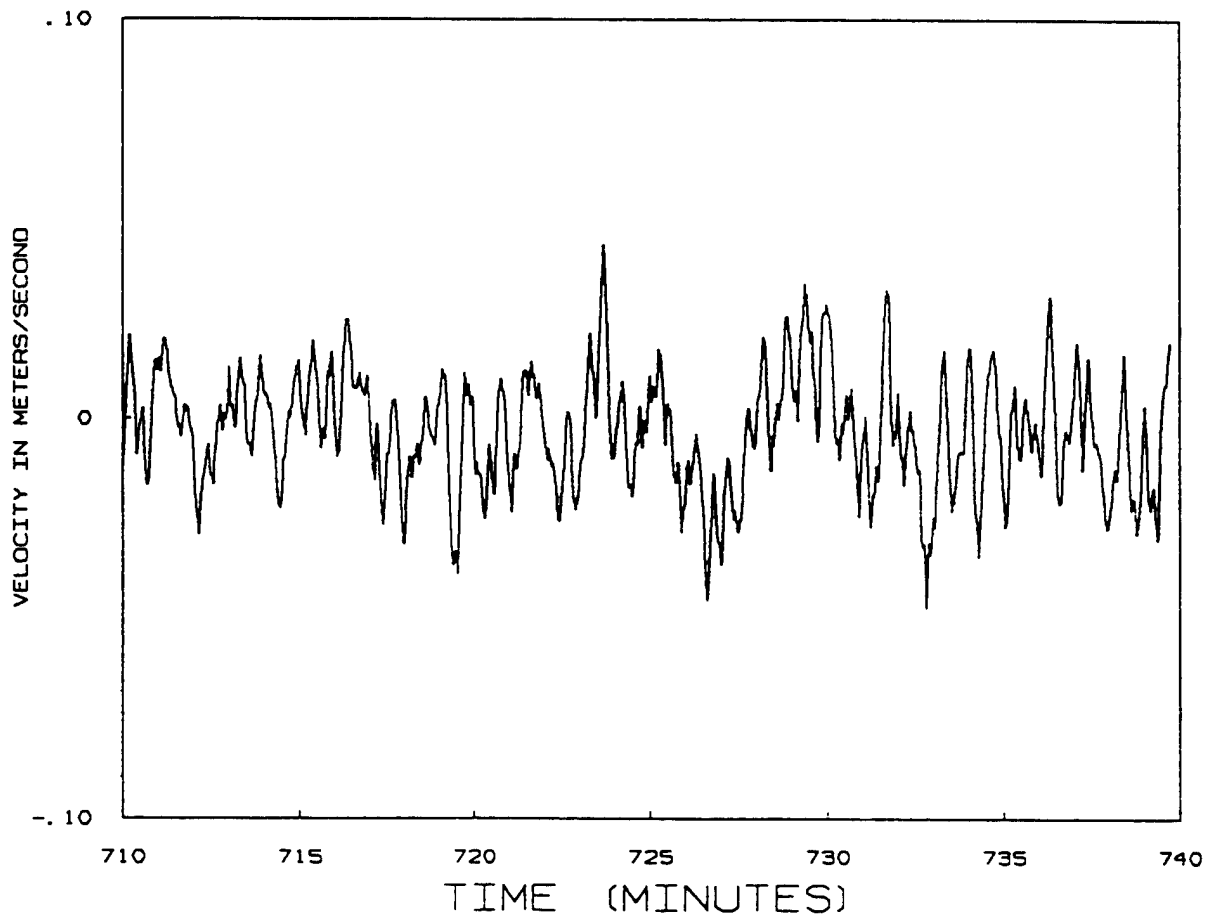
|               |              |            |                  |
|---------------|--------------|------------|------------------|
| meter number  | B-332        | start-time | 1150             |
| tow name      | Jack Bullard | end-time   | 1220             |
| configuration | 2x1+3x4      | mean =     | 0.23             |
| draft         | 9.0          | vmax =     | 0.00 tmax = 728. |
| speed         | 5.3 mph      | vmin =     | 0.00 tmin = 719. |
| direction     | upstream     |            |                  |
| distance      | 215          |            |                  |

MARSH MCBIRNEY 511/527 PLOTTING ROUTINE X - COMPONENT



|               |              |            |                  |
|---------------|--------------|------------|------------------|
| meter number  | B-332        | start-time | 1150             |
| tow name      | Jack Bullard | end-time   | 1220             |
| configuration | 2x1+3x4      | mean =     | 0.00             |
| draft         | 9.0          | vmax =     | 0.00 tmax = 724. |
| speed         | 5.3 mph      | vmin =     | 0.00 tmin = 733. |
| direction     | upstream     |            |                  |
| distance      | 215          |            |                  |

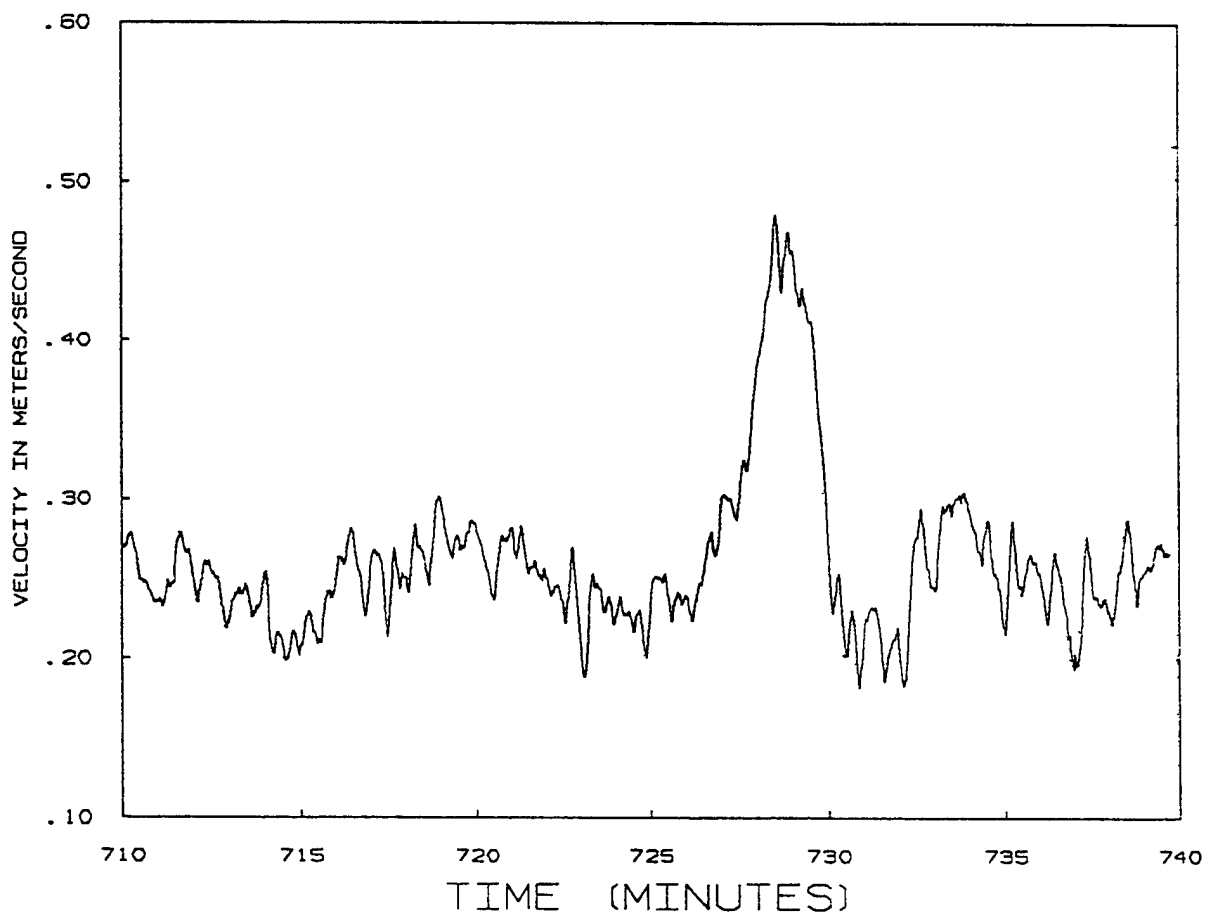
MARSH MCBIRNEY 511/527 PLOTTING ROUTINE Y - COMPONENT





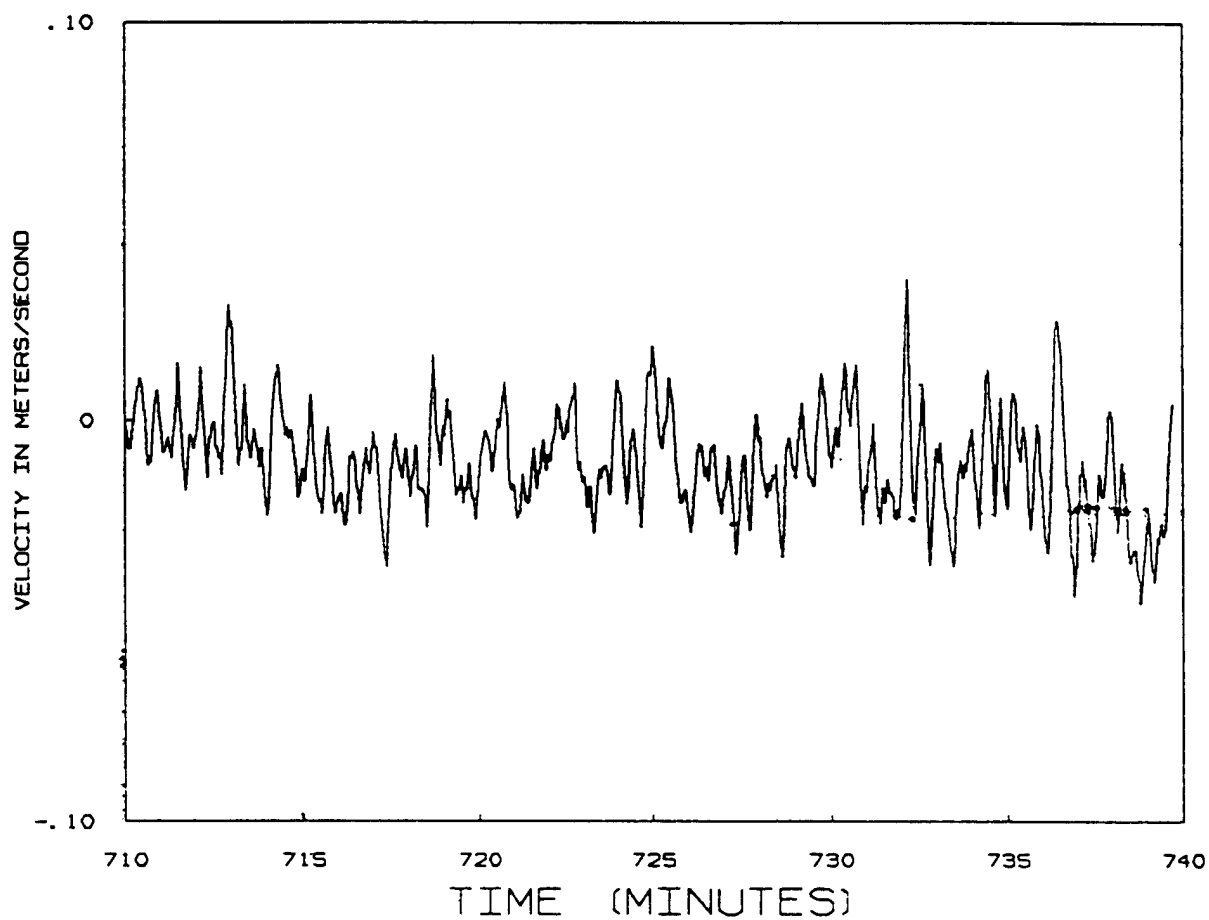
|               |              |            |                  |
|---------------|--------------|------------|------------------|
| meter number  | B-642        | start-time | 1150             |
| tow name      | Jack Bullard | end-time   | 1220             |
| configuration | 2x1+3x4      | mean =     | 0.25             |
| draft         | 9.0          | vmax =     | 0.00 tmax = 729. |
| speed         | 5.3 mph      | vmin =     | 0.00 tmin = 731. |
| direction     | upstream     |            |                  |
| distance      | 215          |            |                  |

MARSH MCBIRNEY 511/527 PLOTTING ROUTINE X - COMPONENT



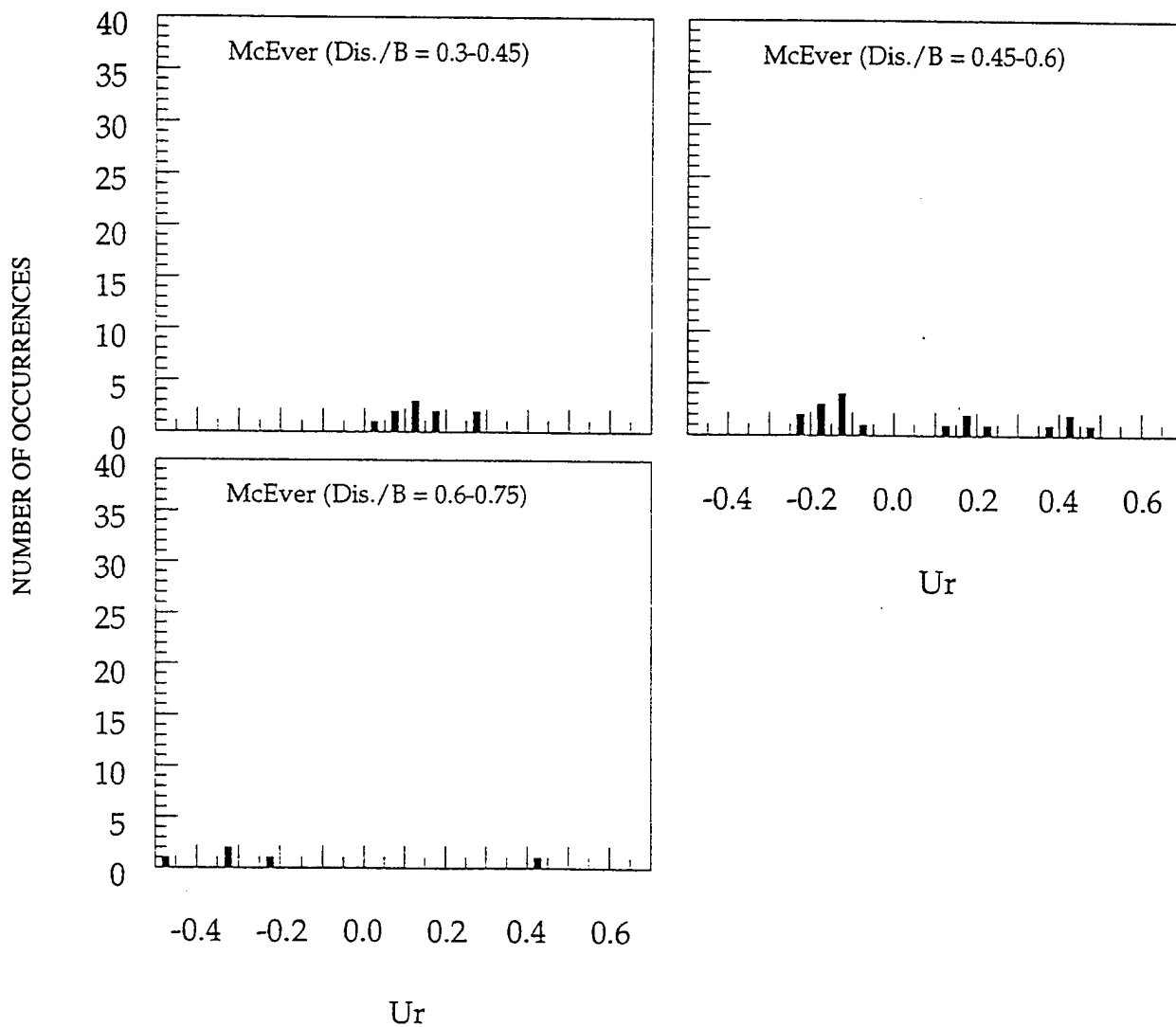
|               |              |            |                    |
|---------------|--------------|------------|--------------------|
| meter number  | B-642        | start-time | 1150               |
| tow name      | Jack Bullard | end-time   | 1220               |
| configuration | 2x1+3x4      | mean       | = -0.01            |
| draft         | 9.0          | vmax       | = 0.00 tmax = 732. |
| speed         | 5.3 mph      | vmin       | = 0.00 tmin = 739. |
| direction     | upstream     |            |                    |
| distance      | 215          |            |                    |

MARSH MCBIRNEY 511/527 PLOTTING ROUTINE Y - COMPONENT

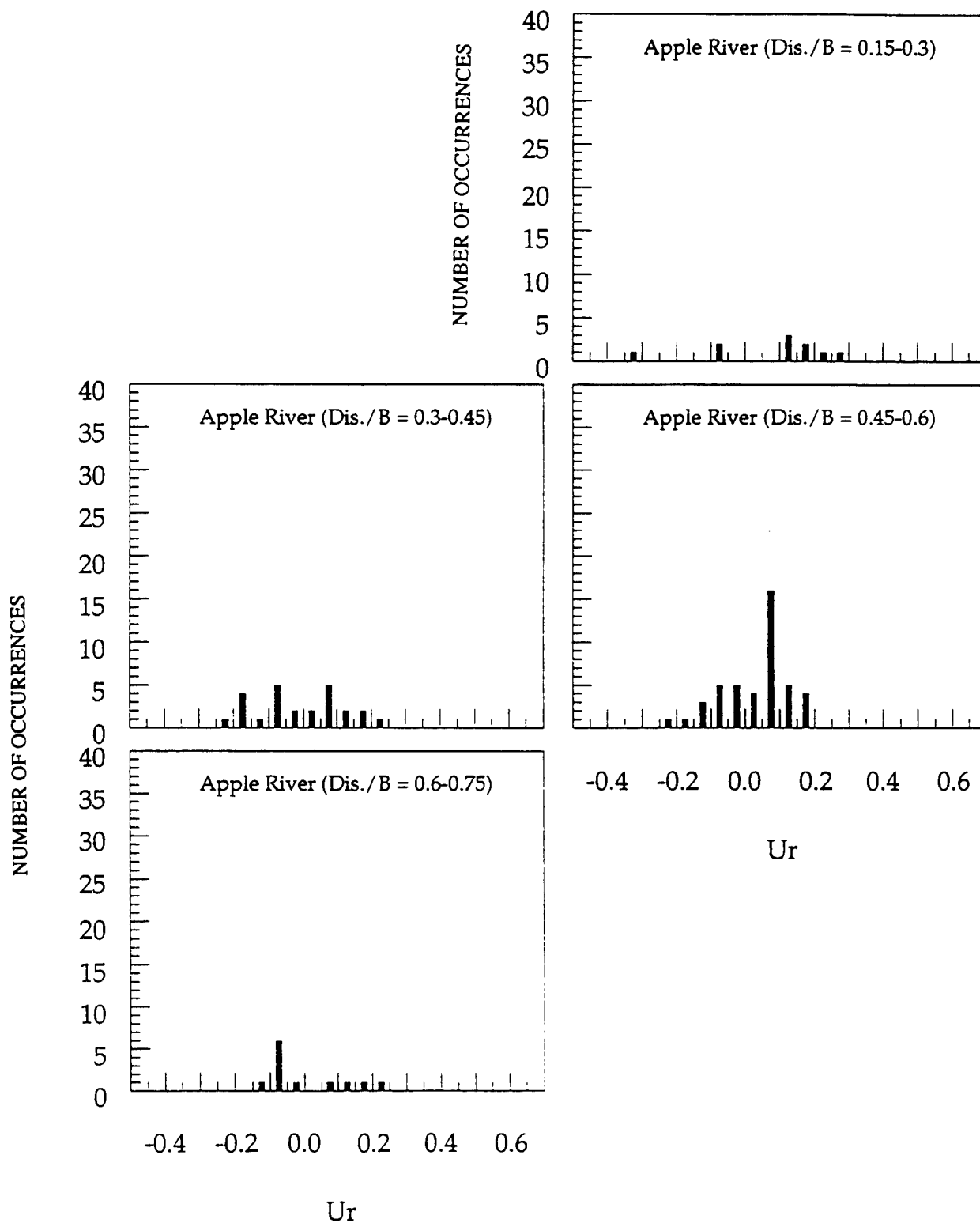


**APPENDIX XXI.**

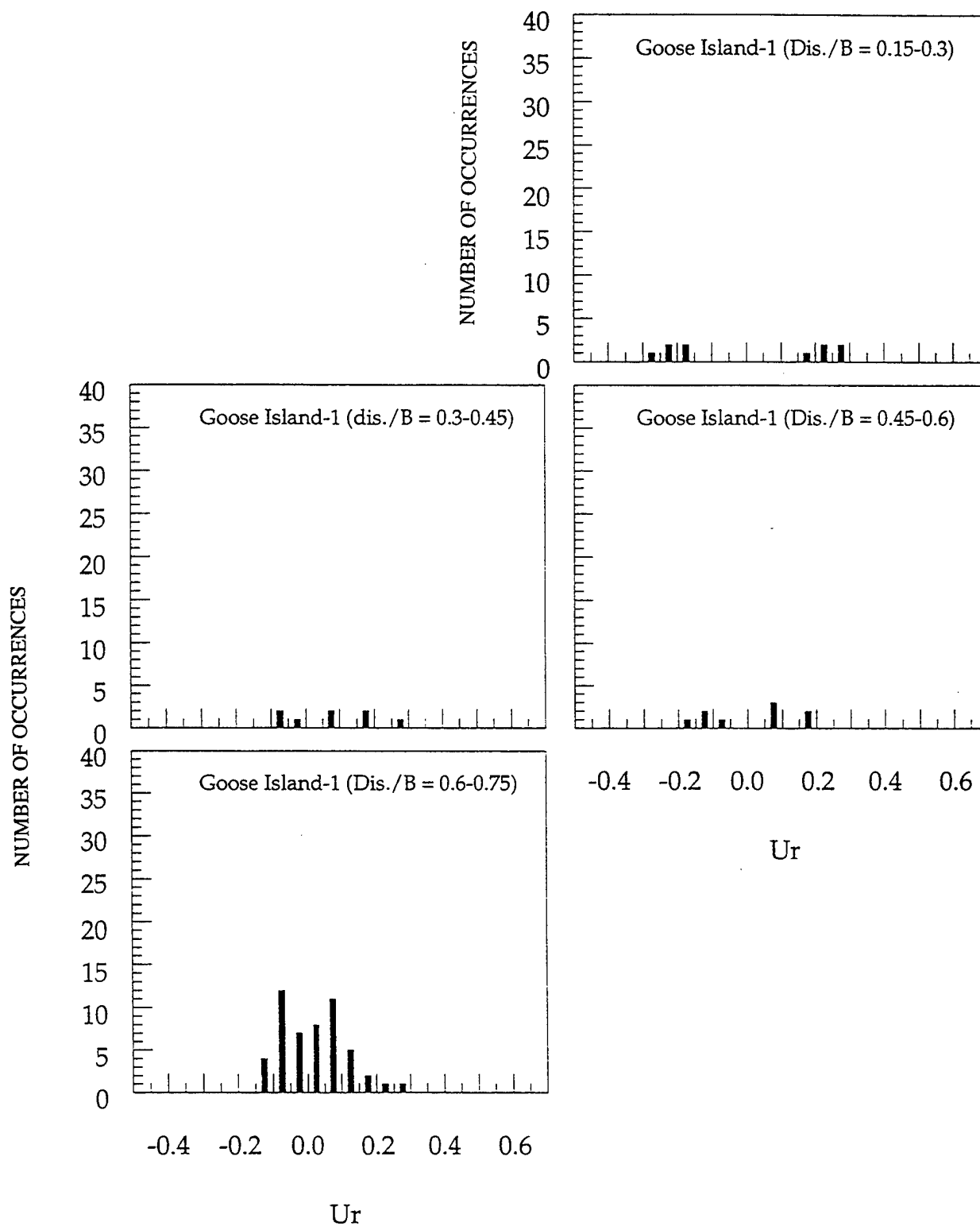
**HISTOGRAMS OF MAXIMUM RETURN VELOCITY  
WITHIN VARIOUS ZONES FOR ALL STUDY SITES**



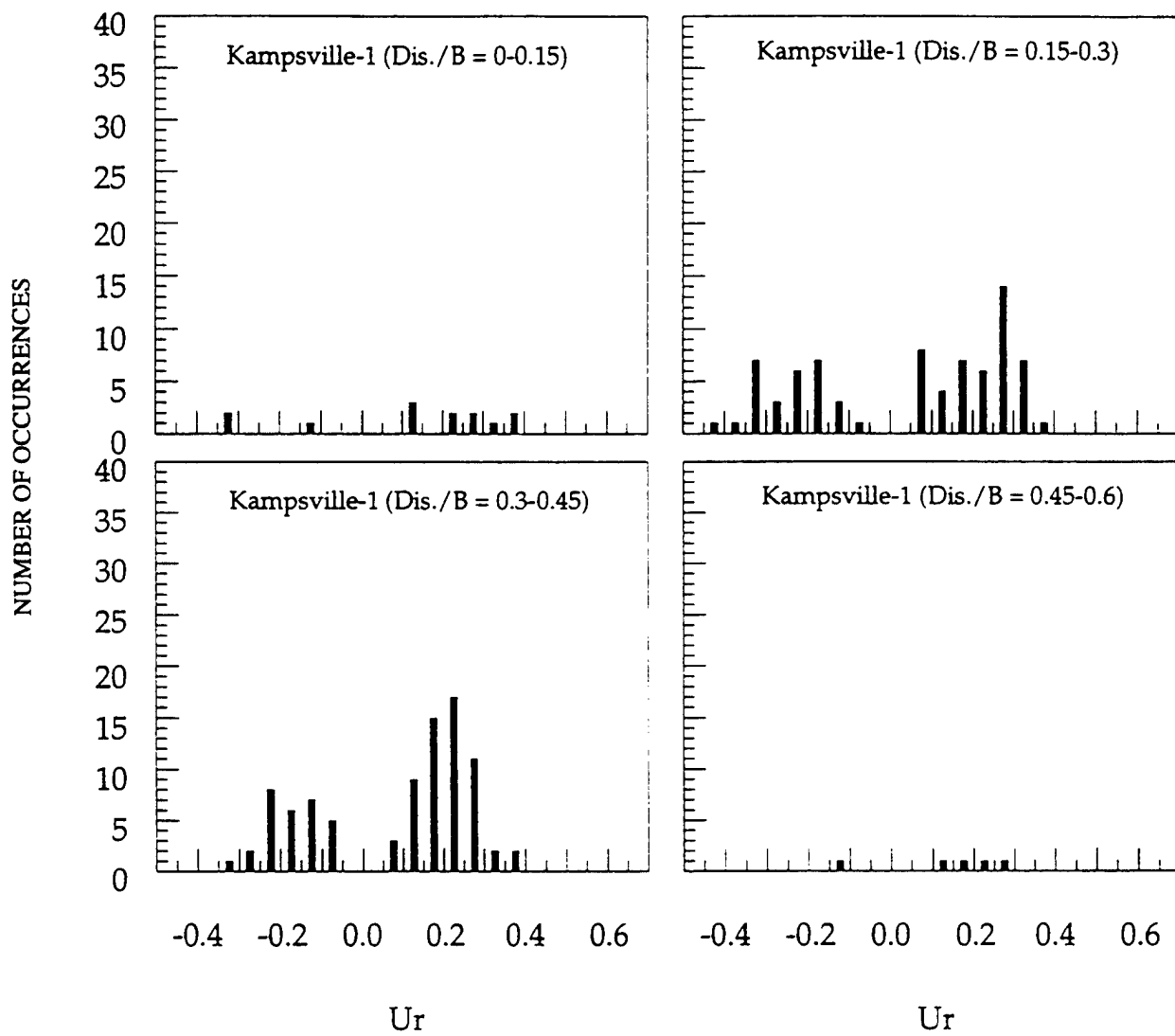
XXI-1. Histograms of  $U_{r(max)}$  within various zones, McEver's Island  
( $U_{r(max)}$  carries signs to indicate an upstream- or downstream-bound barge effect)



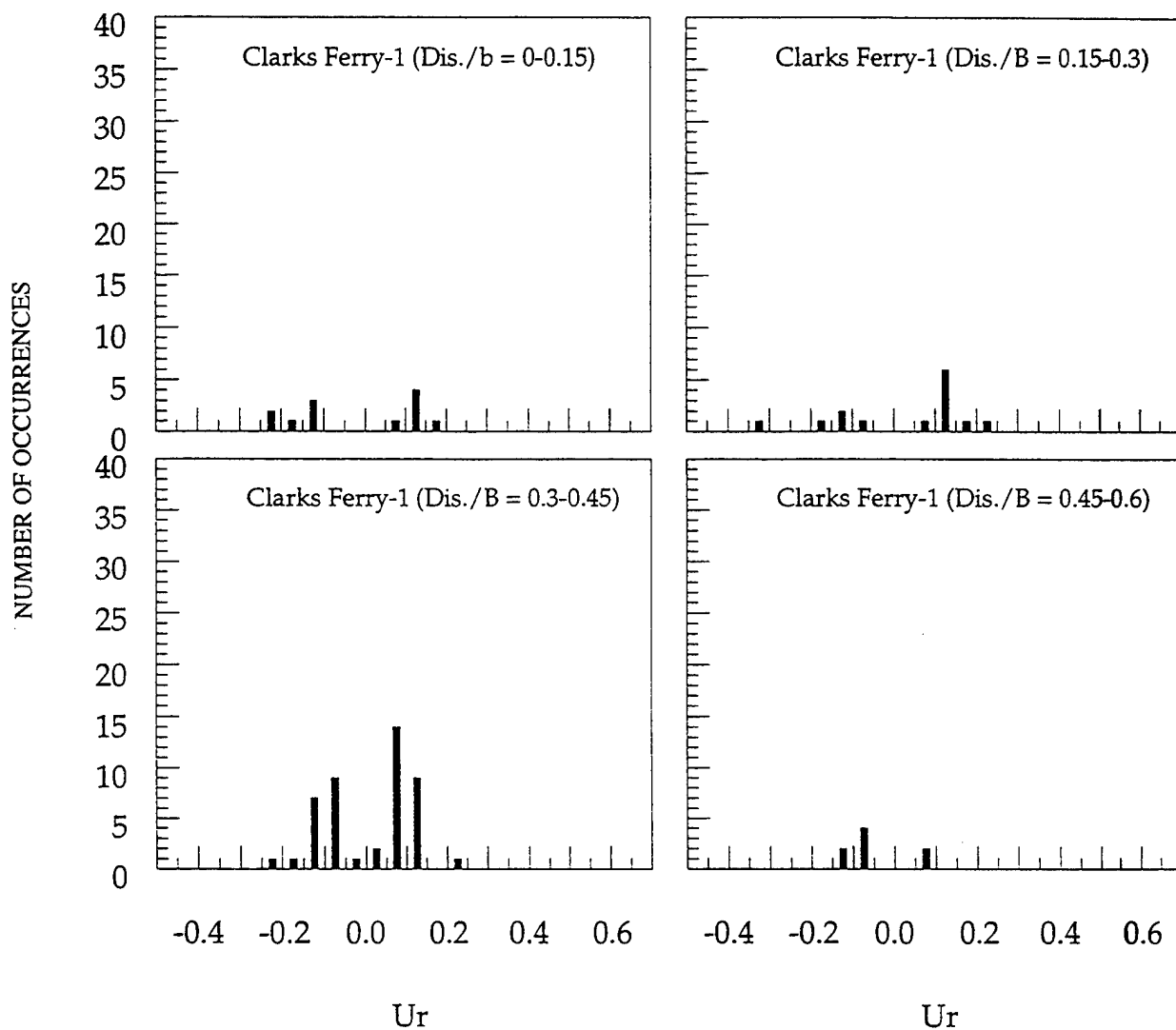
XXI-2. Histograms of  $U_{r(max)}$  within various zones, Apple River Island  
 ( $U_{r(max)}$  carries signs to indicate an upstream- or downstream-bound barge effect)



XXI-3. Histograms of  $U_{r(max)}$  within various zones, Goose Island, trip 1  
 ( $U_{r(max)}$  carries signs to indicate an upstream- or downstream-bound barge effect)

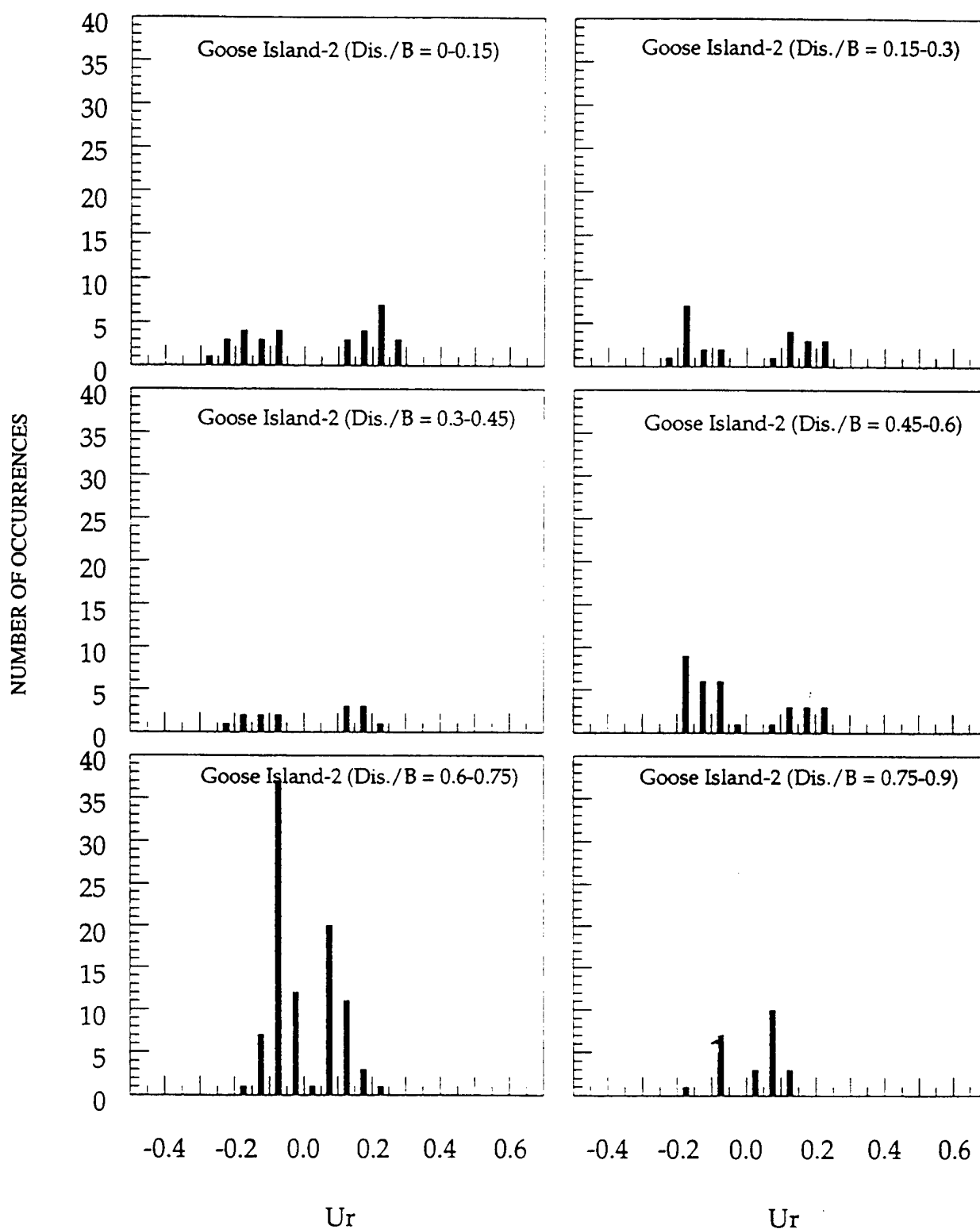


XXI-4. Histograms of  $U_{r(max)}$  within various zones, Kampsville, trip 1  
 ( $U_{r(max)}$  carries signs to indicate an upstream- or downstream-bound barge effect)

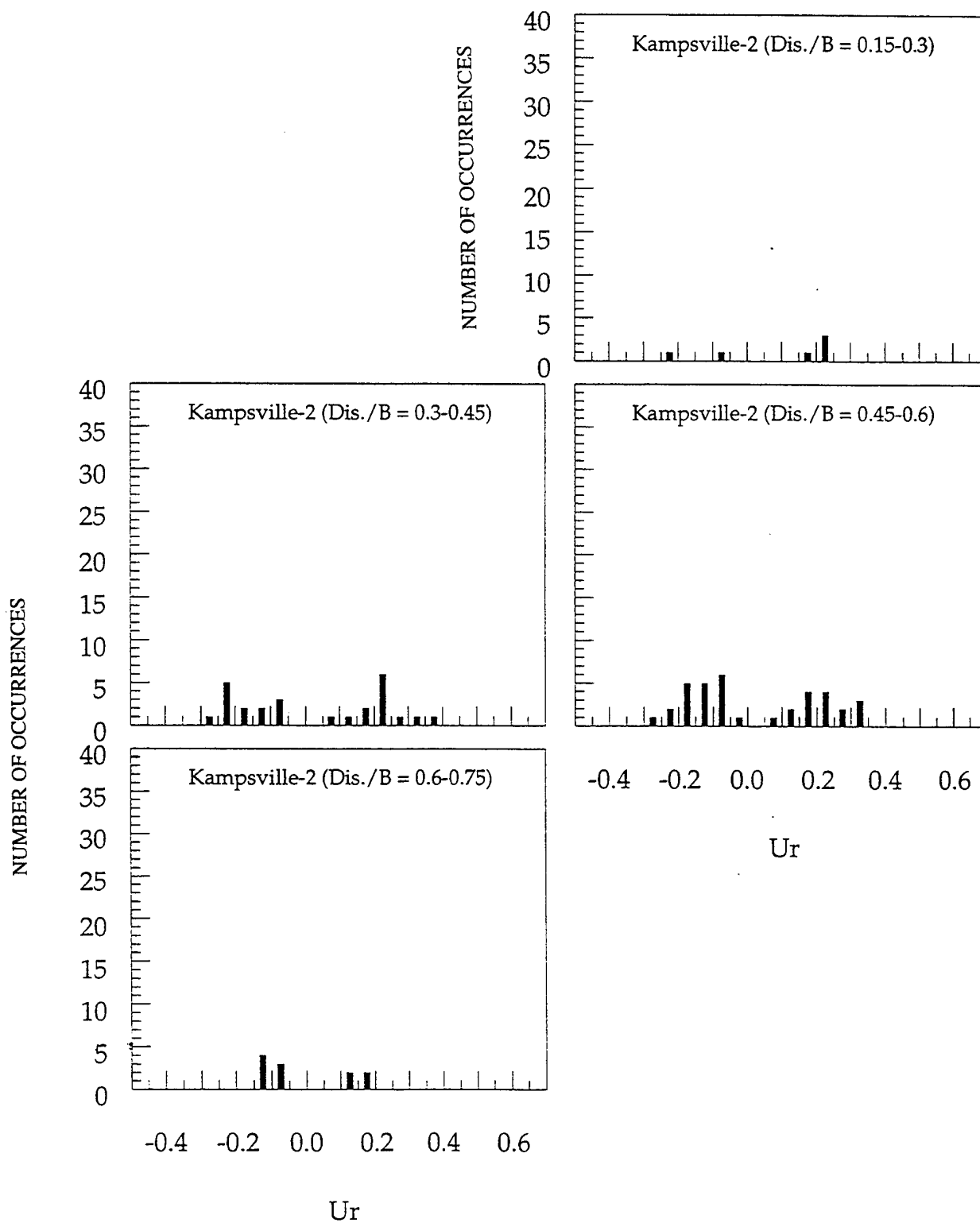


XXI-5. Histograms of  $U_{r(max)}$  within various zones, Clarks Ferry, trip 1  
 ( $U_{r(max)}$  carries signs to indicate an upstream- or downstream-bound barge effect)

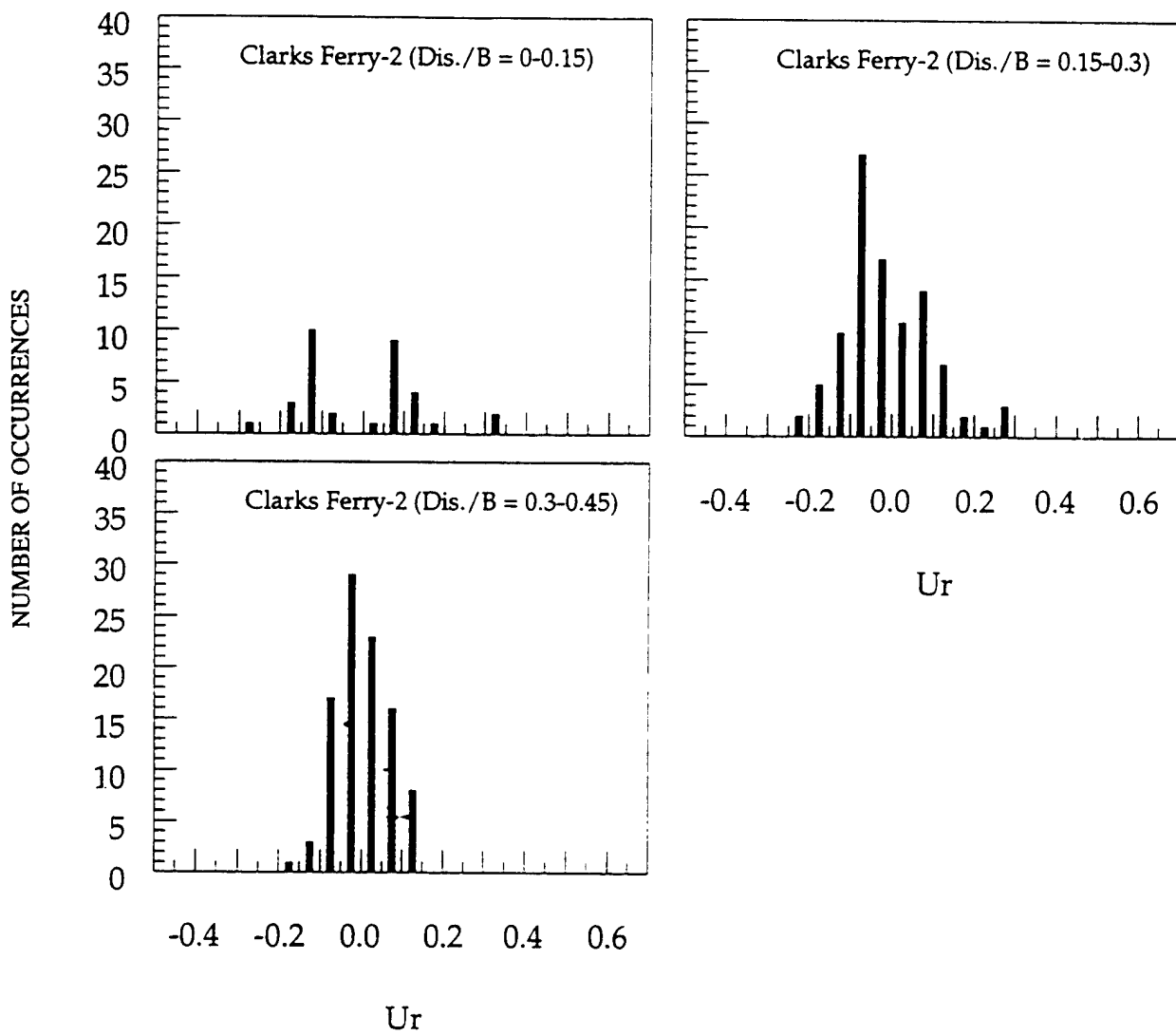




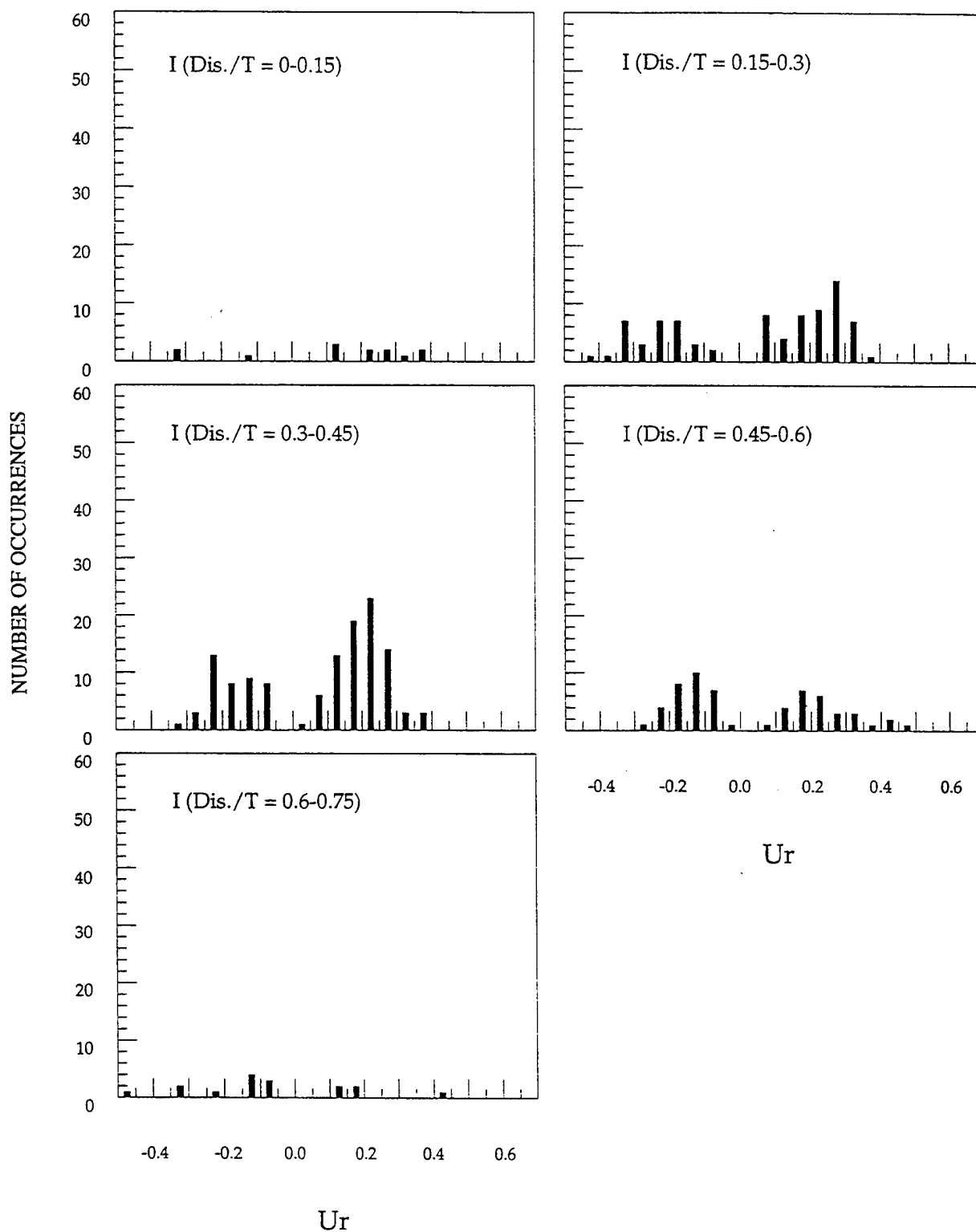
XXI-6. Histograms of  $U_{r(max)}$  within various zones, Goose Island, trip 2  
 ( $U_{r(max)}$  carries signs to indicate an upstream- or downstream-bound barge effect)



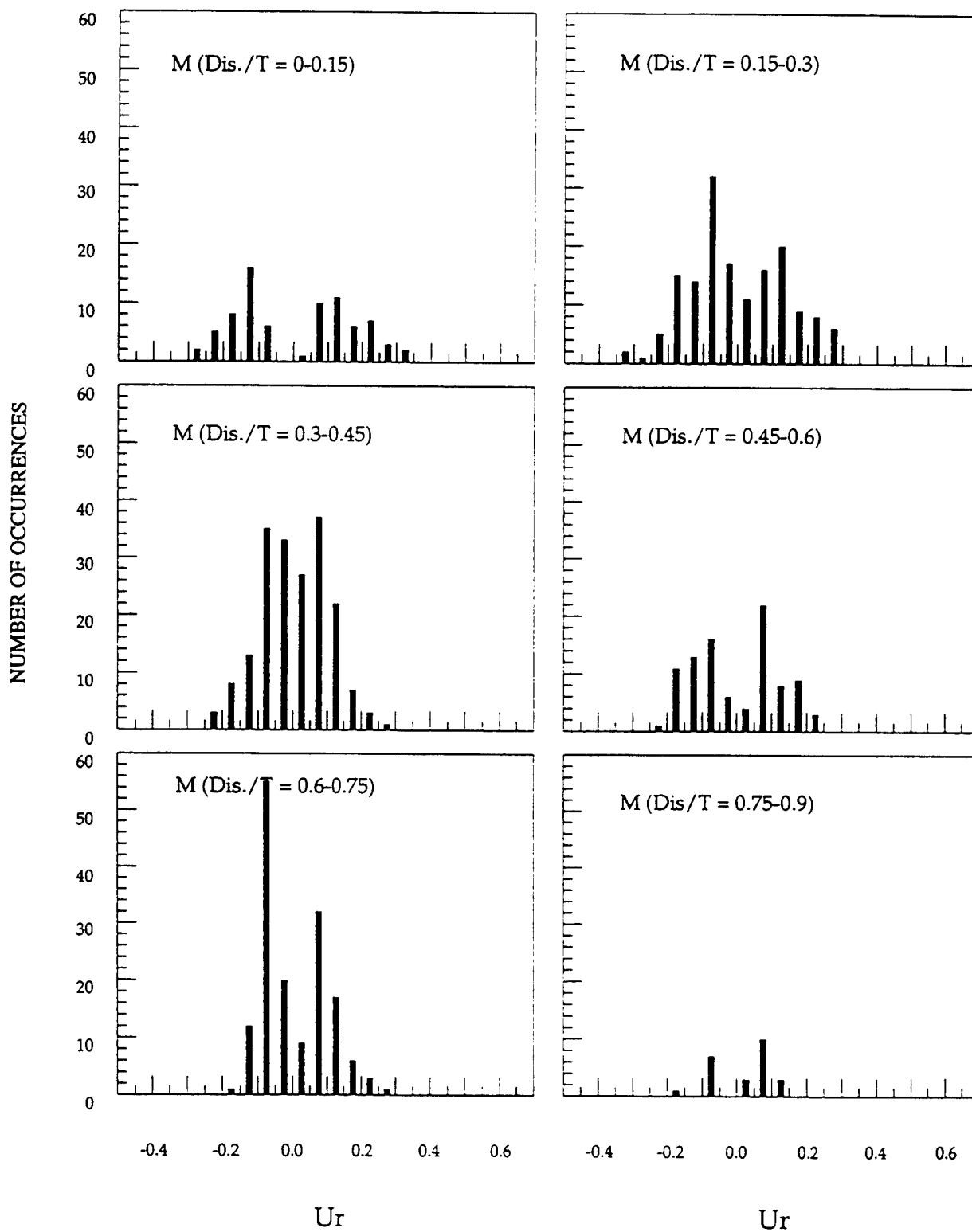
XXI-7. Histograms of  $U_{r(max)}$  within various zones, Kampsville, trip 2  
 ( $U_{r(max)}$  carries signs to indicate an upstream- or downstream-bound barge effect)



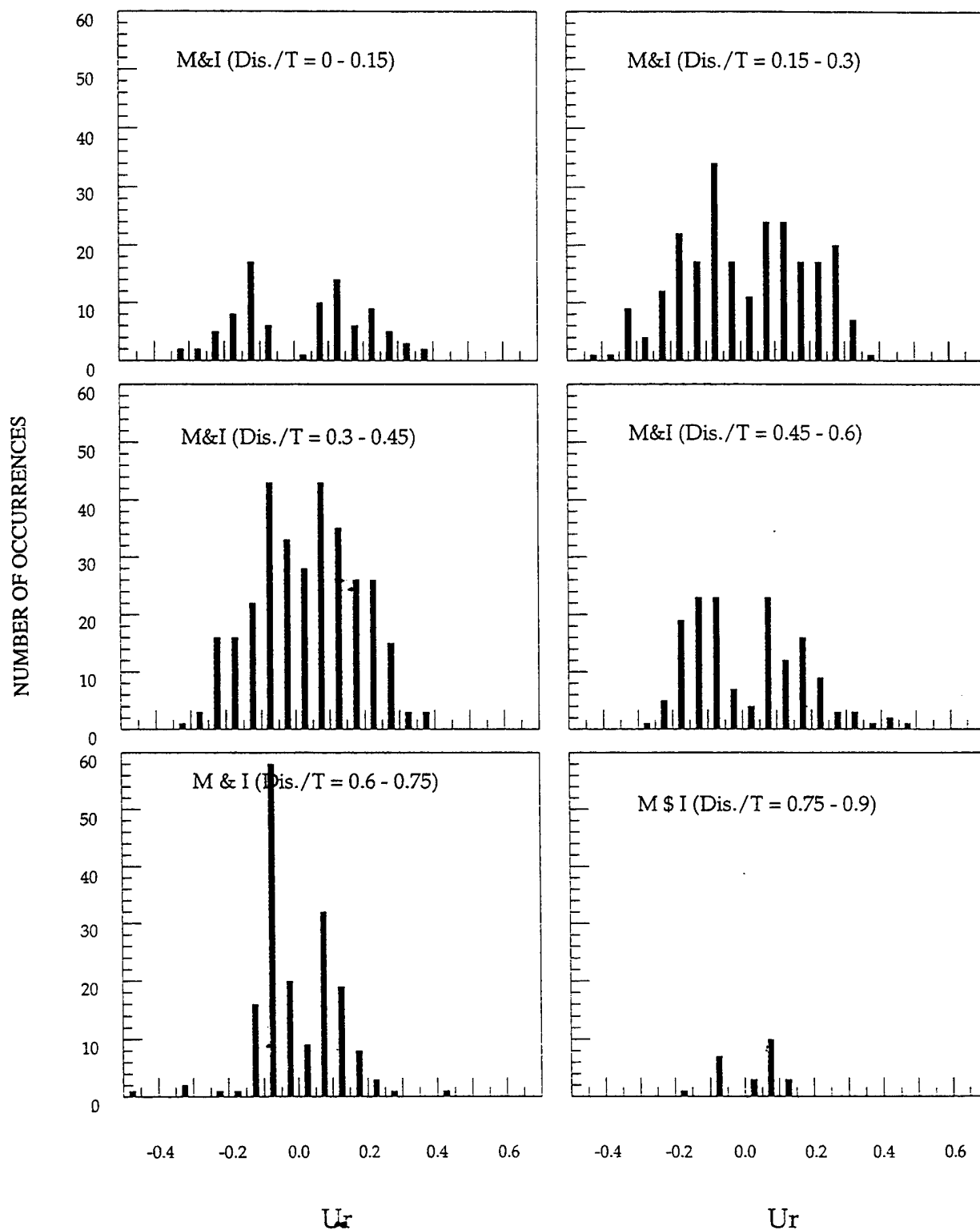
XXI-8. Histograms of  $U_{r(max)}$  within various zones, Clarks Ferry, trip 2  
 ( $U_{r(max)}$  carries signs to indicate an upstream- or downstream-bound barge effect)



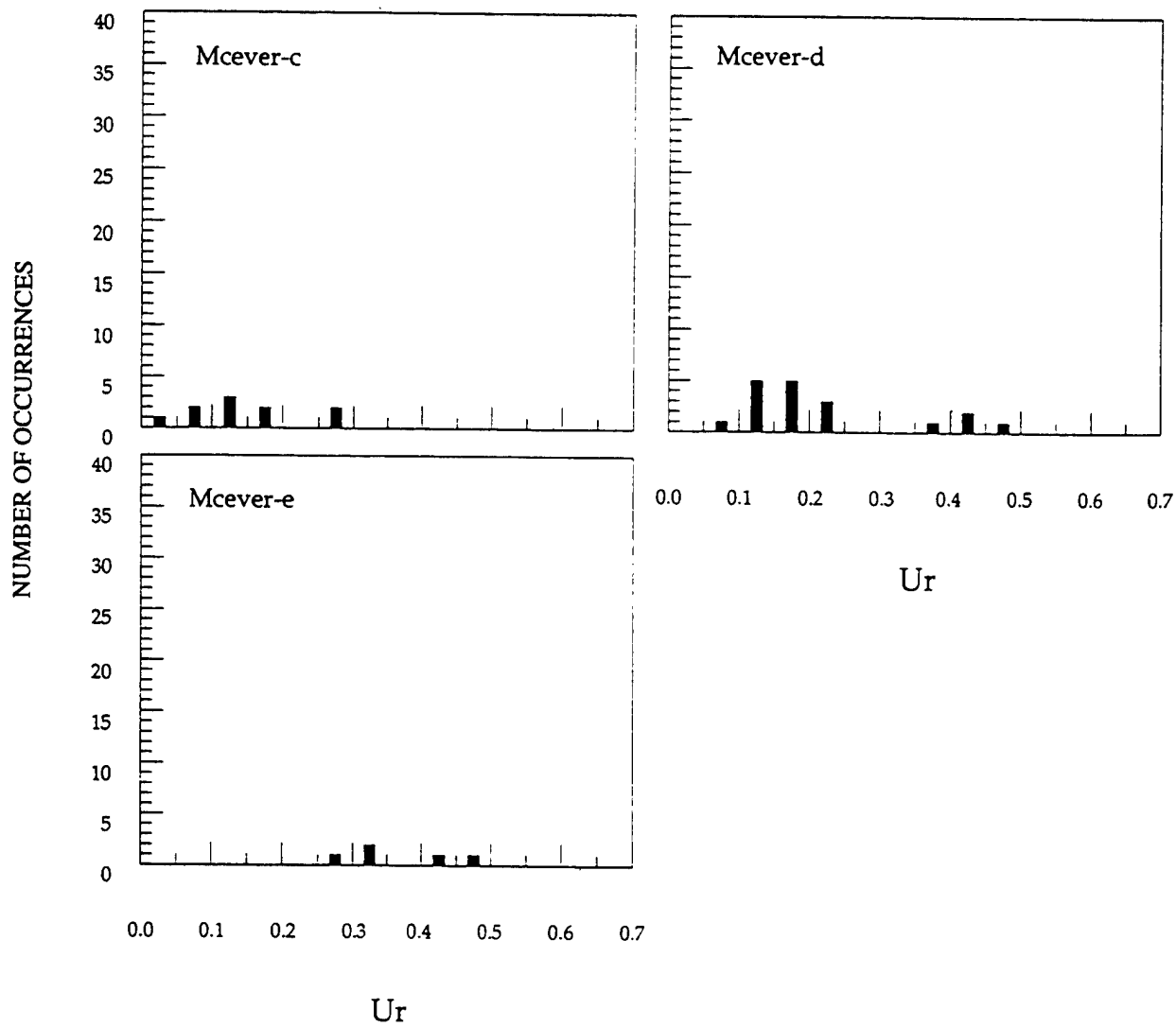
XXI-9. Histograms of  $U_{r(max)}$  within various zones, Illinois River  
 ( $U_{r(max)}$  carries signs to indicate an upstream- or downstream-bound barge effect)



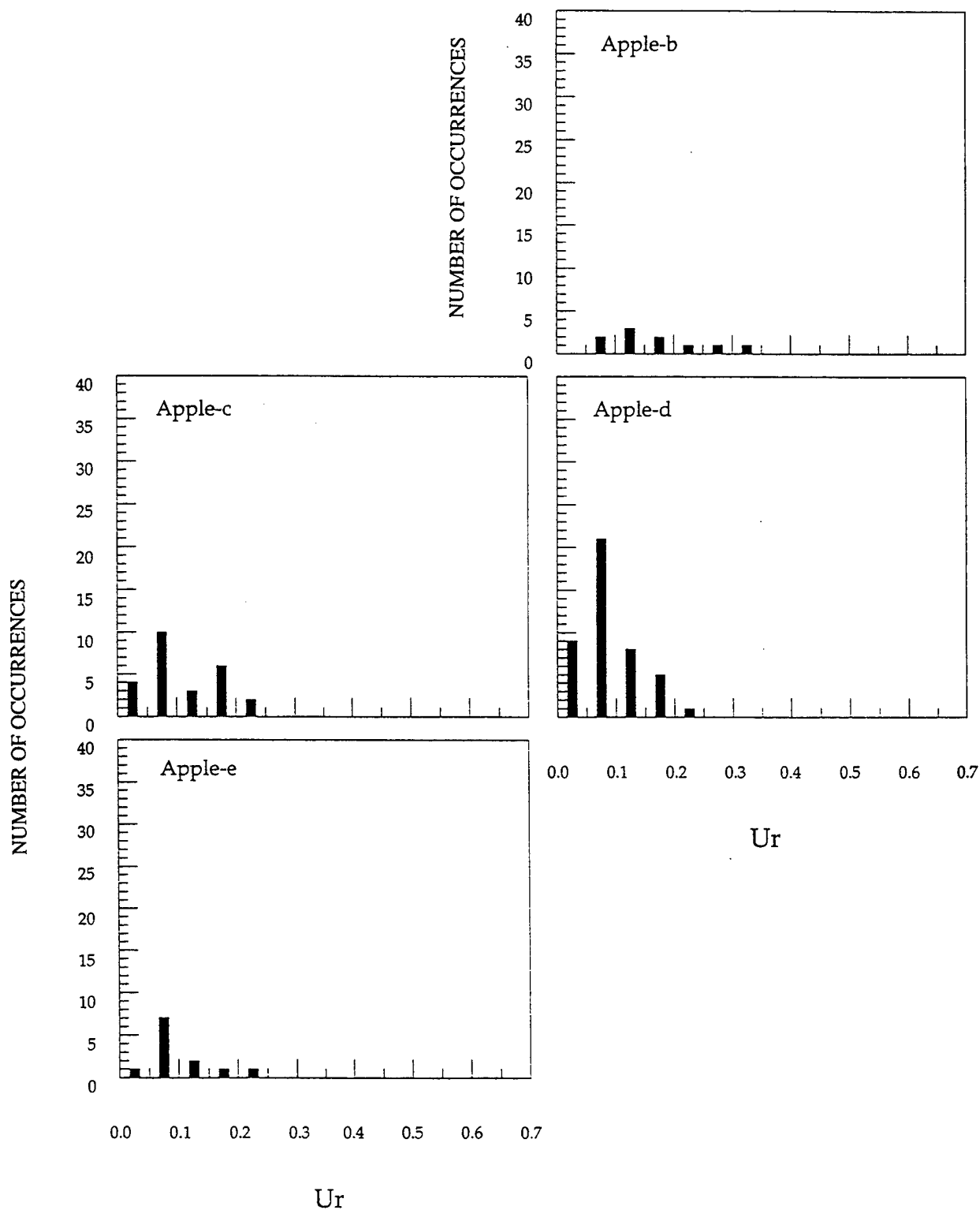
XXI-10. Histograms of  $U_{r(max)}$  within various zones, Mississippi River  
 ( $U_{r(max)}$  carries signs to indicate an upstream- or downstream-bound barge effect)



XXI-11. Histograms of  $U_{r(max)}$  within various zones, Illinois and Mississippi Rivers  
 (  $U_{r(max)}$  carries signs to indicate an upstream- or downstream-bound barge effect)

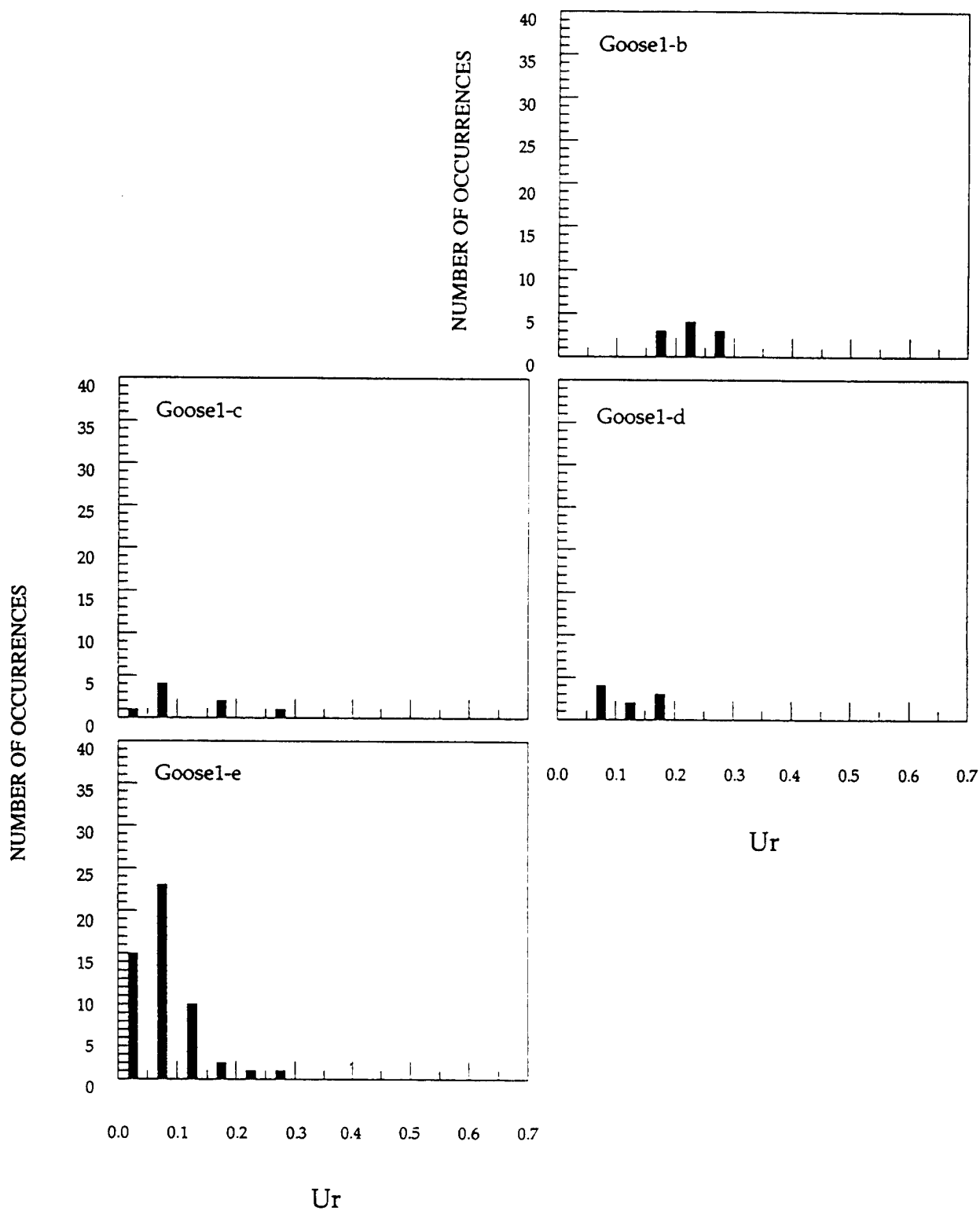


XXI-12. Histograms of absolute  $U_{r(max)}$  within various zones, McEver's Island

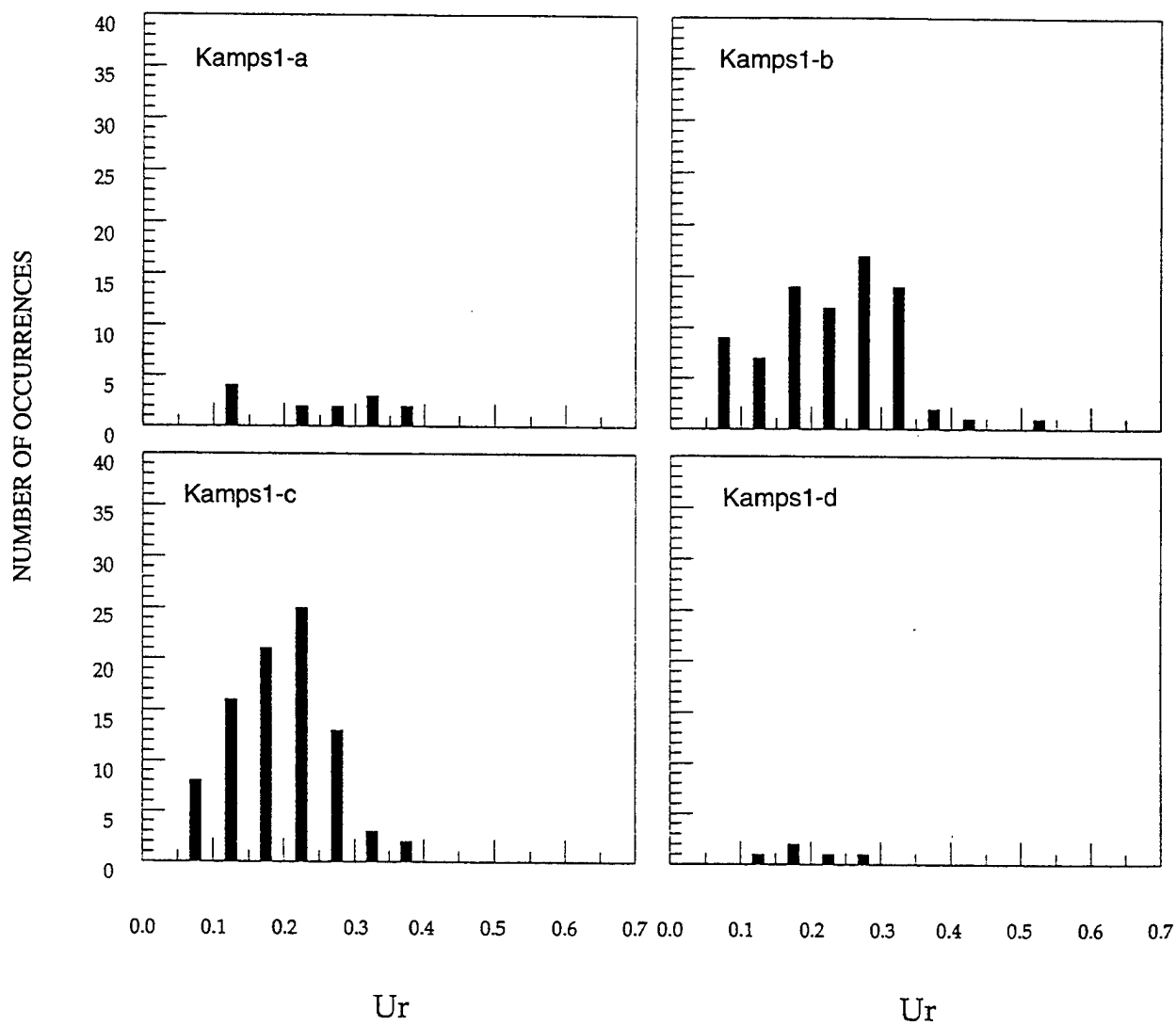


XXI-13. Histograms of absolute  $U_{r(max)}$  within various zones, Apple River Island

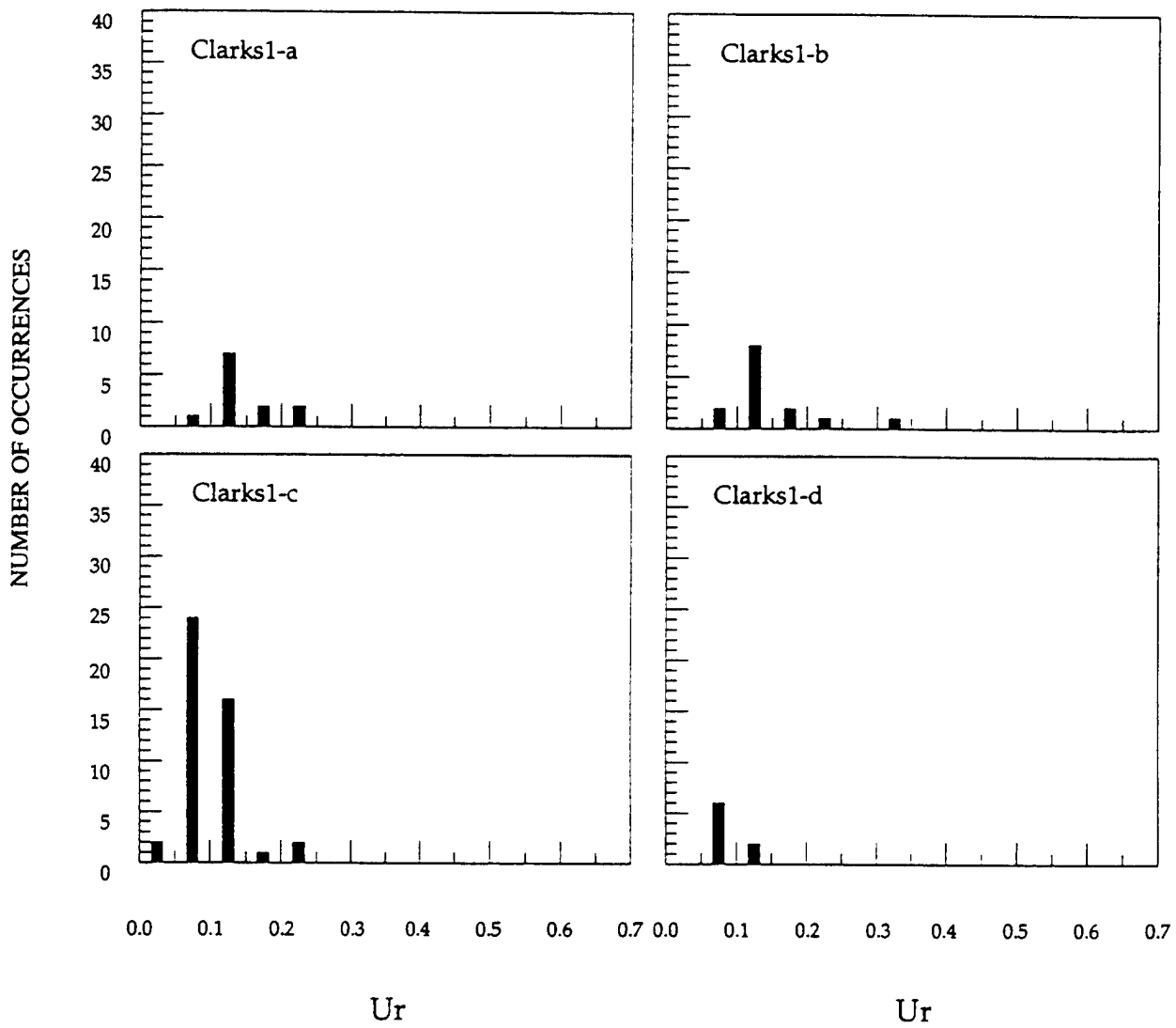




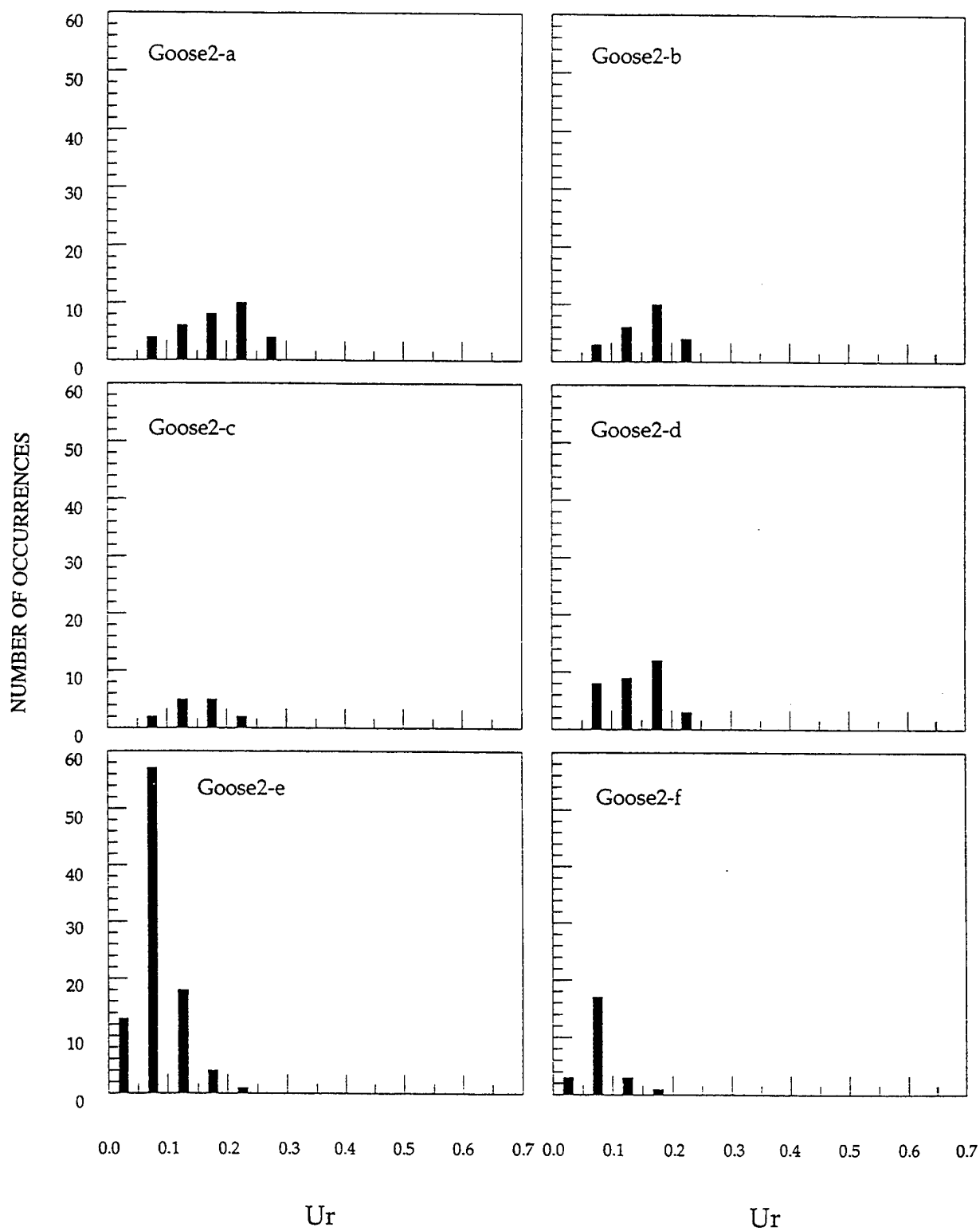
XXI-14. Histograms of absolute  $U_{r(max)}$  within various zones, Goose Island, trip 1



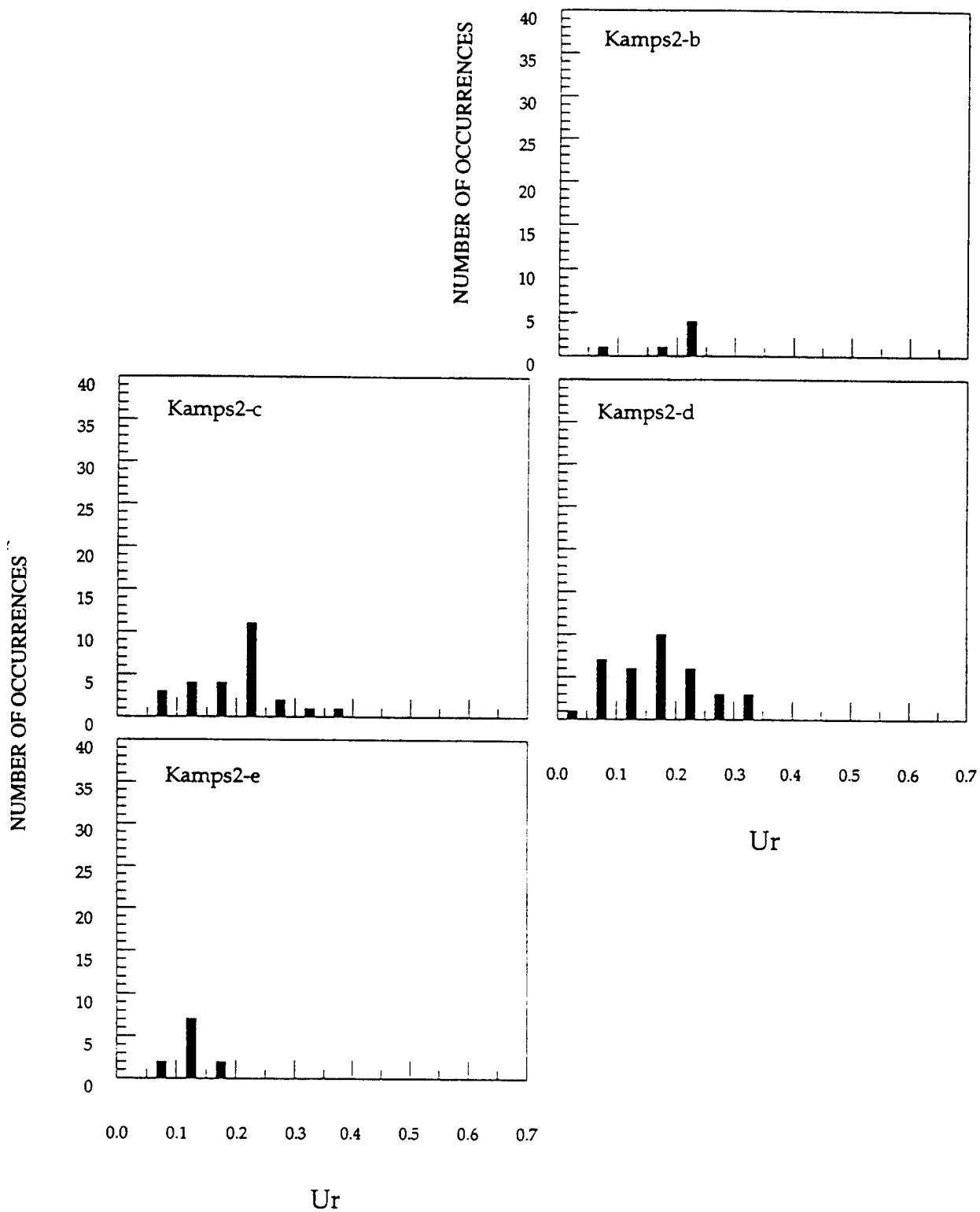
XXI-15. Histograms of absolute  $U_{r(max)}$  within various zones, Kampsville, trip 1



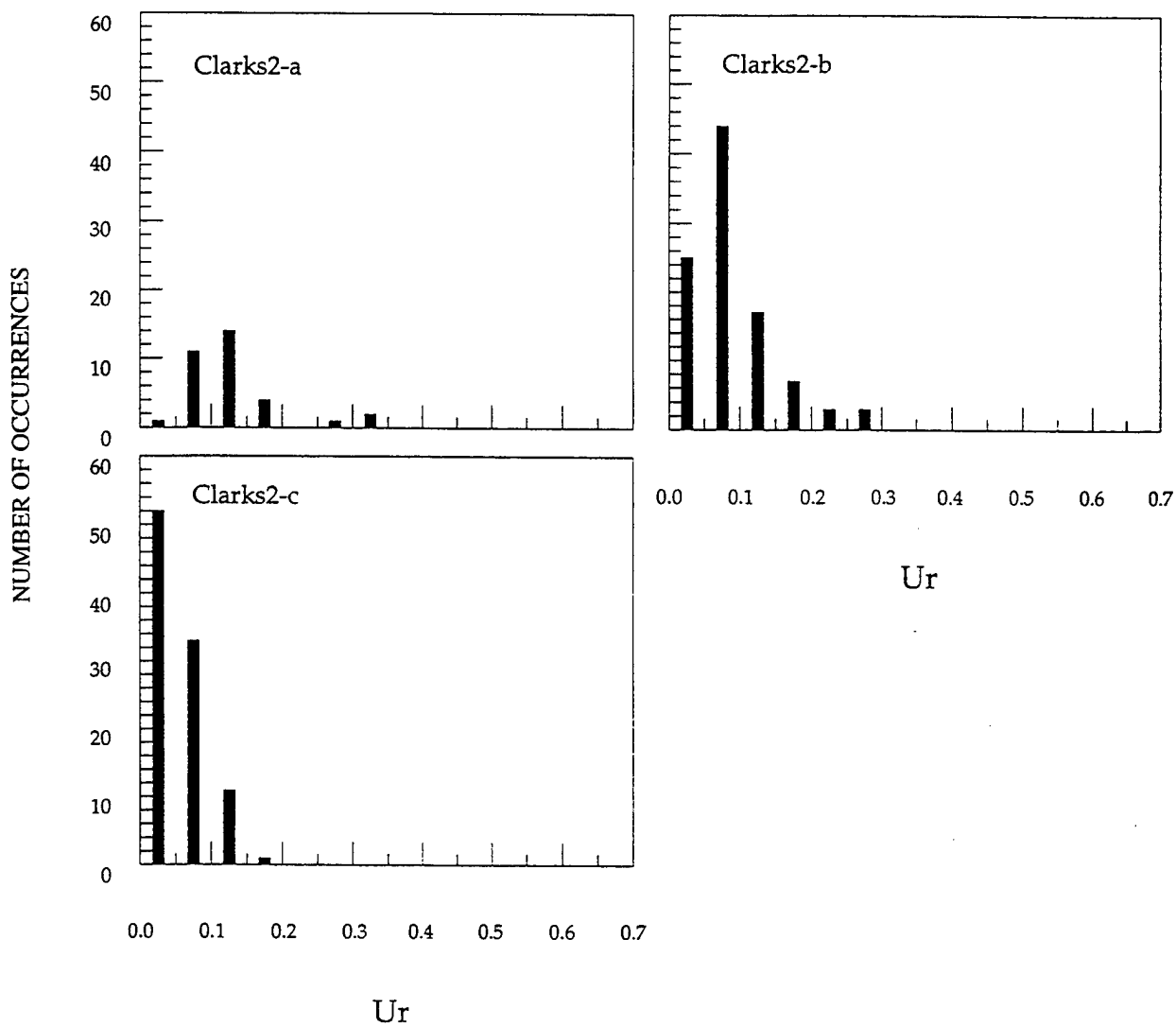
XXI-16. Histograms of absolute  $U_{r(max)}$  within various zones, Clarks Ferry, trip 1



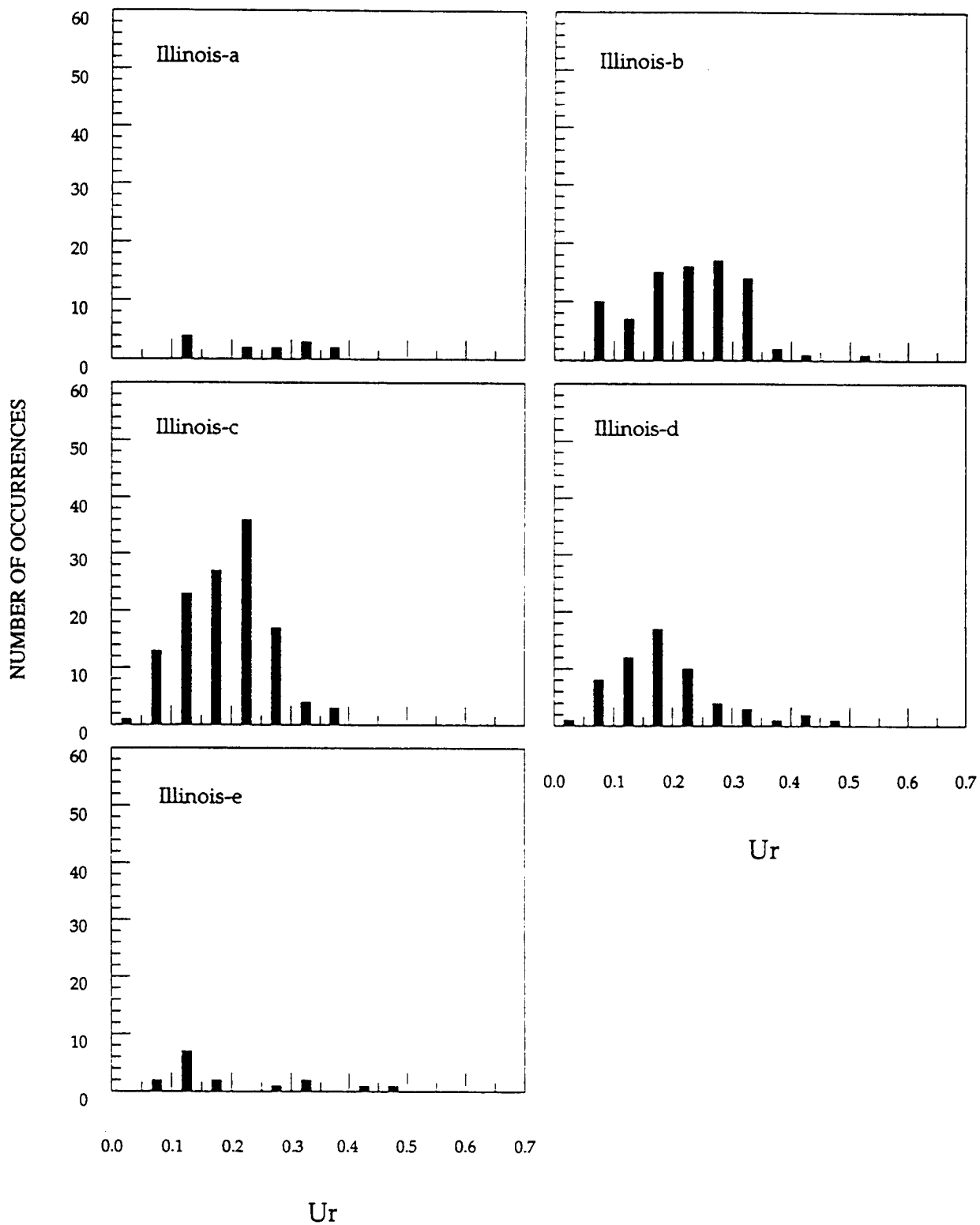
XXI-17. Histograms of absolute  $U_{r(max)}$  within various zones, Goose Island, trip 2



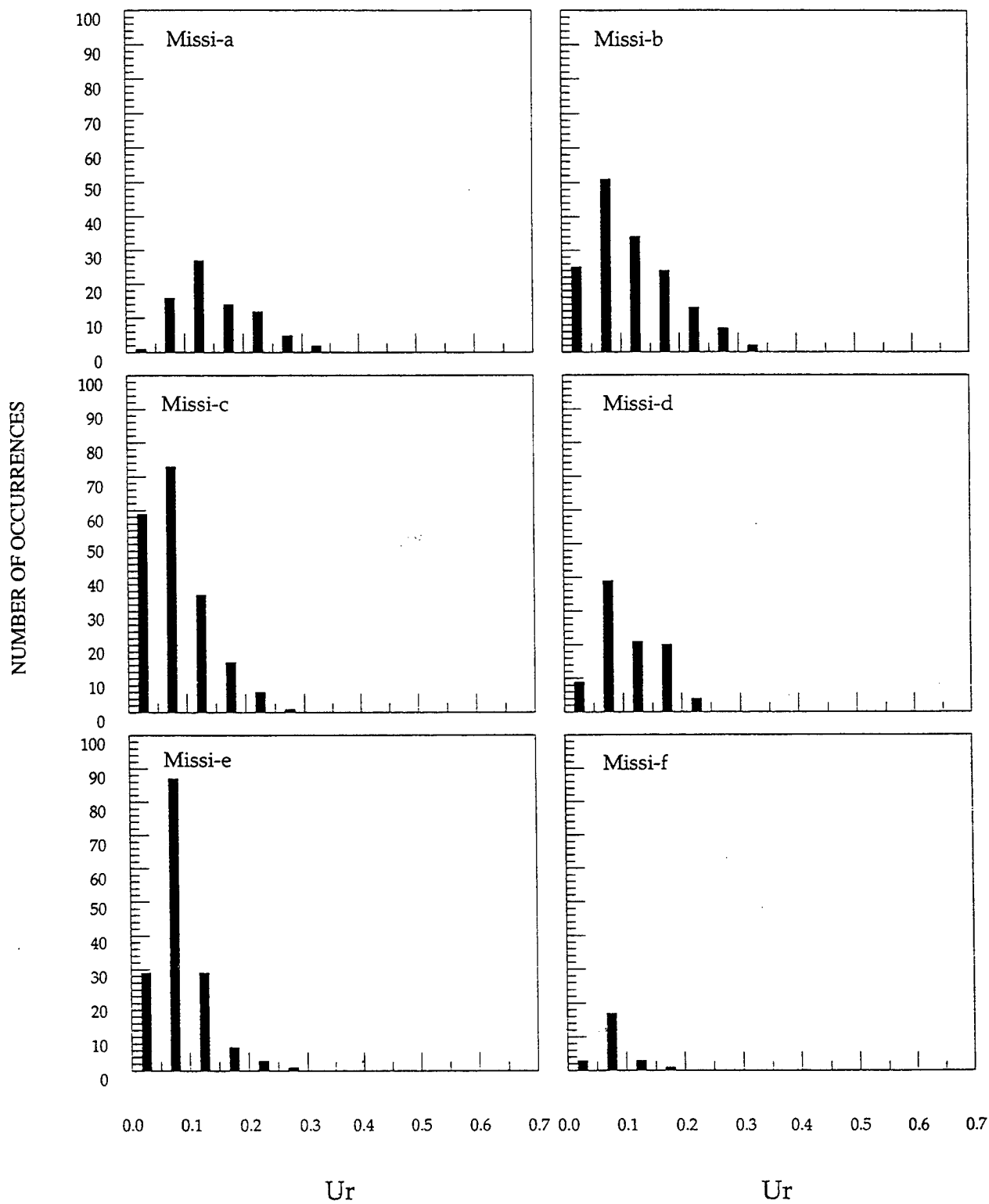
XXI-18. Histograms of absolute  $U_{r(max)}$  within various zones, Kampsville, trip 2



XXI-19. Histograms of absolute  $U_{r(max)}$  within various zones, Clarks Ferry, trip 2



XXI-20. Histograms of absolute  $U_{r(max)}$  within various zones, Illinois River



XXI-21. Histograms of absolute  $U_{r(max)}$  within various zones, Mississippi River



**APPENDIX XXII.**

**SAMPLE PLOTS OF WAVES AND DRAWDOWN GENERATED  
BY NAVIGATION TRAFFIC**

Jeff Boat

MEAN = 1.29

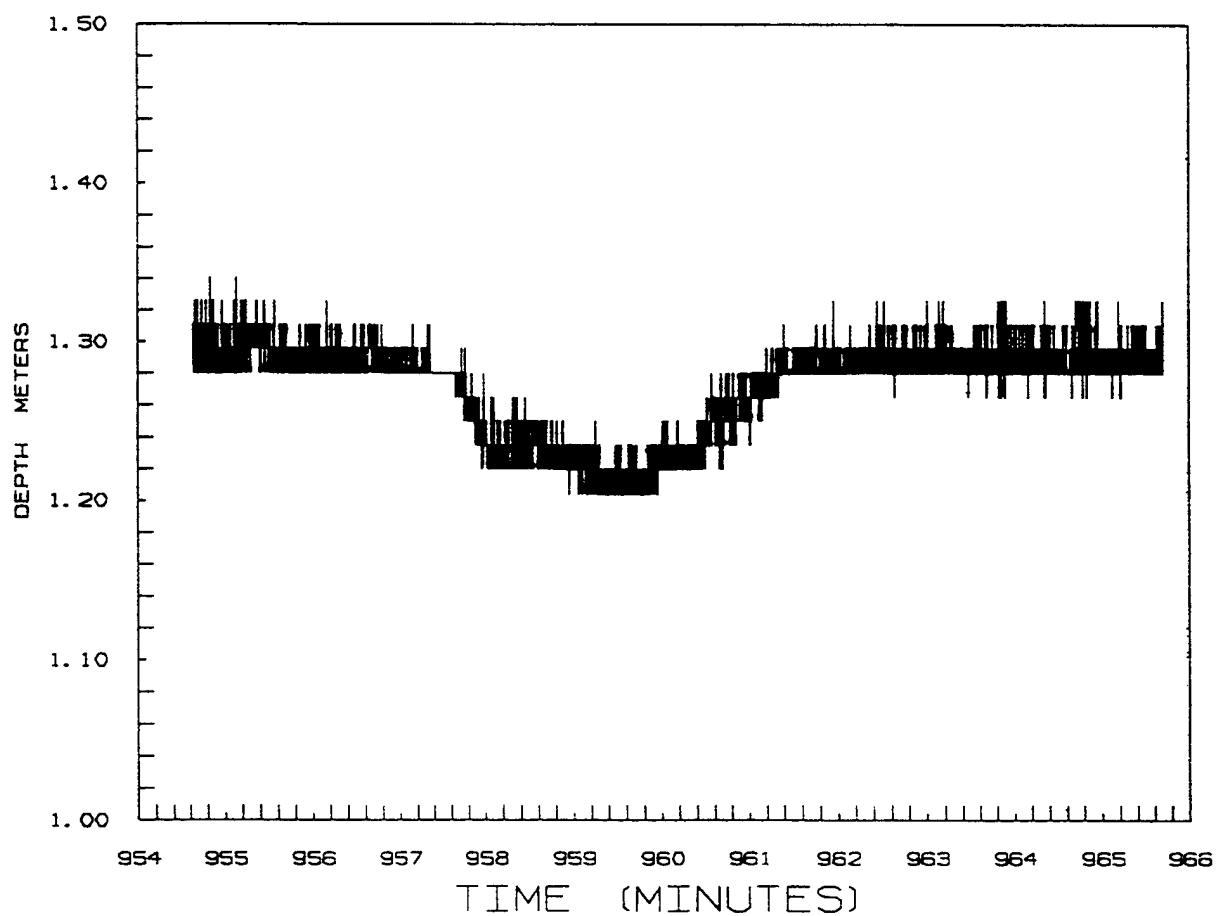
At: Kampsville (1)

VMAX = 1.34 TMAX = 954.84

date:10/14/90

VMIN = 1.20 TMIN = 958.95

time:15:57



XXII-1. Measured drawdown and waves for barge *Jeff Boat* at Kampsville, trip 1

Irving Crown

MEAN = 0.99

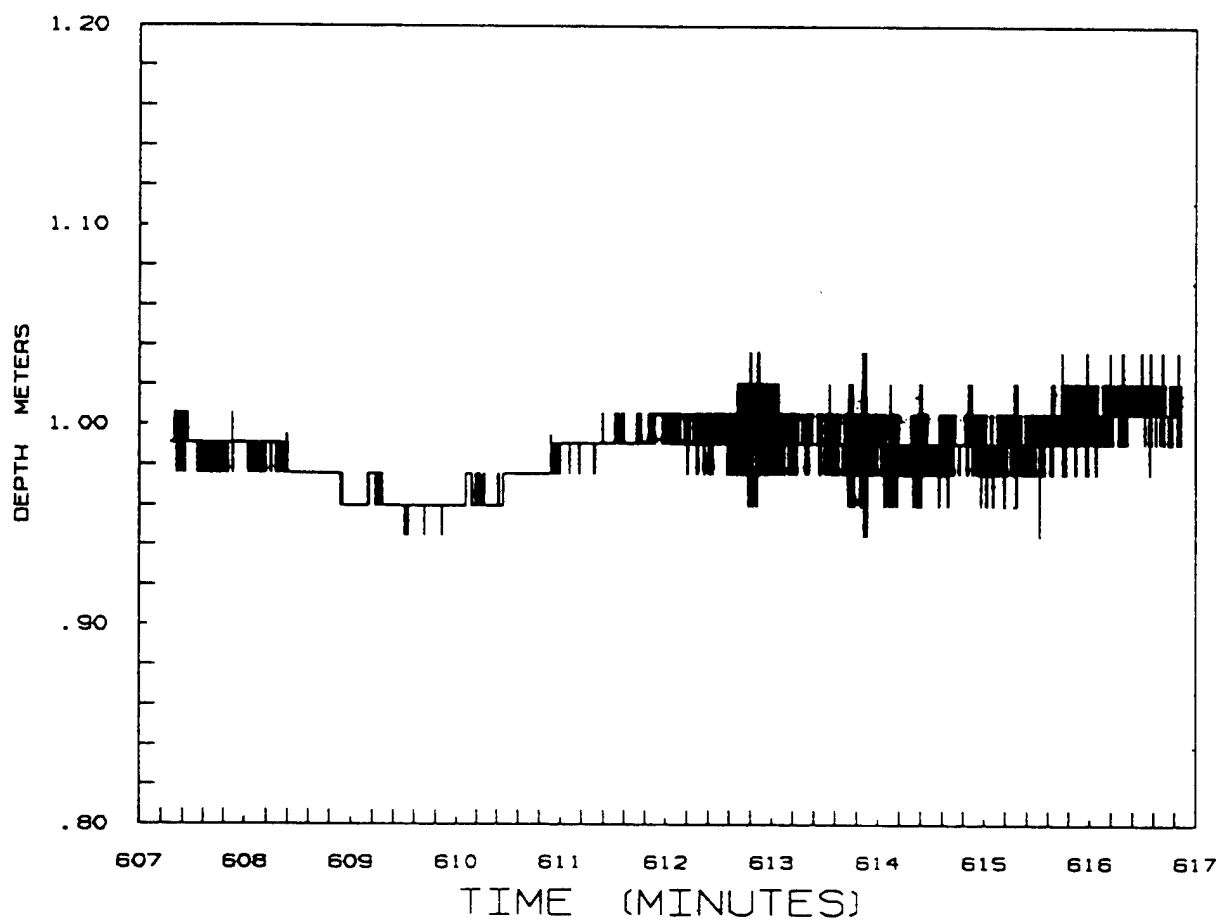
At: Kampsville (2)

VMAX = 1.04 TMAX = 612.79

date:8/14/91

VMIN = 0.95 TMIN = 609.50

time:10:08



XXII-2. Measured drawdown and waves for barge *Irving Crown* at Kampsville, trip 2

American Beauty

MEAN = 0.94

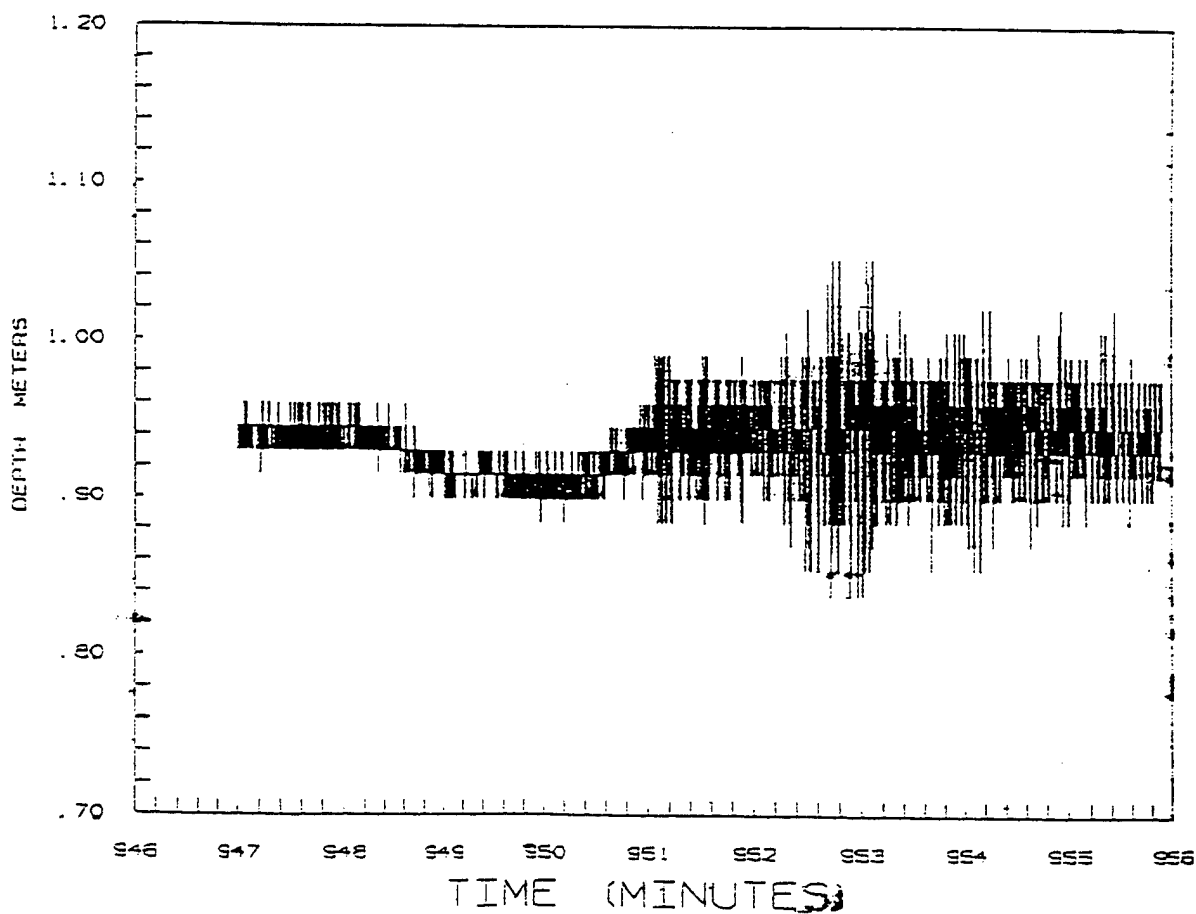
At: Clarks Ferry (1)

VMAX = 1.05 TMAX = 952.73

date:05/20/91

VMIN = 0.84 TMIN = 952.71

time:15:48:23



XXII-3. Measured drawdown and waves for barge *American Beauty* at Clarks Ferry, trip 1

Hugh C. Blaske

MEAN = 0.74

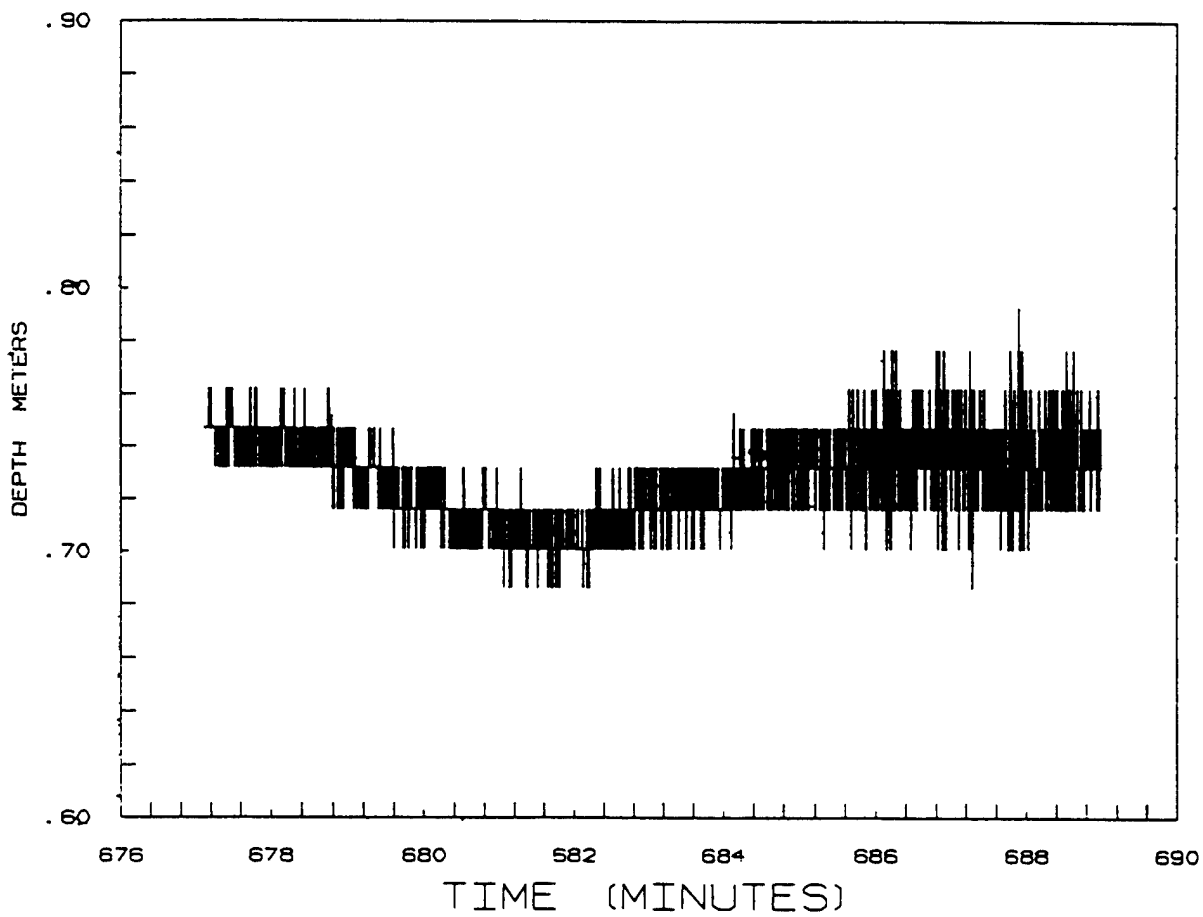
At: Goose Island

VMAX = 0.79 TMAX = 687.90

date:08/25/90

VMIN = 0.69 TMIN = 681.06

time:11:19



XXII-4. Measured drawdown and waves for barge *Hugh C. Blaske* at Goose Island, trip 1

James F. Neal

MEAN = 0.63

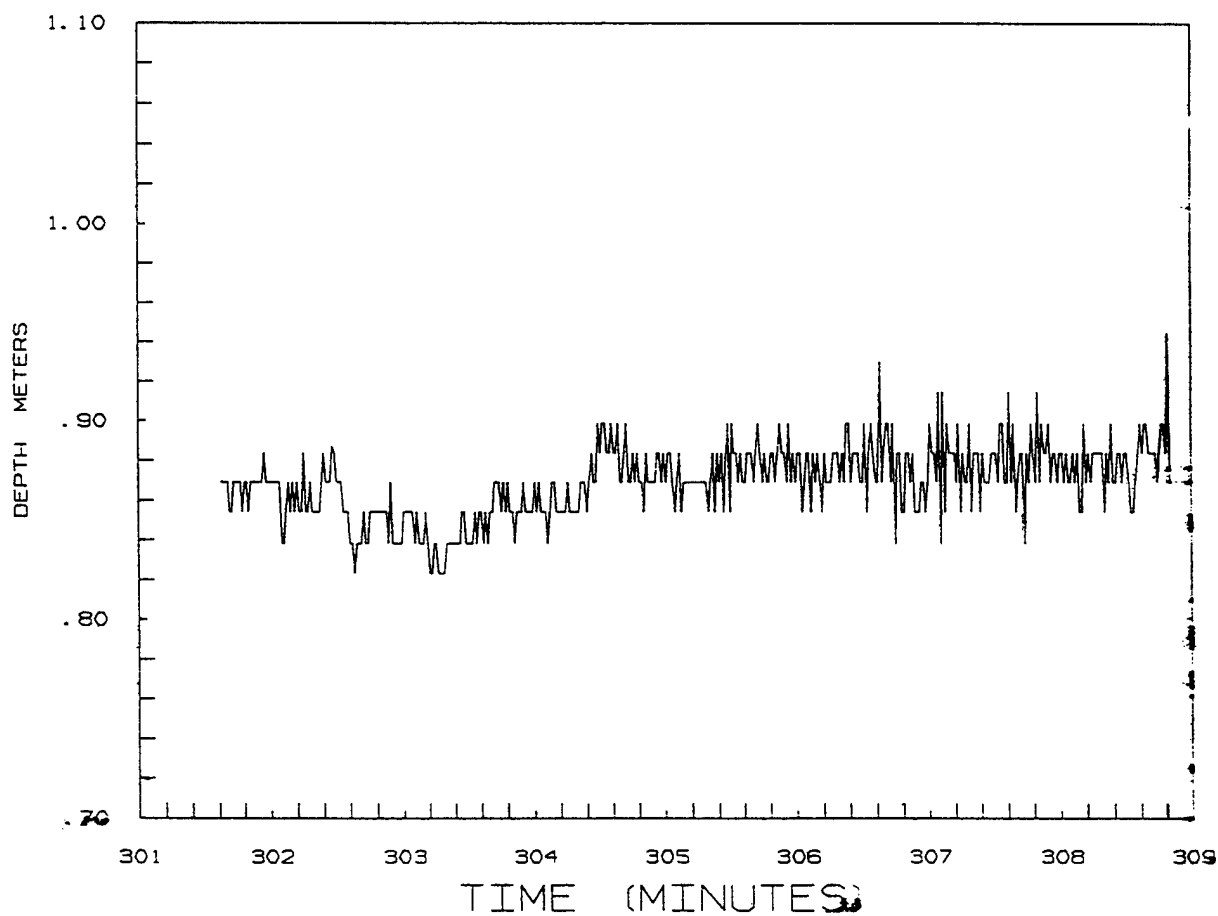
At: Goose Island

VMAX = 0.95 TMAX = 308.81

date:07/18/91

VMIN = 0.82 TMIN = 302.64

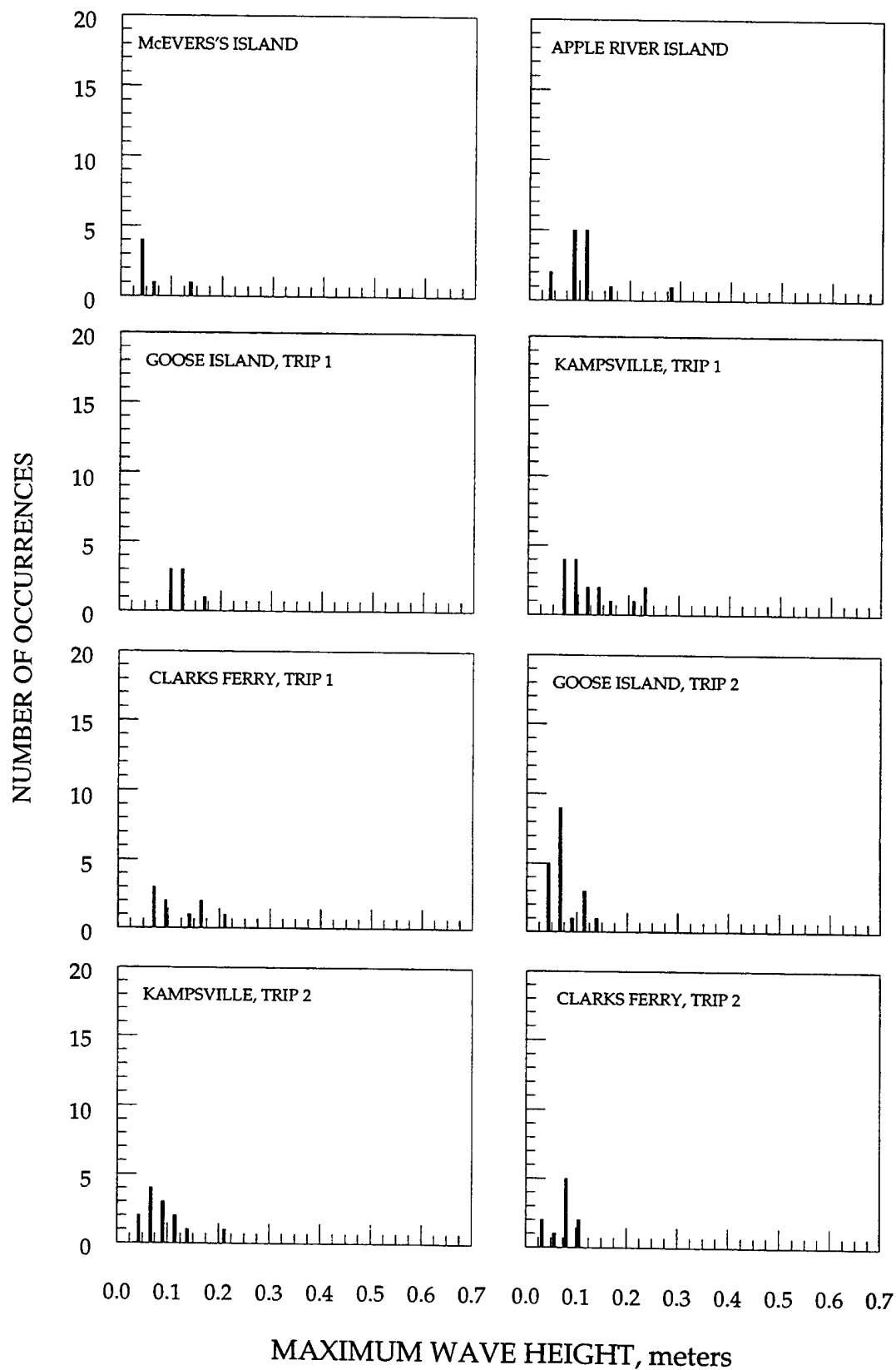
time:14:17



XXII-5. Measured drawdown and waves for barge *James F. Neal* at Goose Island, trip 2

**APPENDIX XXIII.**  
**HISTOGRAMS OF MAXIMUM WAVE HEIGHT**

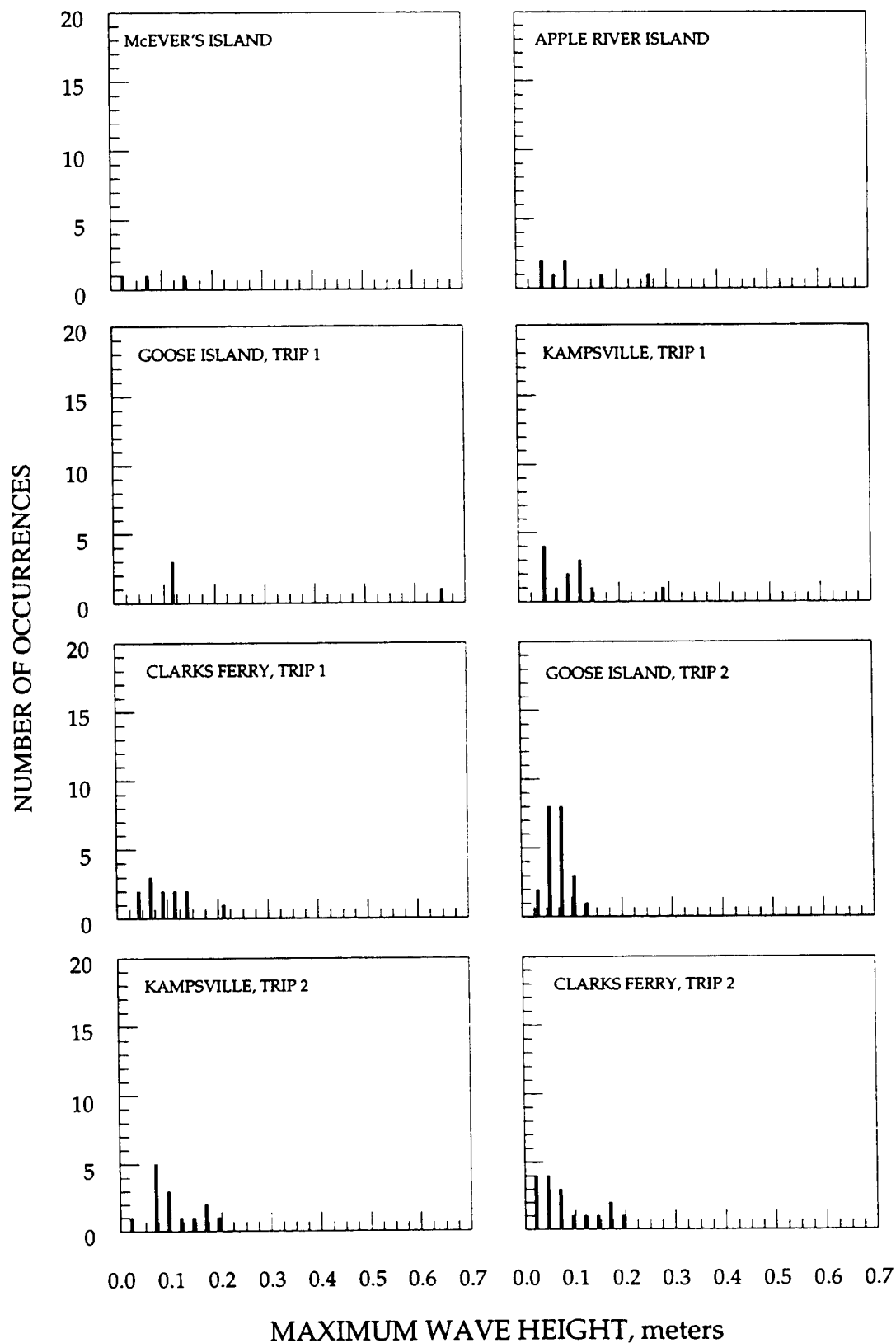
# UPSTREAM BARGES



XXIII-1. Histograms of maximum wave height, upstream barges

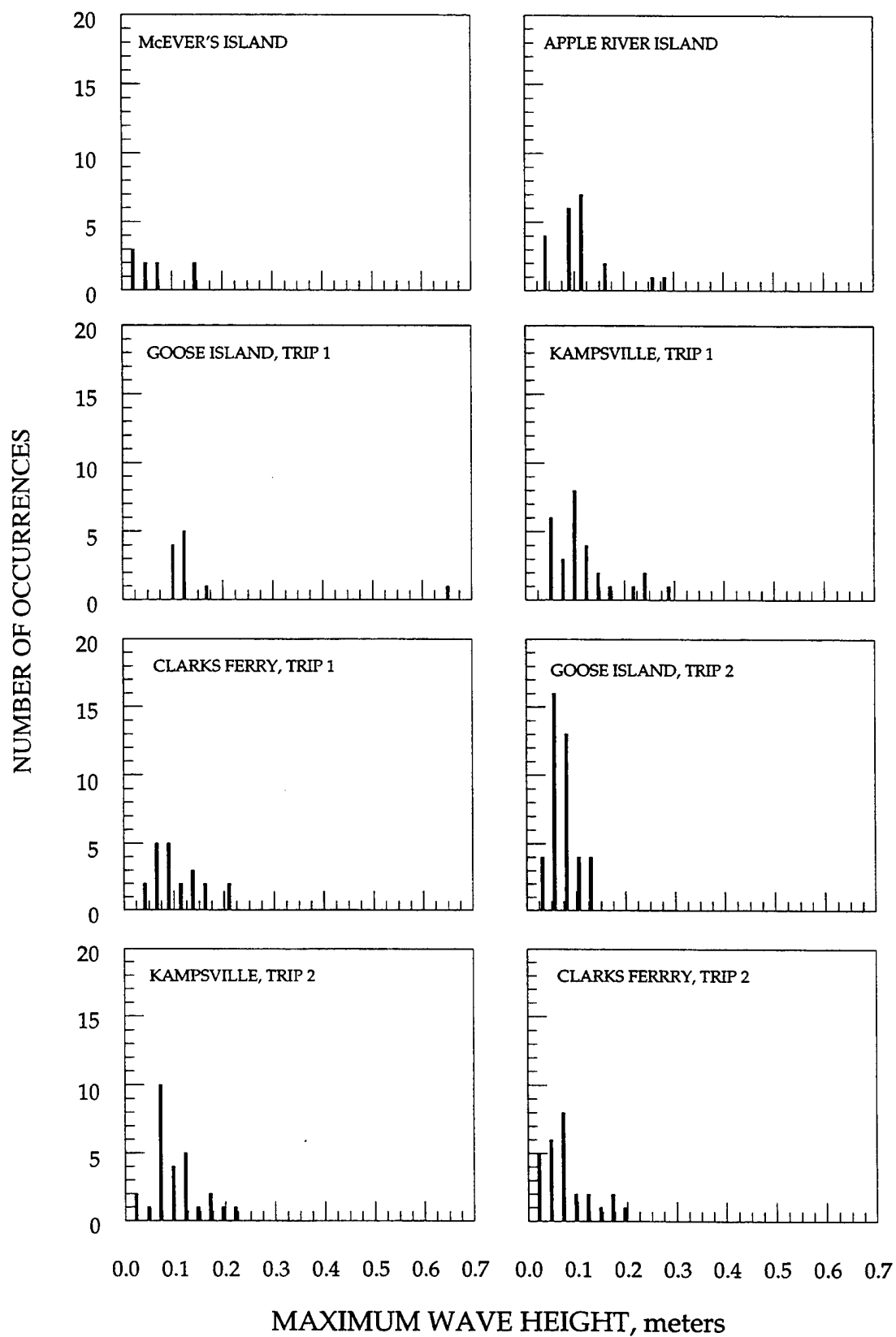


# DOWNSTREAM BARGES

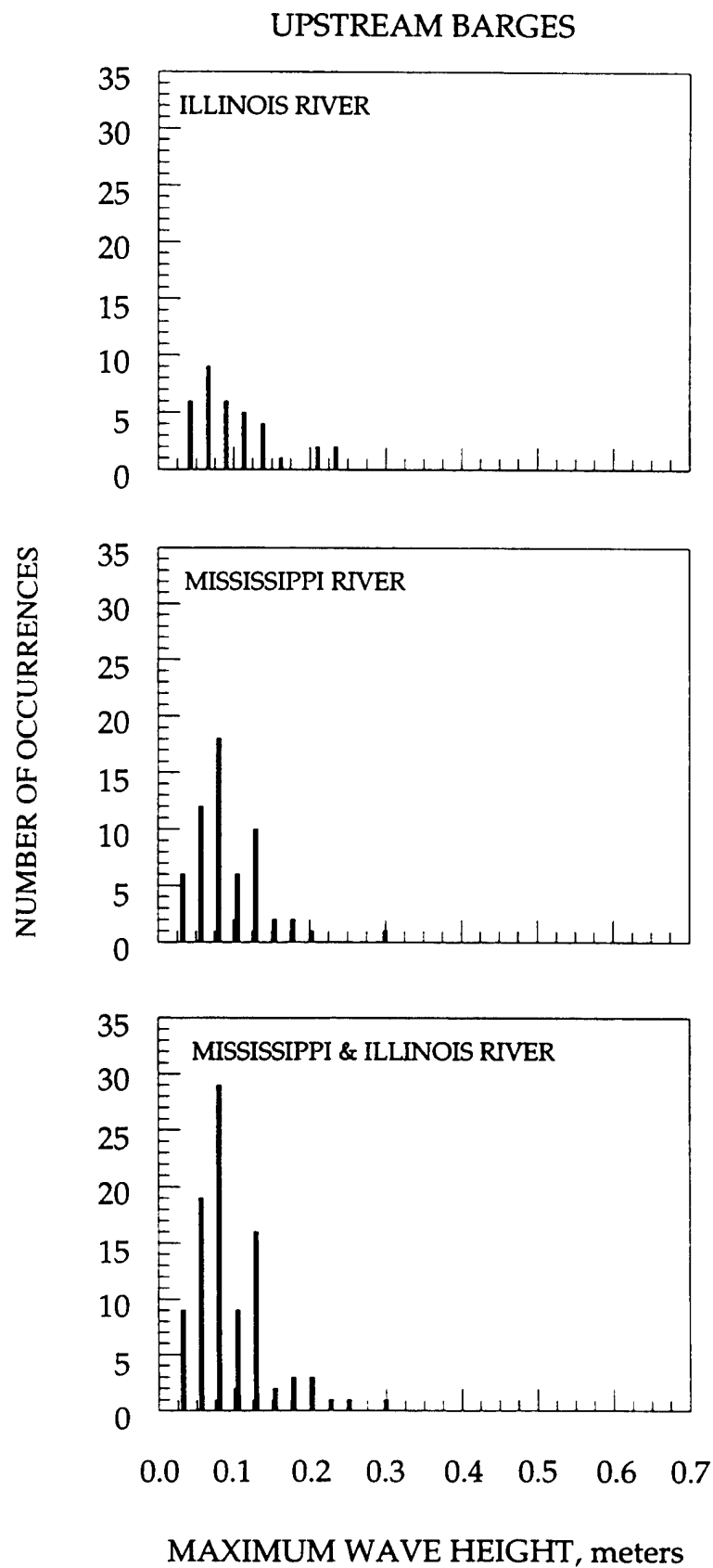


XXIII-2. Histograms of maximum wave height, downstream barges

# ALL BARGES

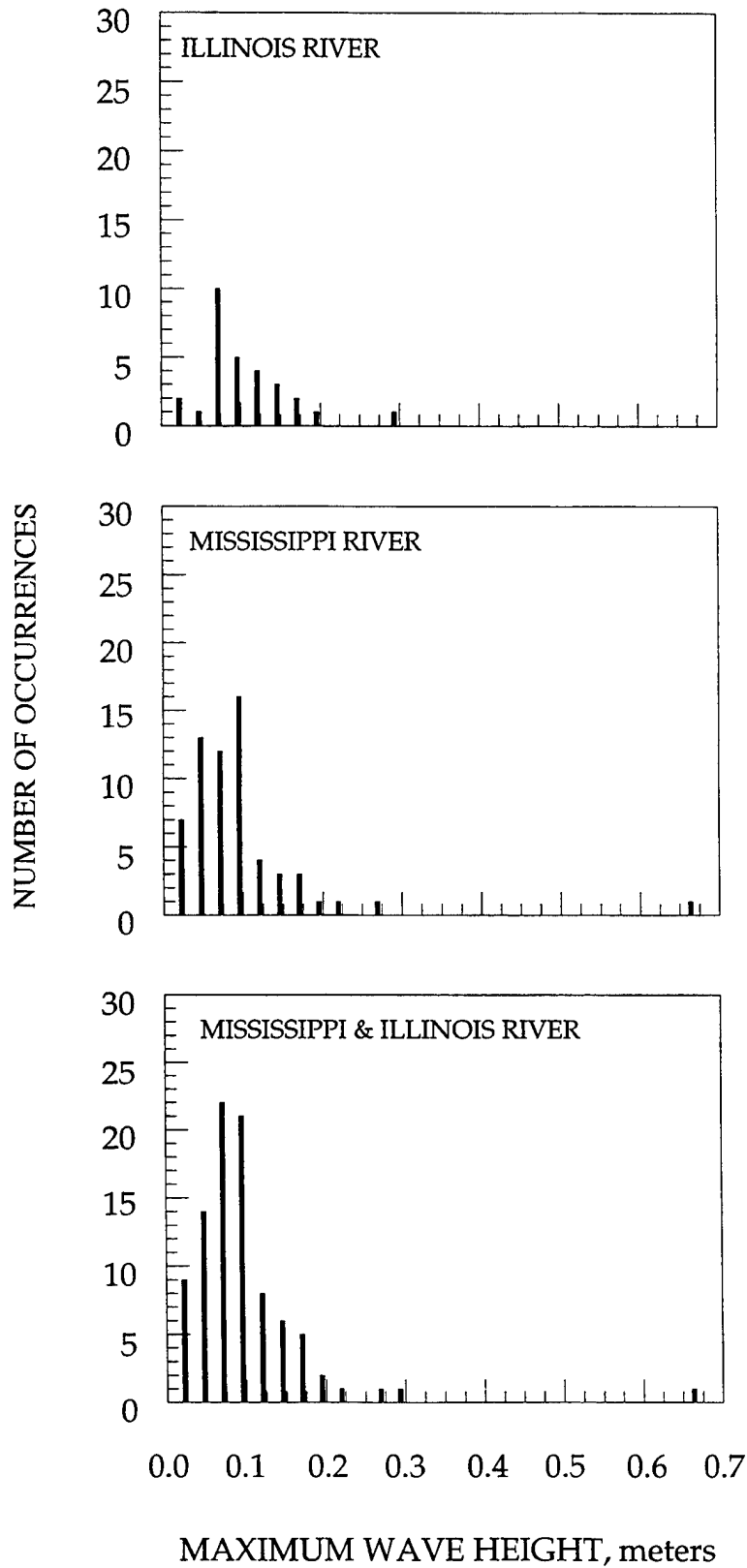


XXIII-3. Histograms of maximum wave height, all barges



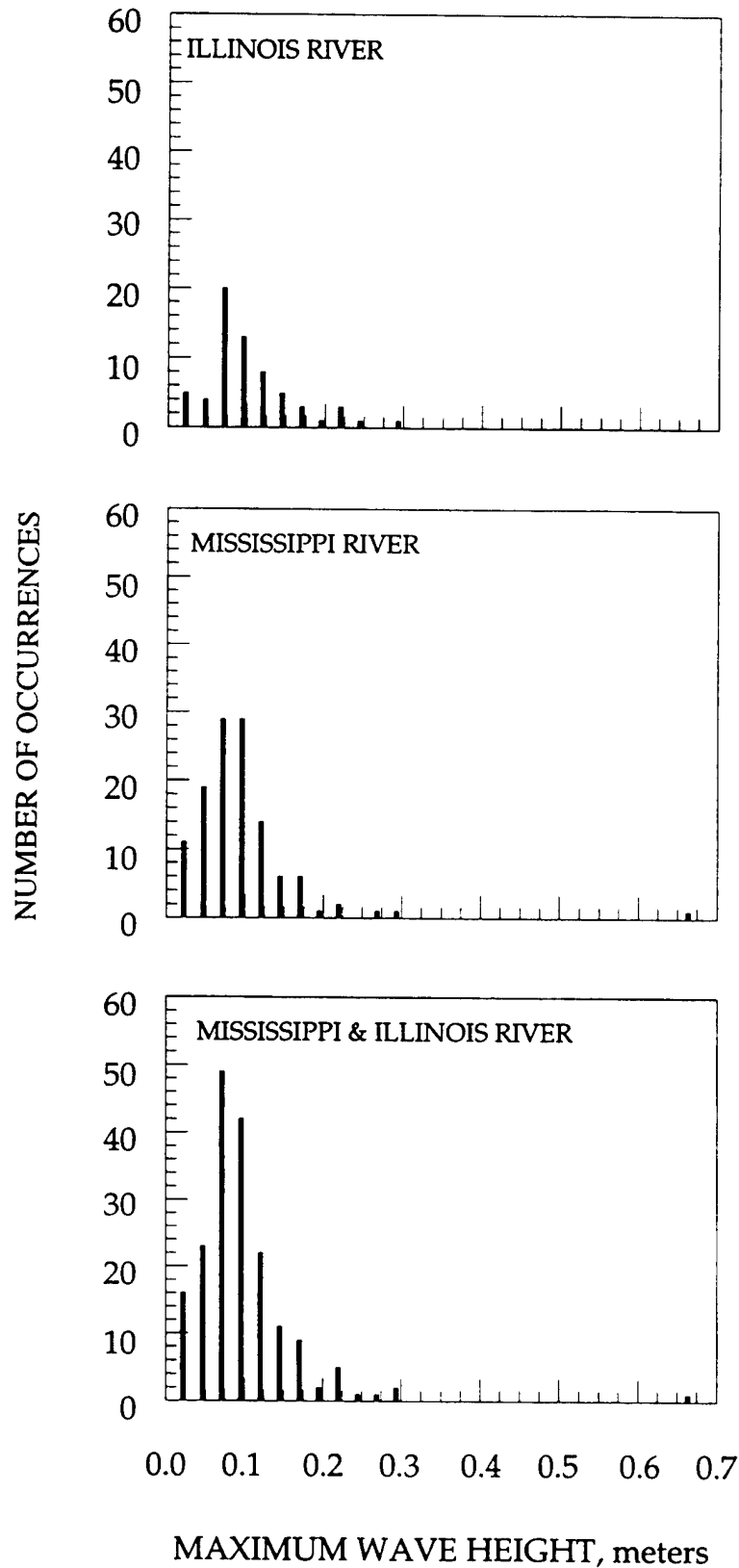
XXIII-4. Histograms of maximum wave height for the river system, upstream barges

# DOWNSTREAM BARGES



XXIII-5. Histograms of maximum wave height for the river system, downstream barges

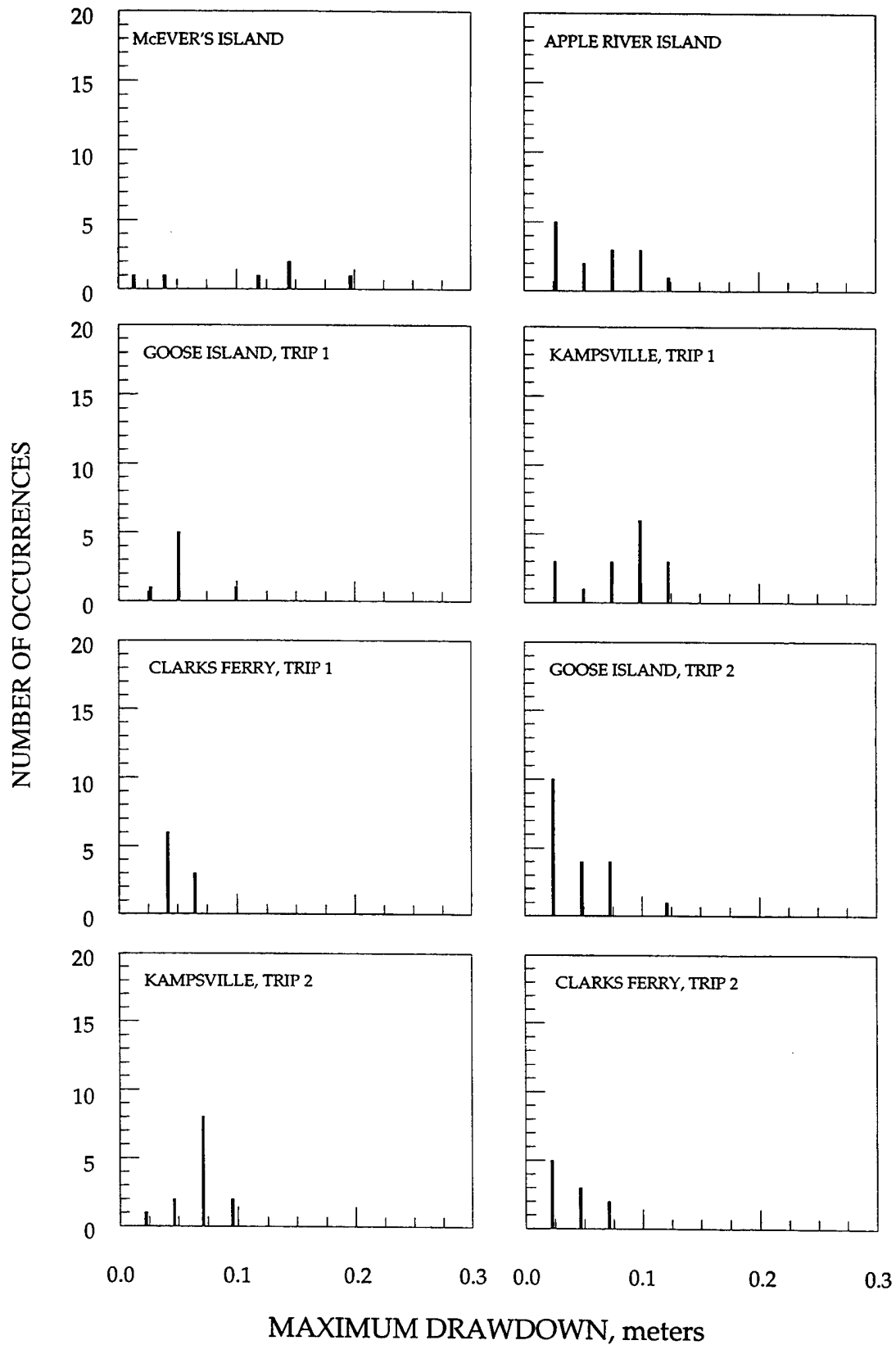
# ALL BARGES



XXIII-6. Histograms of maximum wave height for the river system, all barges

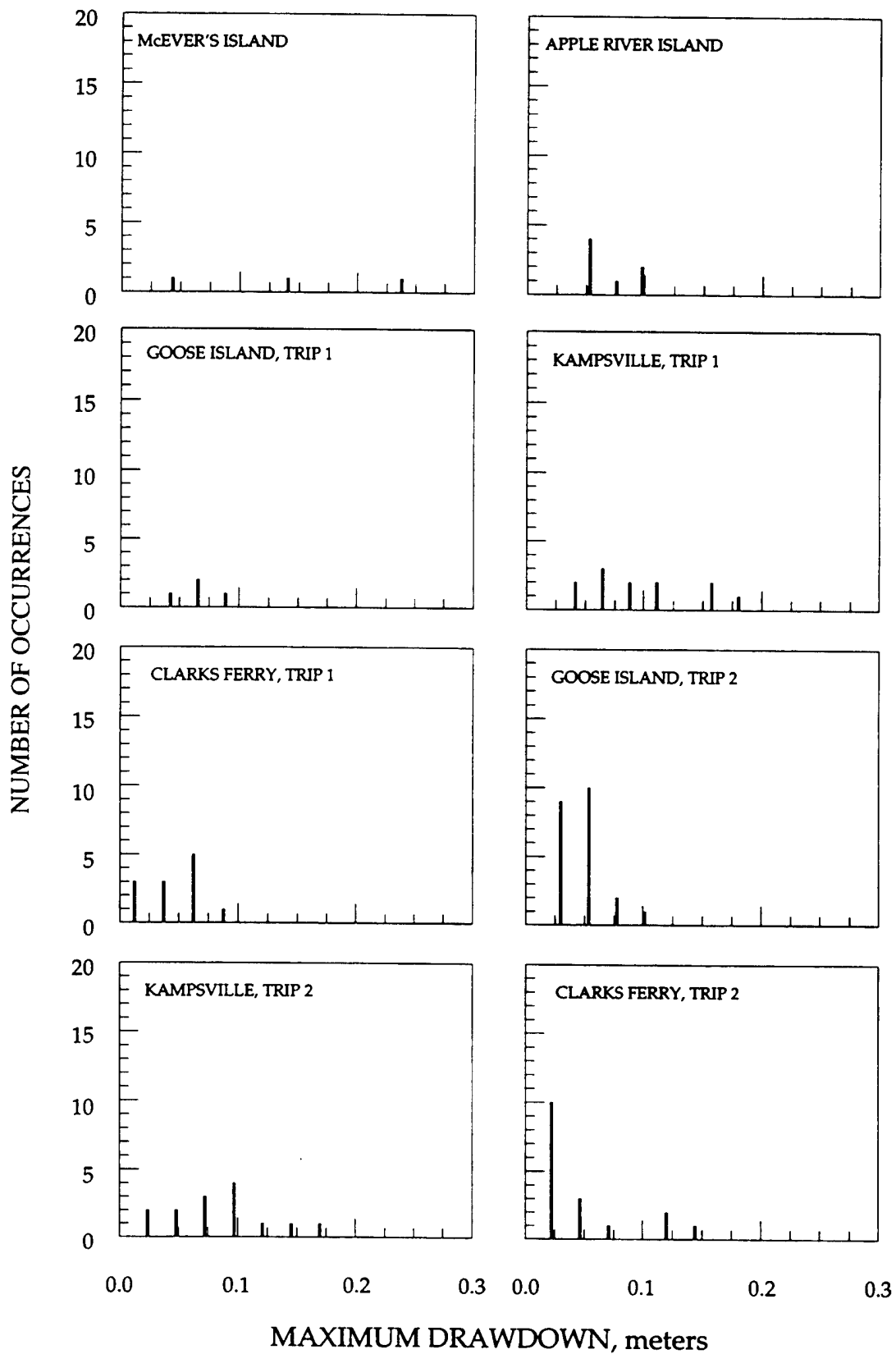
**APPENDIX XXIV.**  
**HISTOGRAMS OF MAXIMUM DRAWDOWN**

# UPSTREAM BARGES



XXIV-1. Histograms of maximum drawdown, upstream barges

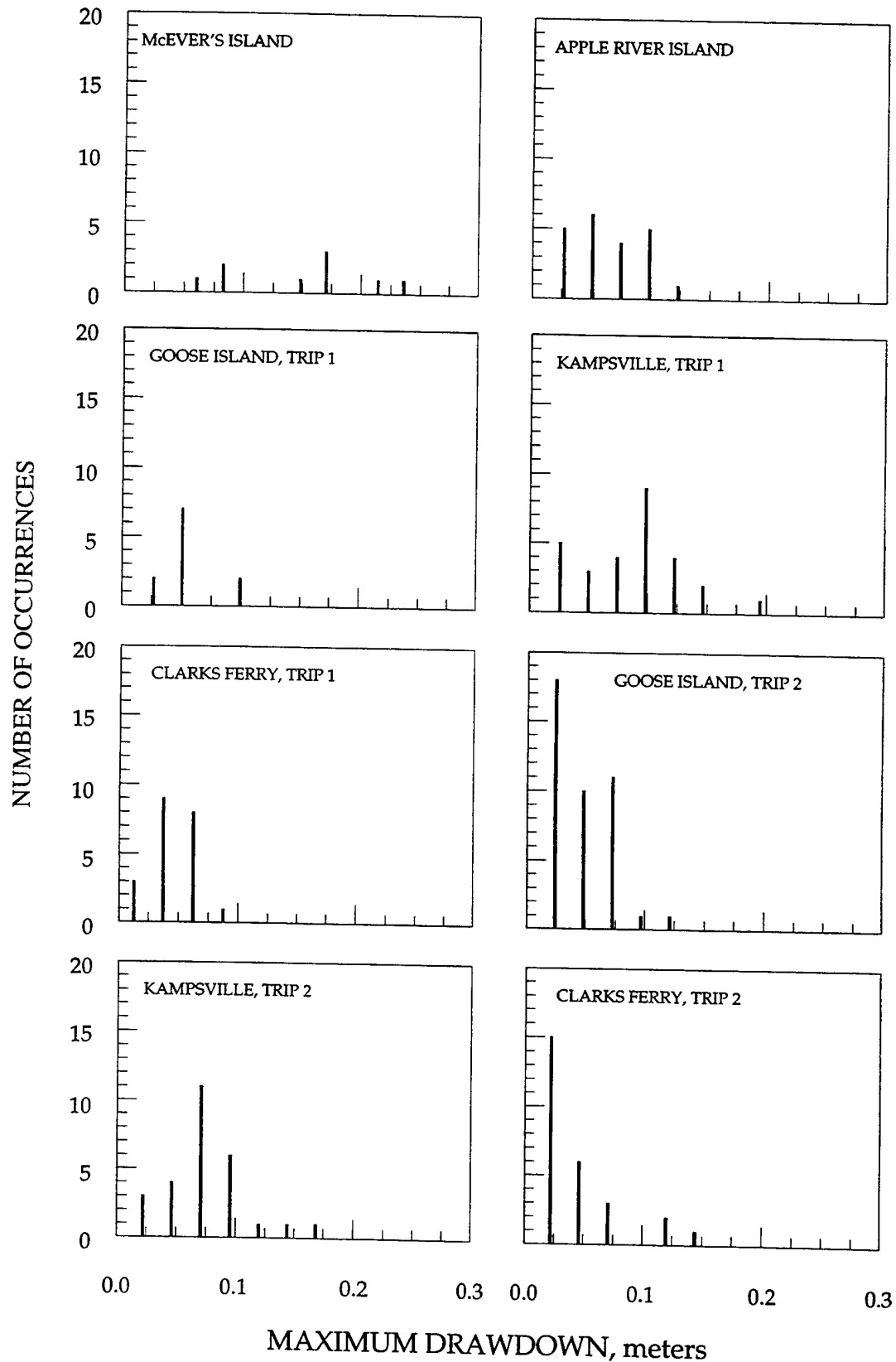
## DOWNSTREAM BARGES



XXIV-2. Histograms of maximum drawdown, downstream barges

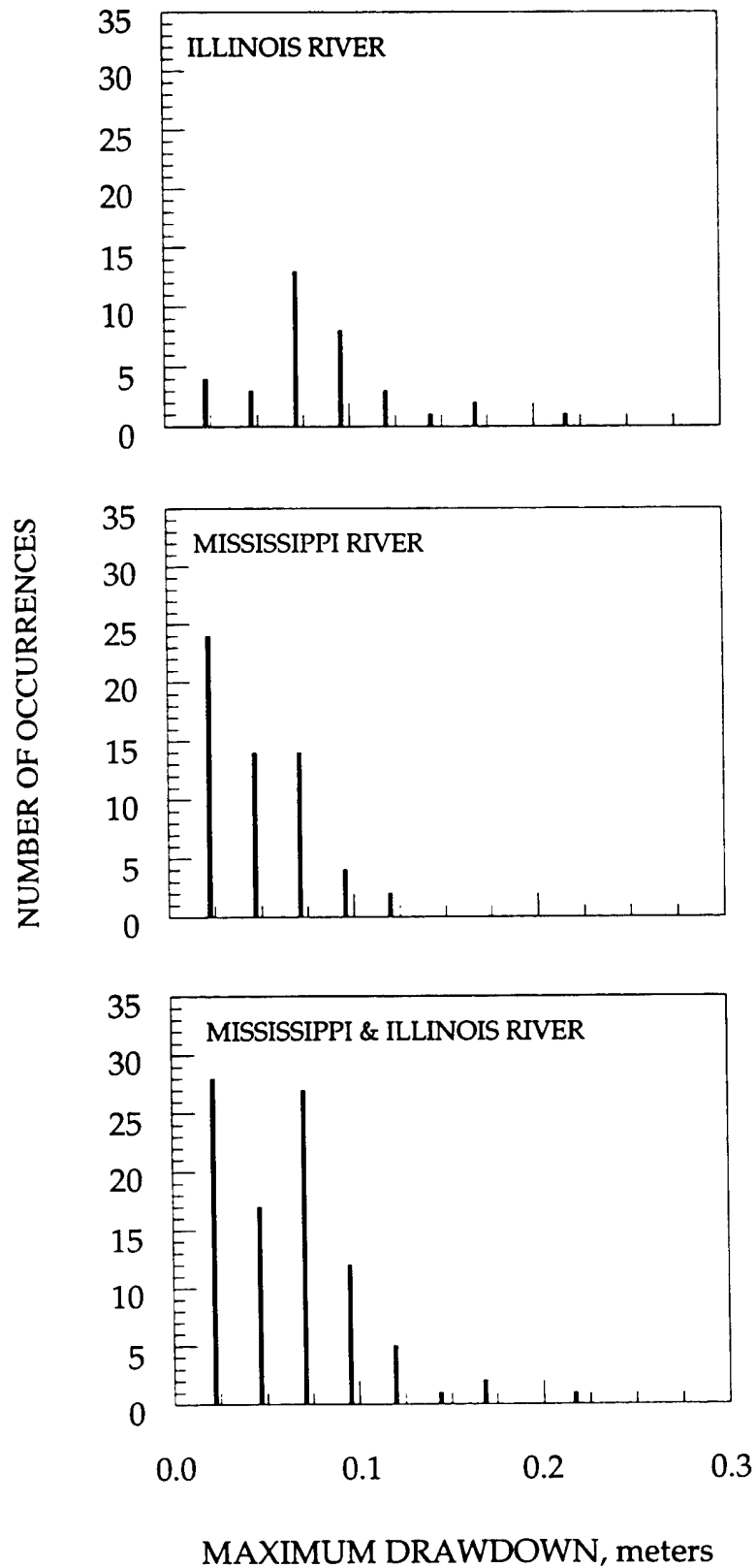


# ALL BARGES



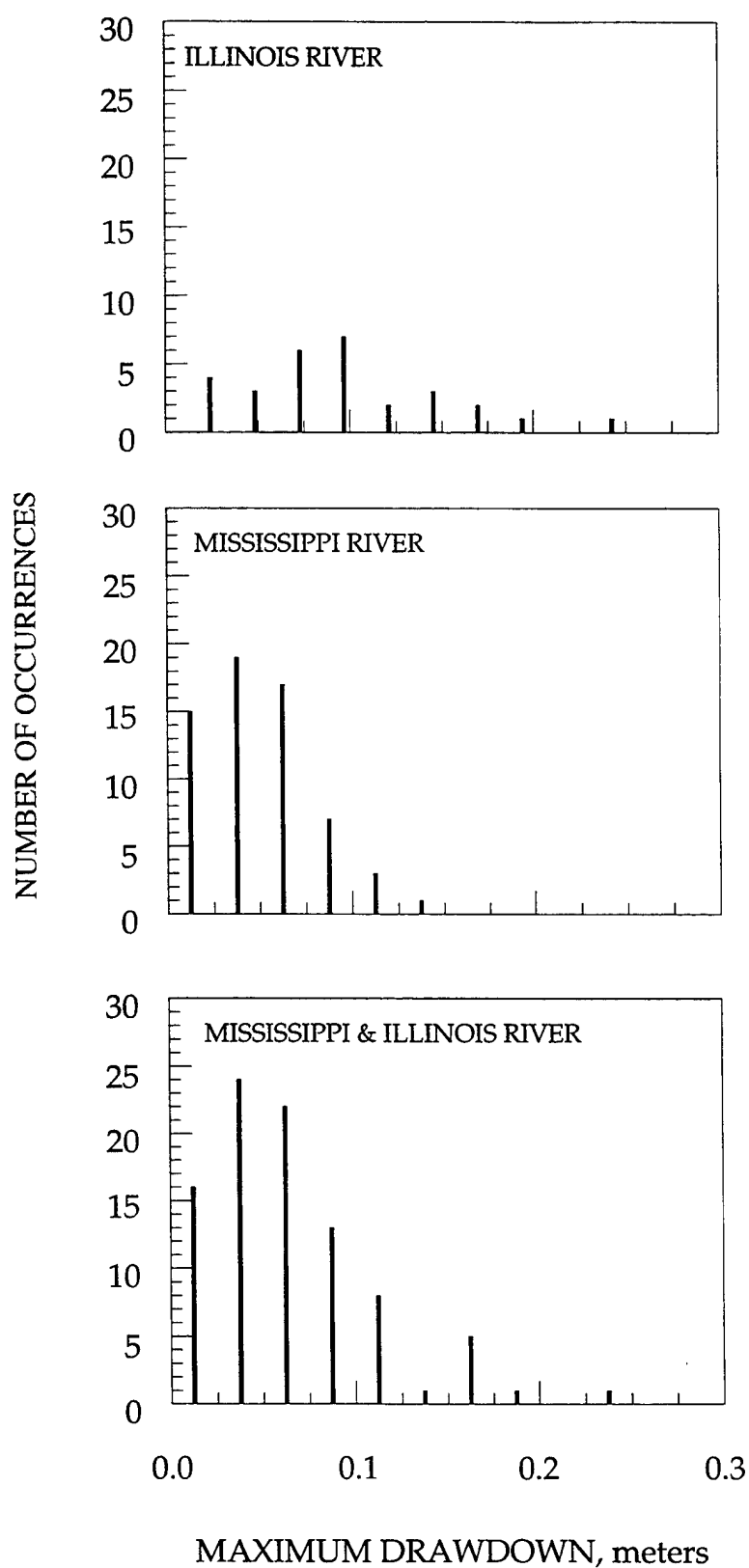
XXIV-3. Histograms of maximum drawdown, all barges

# UPSTREAM BARGES



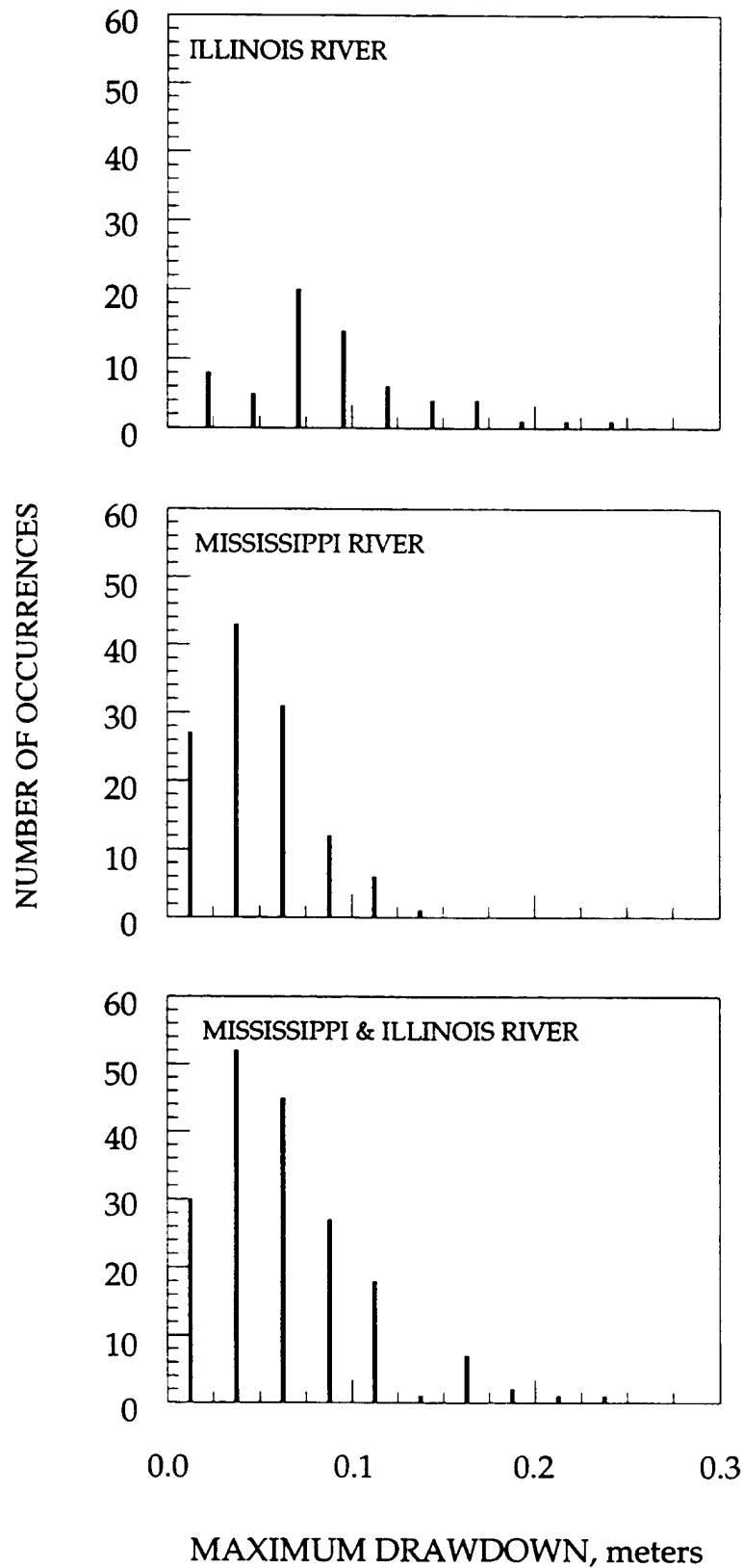
XXIV-4. Histograms of maximum drawdown for the river system, upstream barges

# DOWNSTREAM BARGES



XXIV-5. Histograms of maximum drawdown for the river system, downstream barges

# ALL BARGES



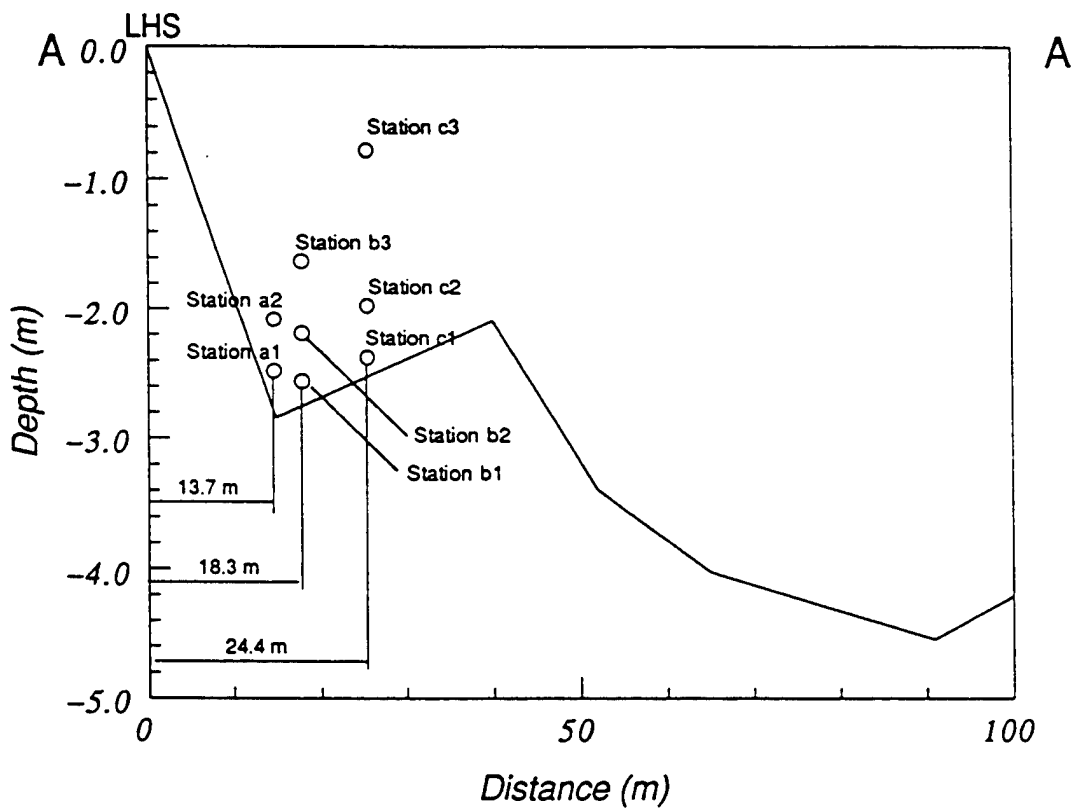
XXIV-6. Histograms of maximum drawdown for the river system, all barges

**APPENDIX XXV.**

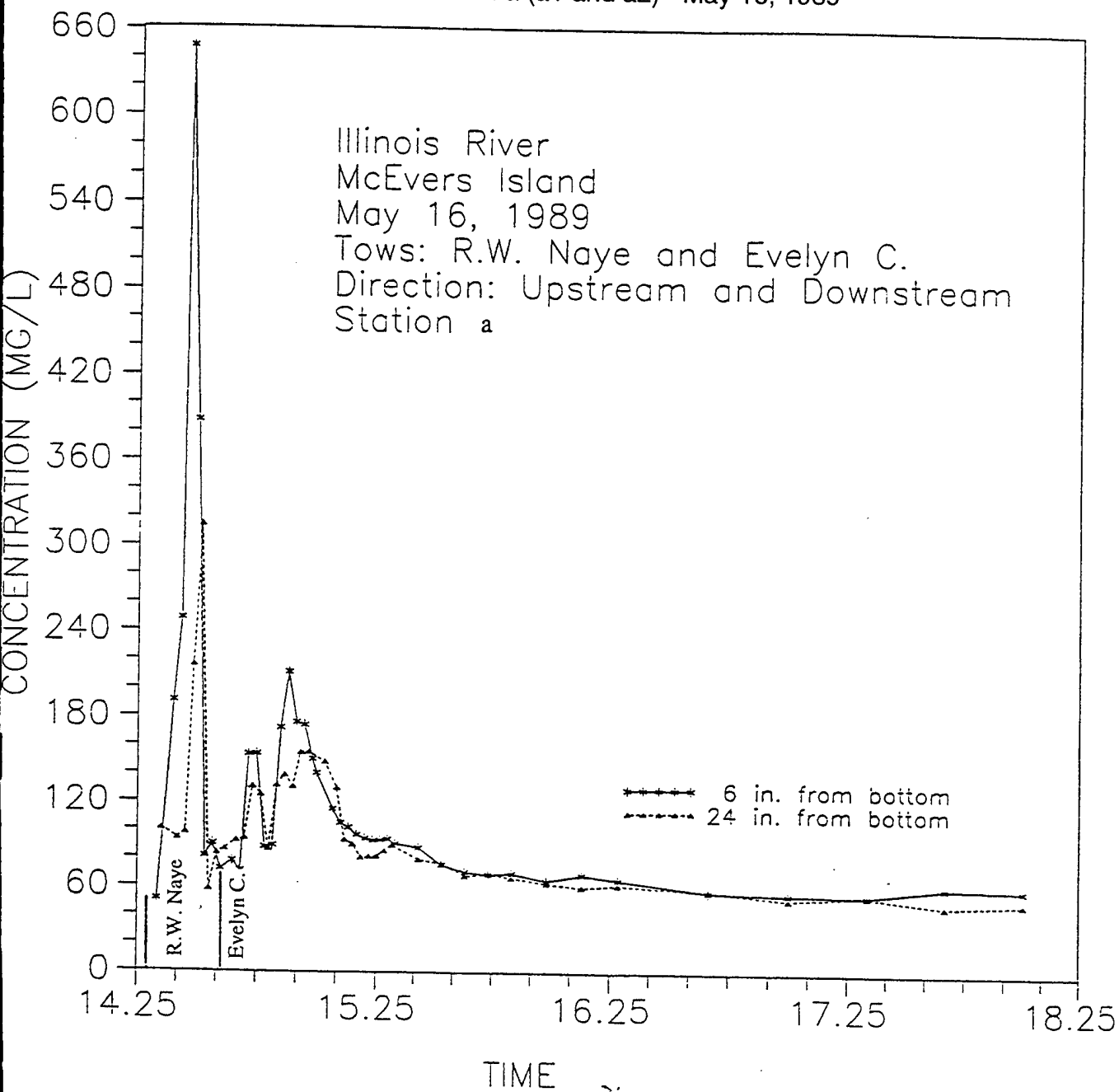
**TYPICAL PLOTS OF SUSPENDED SEDIMENT CONCENTRATION VERSUS TIME**

XXV-1. Variation of suspended sediment concentration with time, McEver's Island

Location of suspended sediment sampling stations on the Illinois River  
near the McEver's Island site during May 15-19, 1989

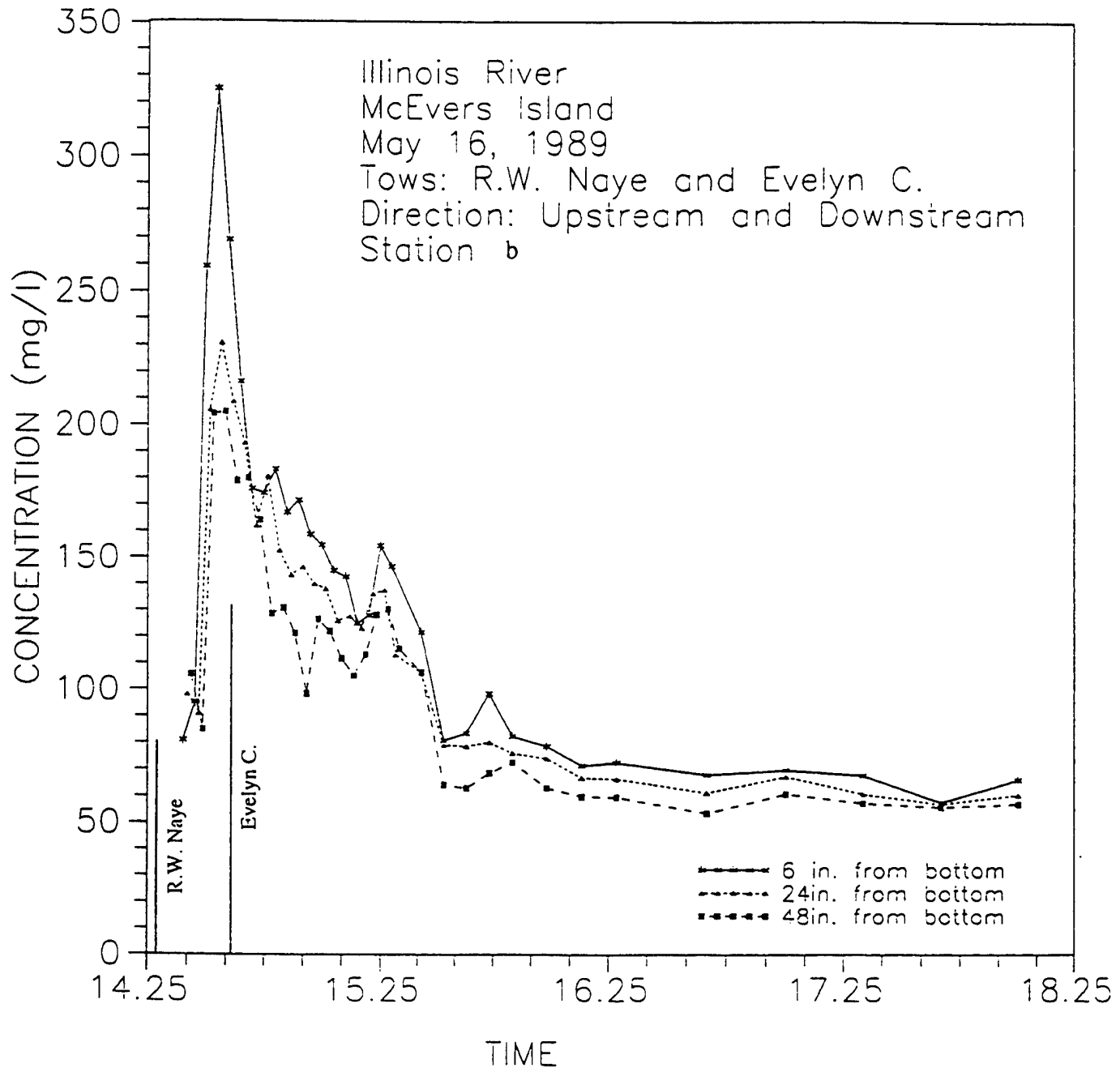


Station a (a1 and a2) May 16, 1989

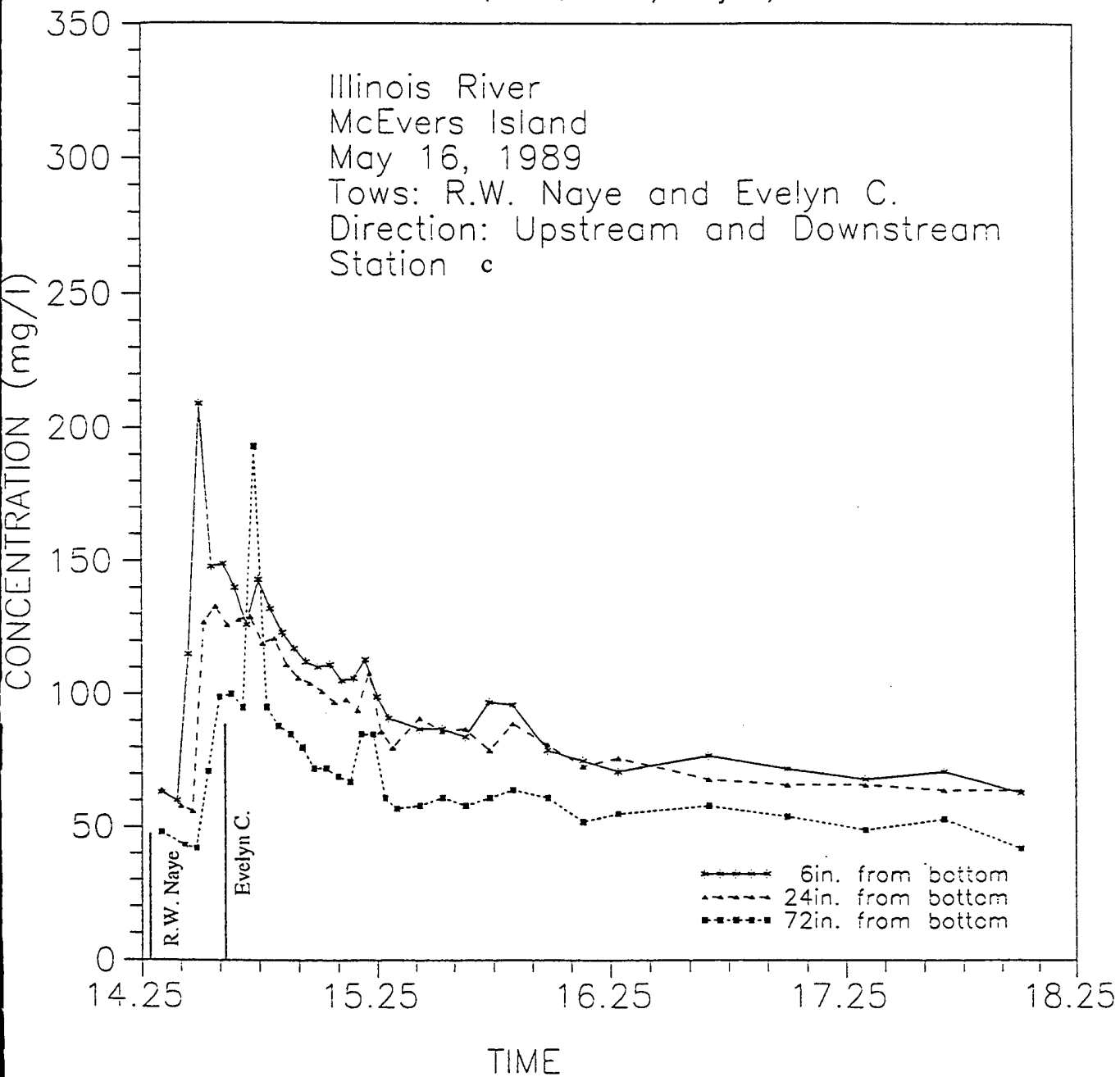




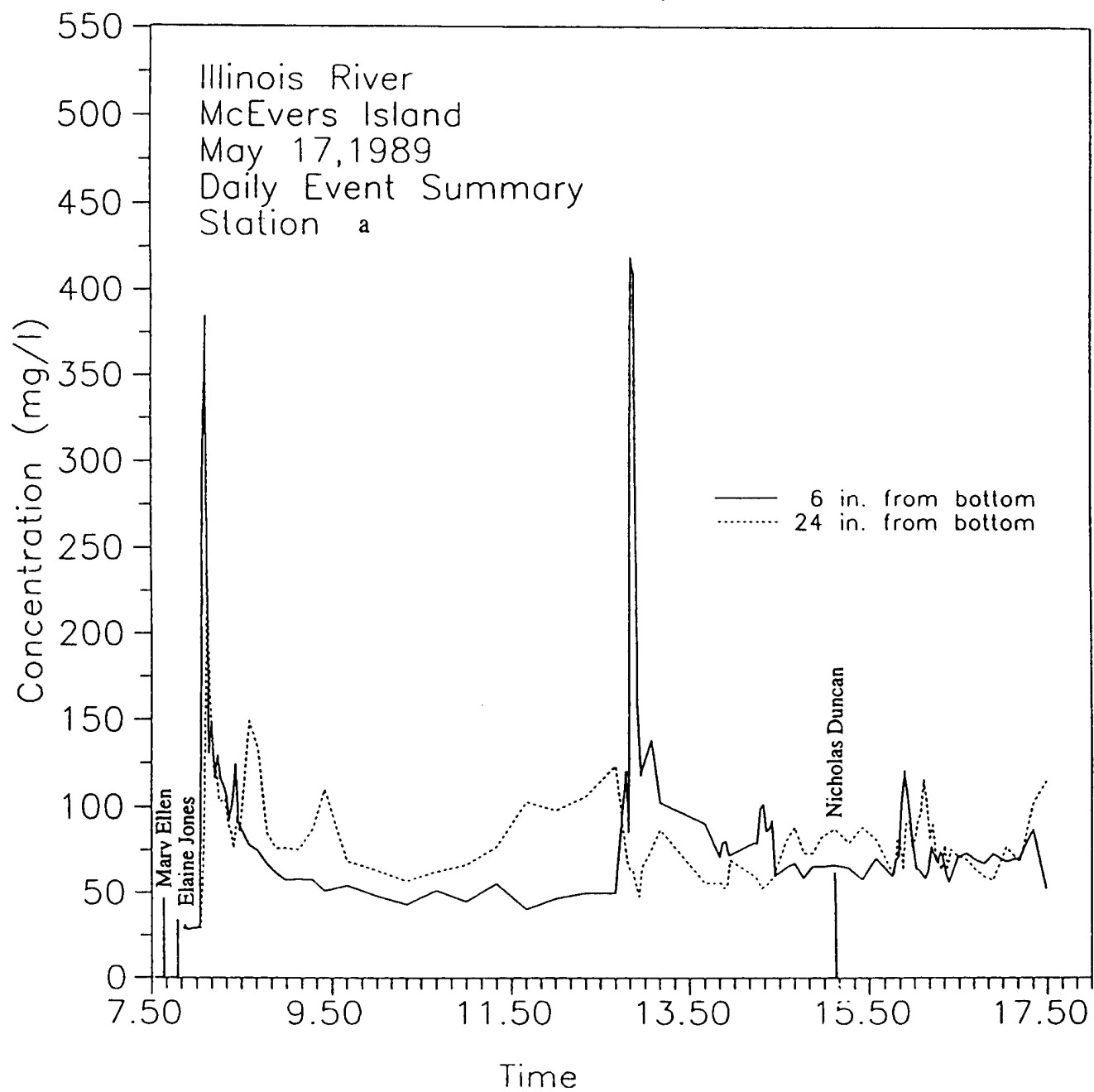
Station b (b1, b2, and b3) May 16, 1989



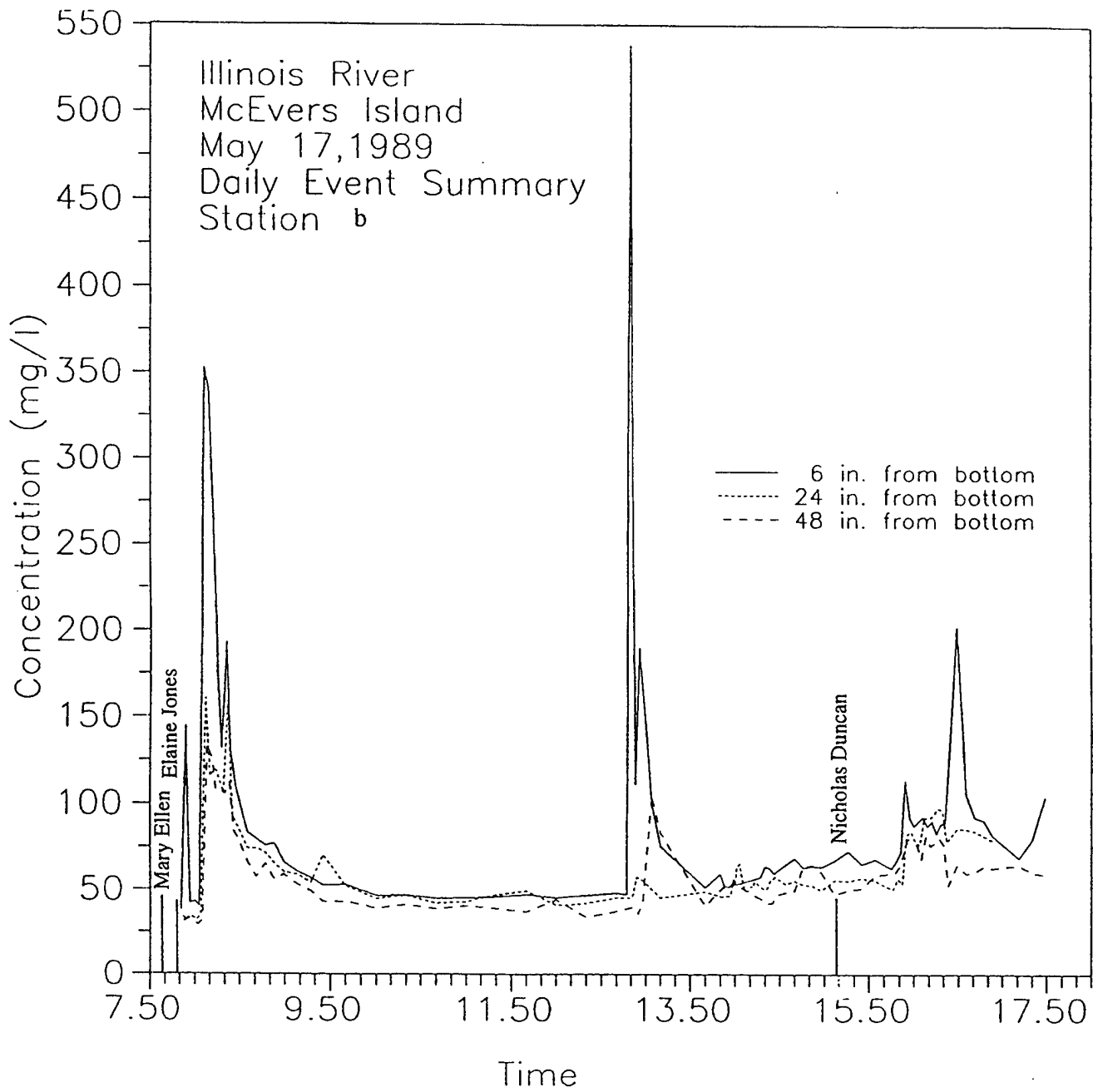
Station c (c1, c2, and c3) May 16, 1989



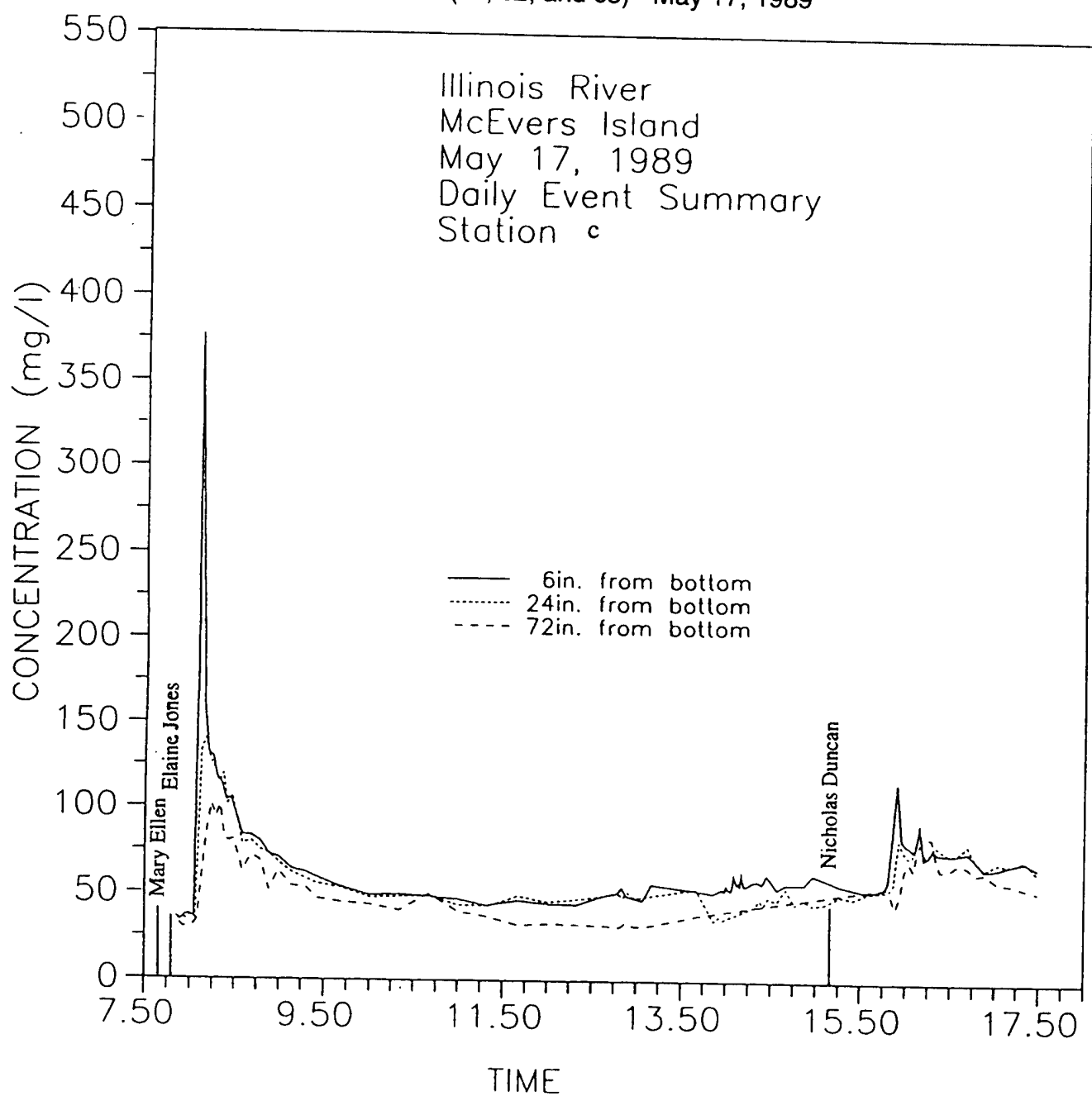
Station a (a1 and a2) May 17, 1989



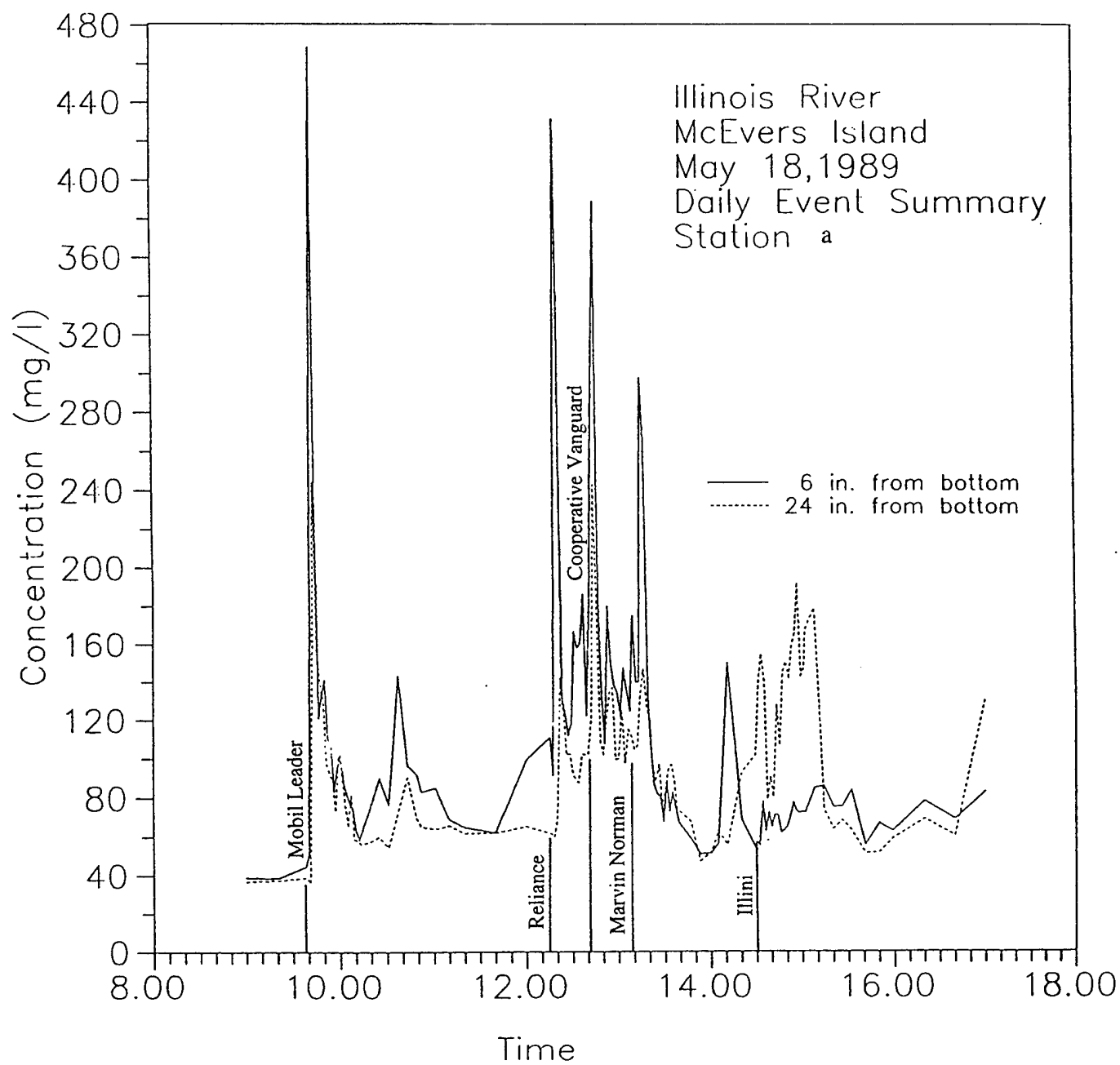
Station b (b1, b2, and b3) May 17, 1989



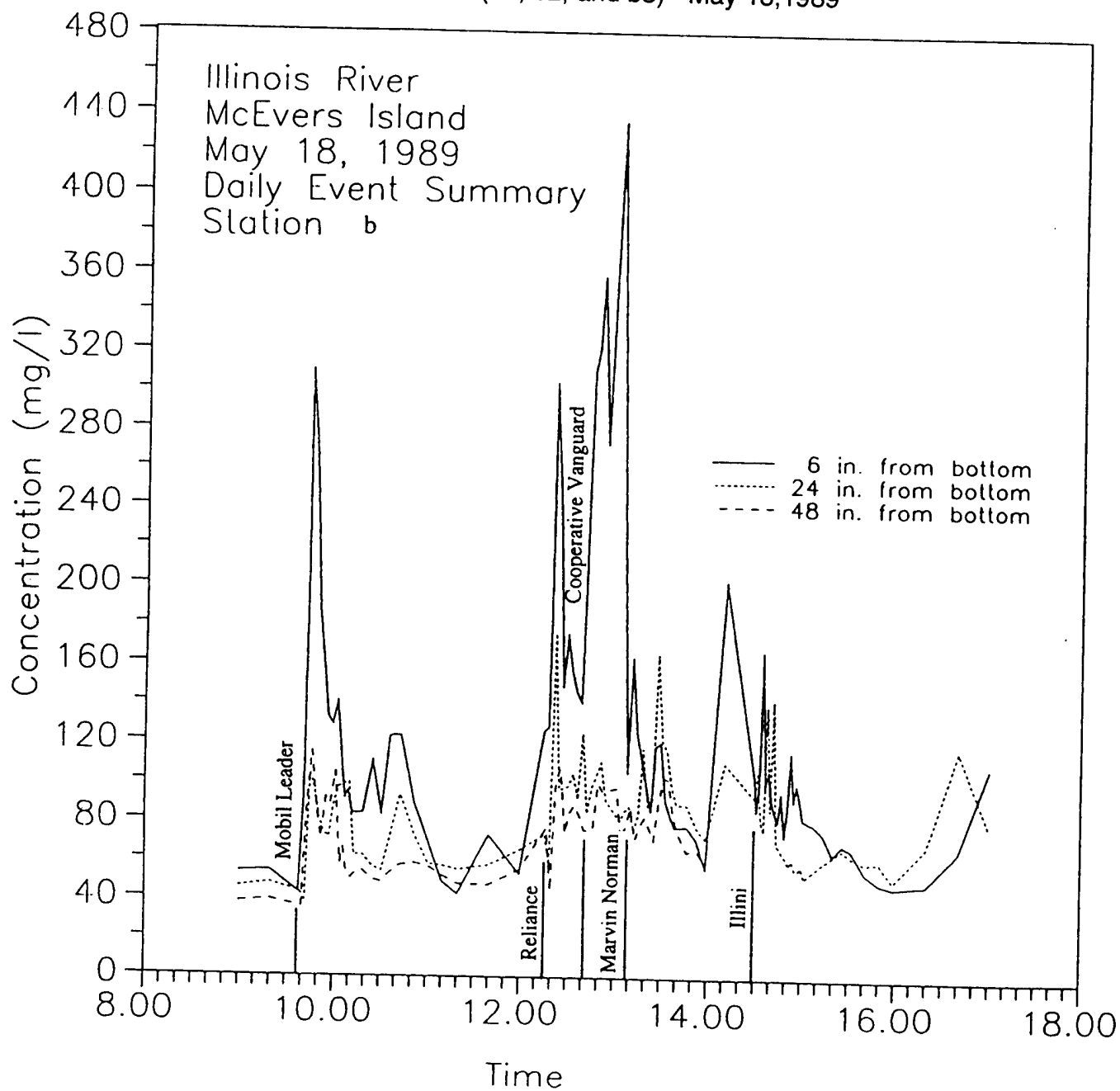
Station c (c1, c2, and c3) May 17, 1989



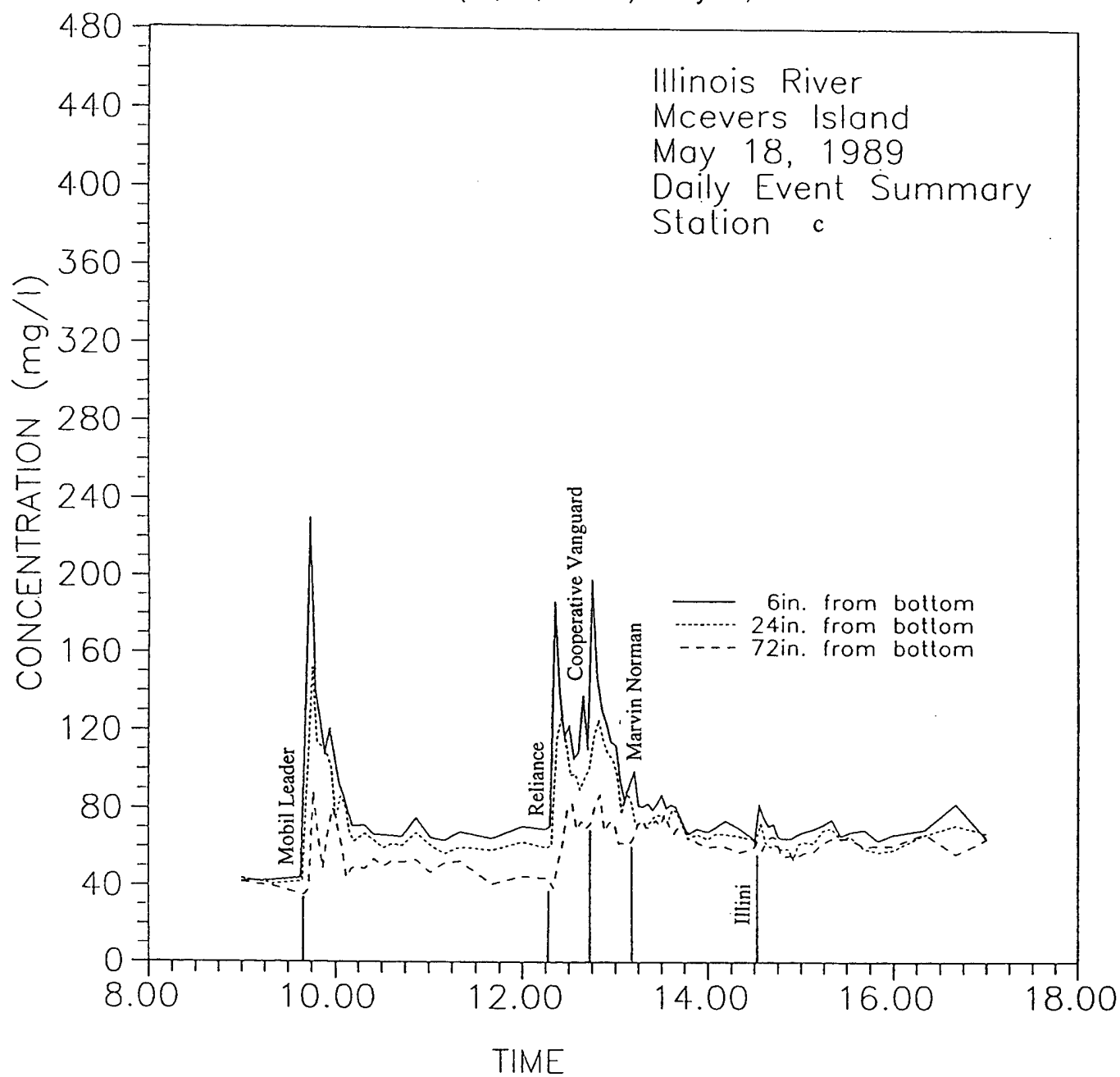
Station a (a1 and a2) May 18, 1989



Station b (b1, b2, and b3) May 18, 1989



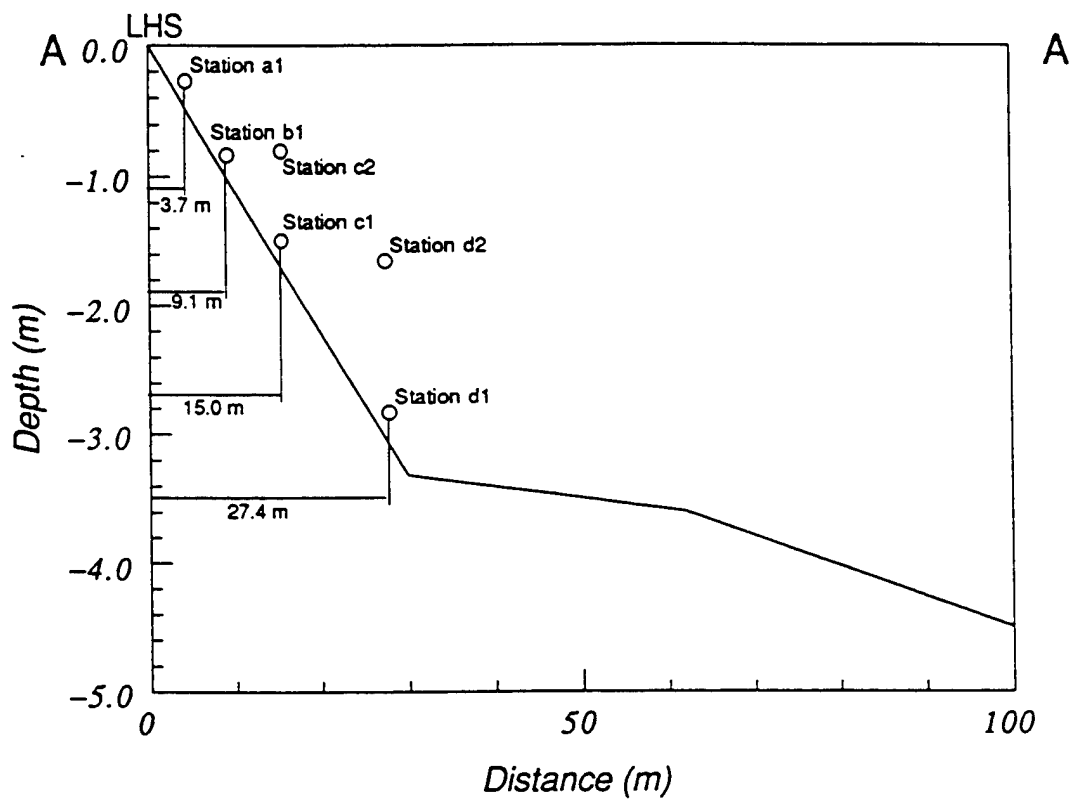
Station c (c1, c2, and c3) May 18, 1989



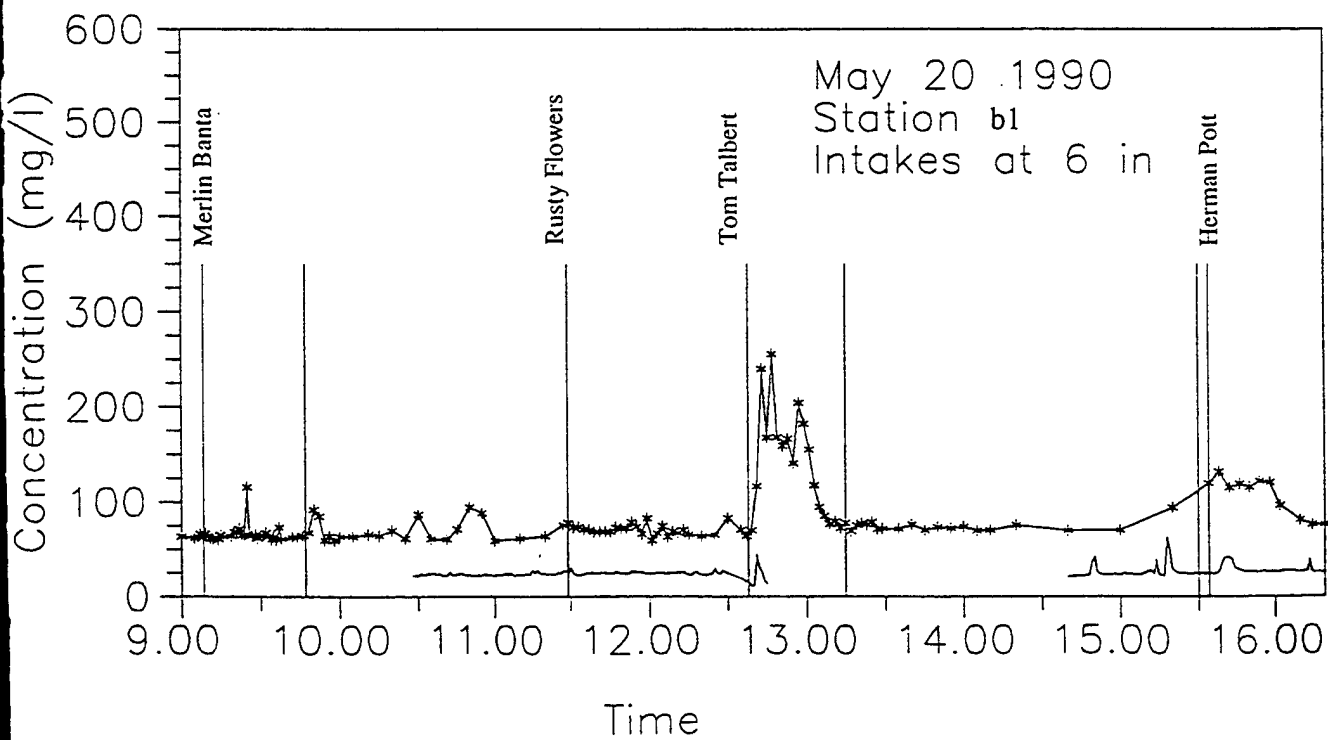
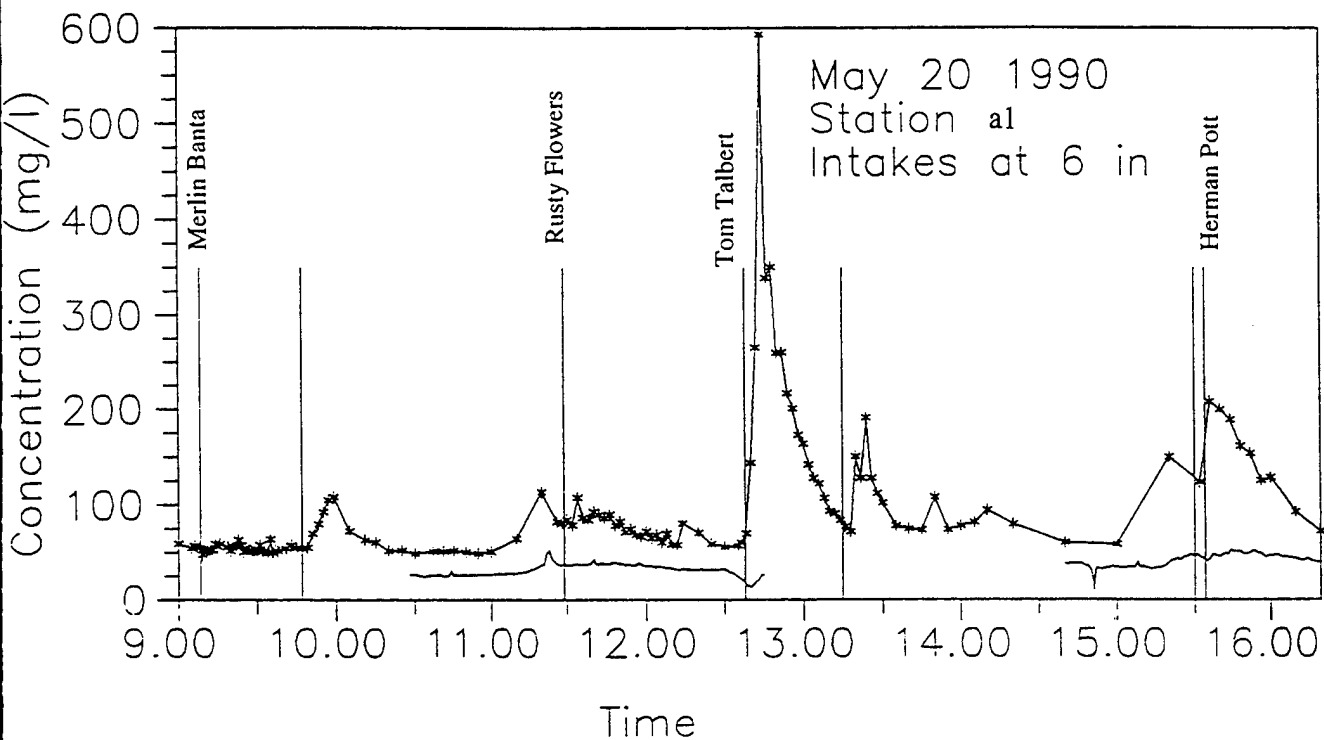


XXV-2. Variation of suspended sediment concentration with time, Apple River Island

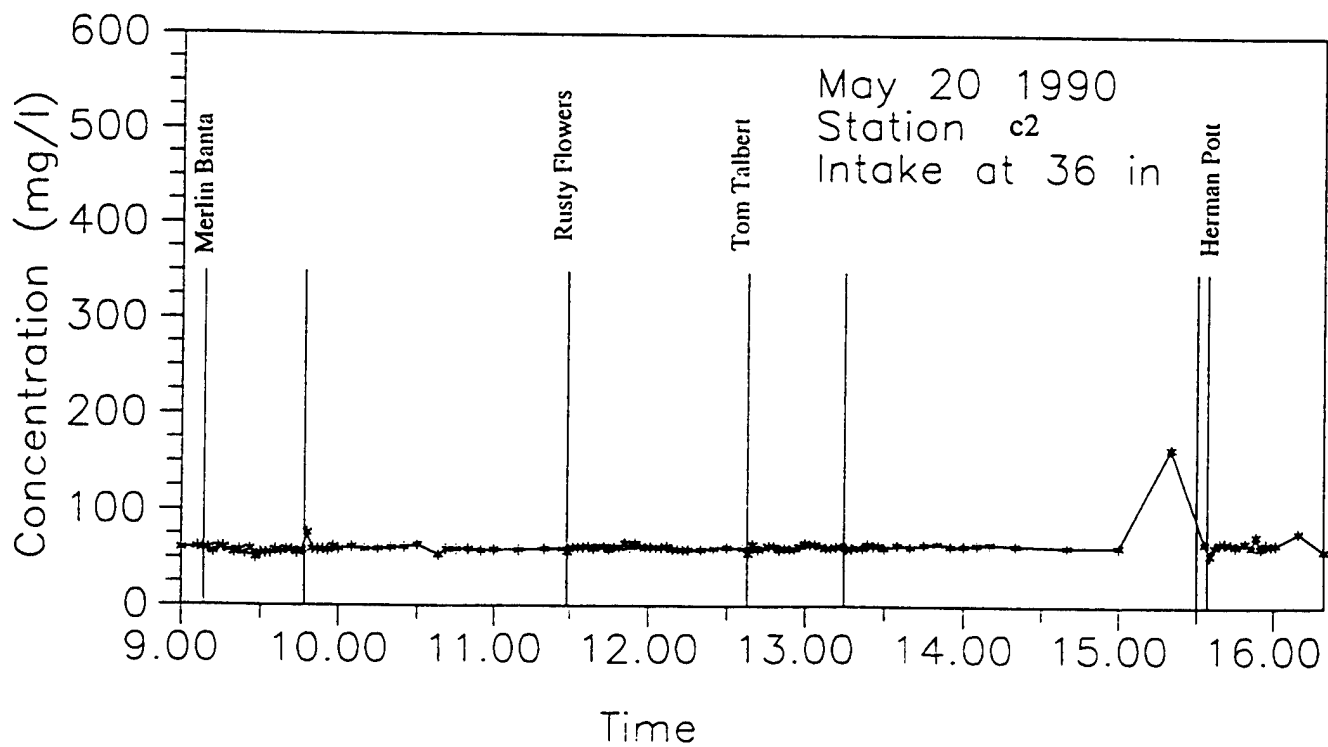
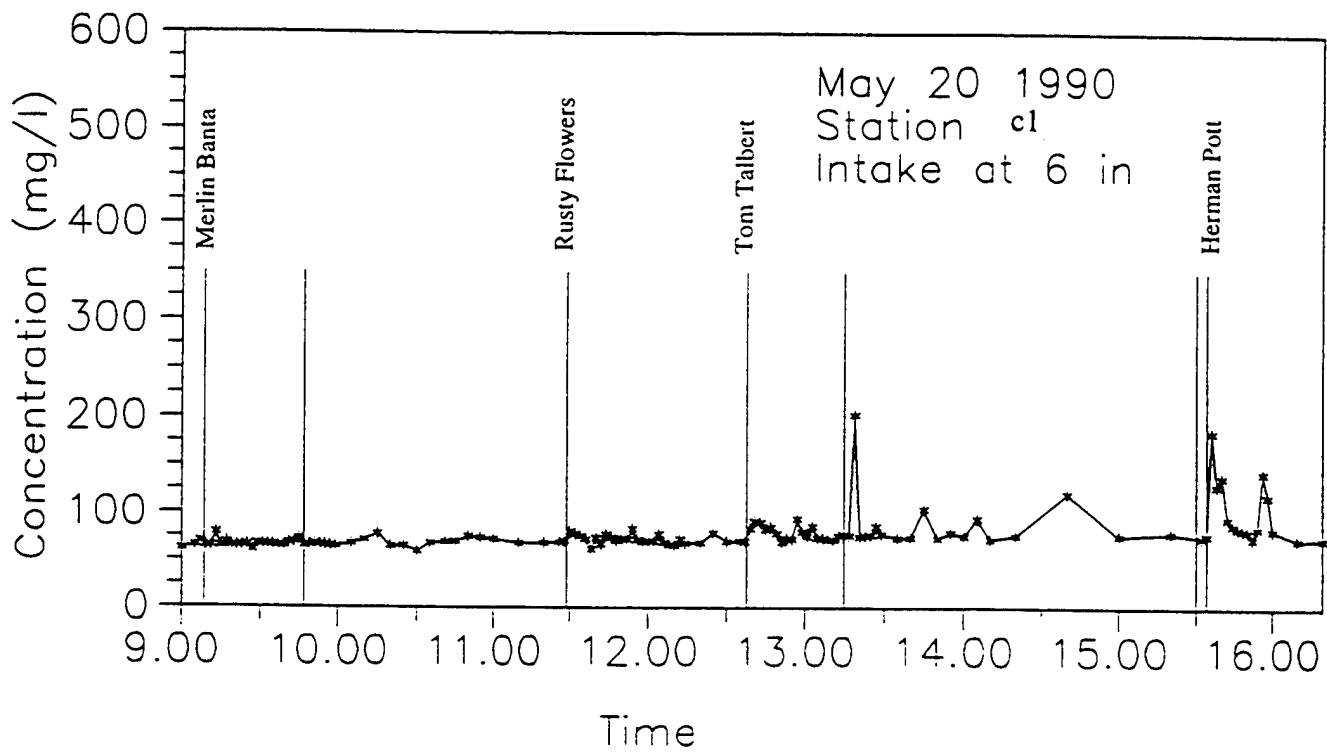
Location of suspended sediment sampling stations on the Mississippi River  
near the Apple River Island site during May 14-25, 1990



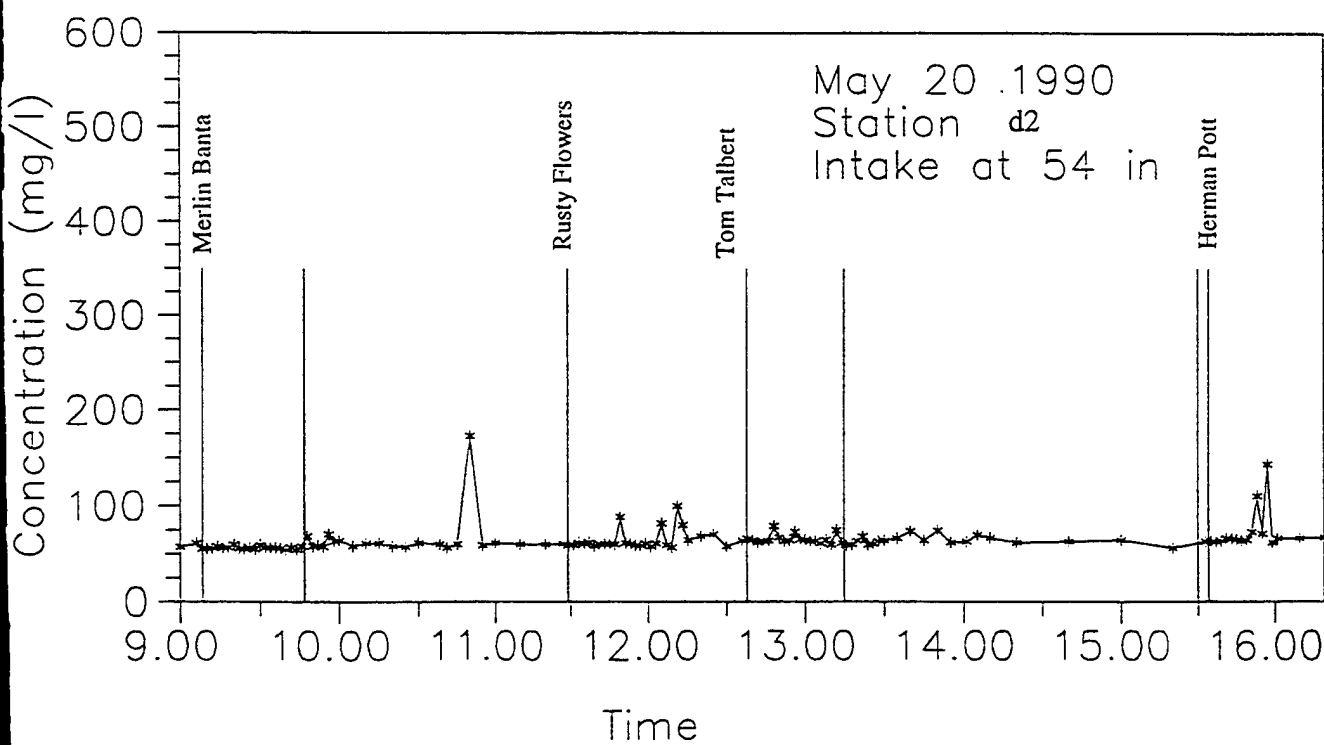
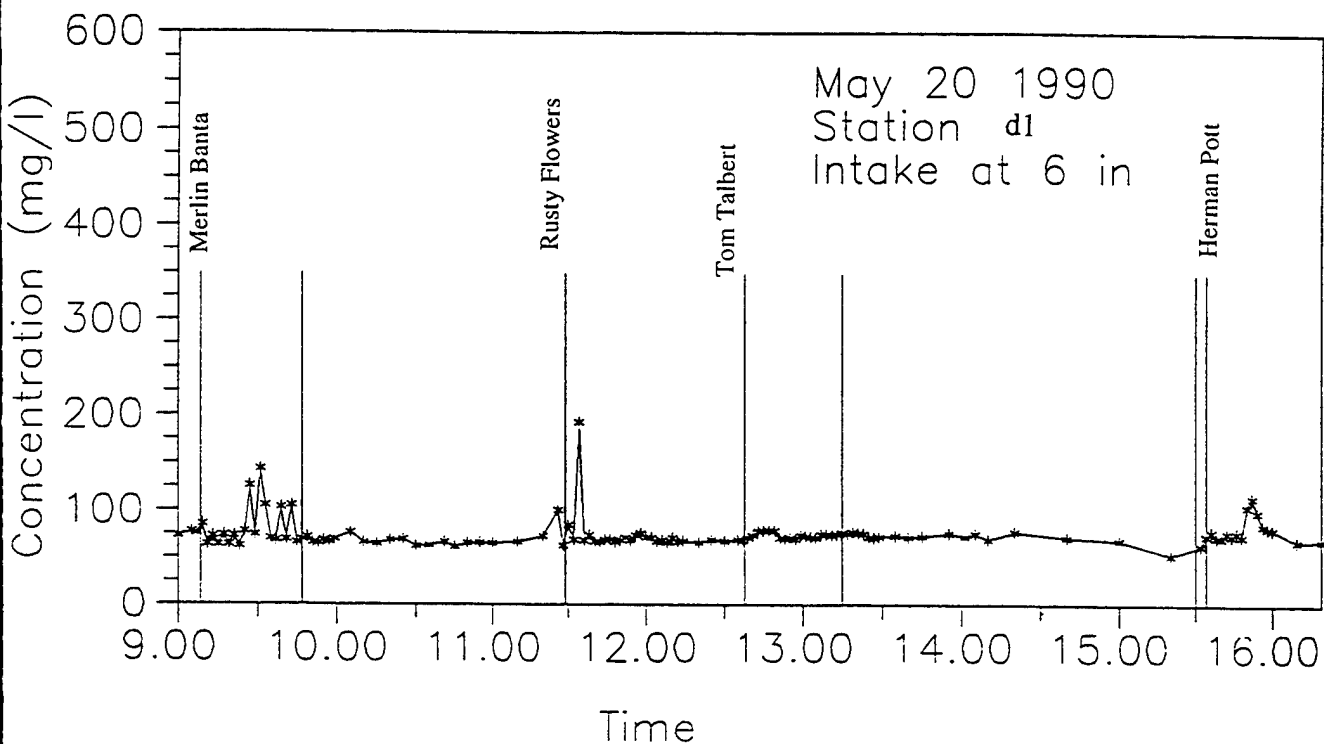
Stations a1 and b1 May 20, 1990



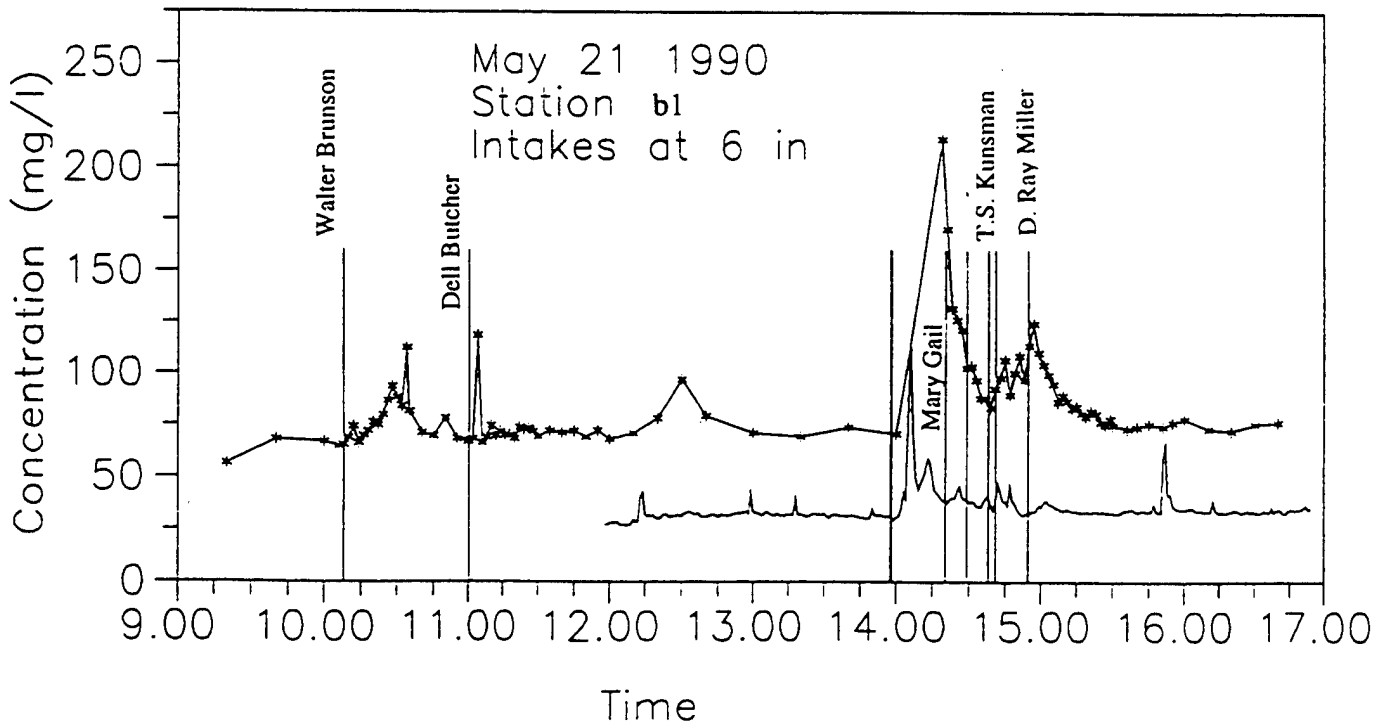
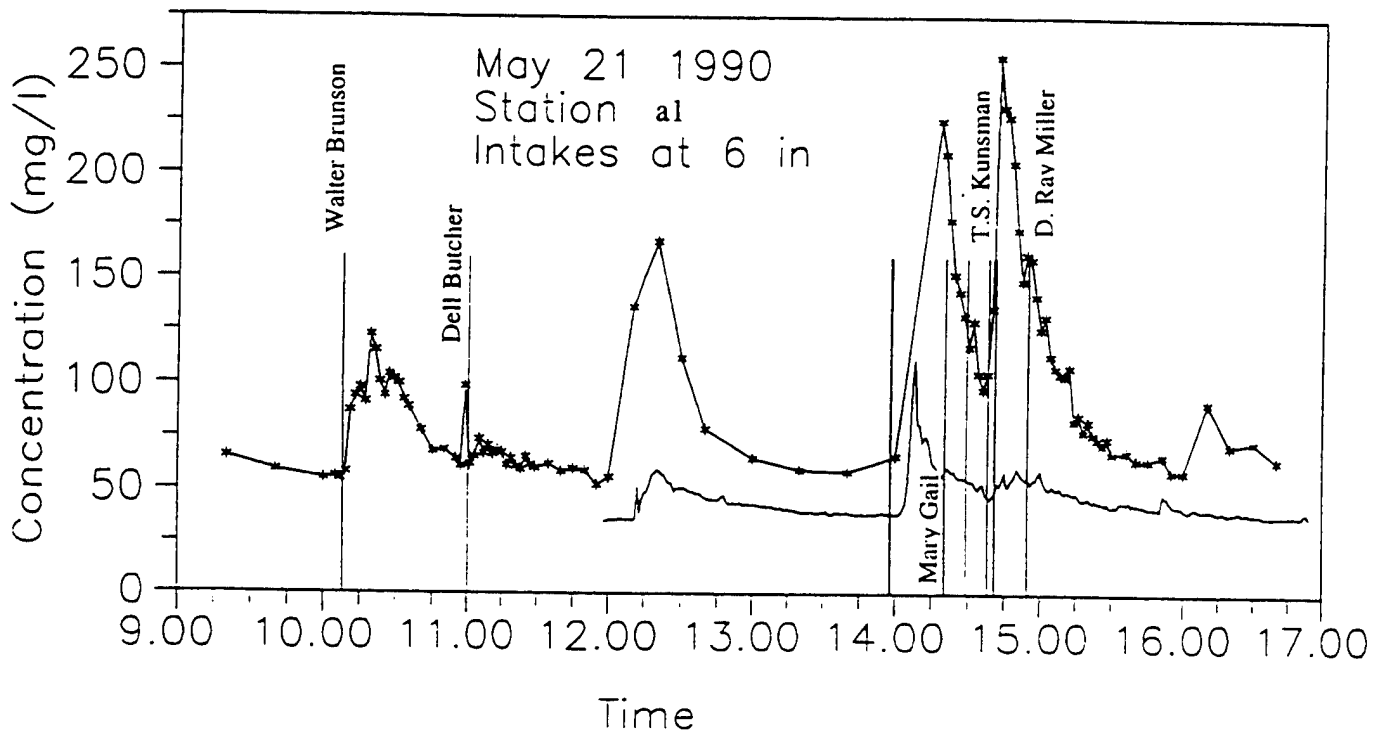
Stations c1 and c2 May 20, 1990



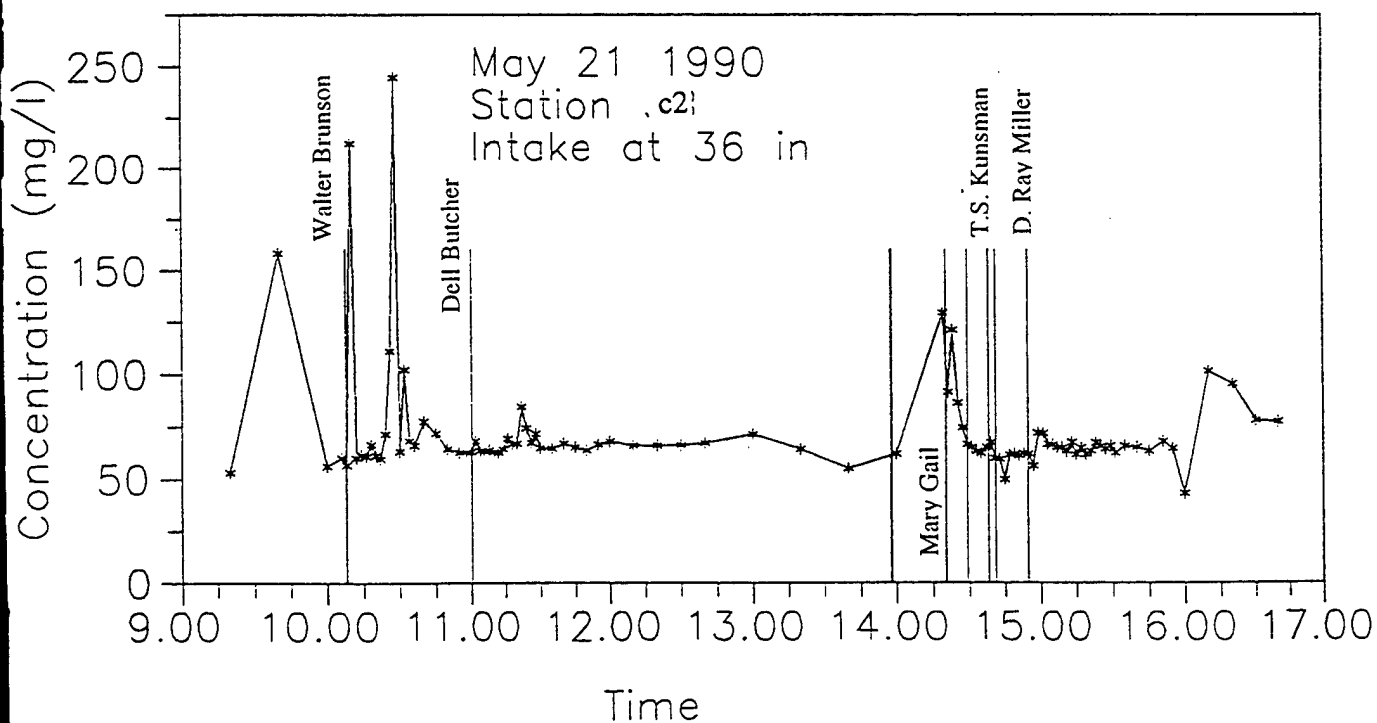
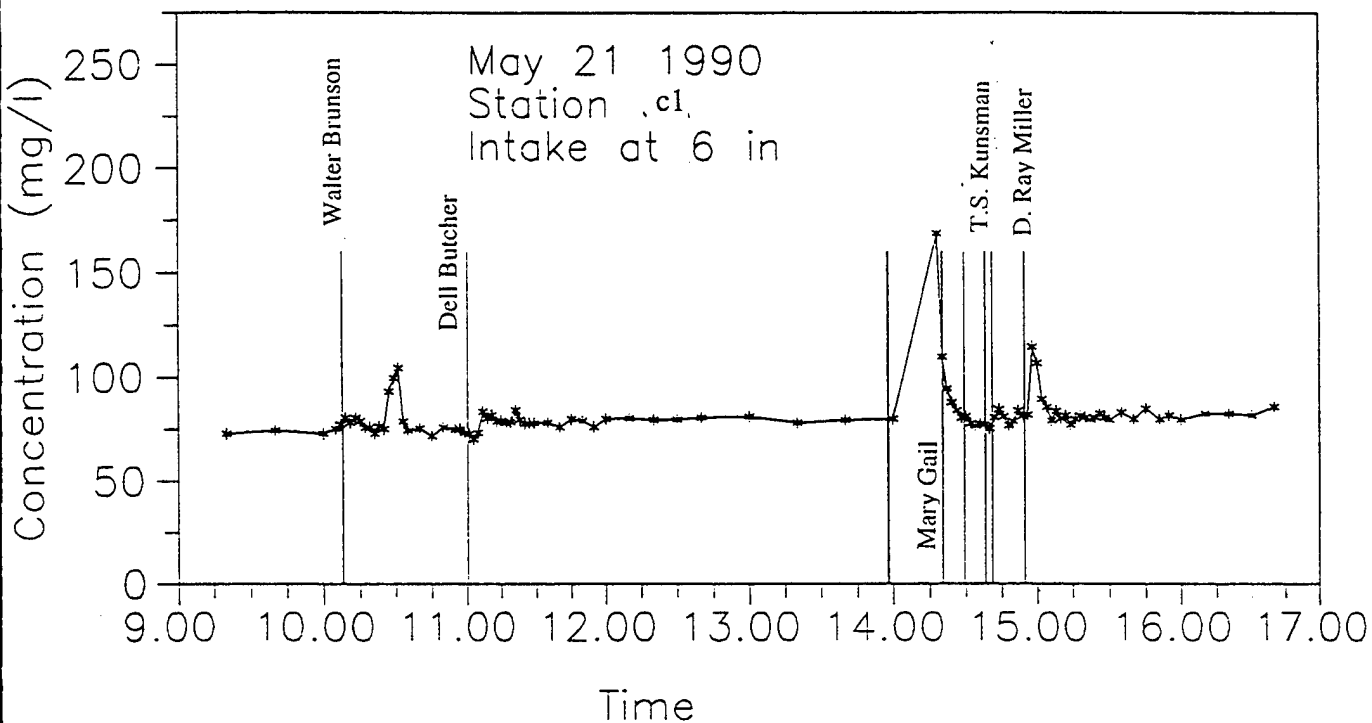
Stations d1 and d2 May 20, 1990



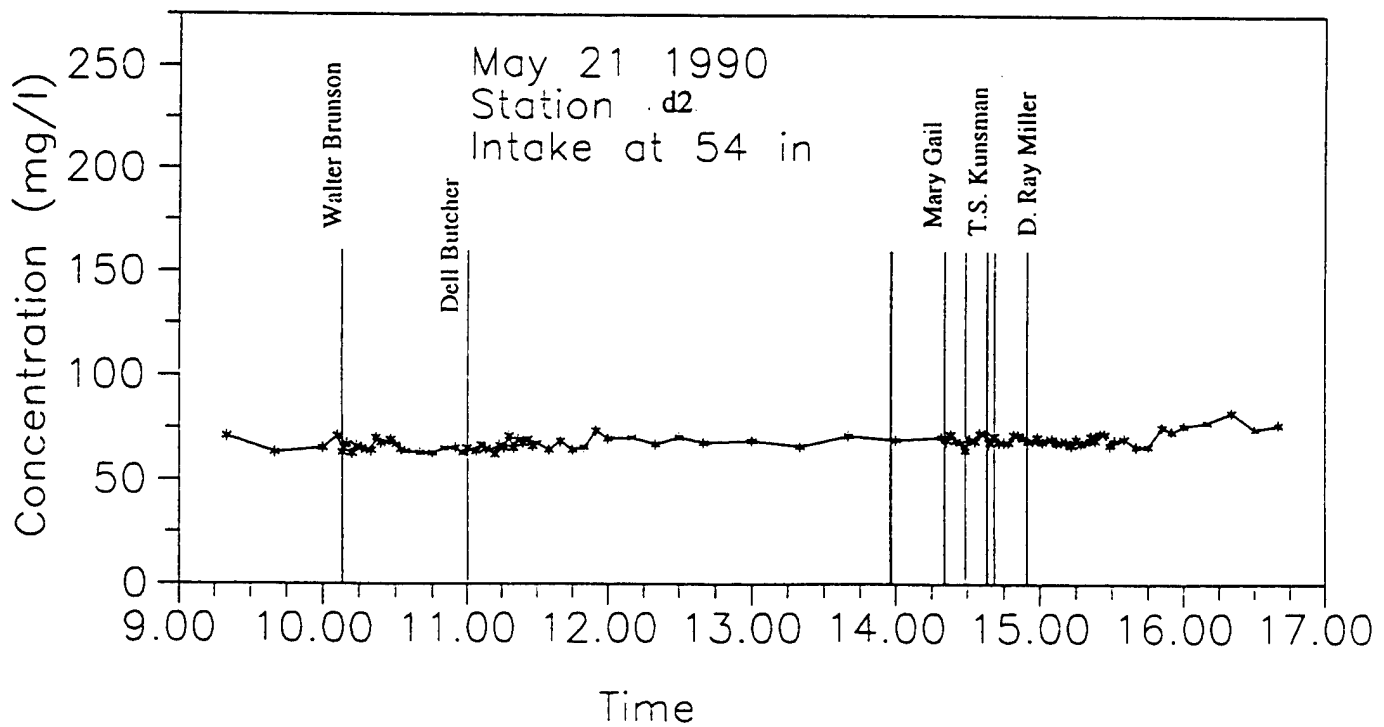
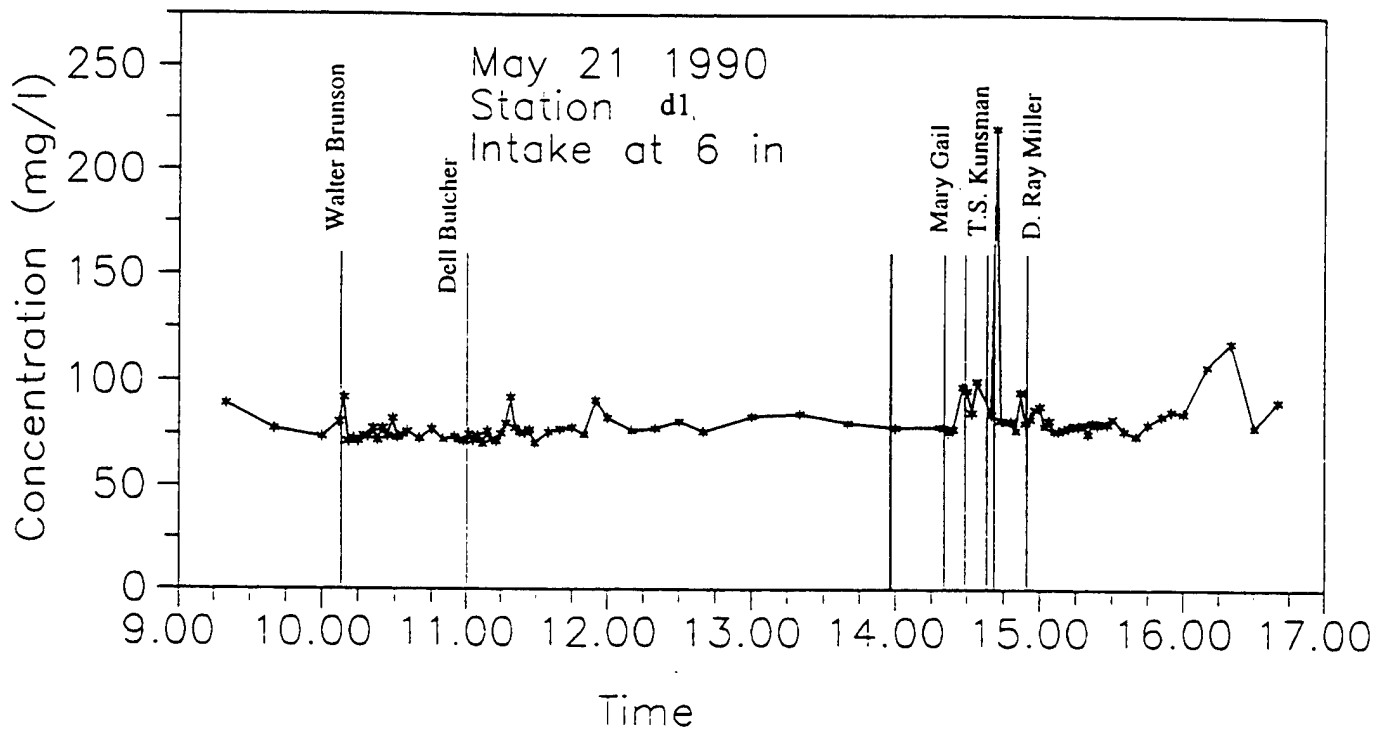
Stations a1 and b1 May 21, 1990



Stations c1 and c2 May 21, 1990

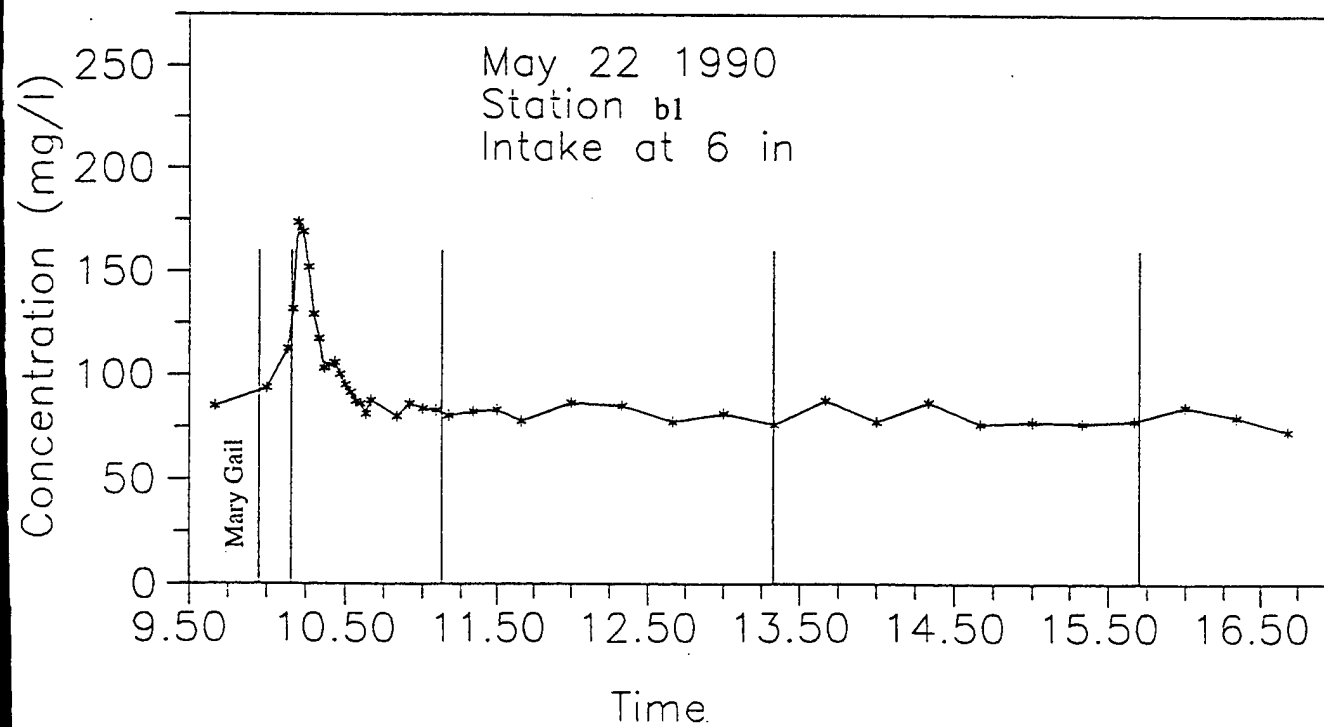
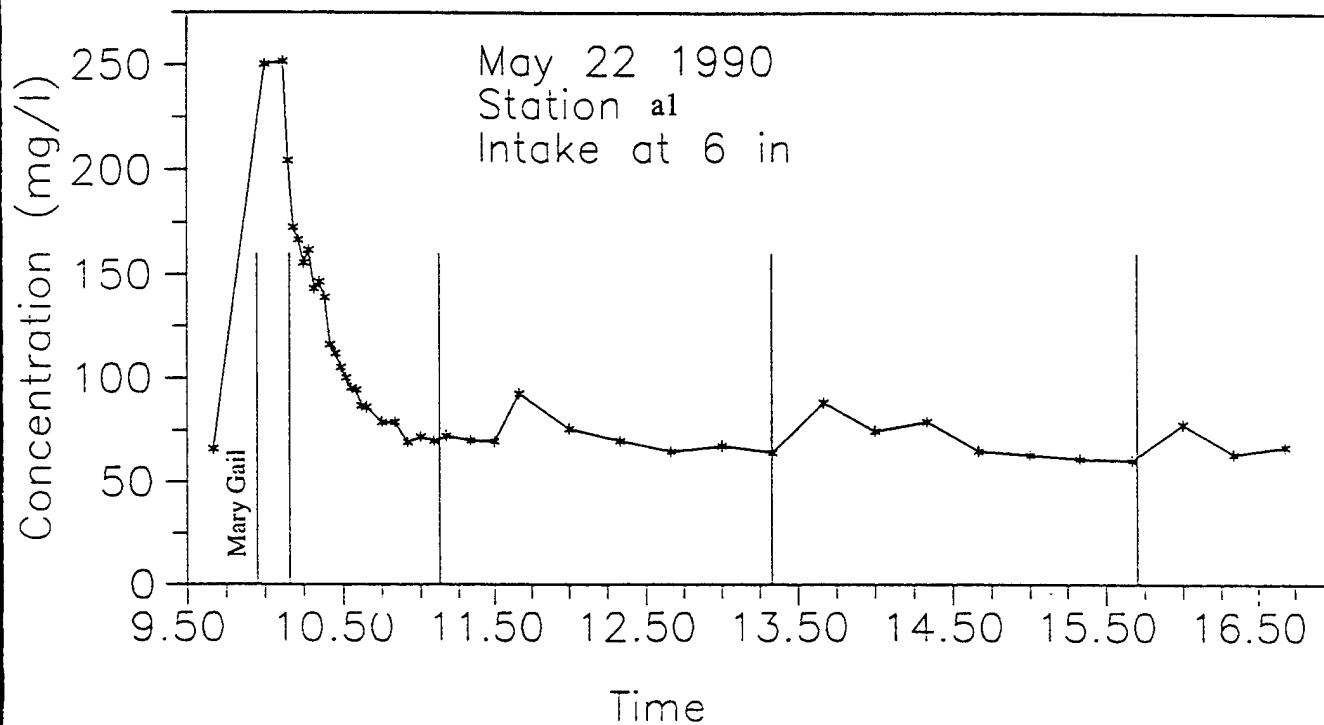


Stations d1 and d2 May 21, 1990

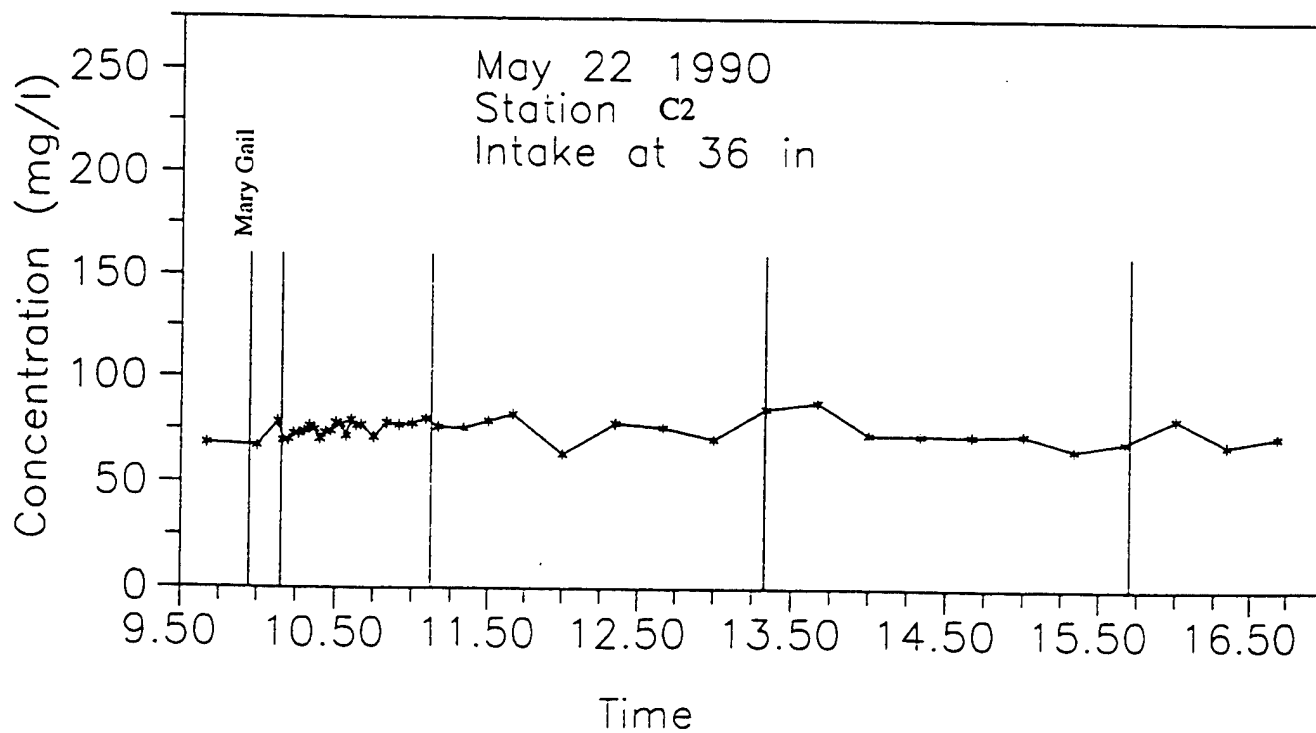
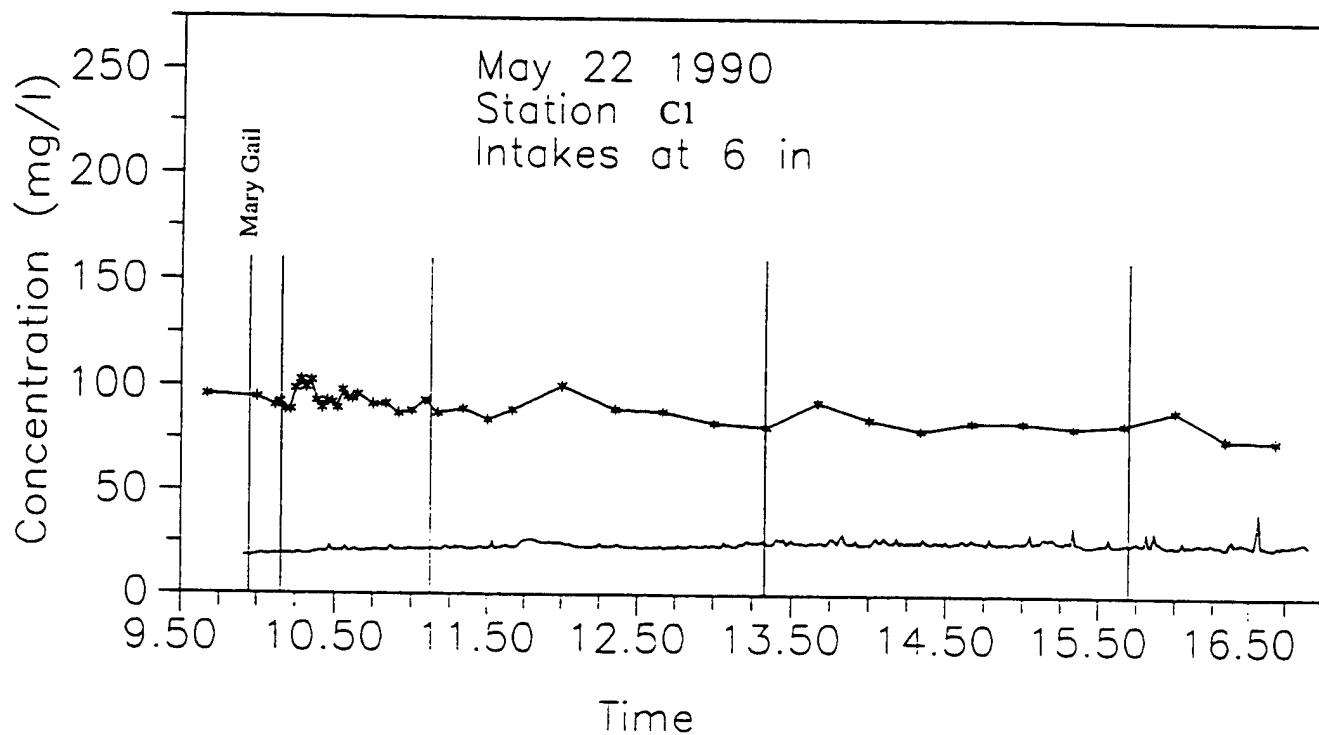




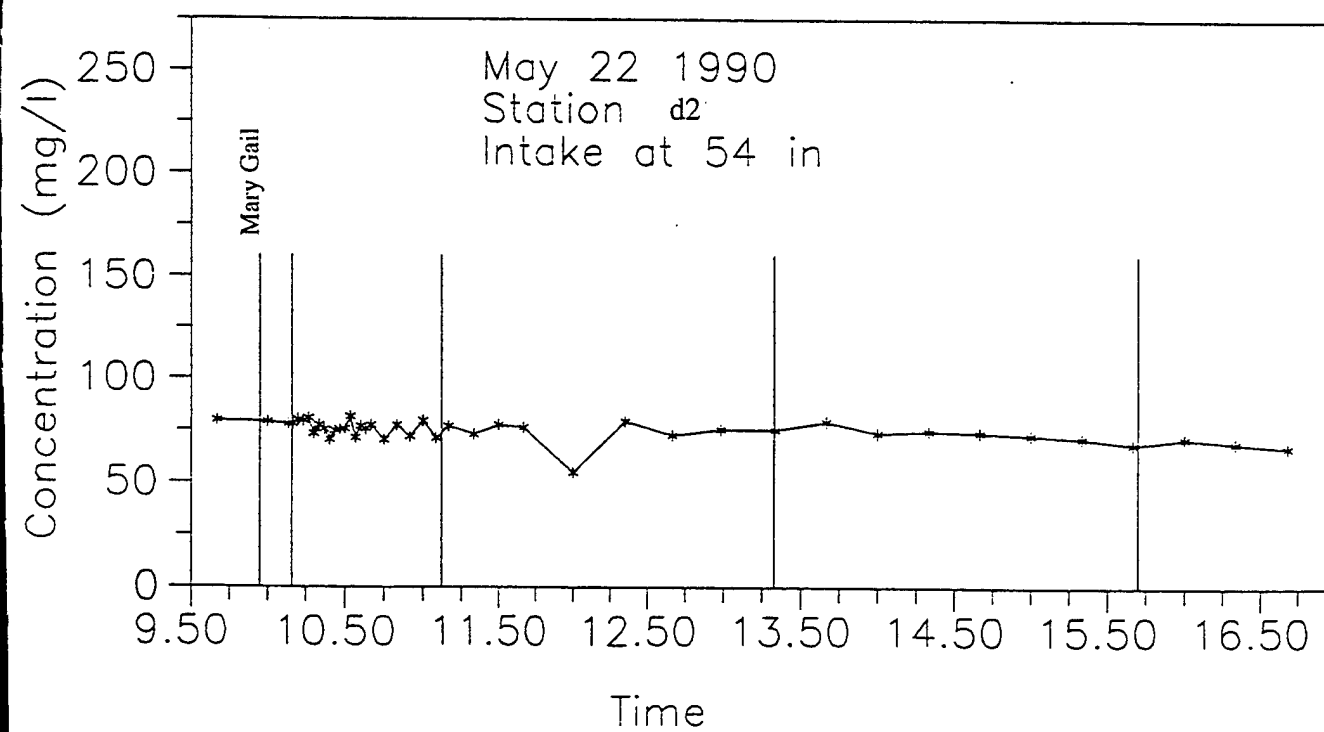
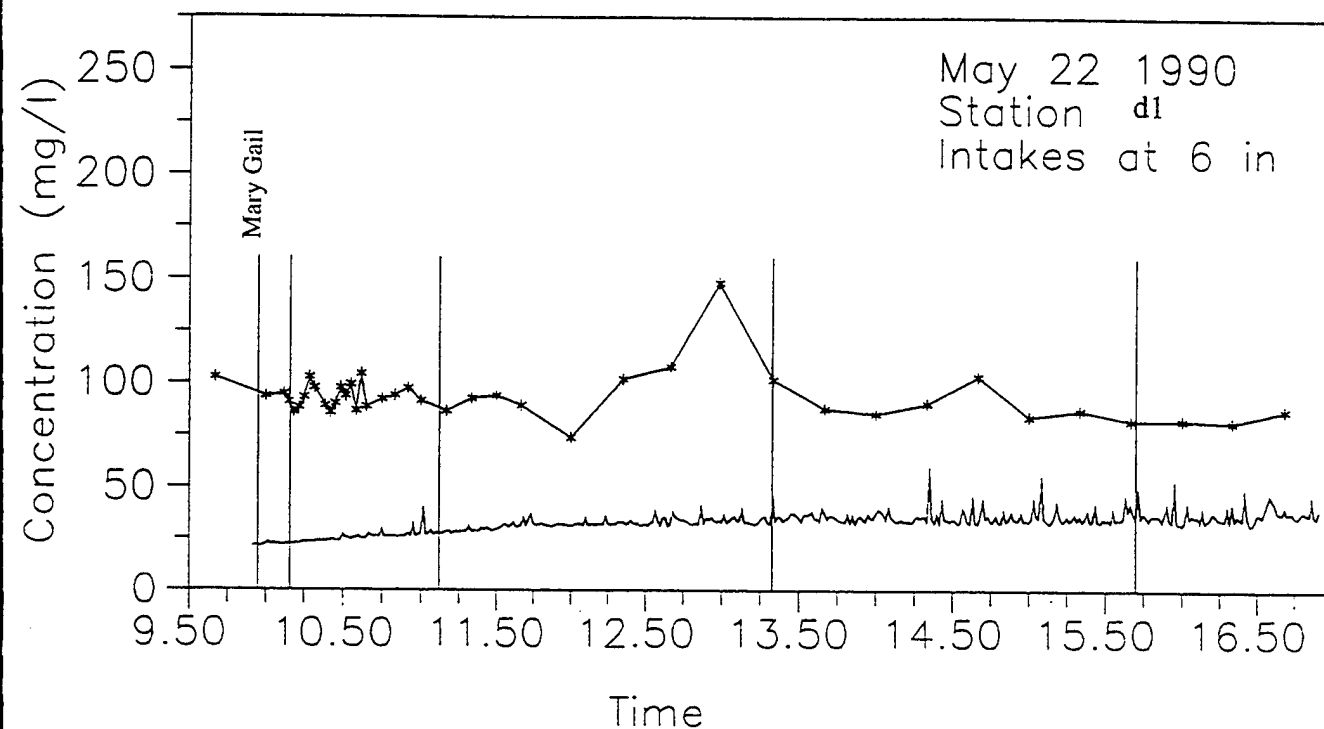
Stations a1 and b1 May 22, 1990



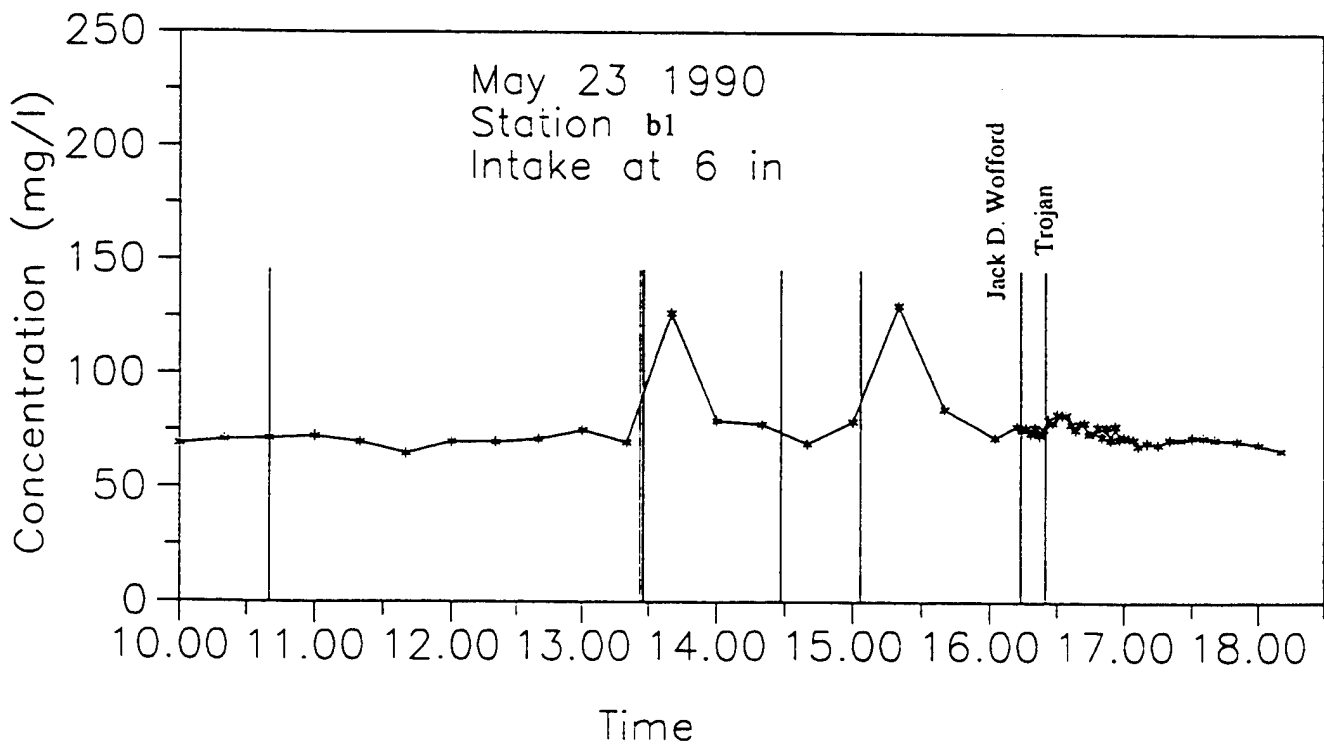
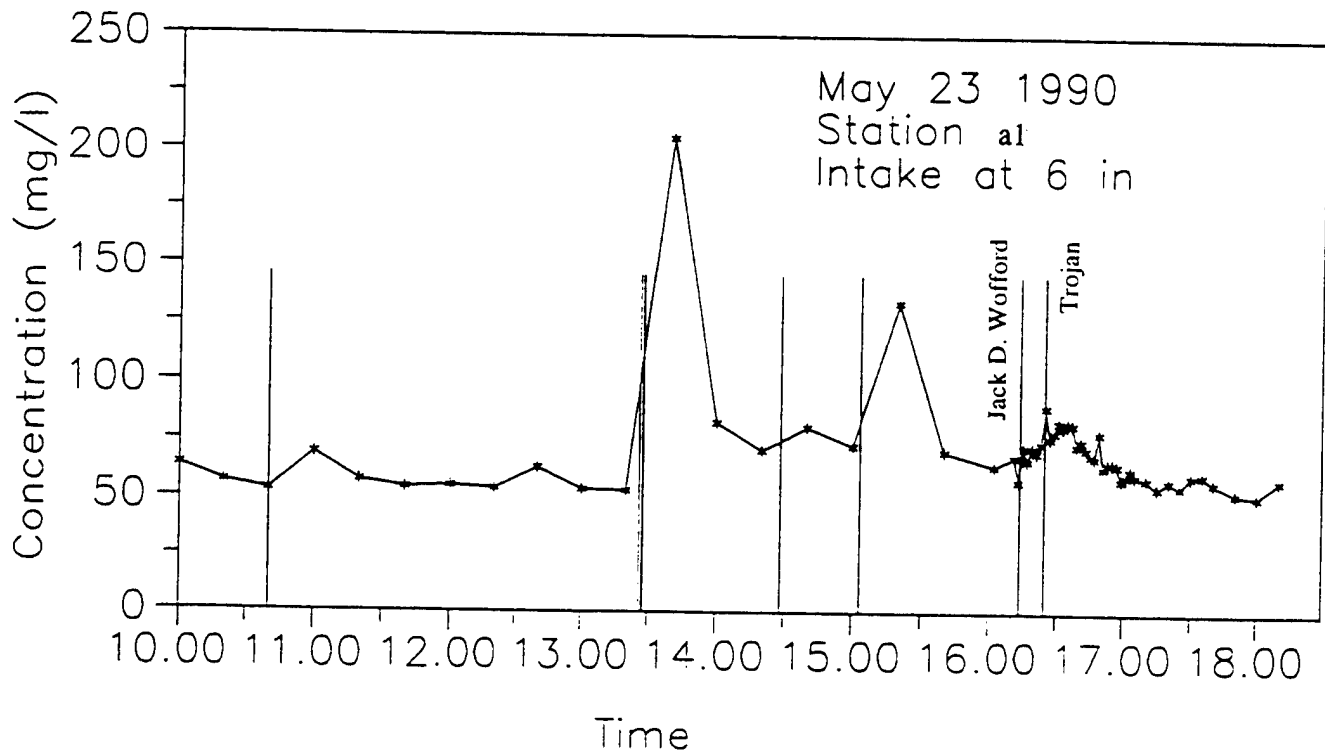
Stations c1 and c2 May 22, 1990



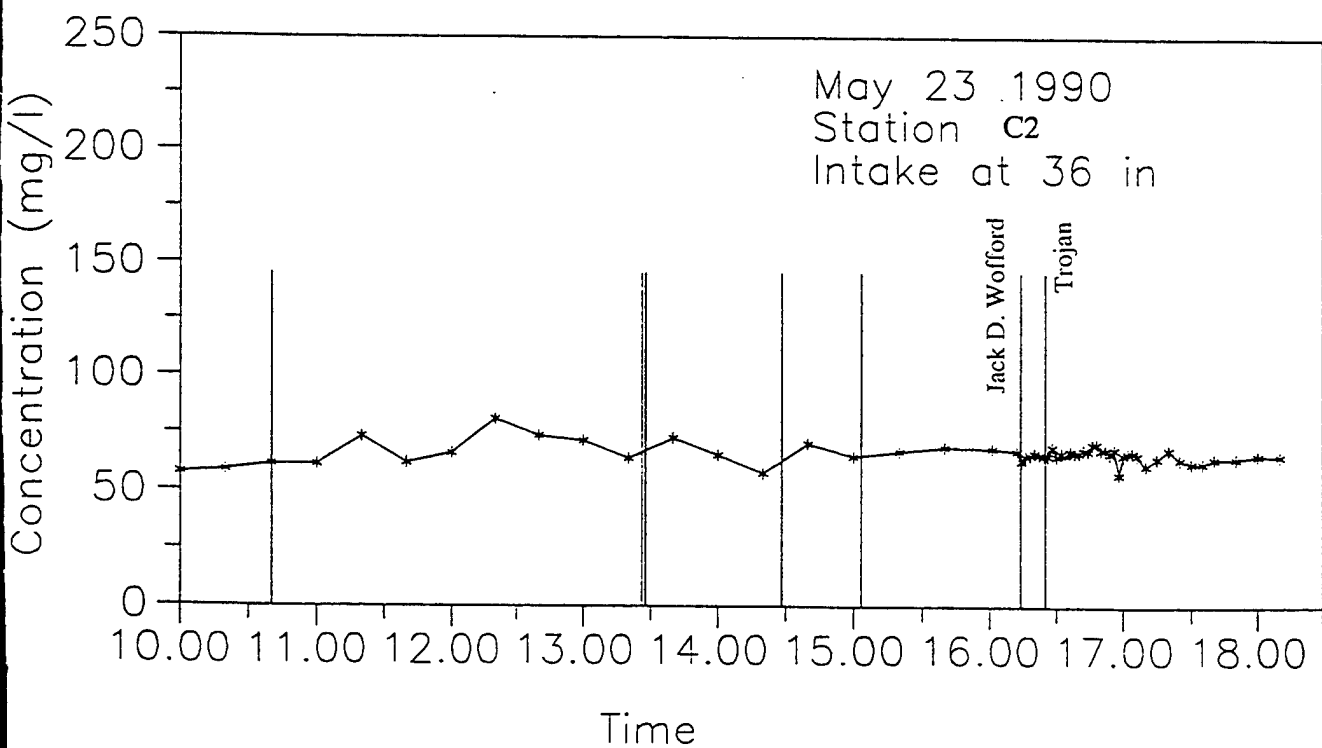
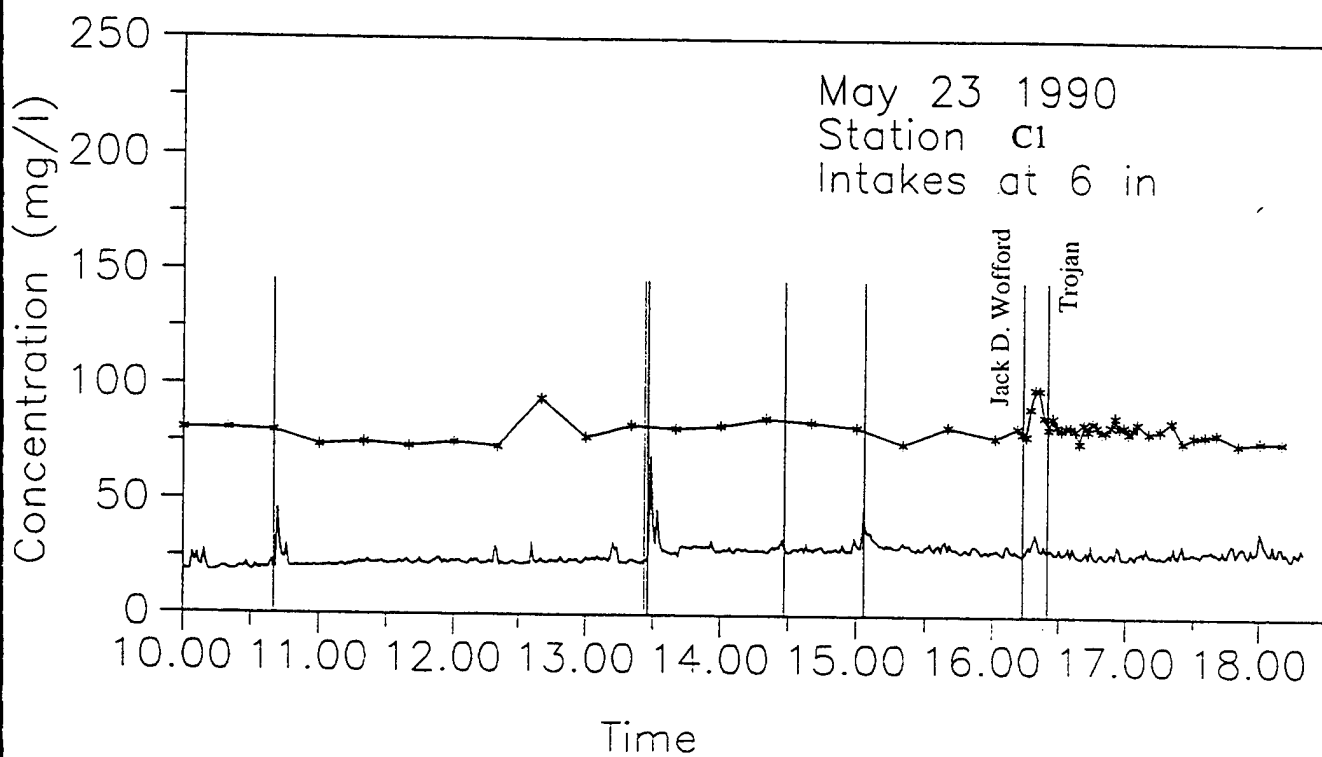
Stations d1 and d2 May 22, 1990



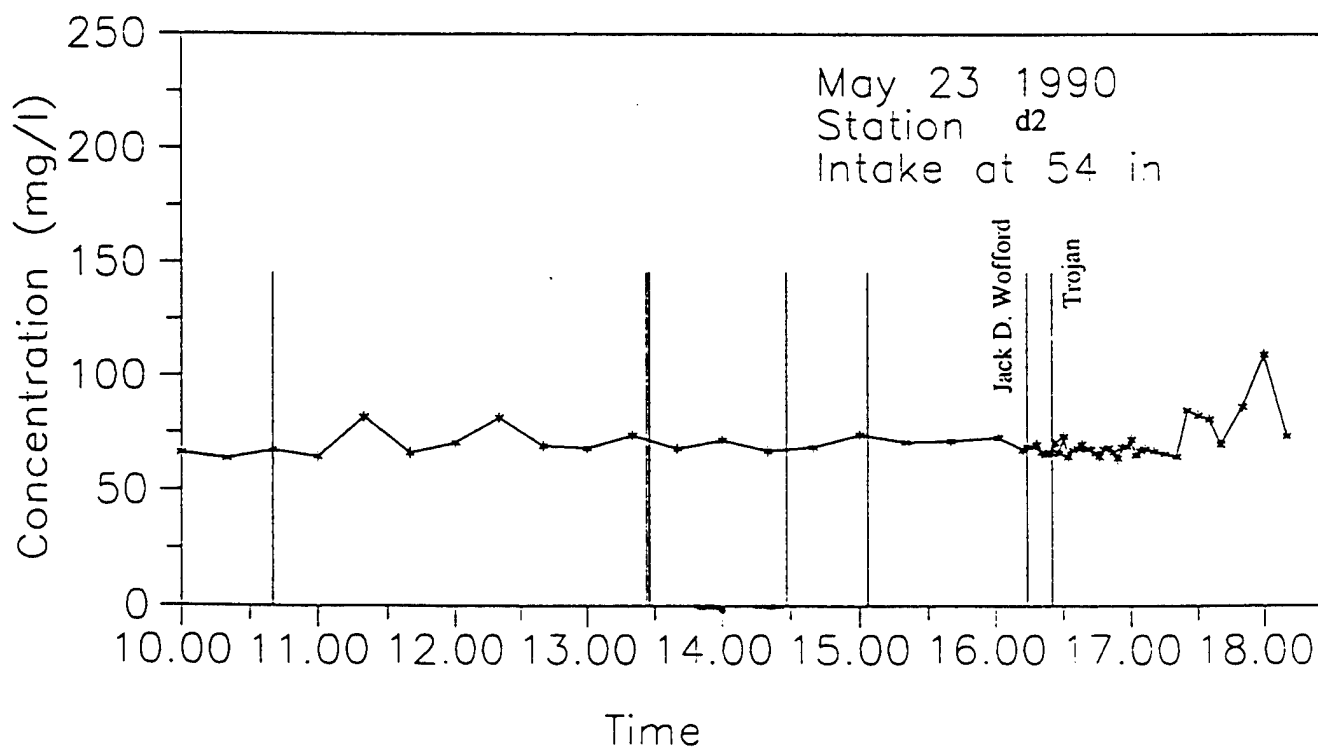
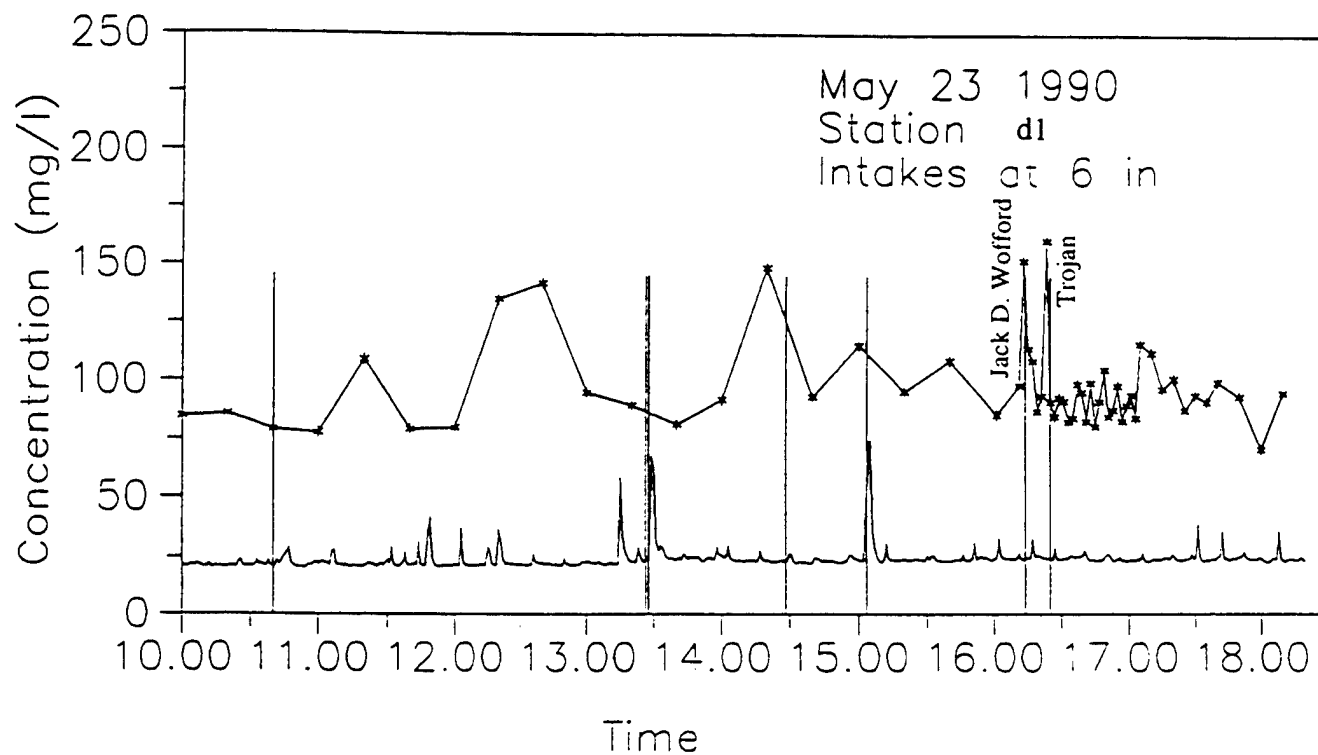
Stations a1 and b1 May 23, 1990



Stations c1 and c2 May 23, 1990

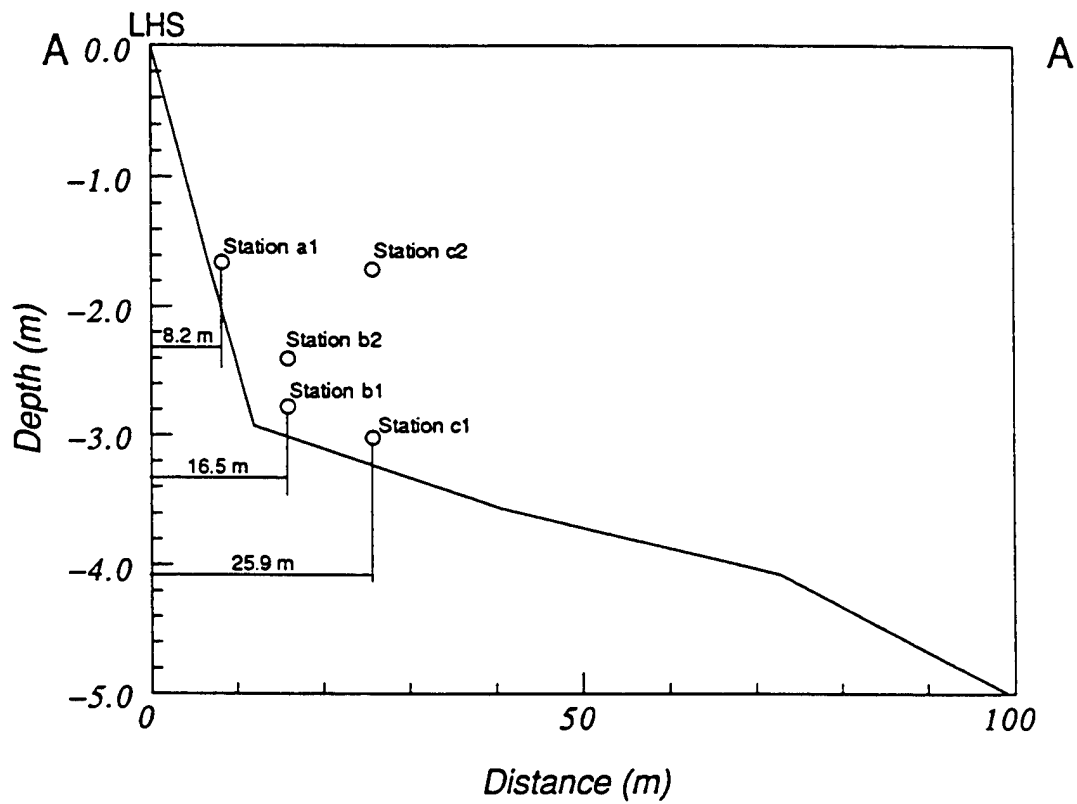


Stations d1 and d2 May 23, 1990



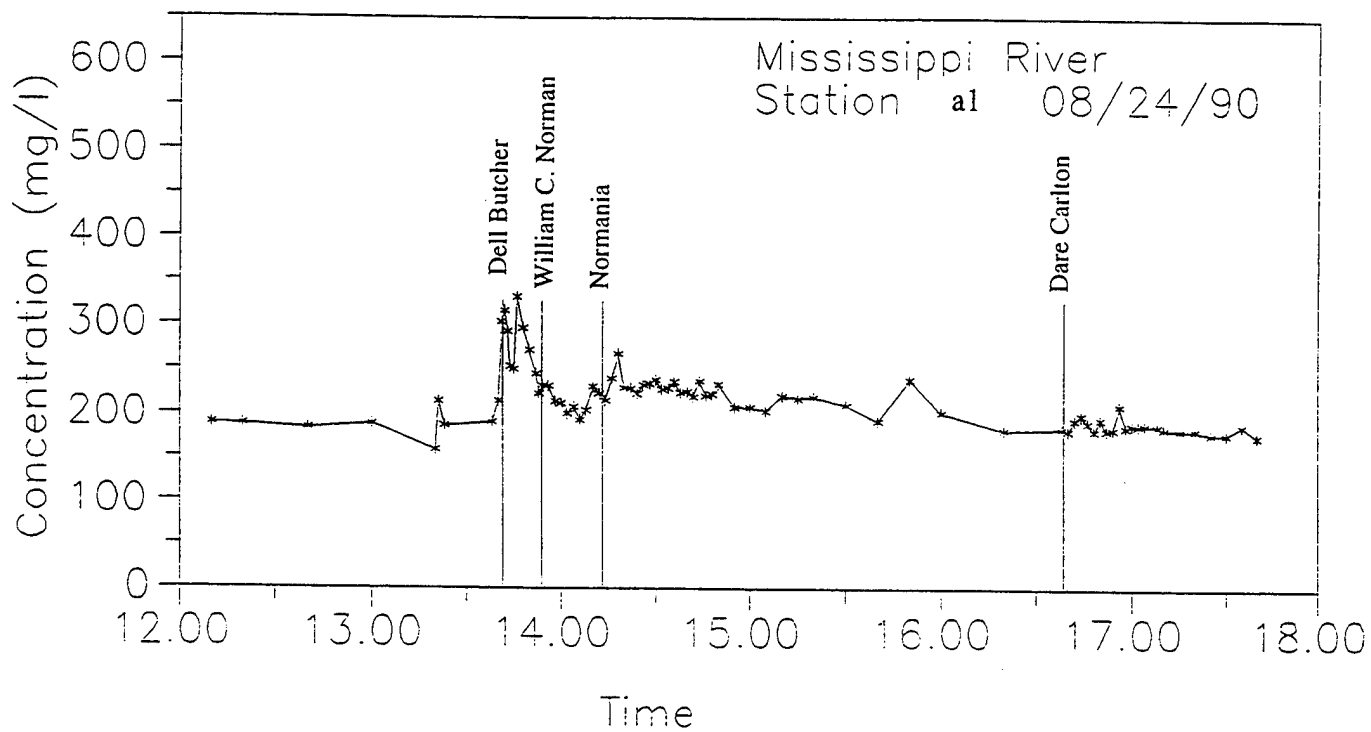
XXV-3. Variation of suspended sediment concentration with time, Goose Island, trip 1

Location of suspended sediment sampling stations on the Mississippi River  
near the Goose Island site during August 20-29, 1990 (trip 1)

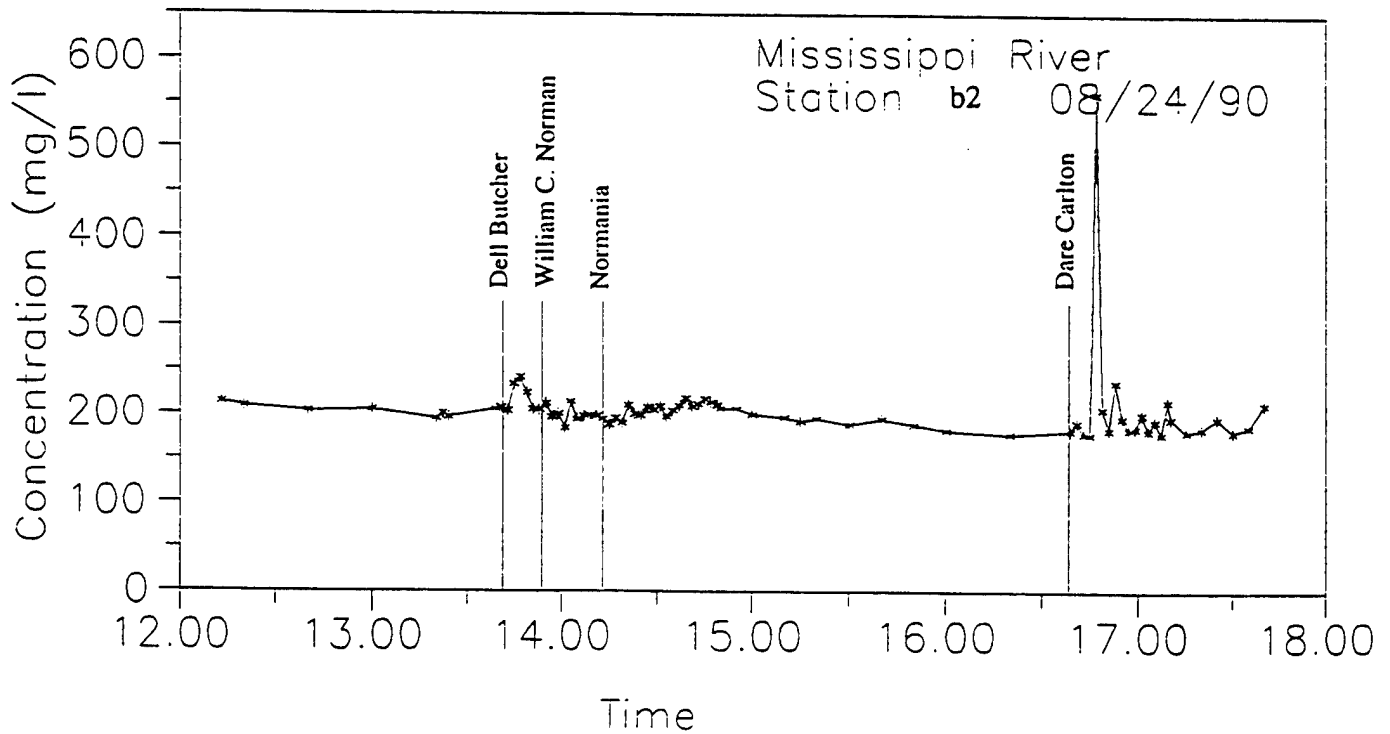
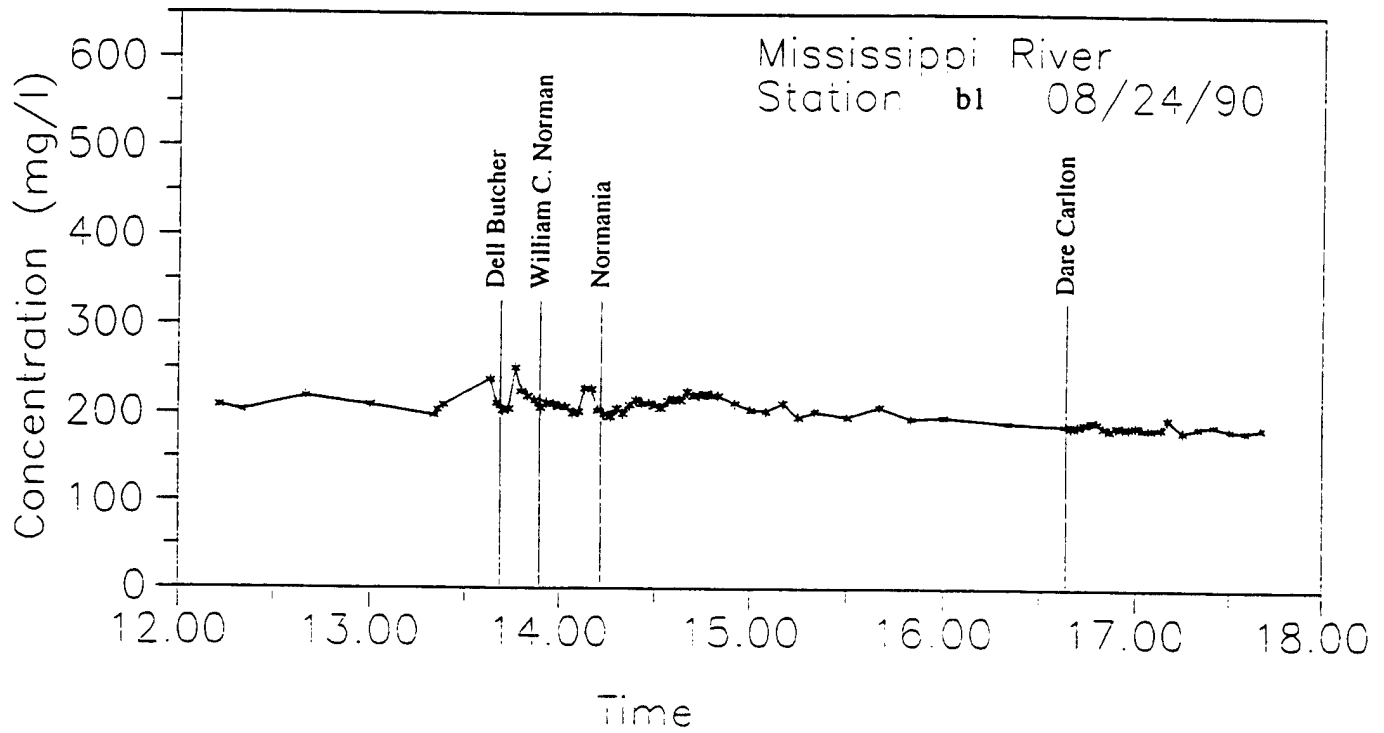




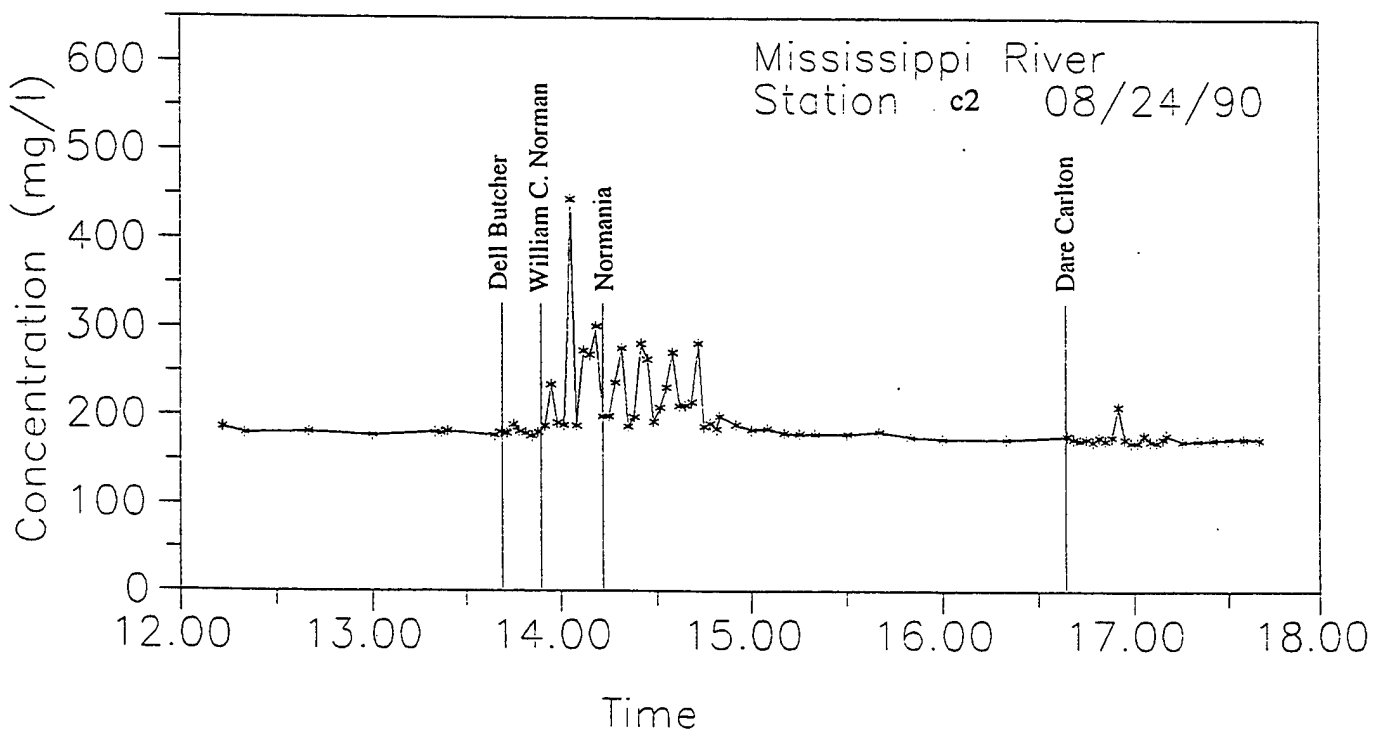
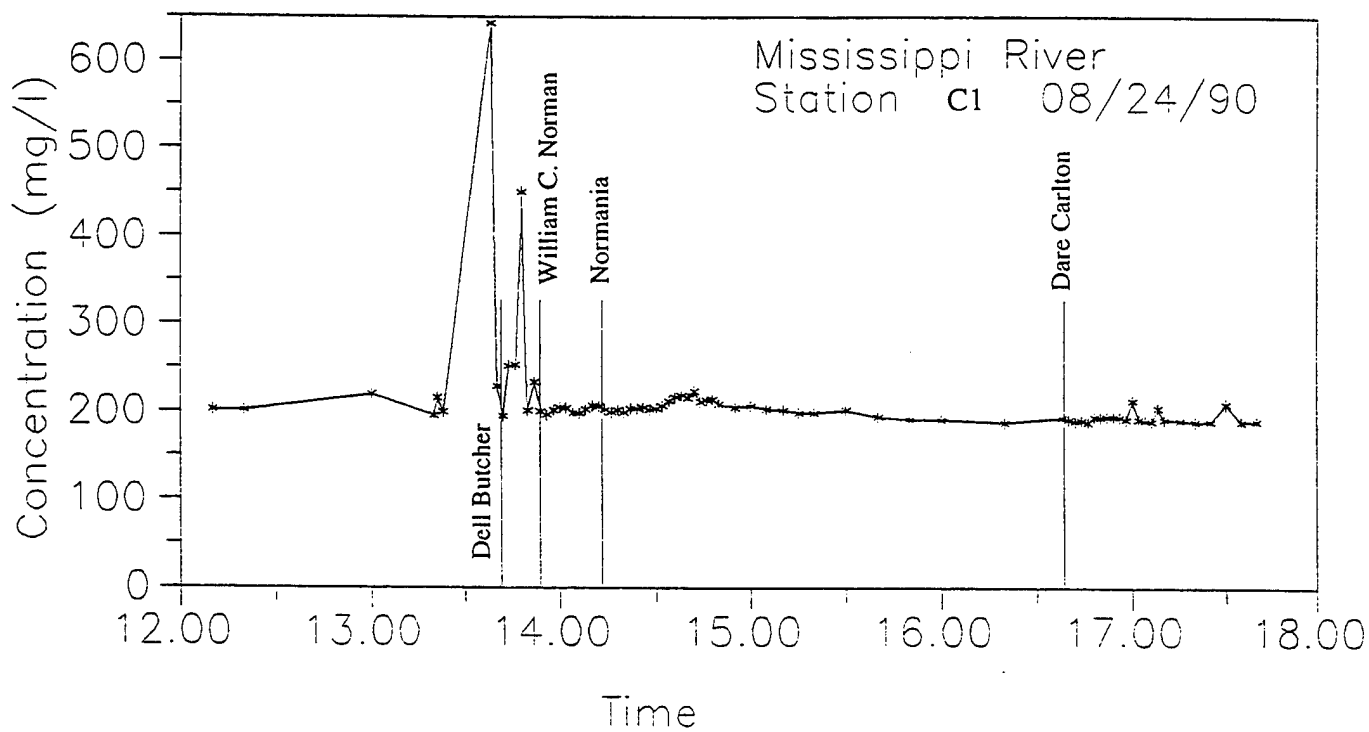
Station a1 August 24, 1990



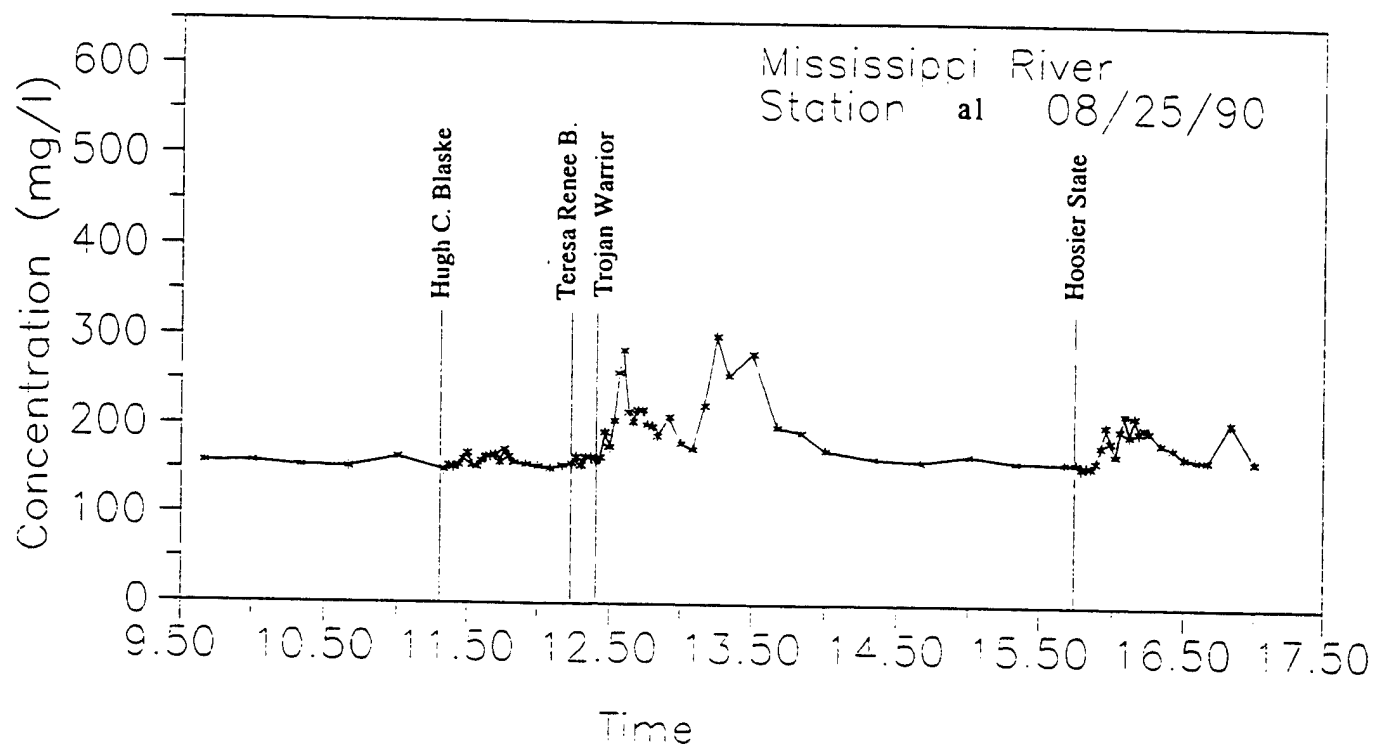
Stations b1 and b2 August 24, 1990



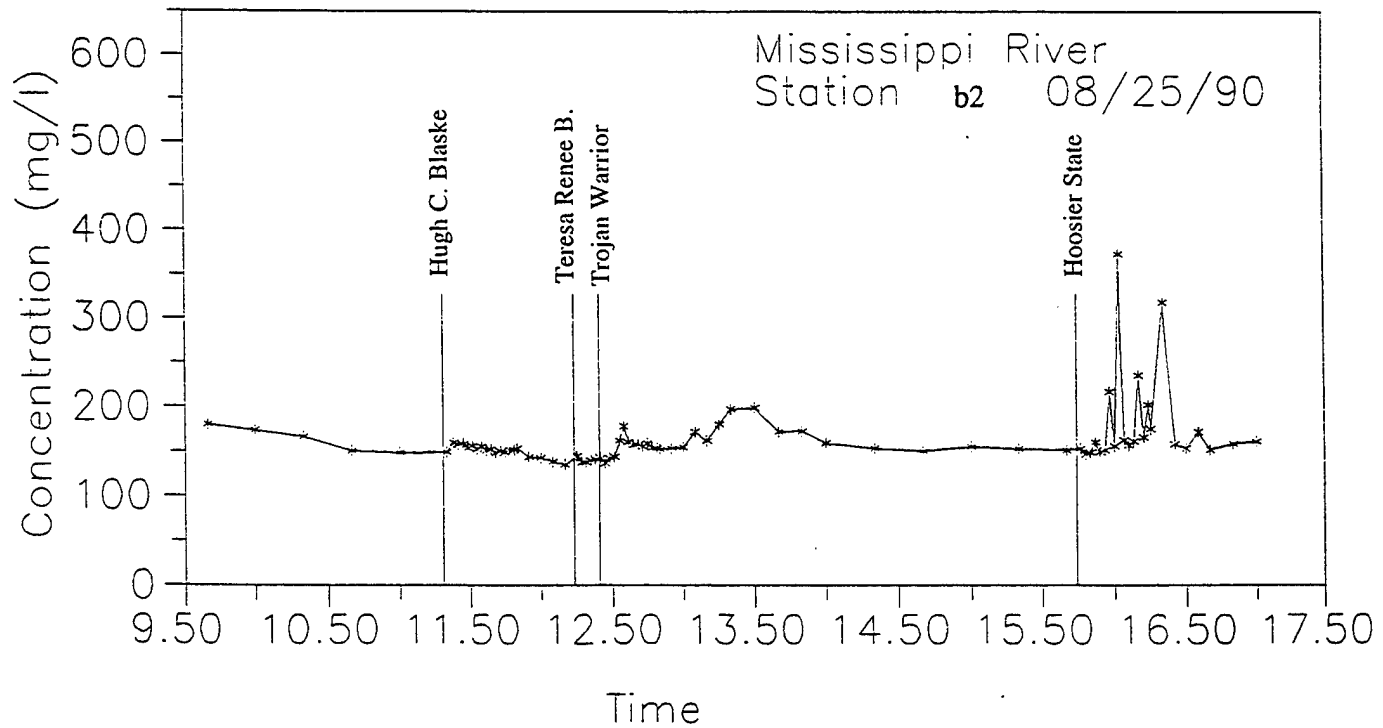
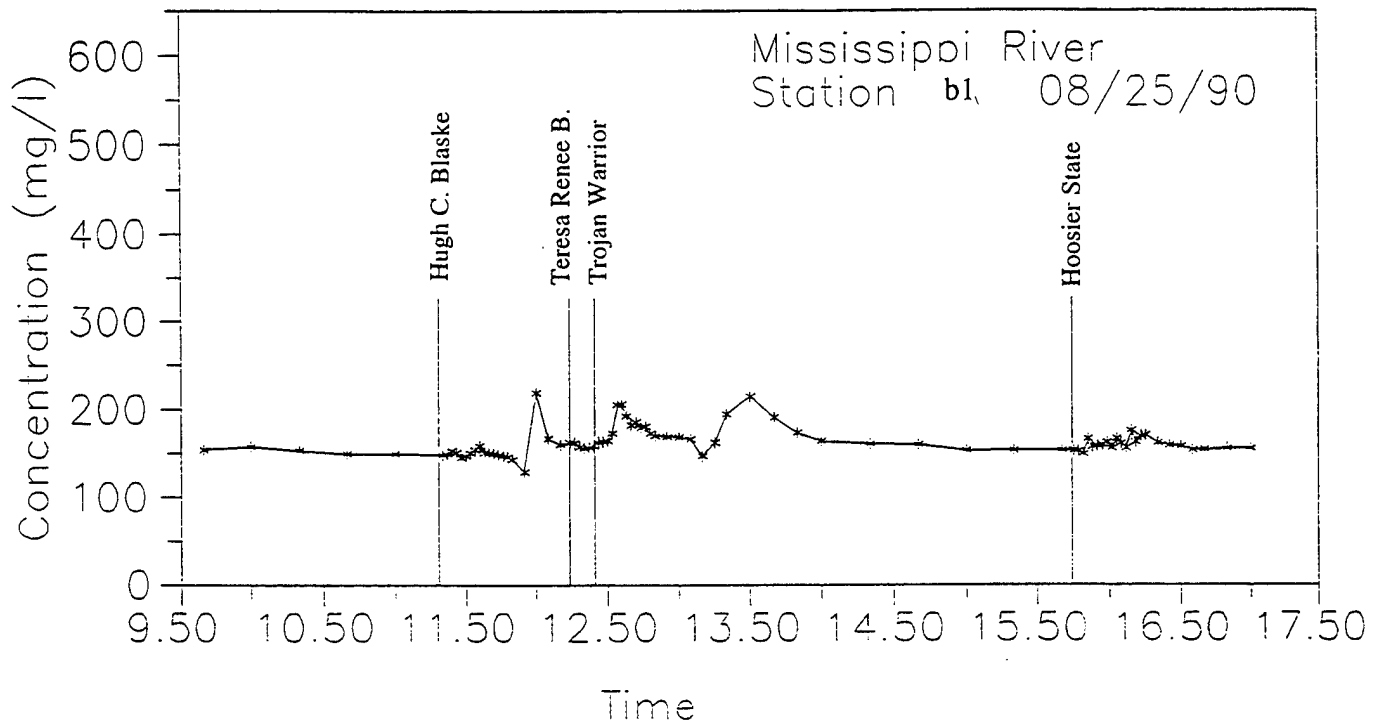
Stations c1 and c2 August 24, 1990



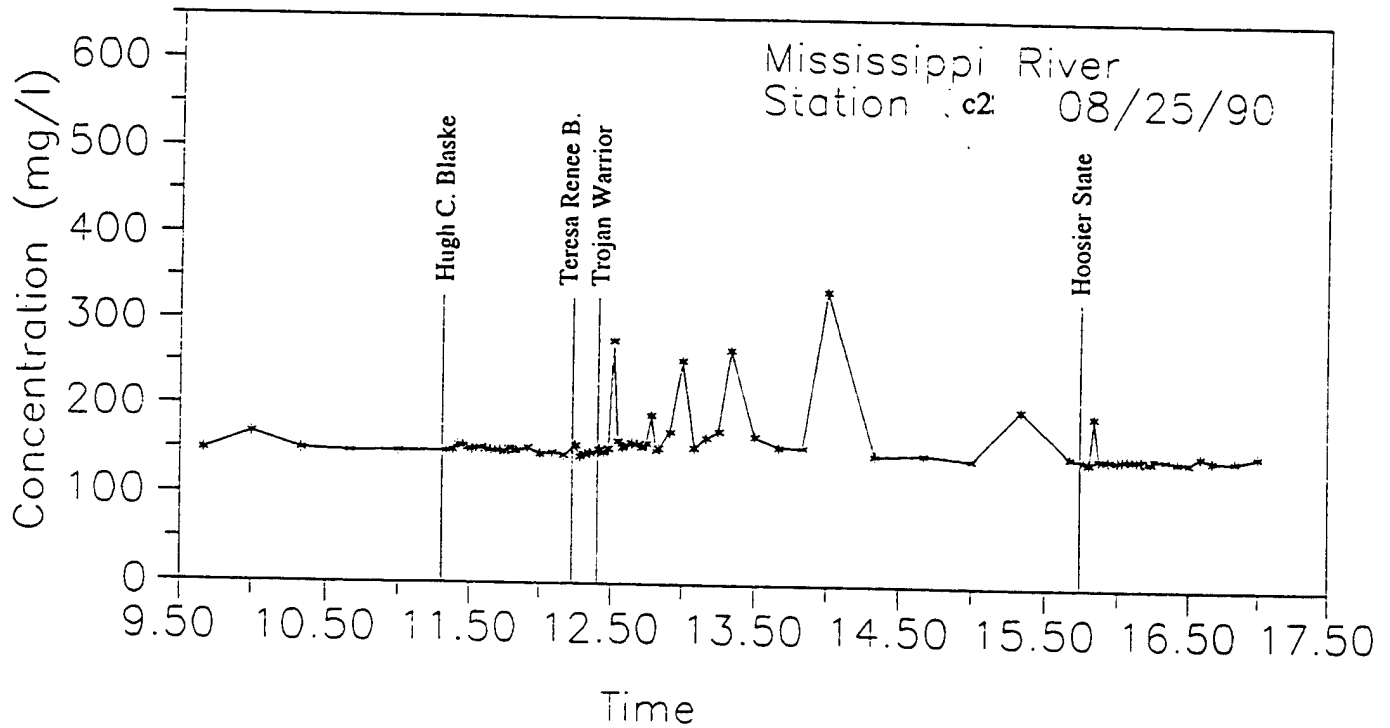
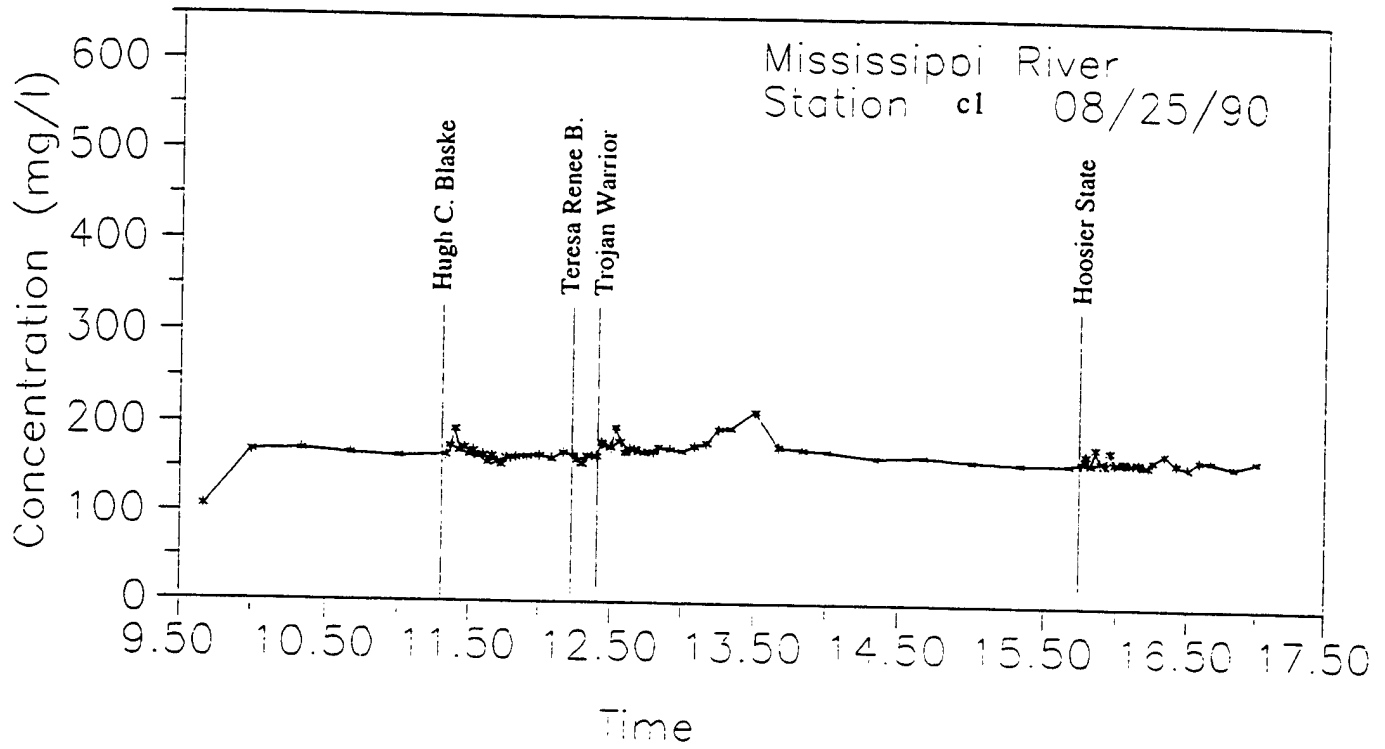
Station a1 August 25, 1990



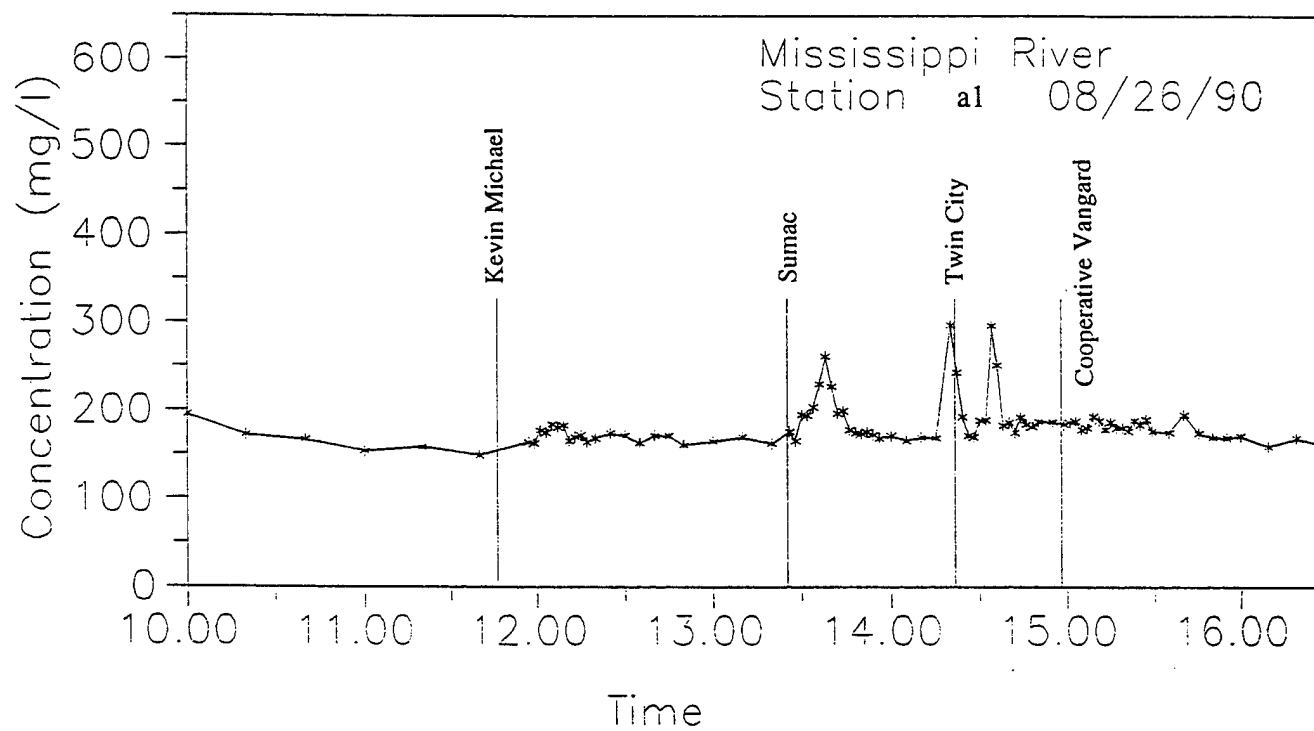
Stations b1 and b2 August 25, 1990



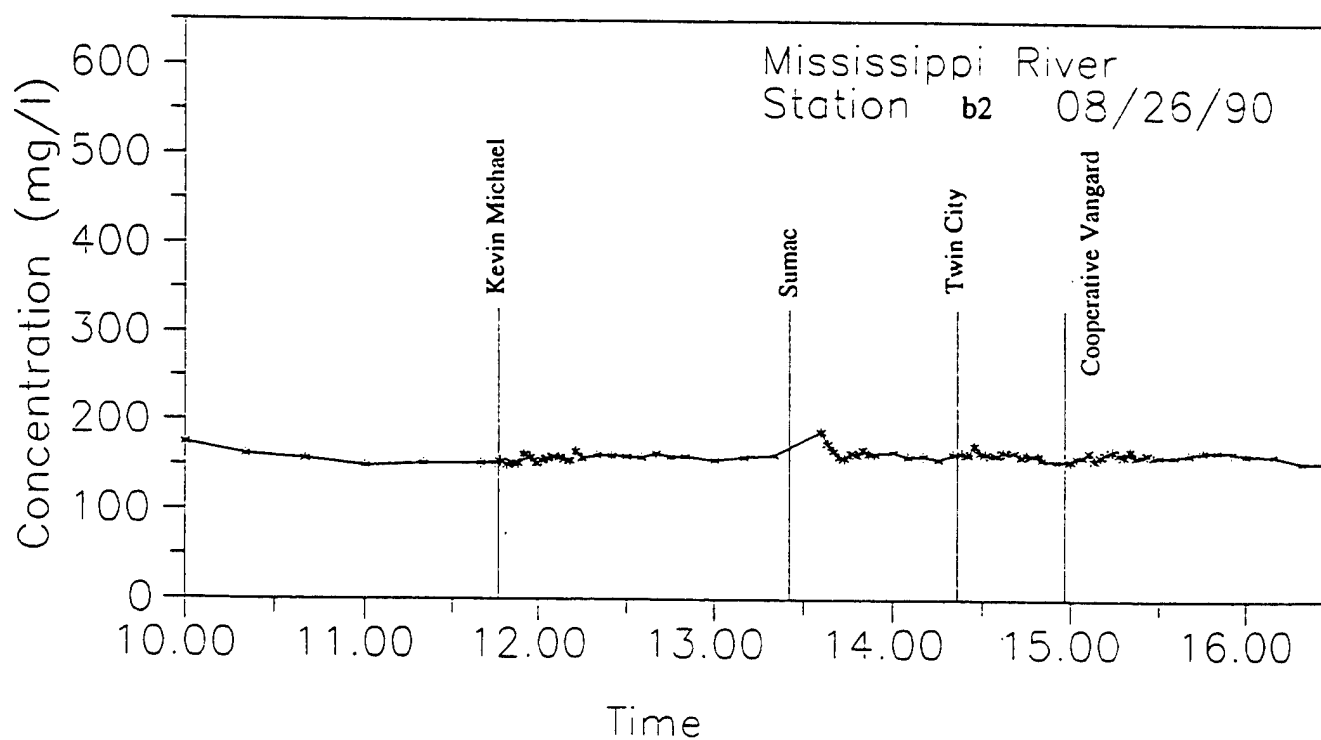
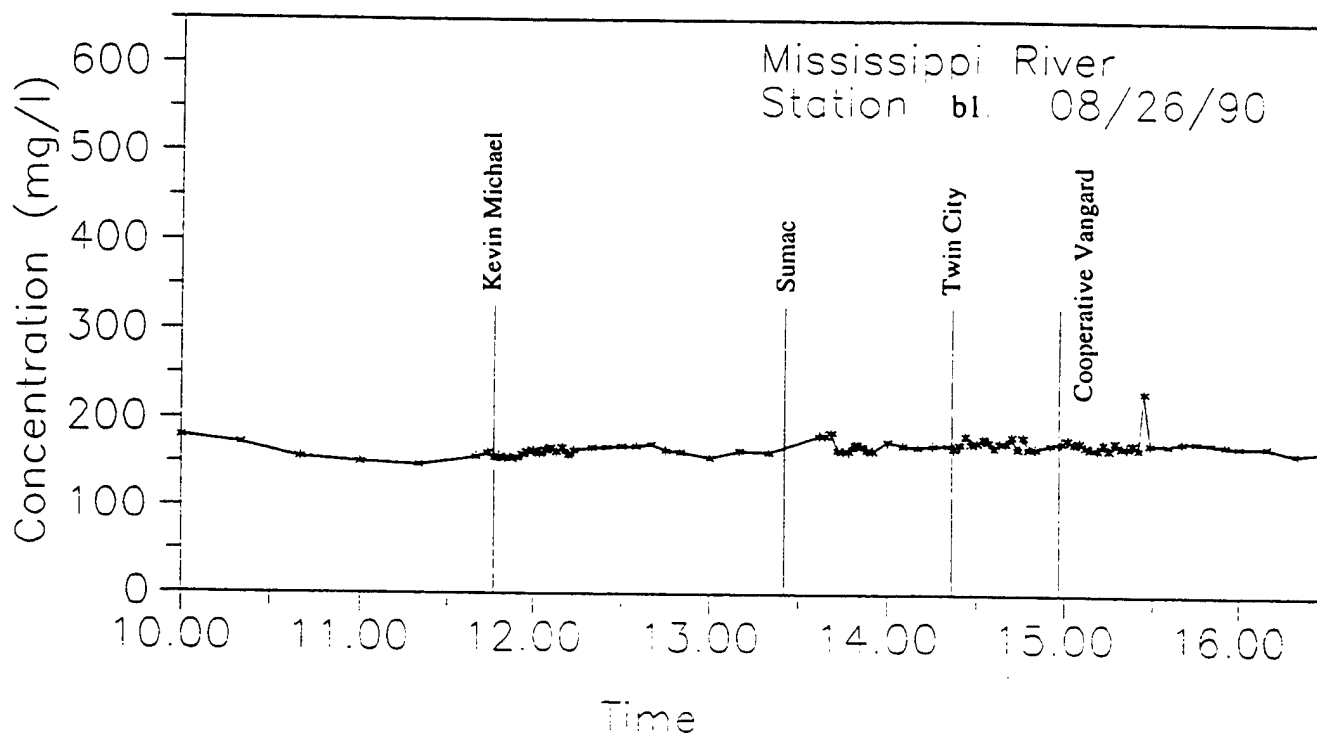
Stations c1 and c2 August 25, 1990



Station a1 August 26, 1990

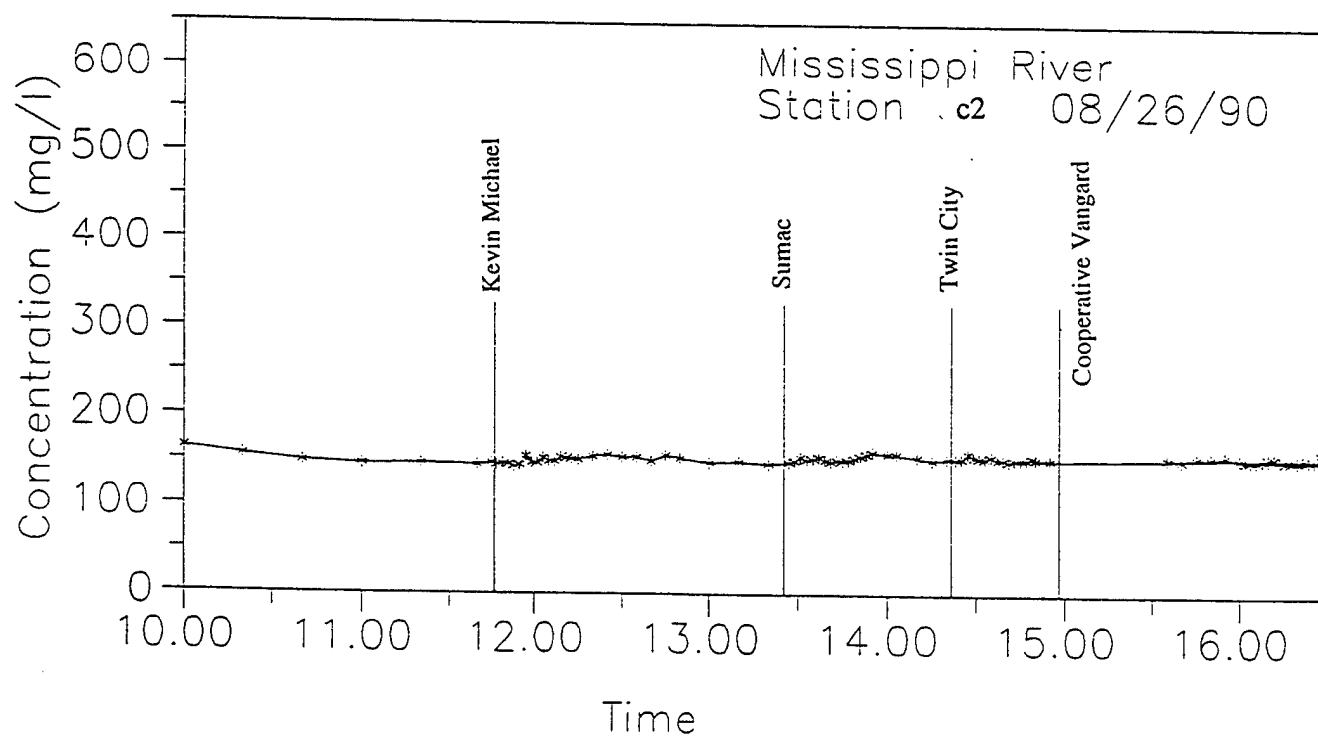
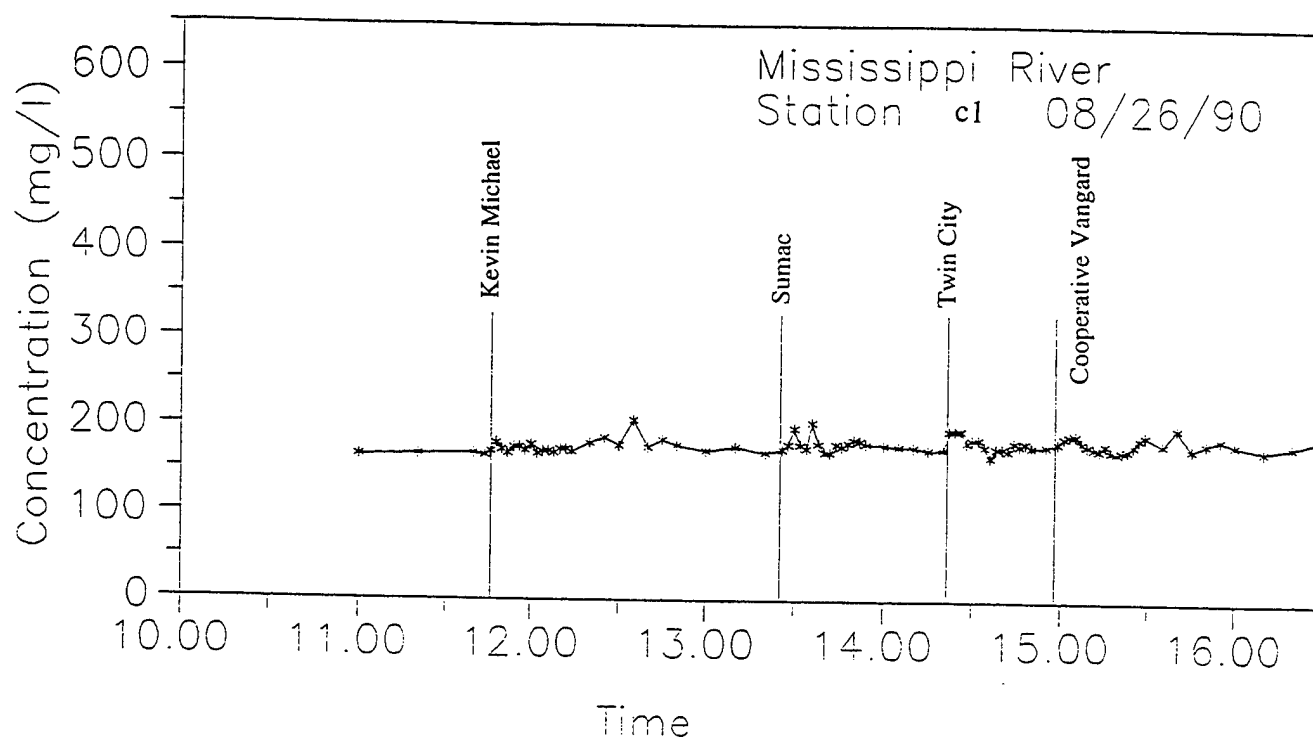


Stations b1 and b2 August 26, 1990

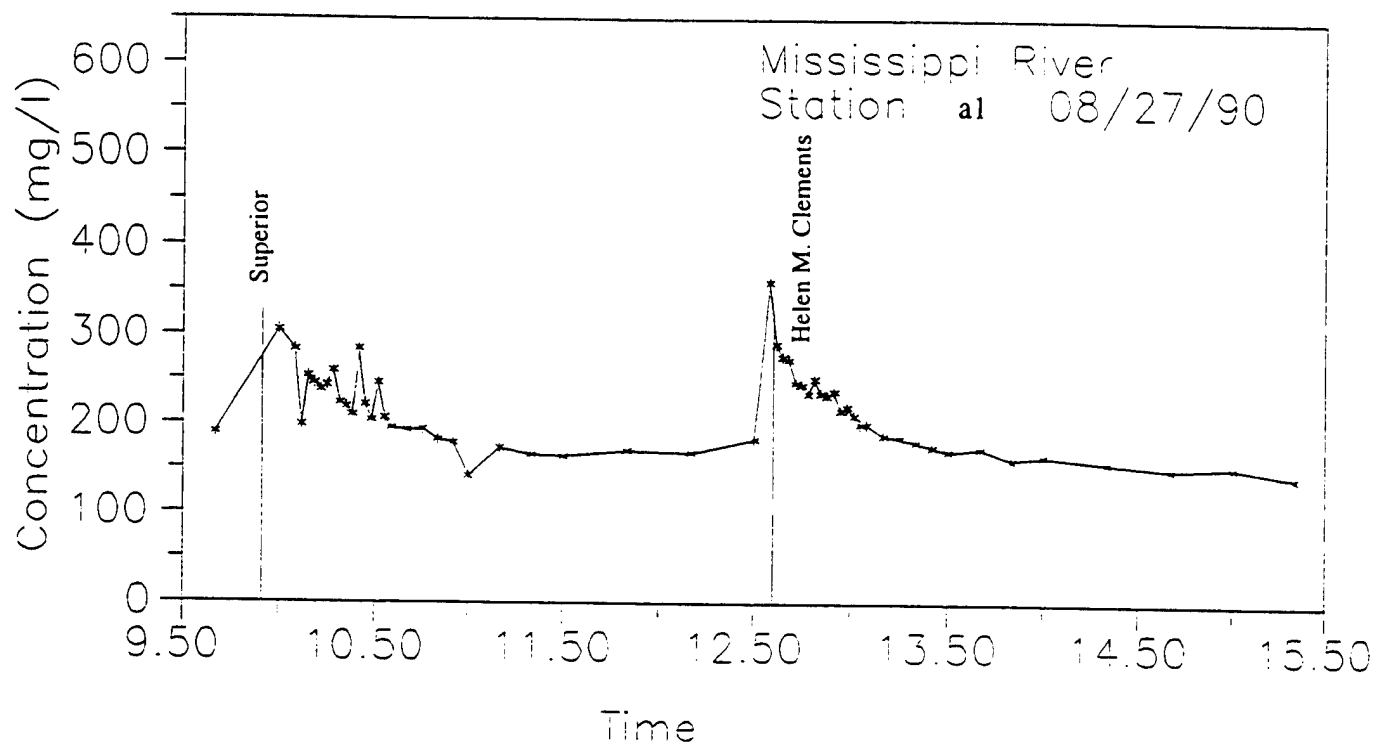




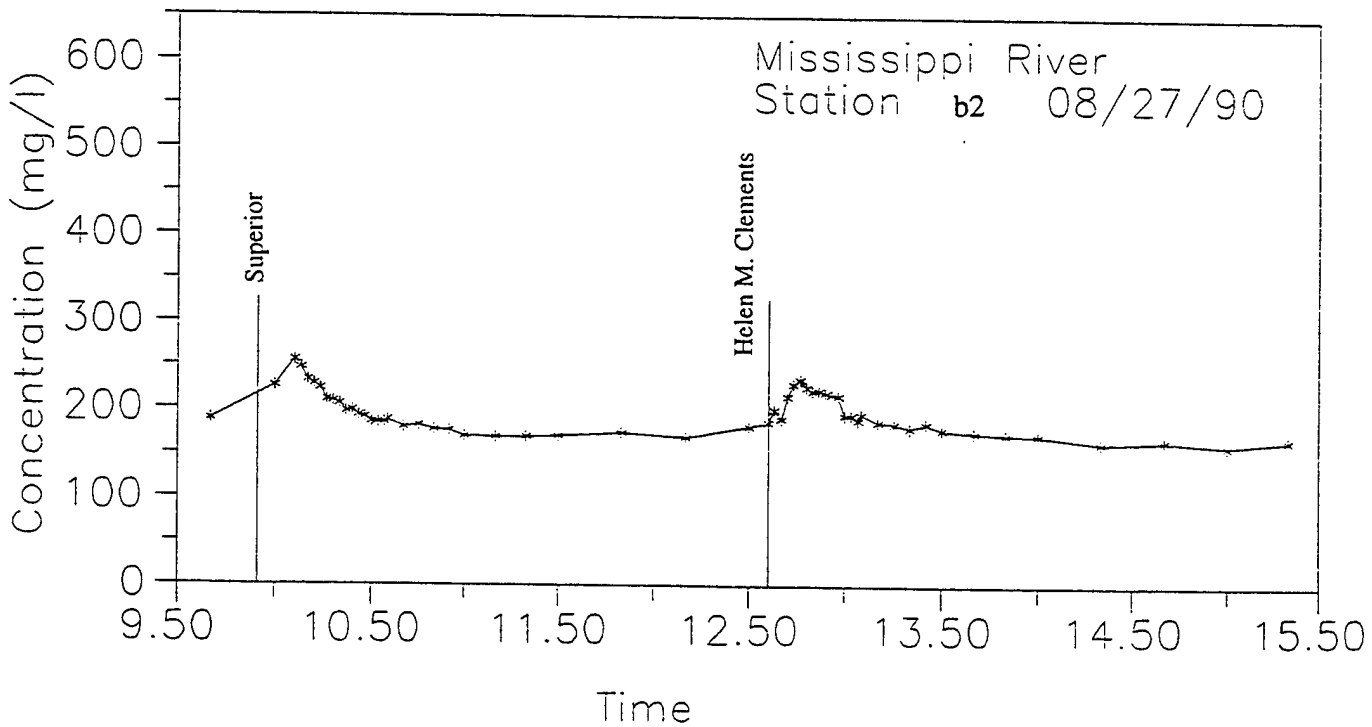
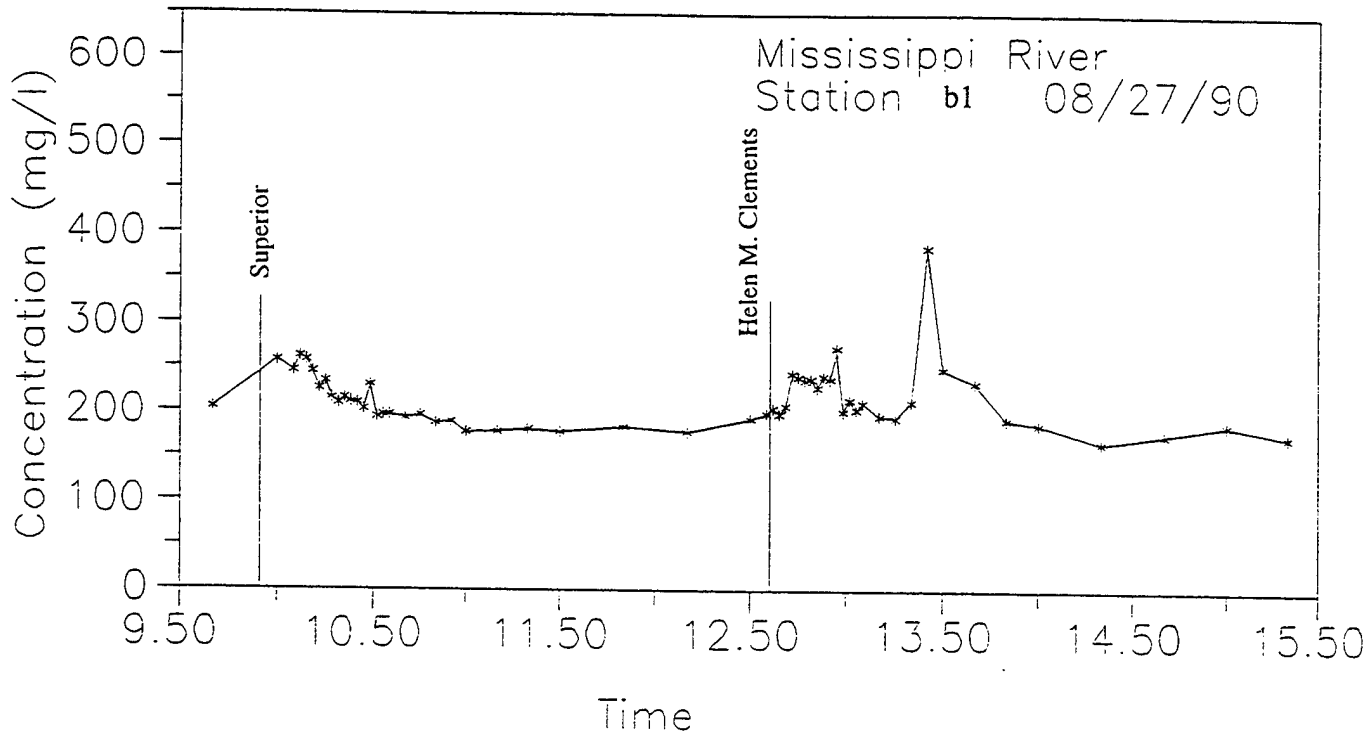
Stations c1 and c2 August 26, 1990



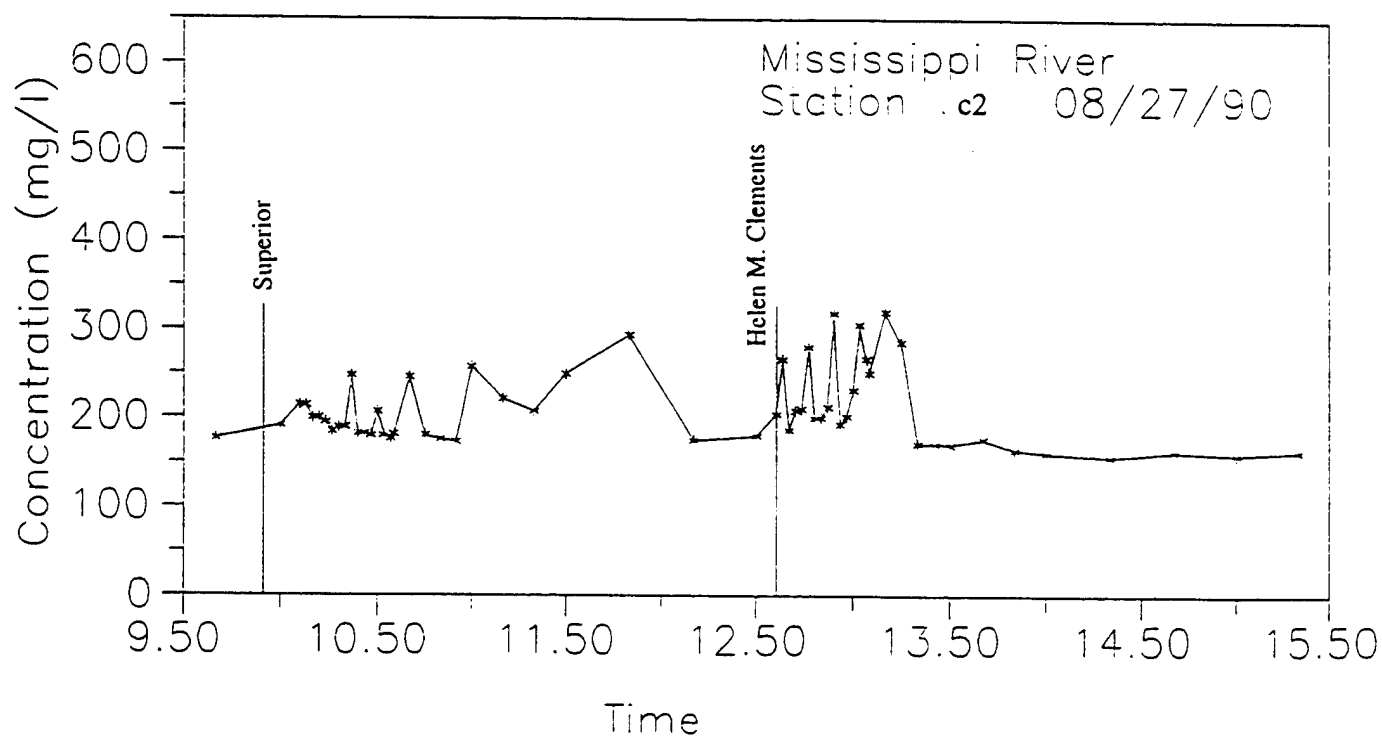
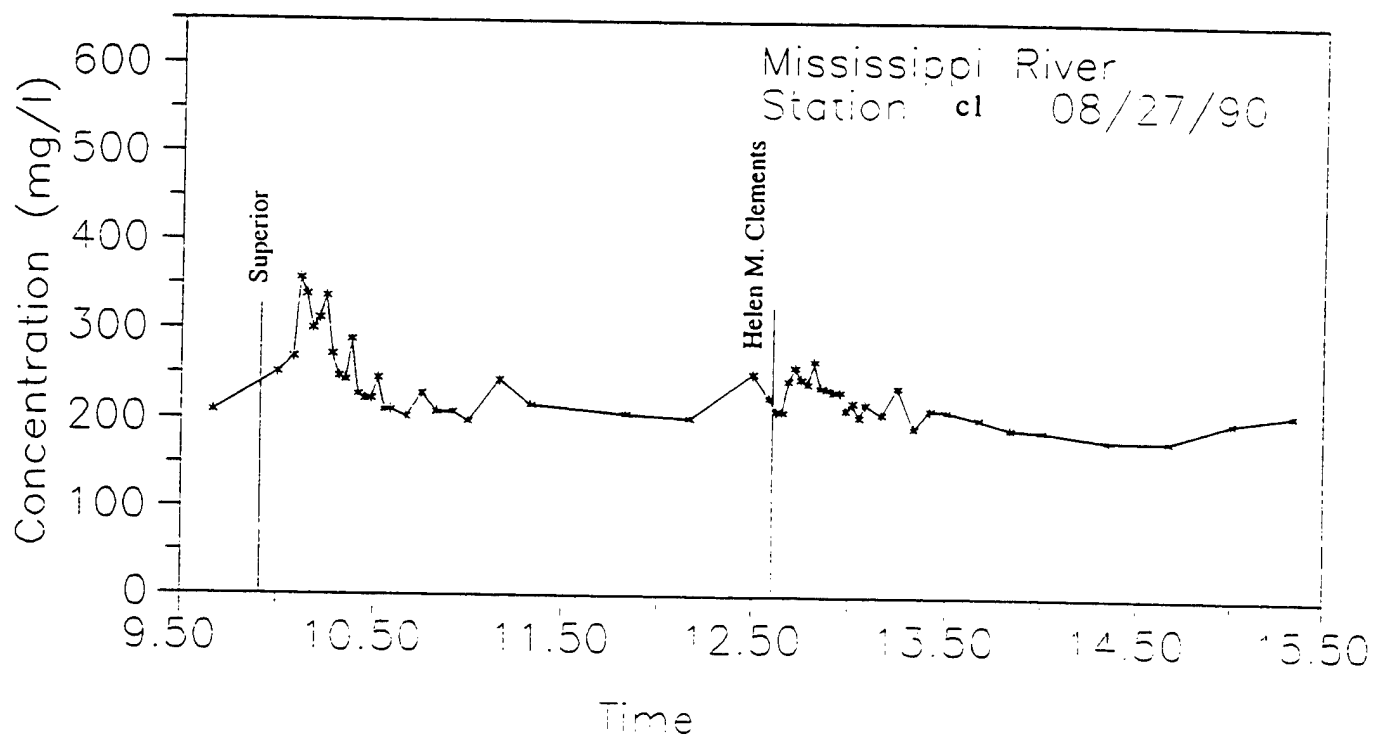
Station a1 August 27, 1990



Stations b1 and b2 August 27, 1990

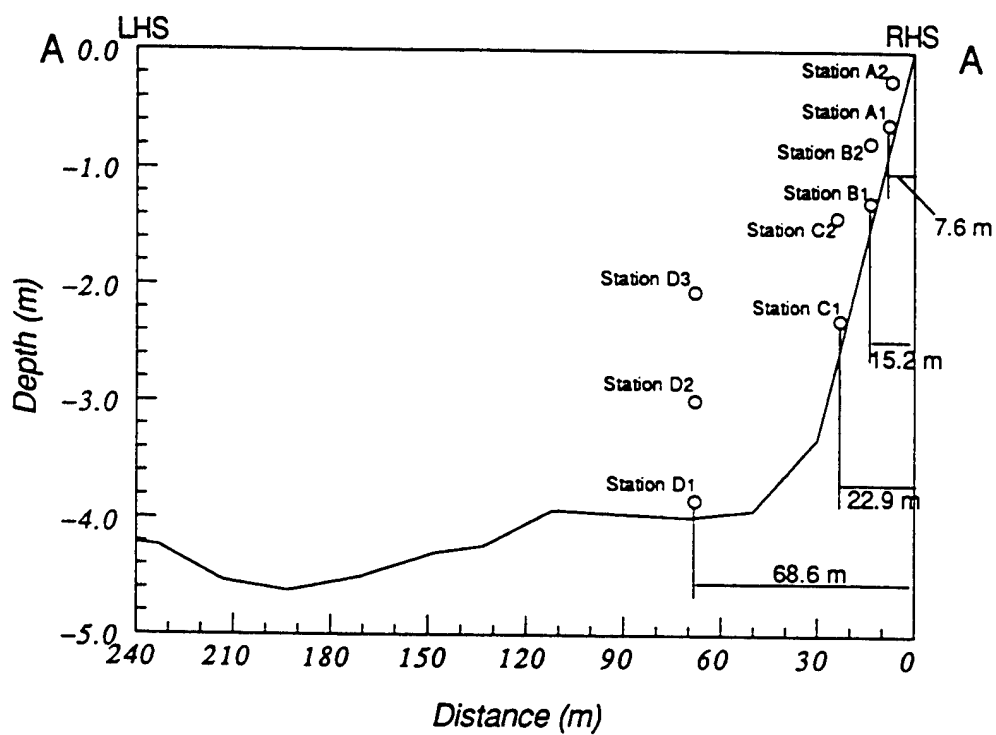


Stations c1 and c2 August 27, 1990

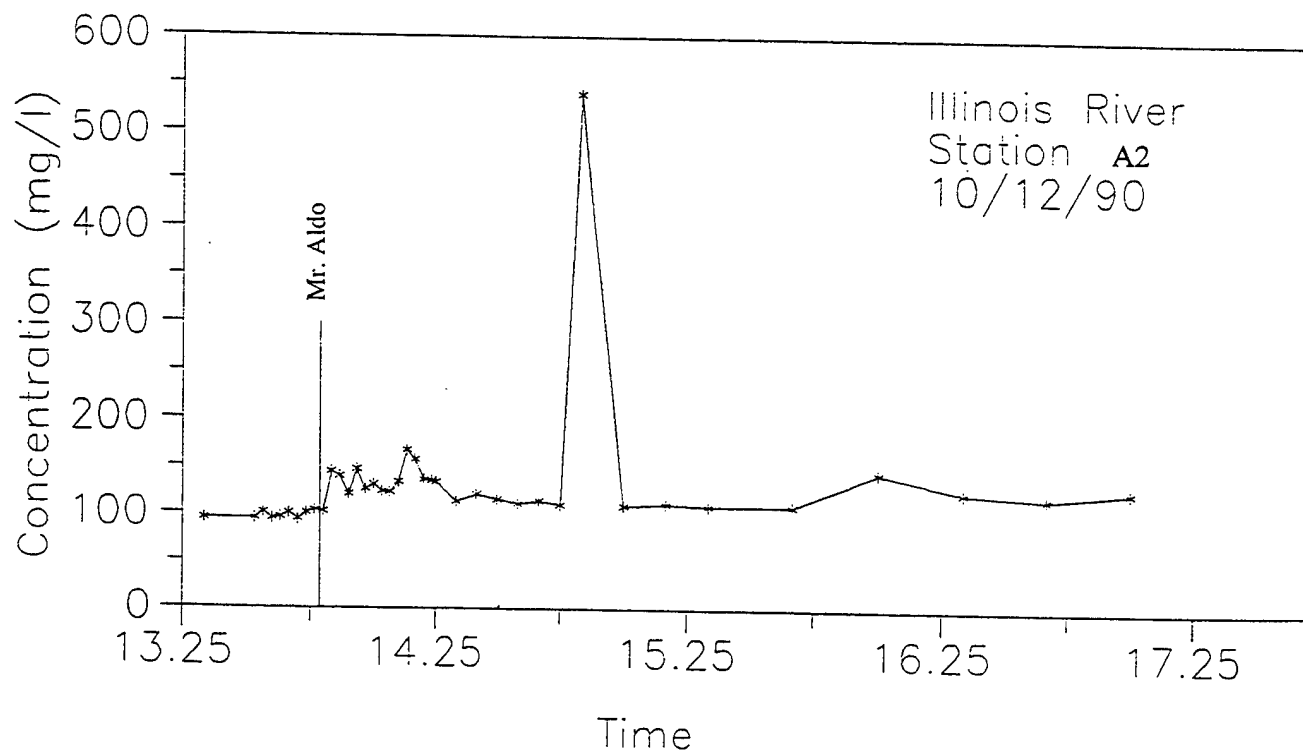
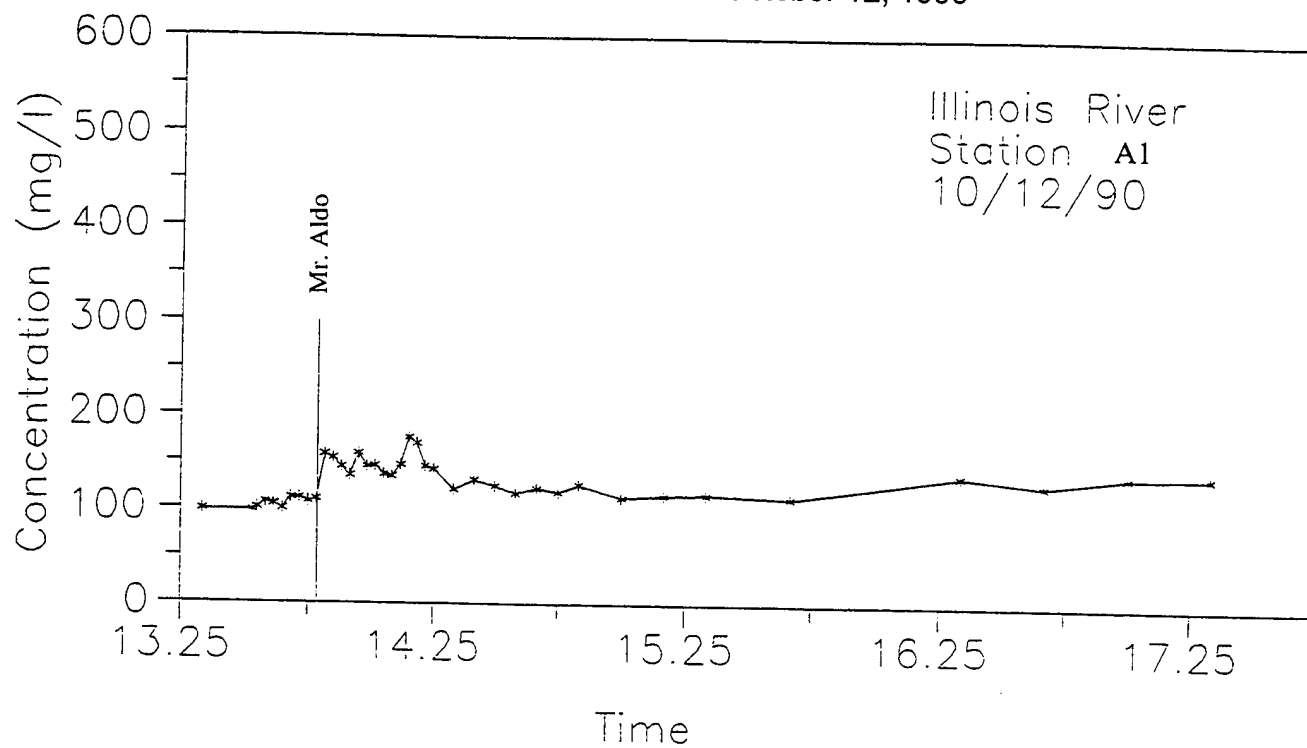


XXV-4. Variation of suspended sediment concentration with time, Kampsville, trip 1

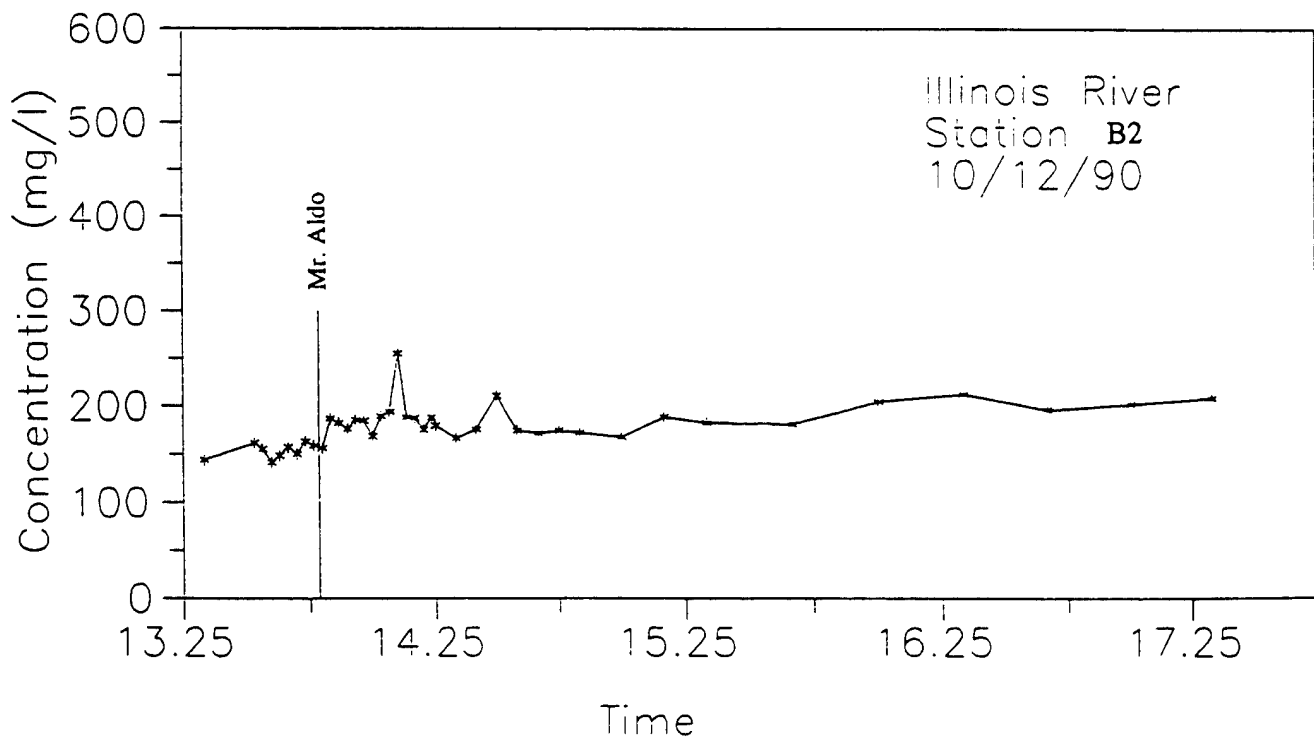
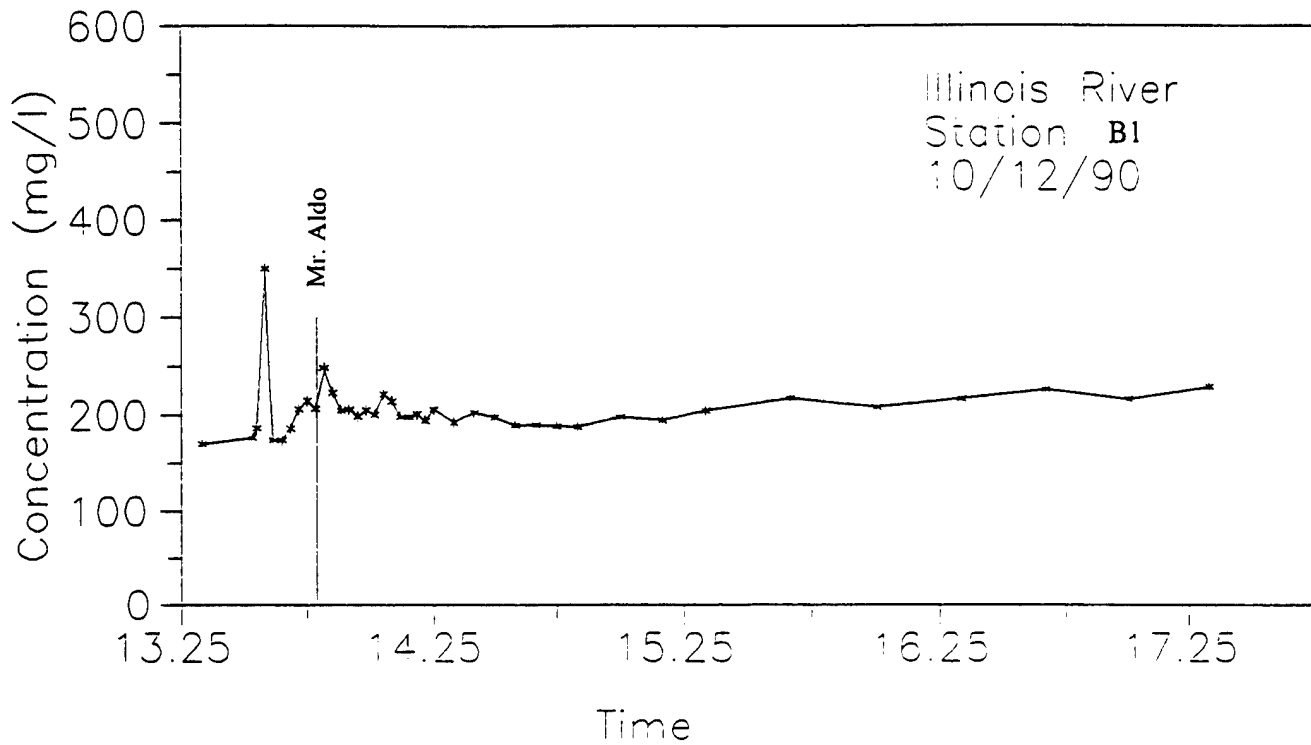
Location of suspended sediment sampling stations on the Illinois River  
near the Kampsville site during October 9-18, 1990 (trip 1)



Stations A1 and A2 October 12, 1990

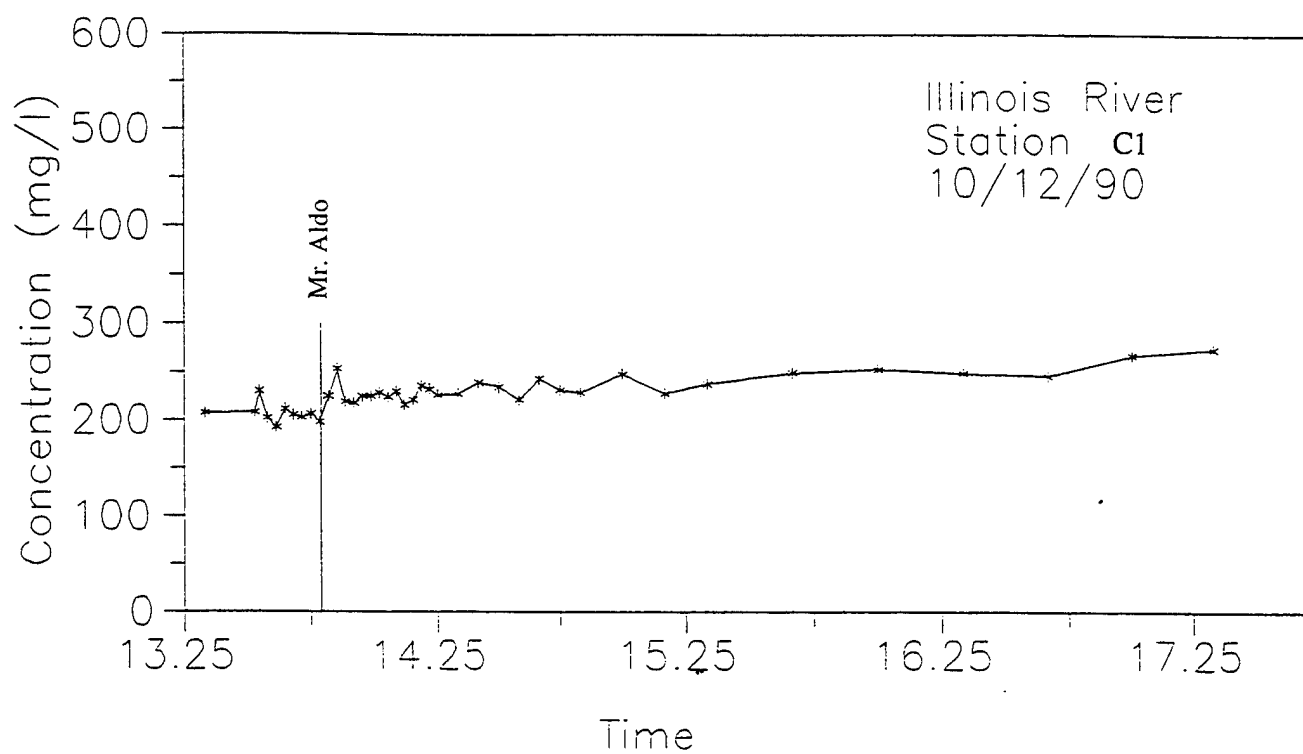


Stations B1 and B2 October 12, 1990

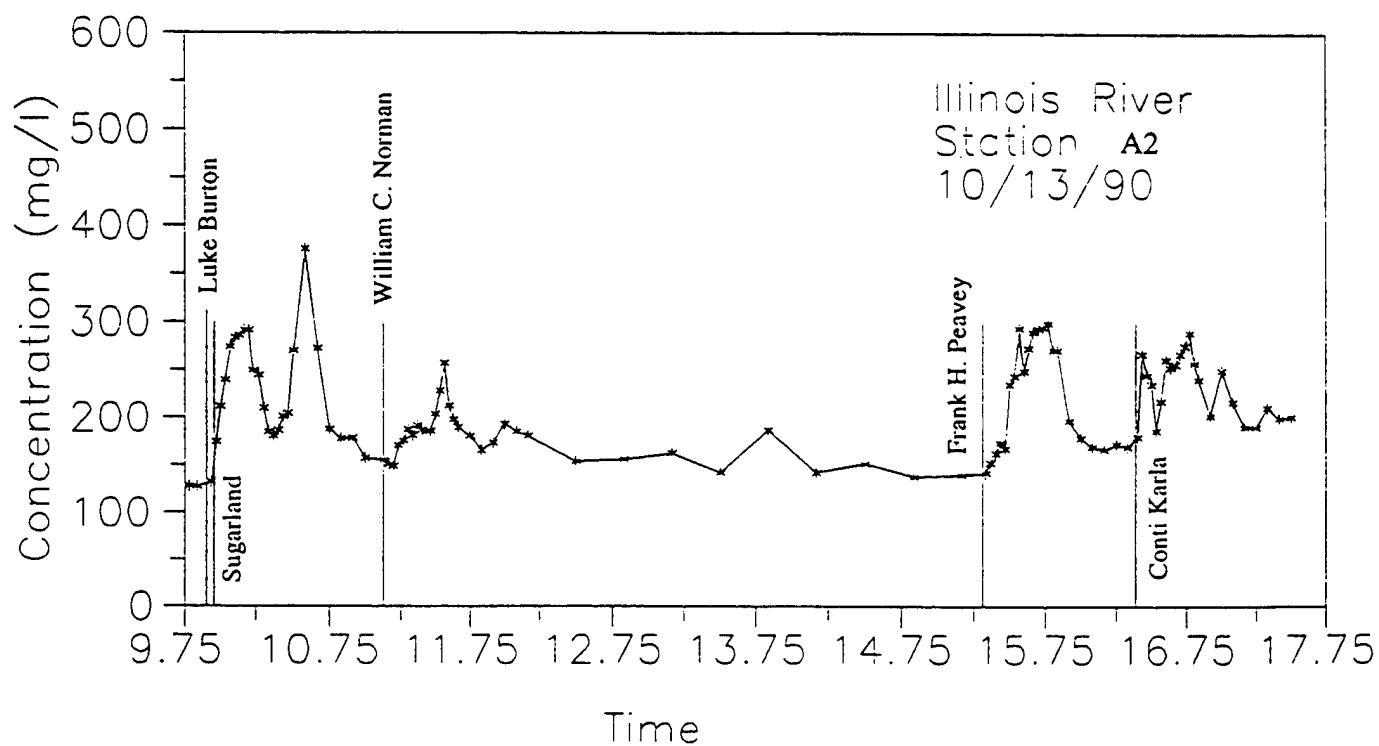
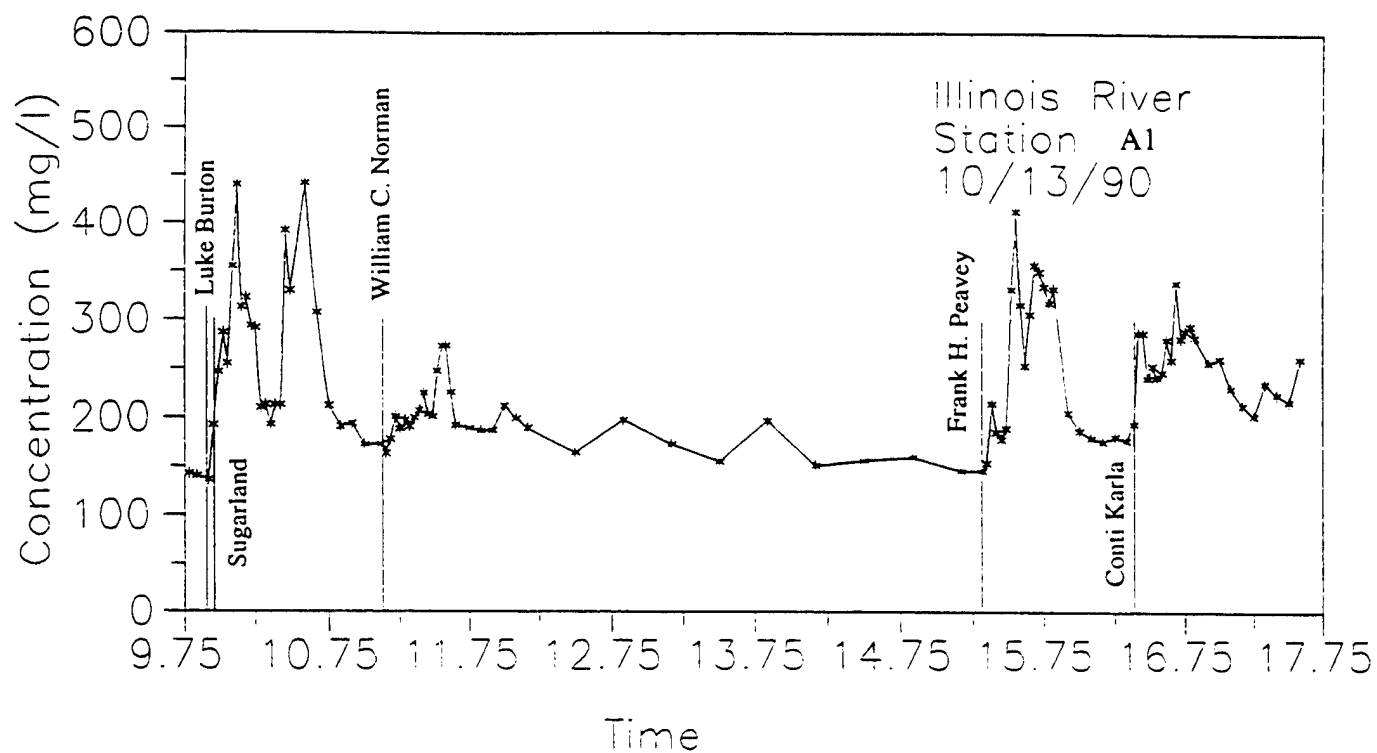




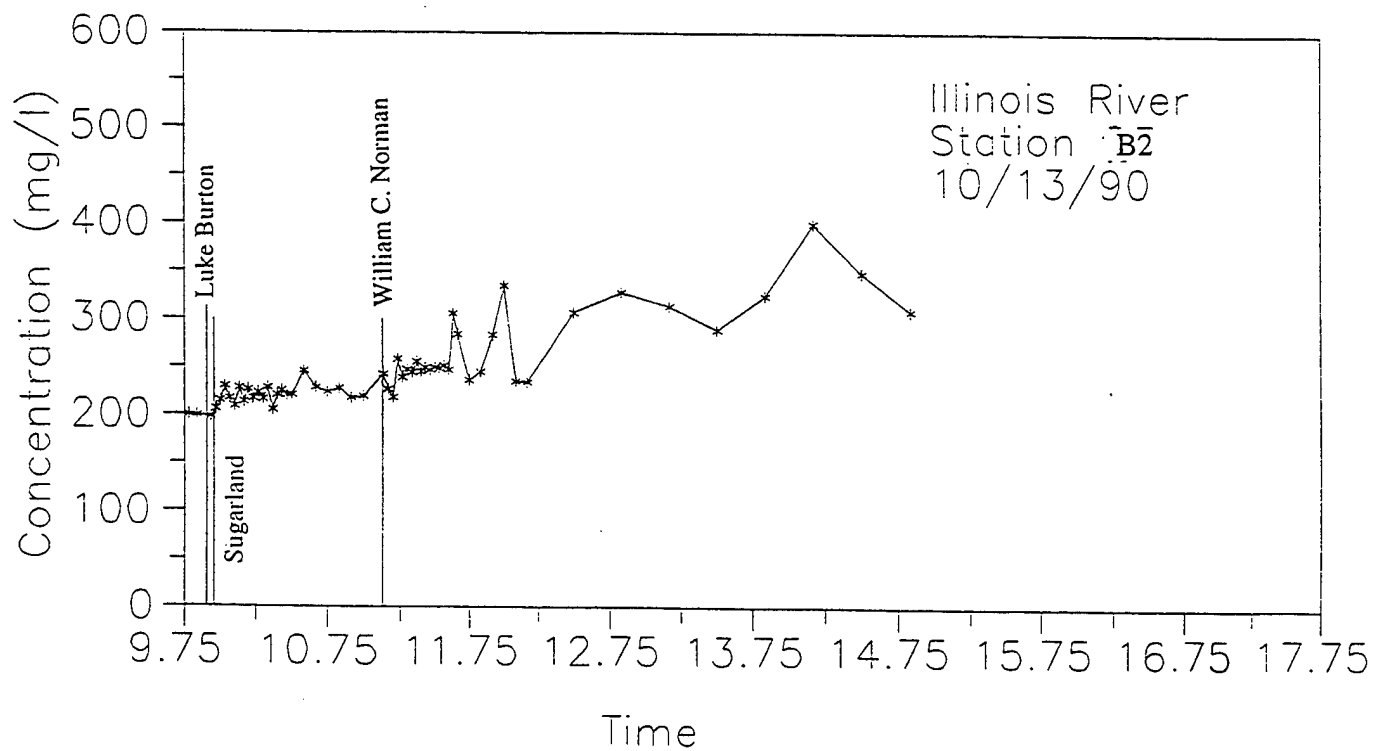
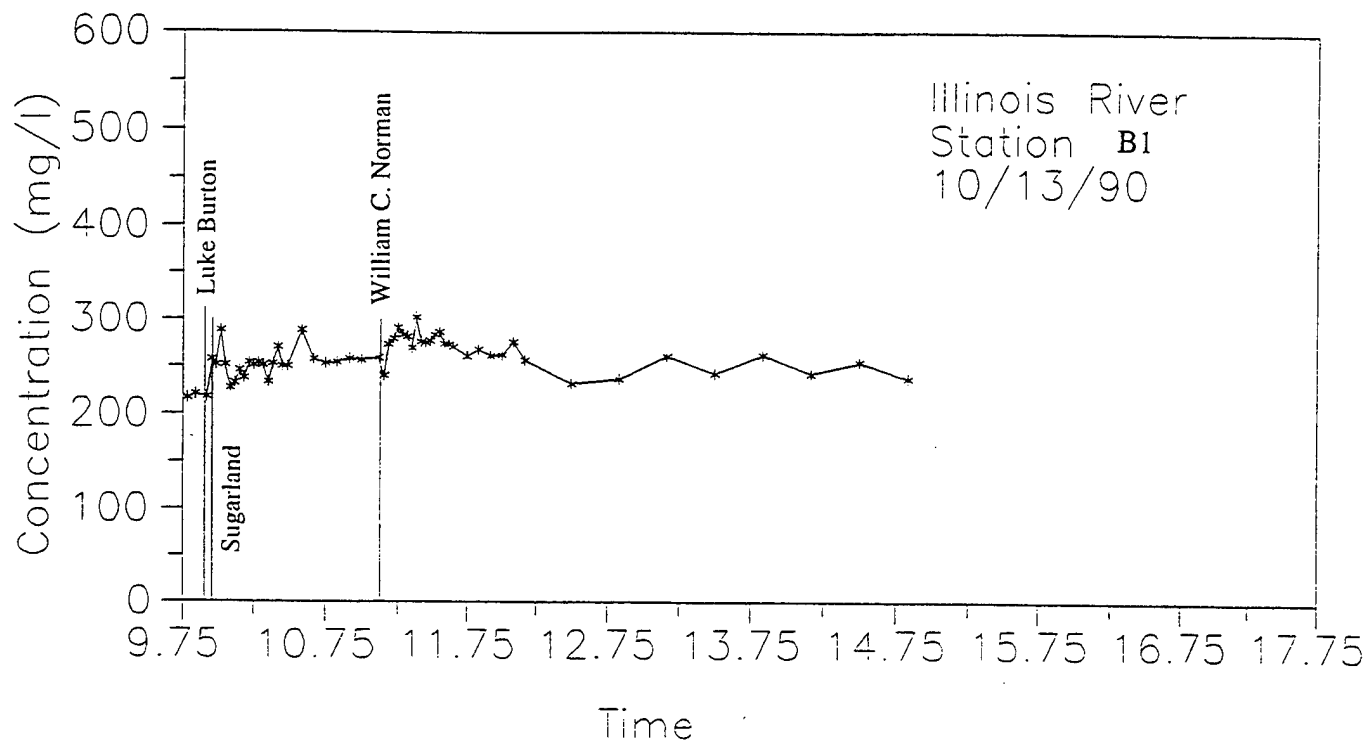
Station C1 October 12, 1990



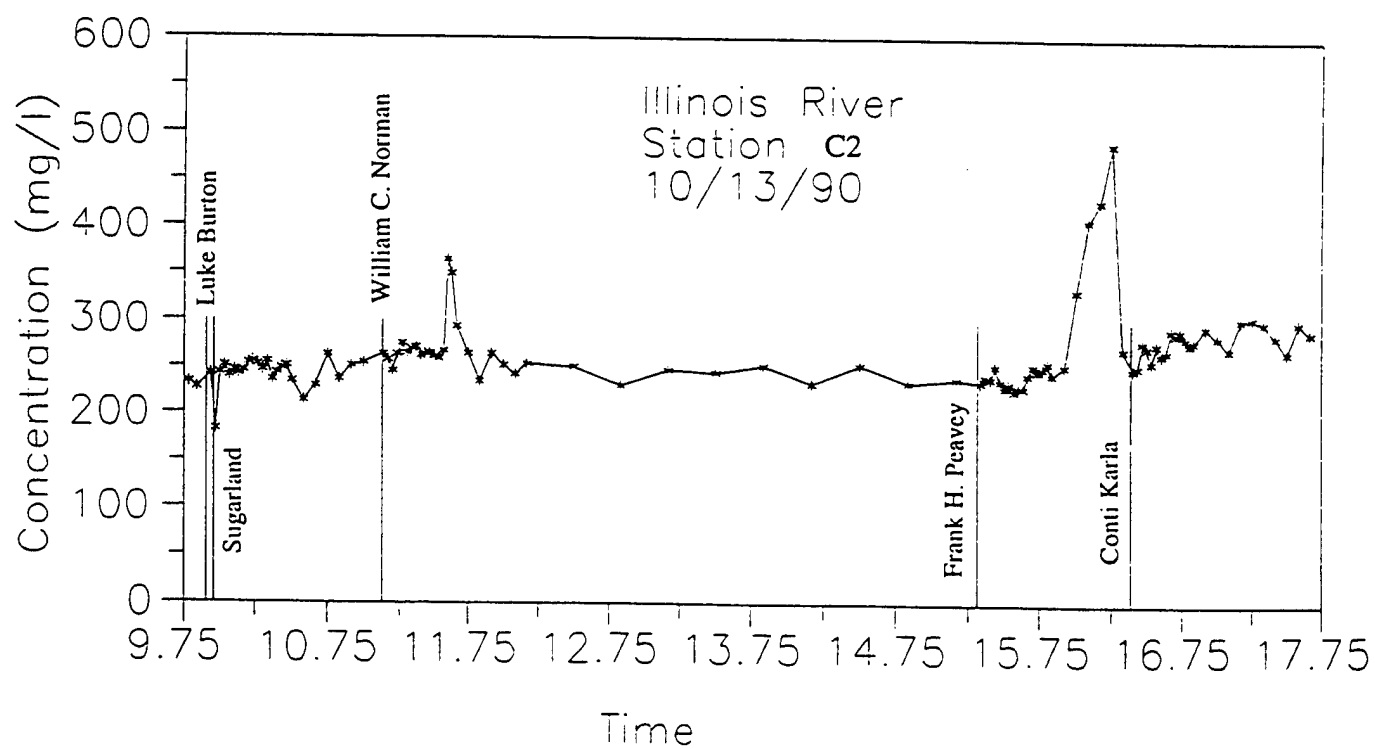
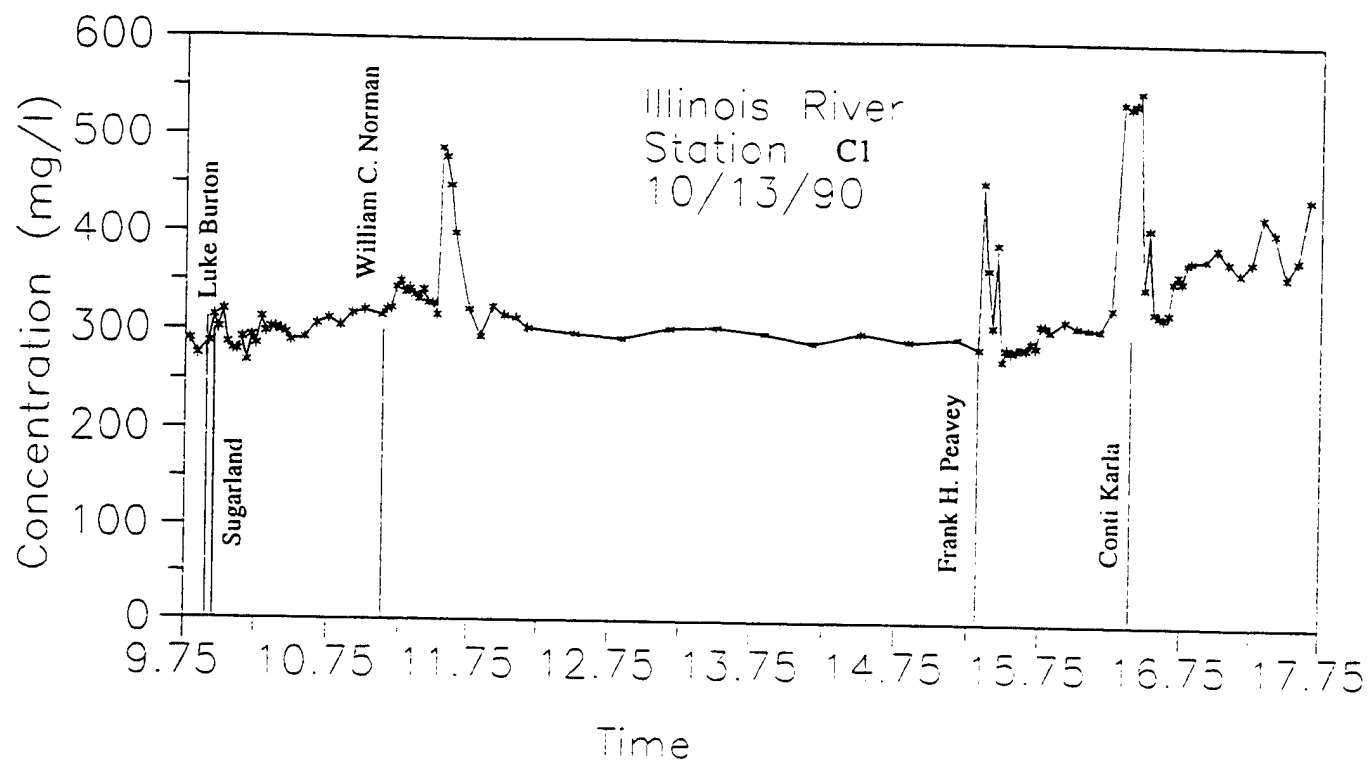
Stations A1 and A2 October 13, 1990



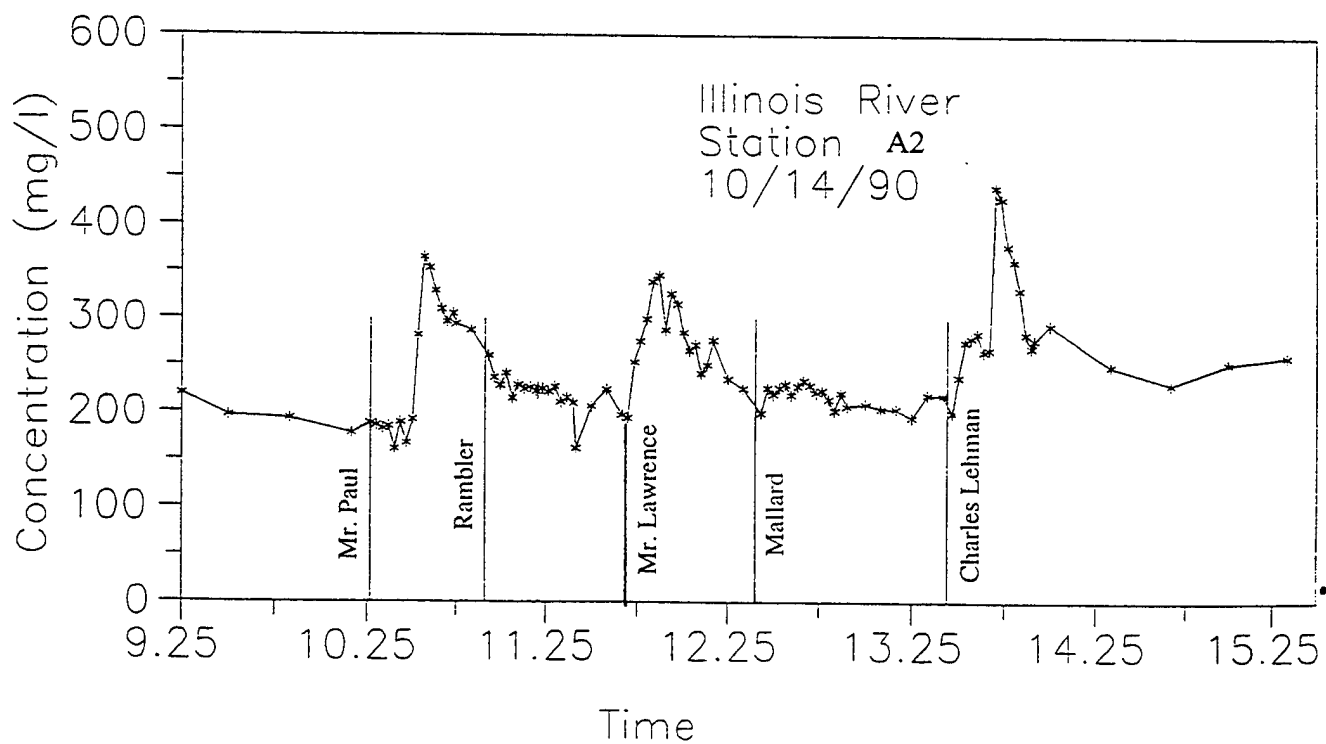
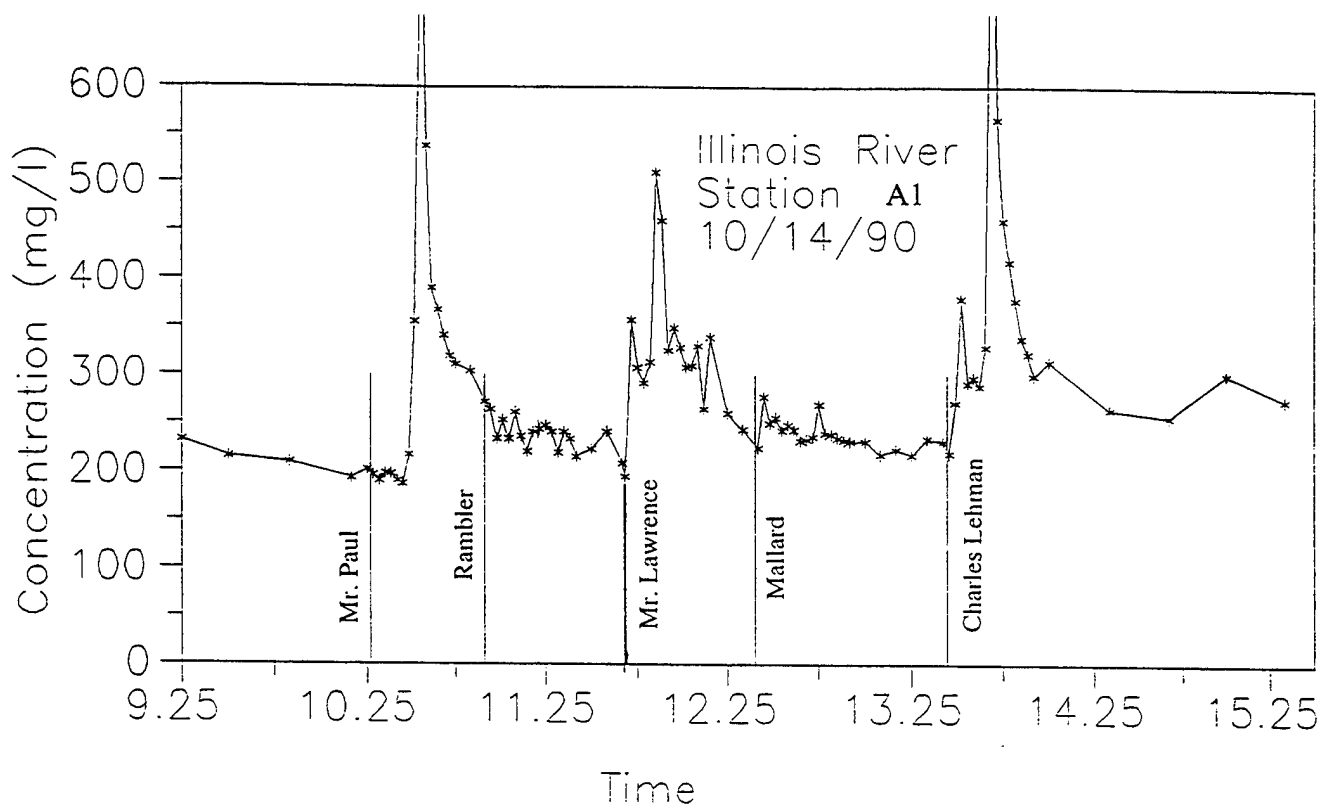
Stations B1 and B2 October 13, 1990



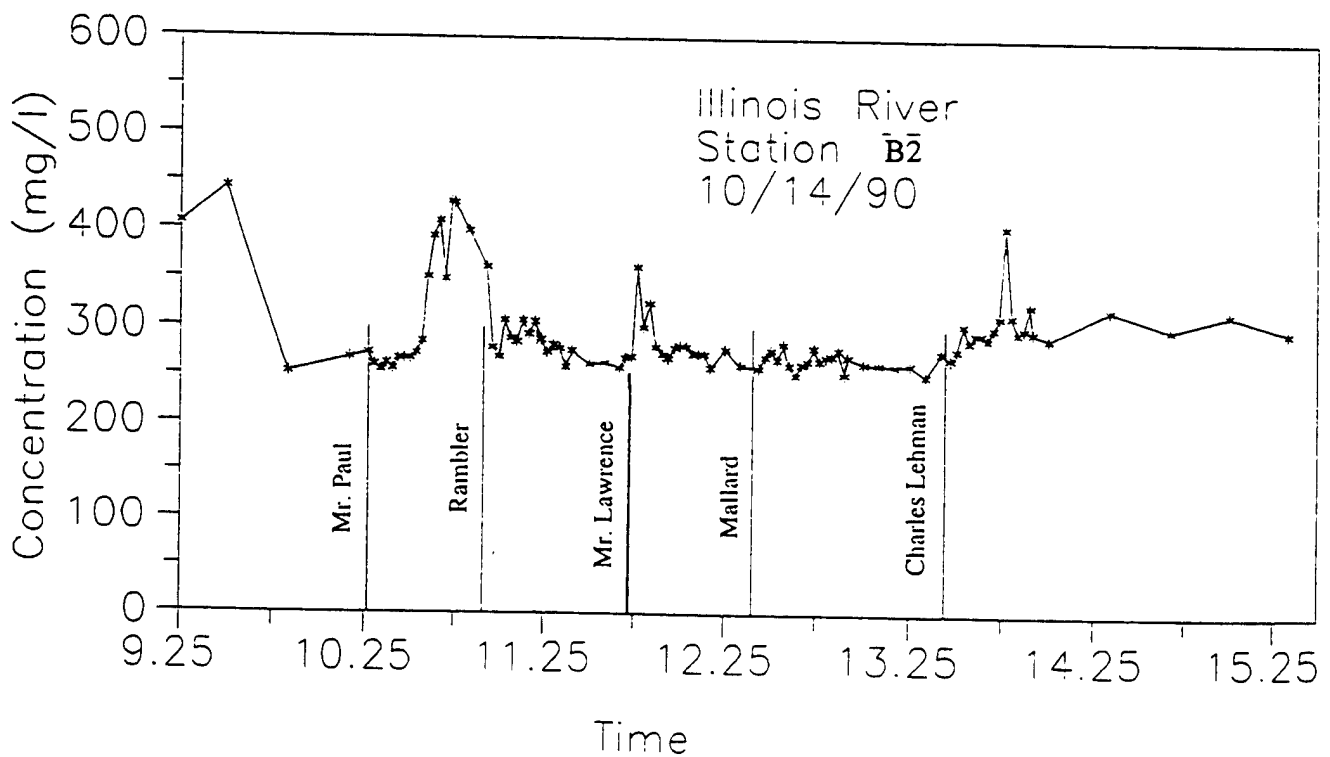
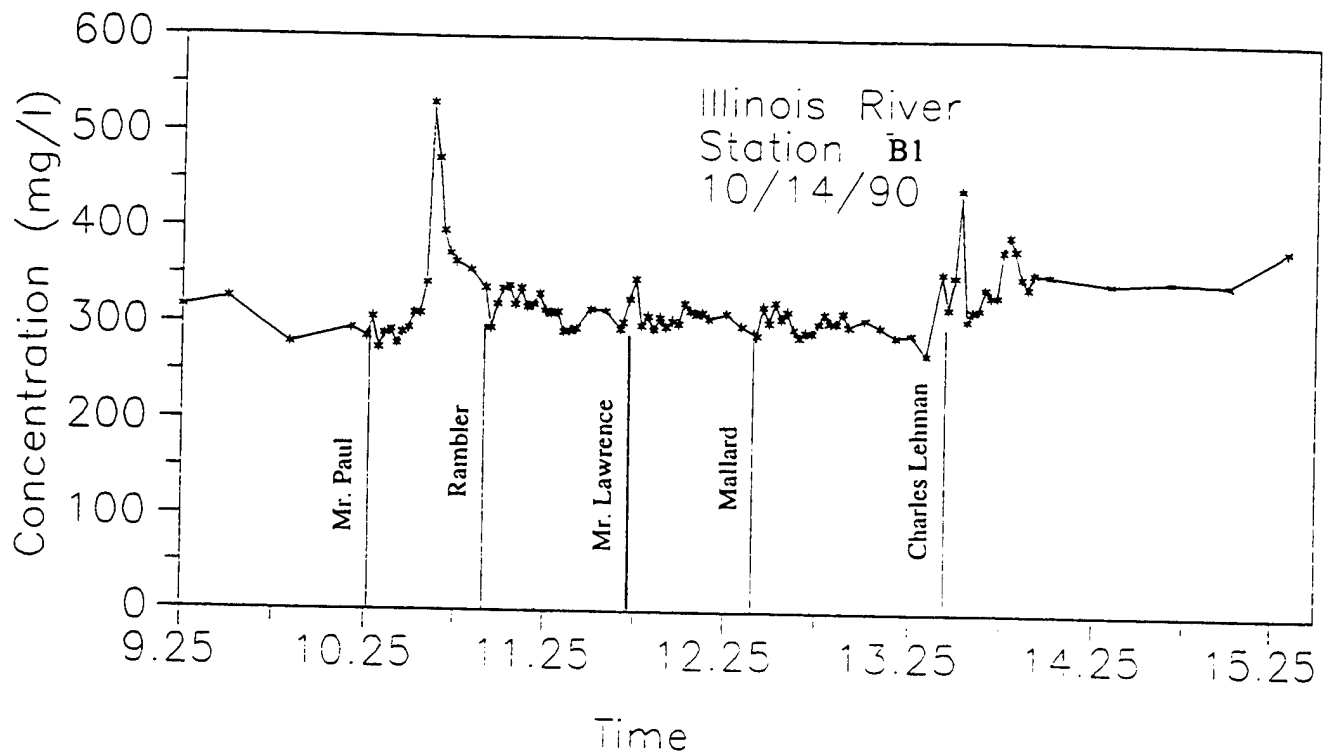
Stations C1 and C2 October 13, 1990



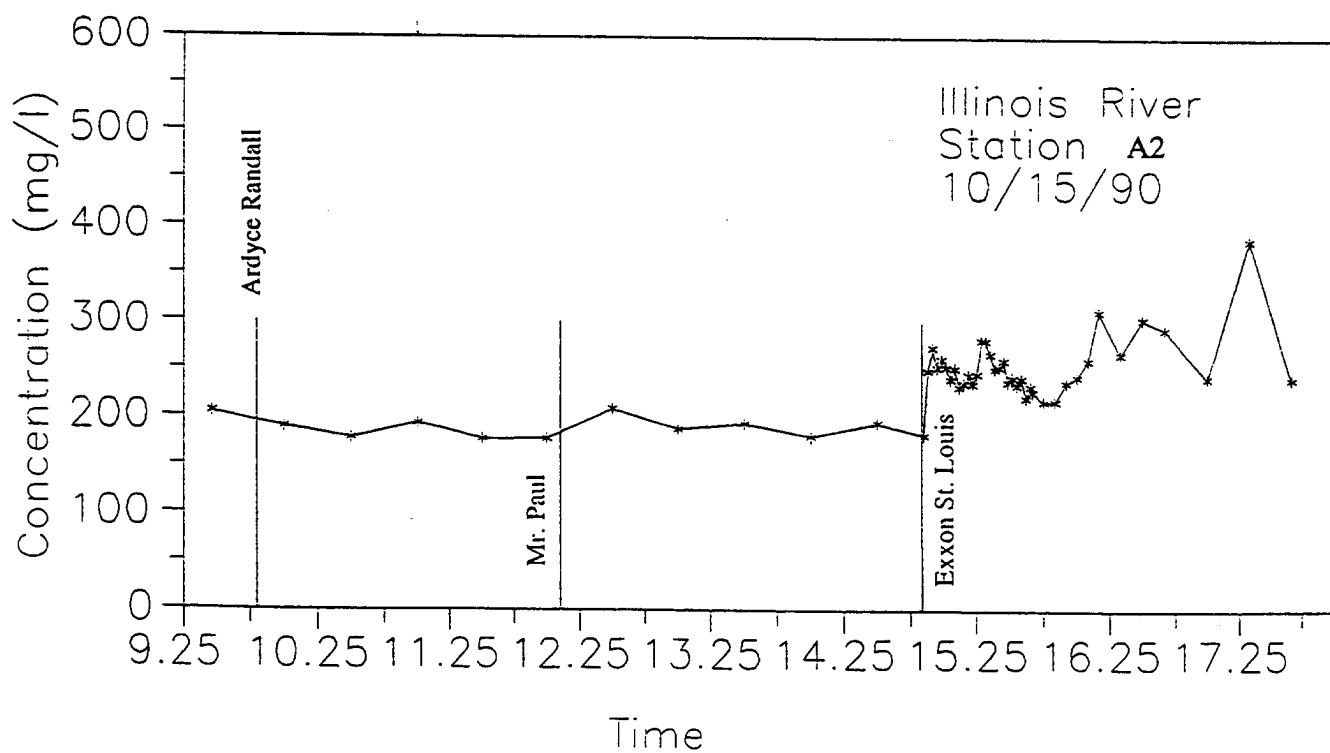
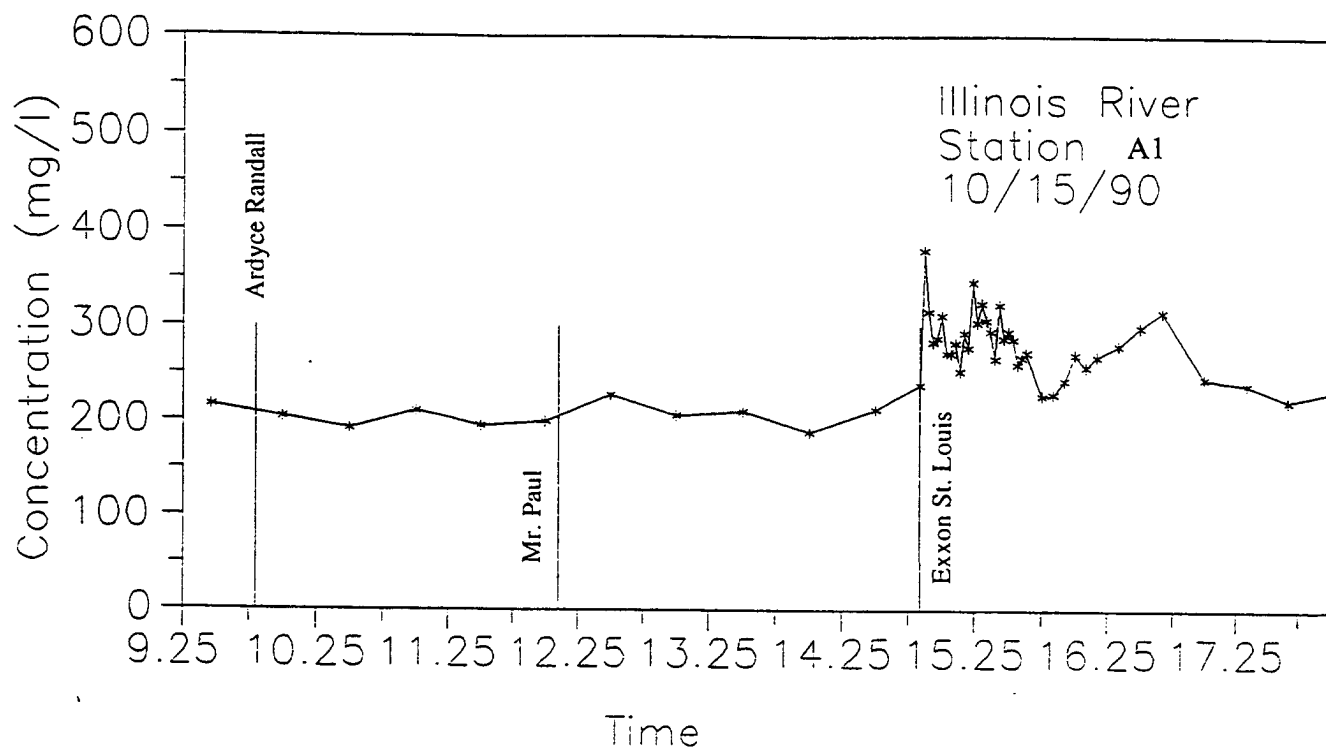
# Stations A1 and A2 October 14, 1990



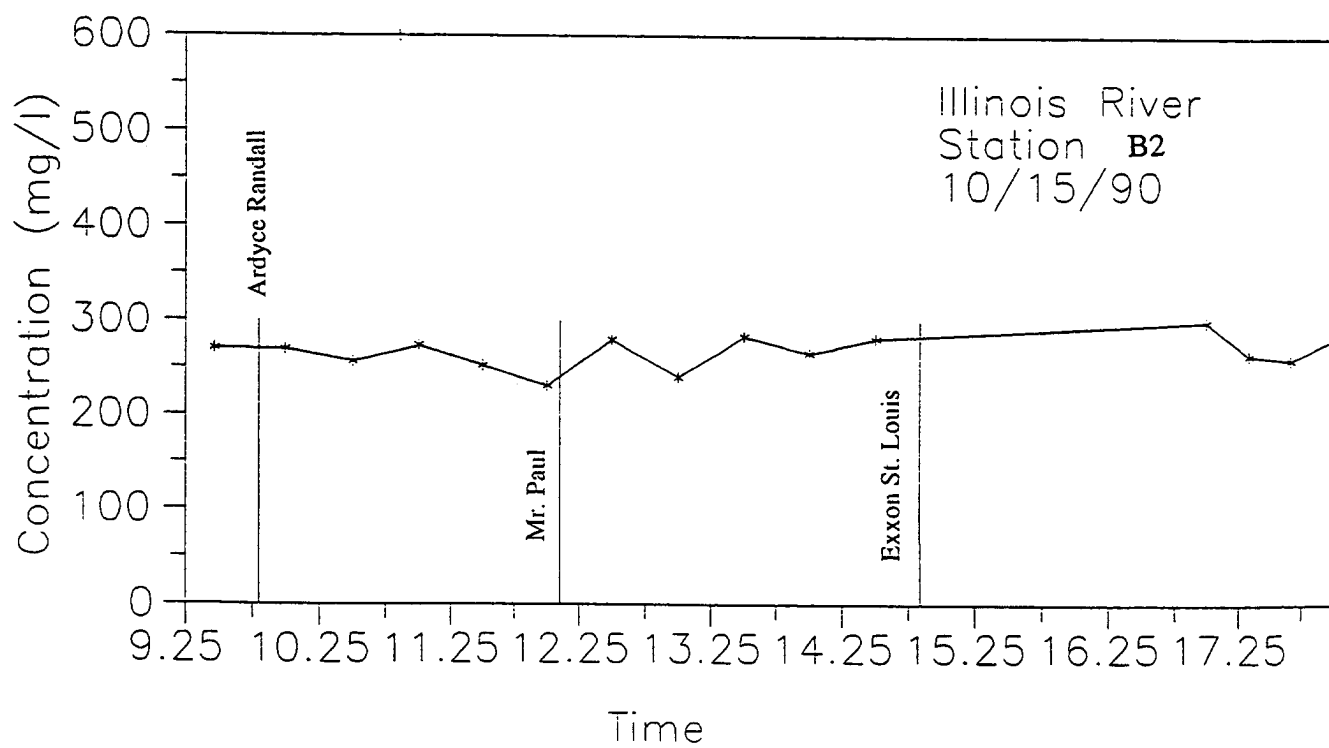
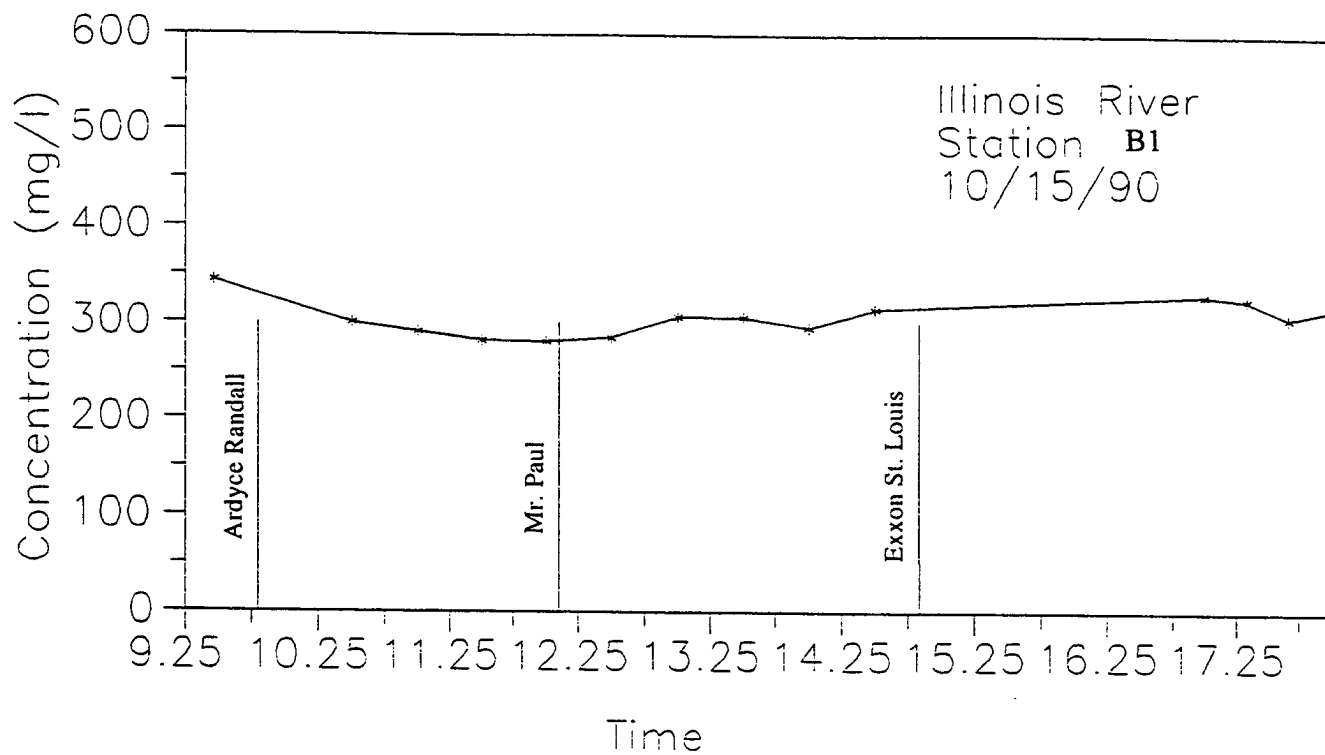
Stations B1 and B2 October 14, 1990



Stations A1 and A2 October 15, 1990

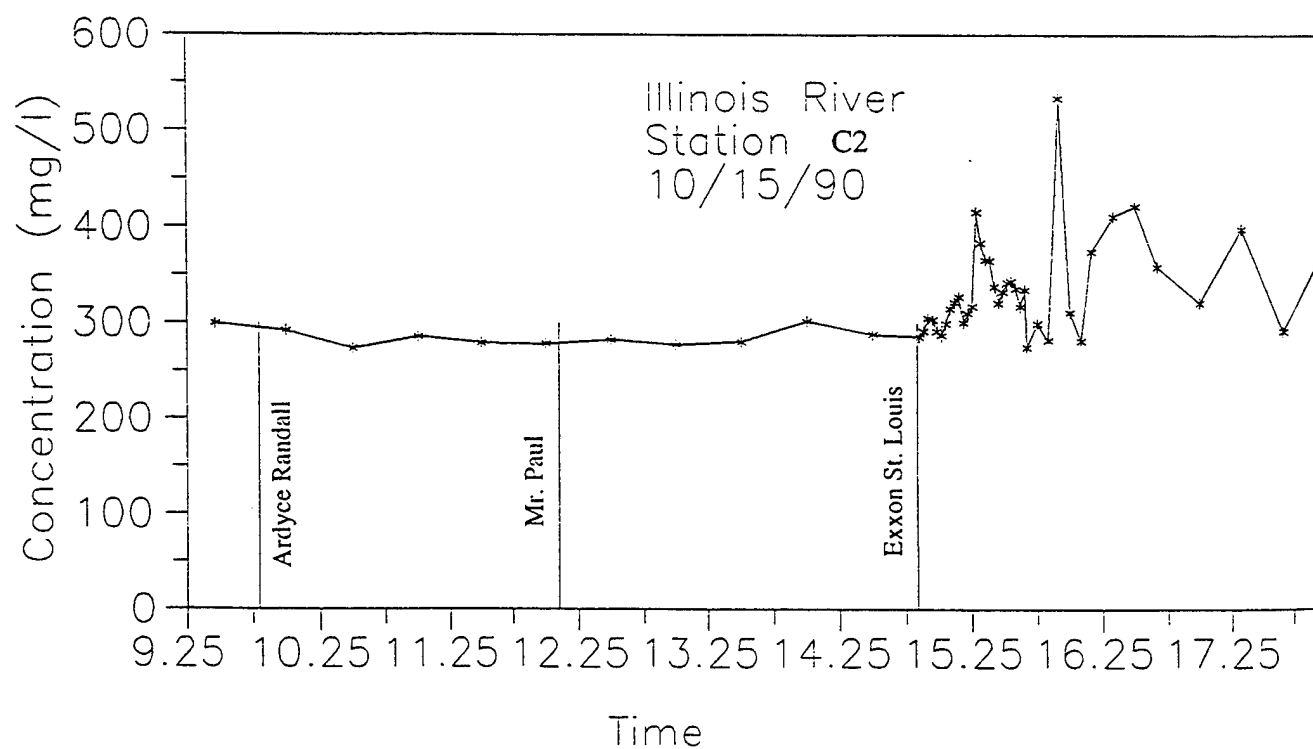
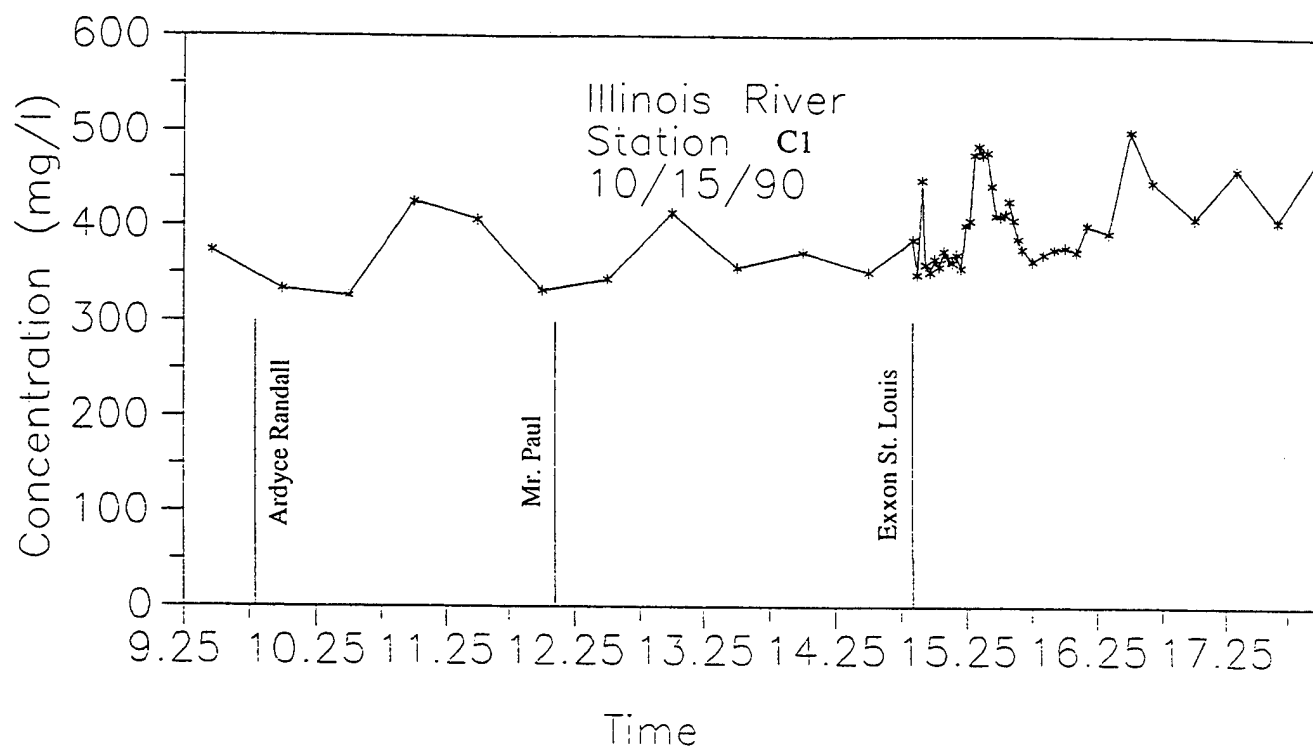


Stations B1 and B2 October 15, 1990

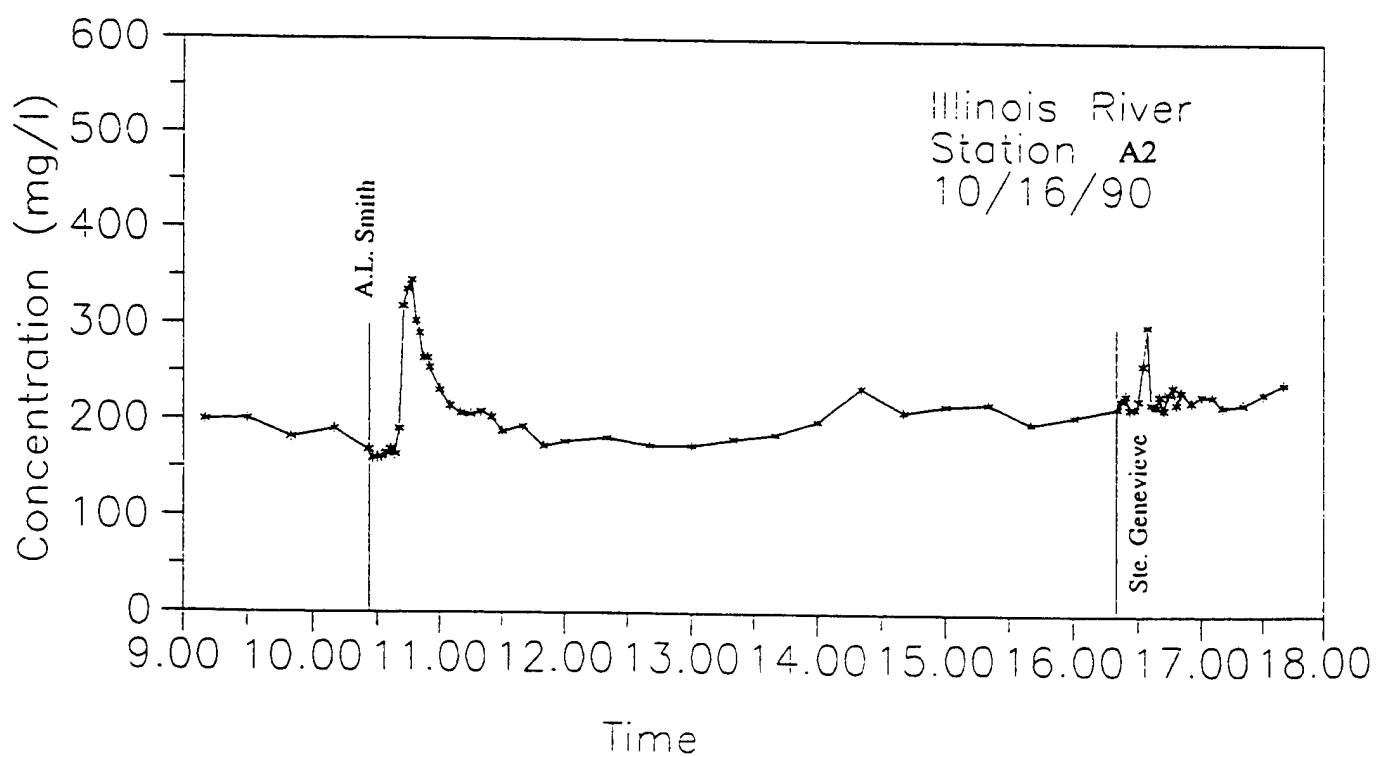
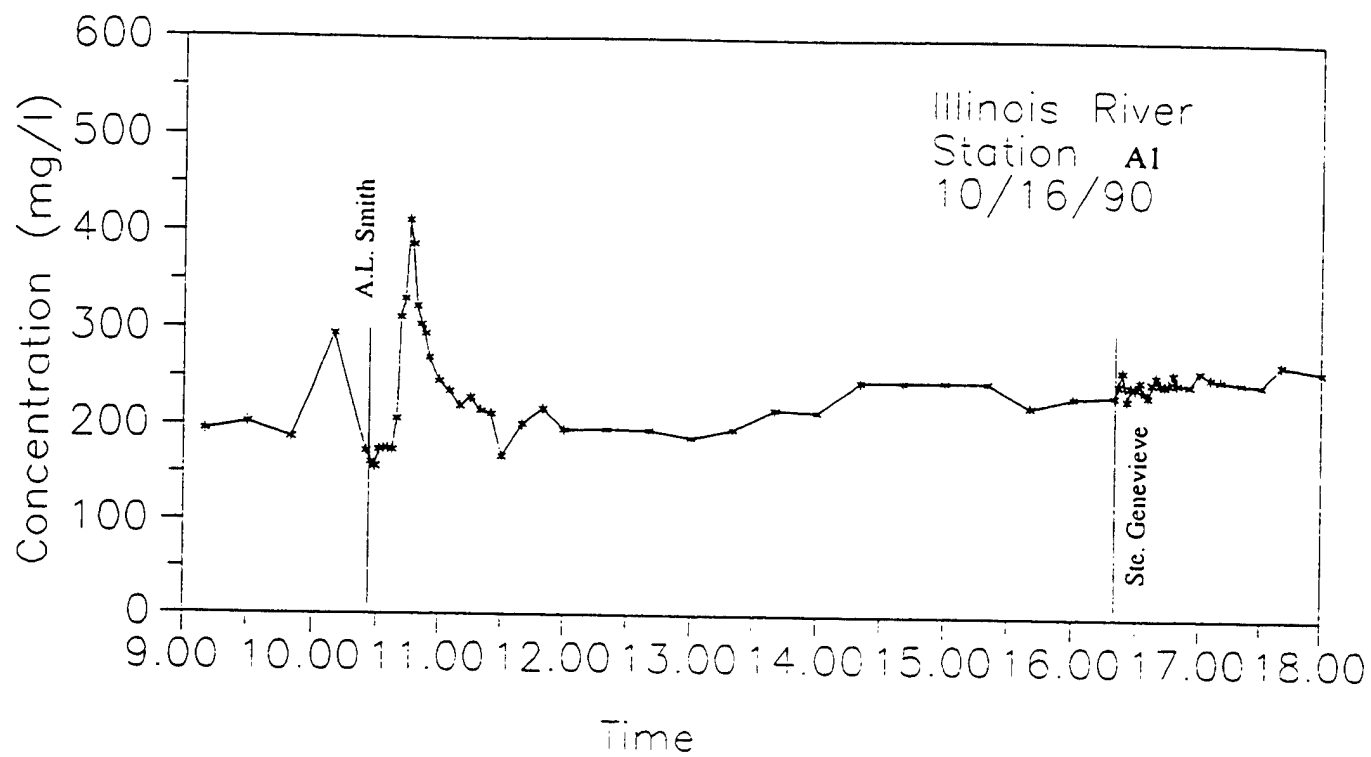




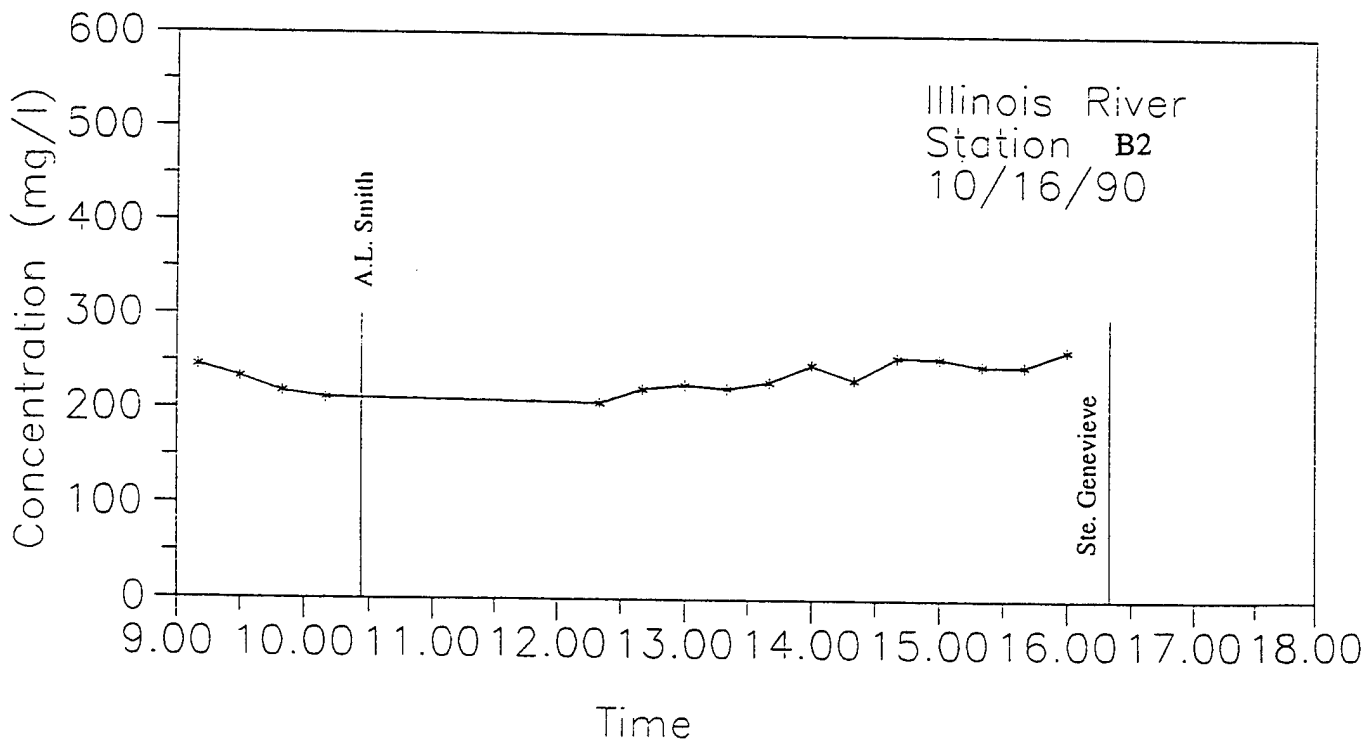
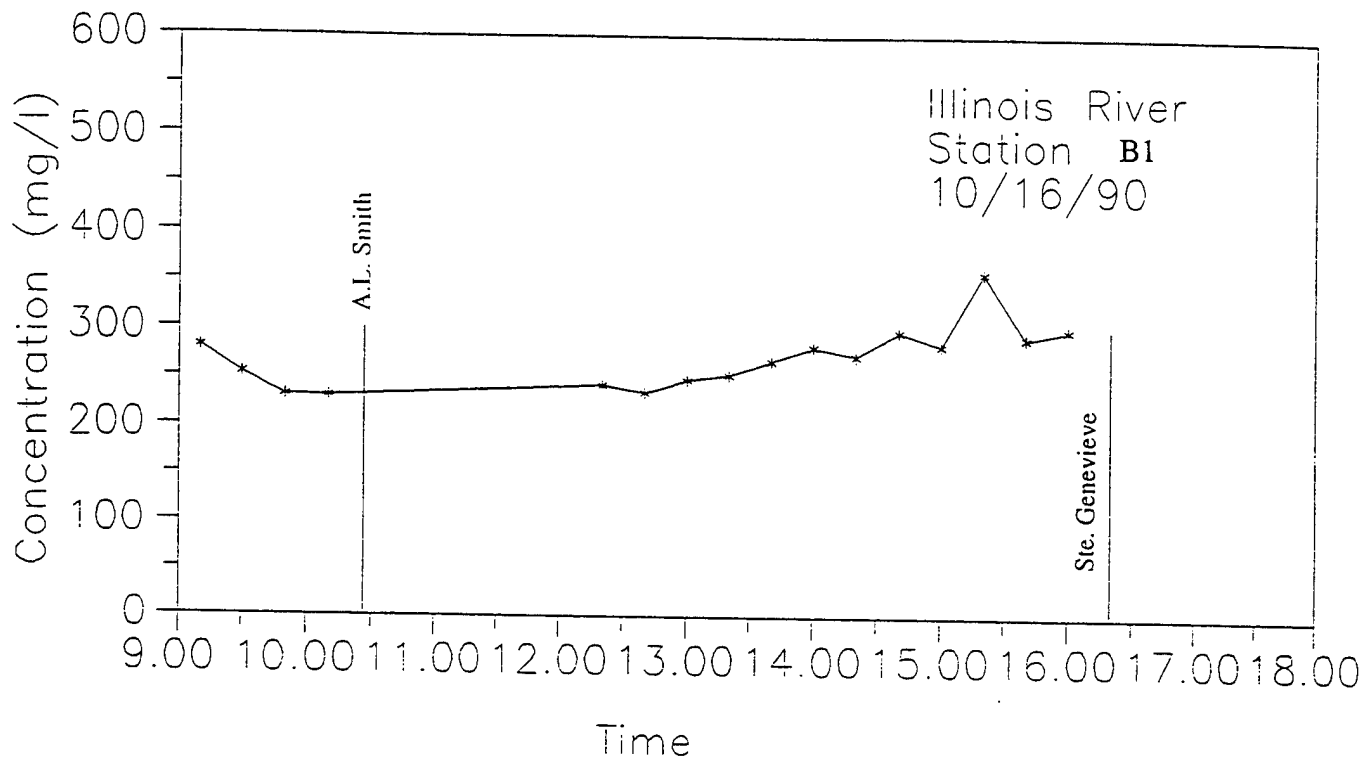
Stations C1 and C2 October 15, 1990



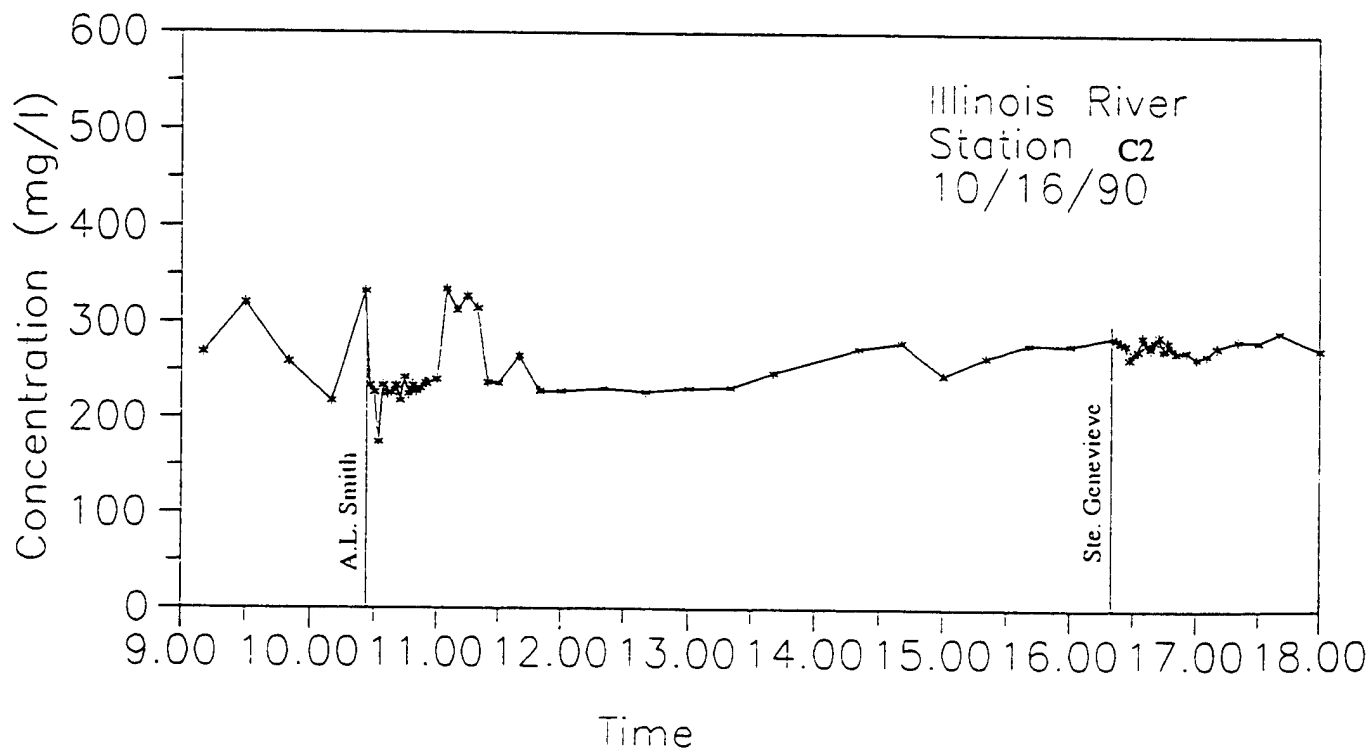
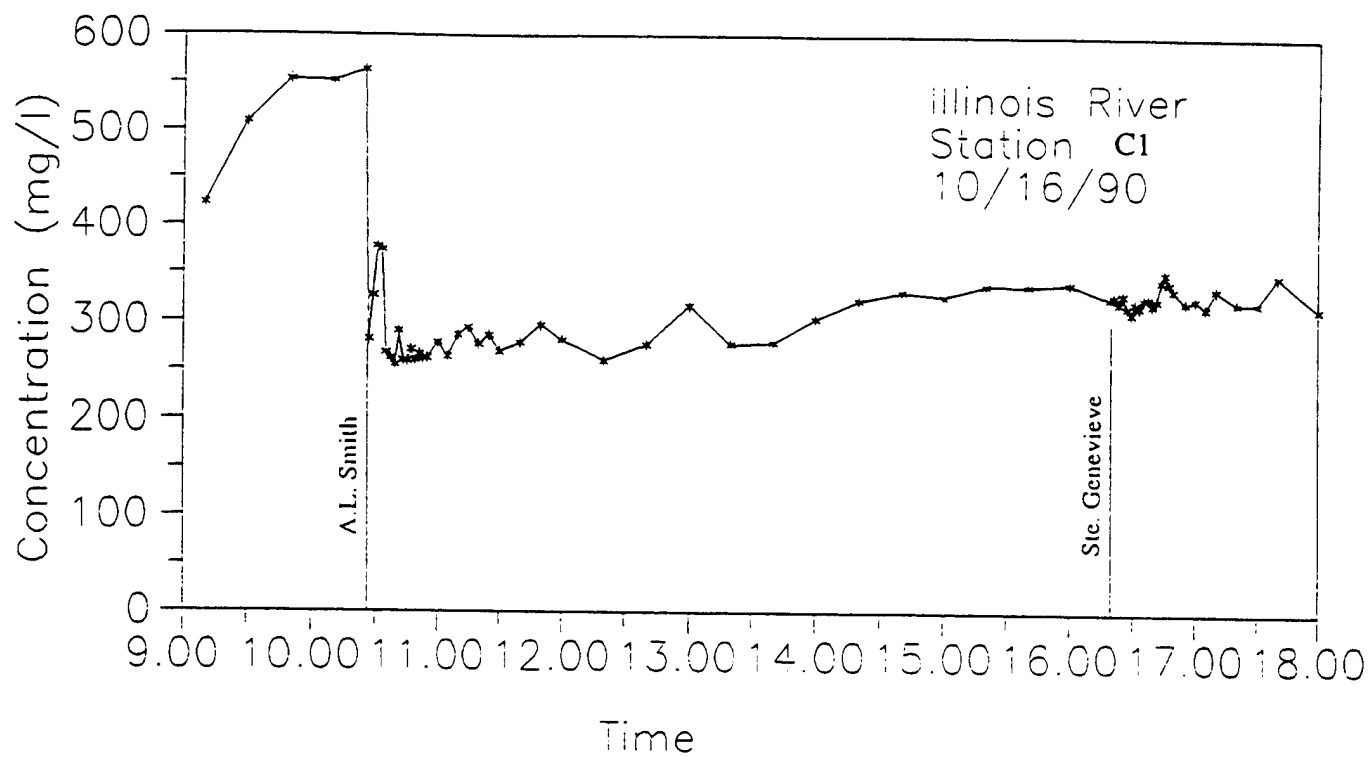
Stations A1 and A2 October 16, 1990



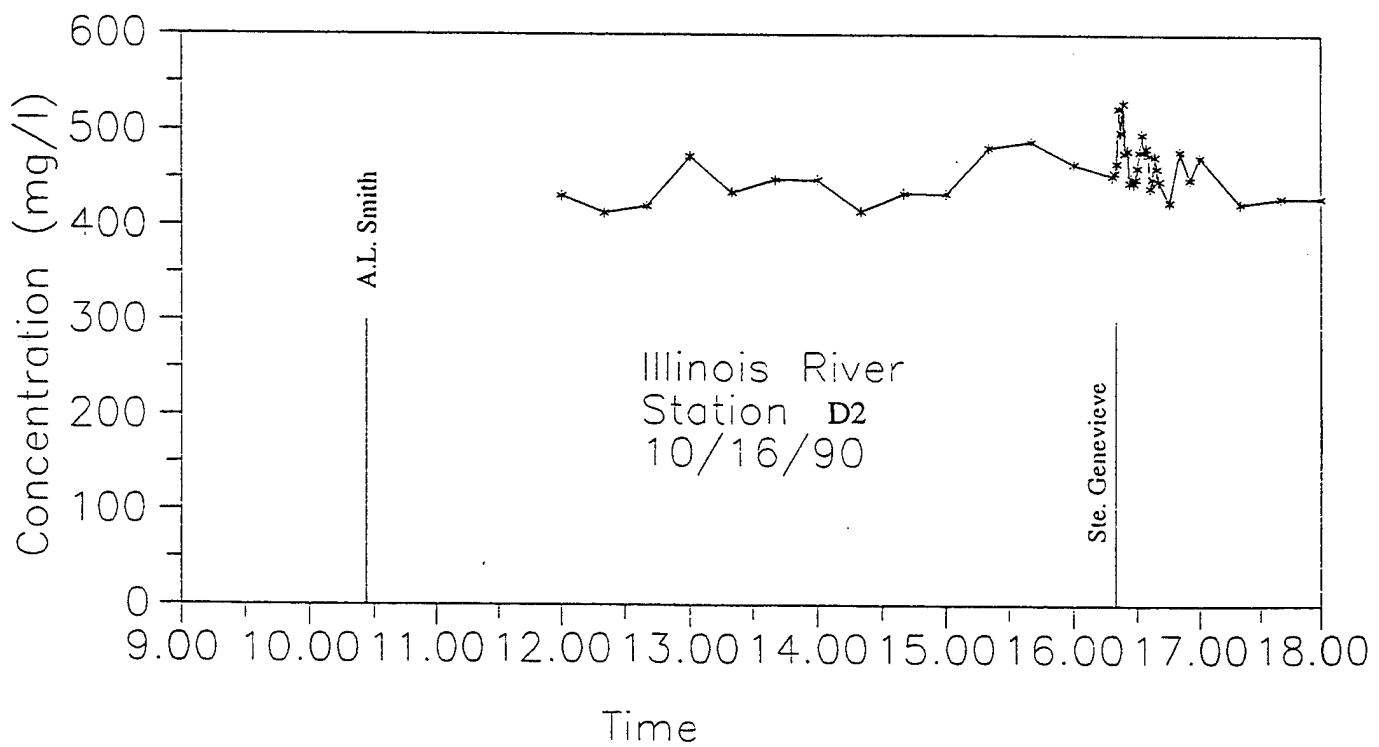
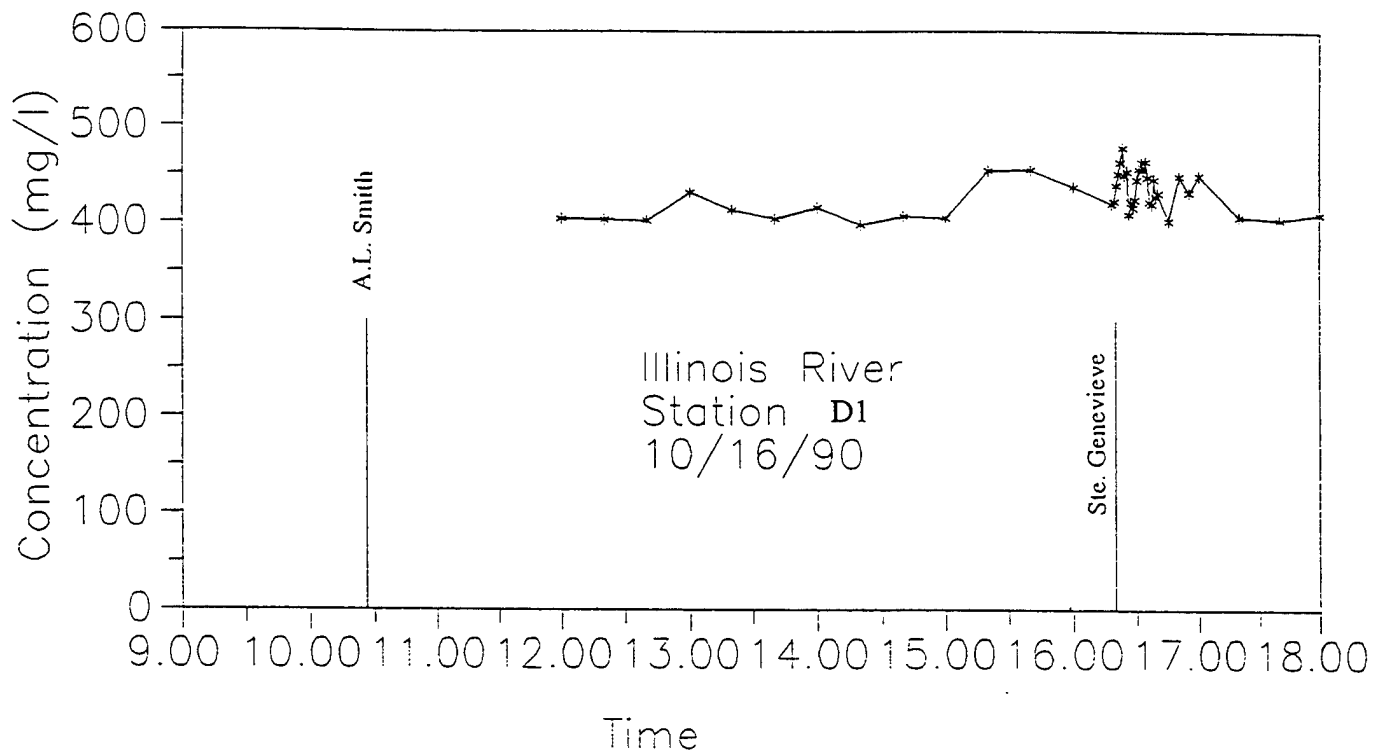
Stations B1 and B2 October 16, 1990



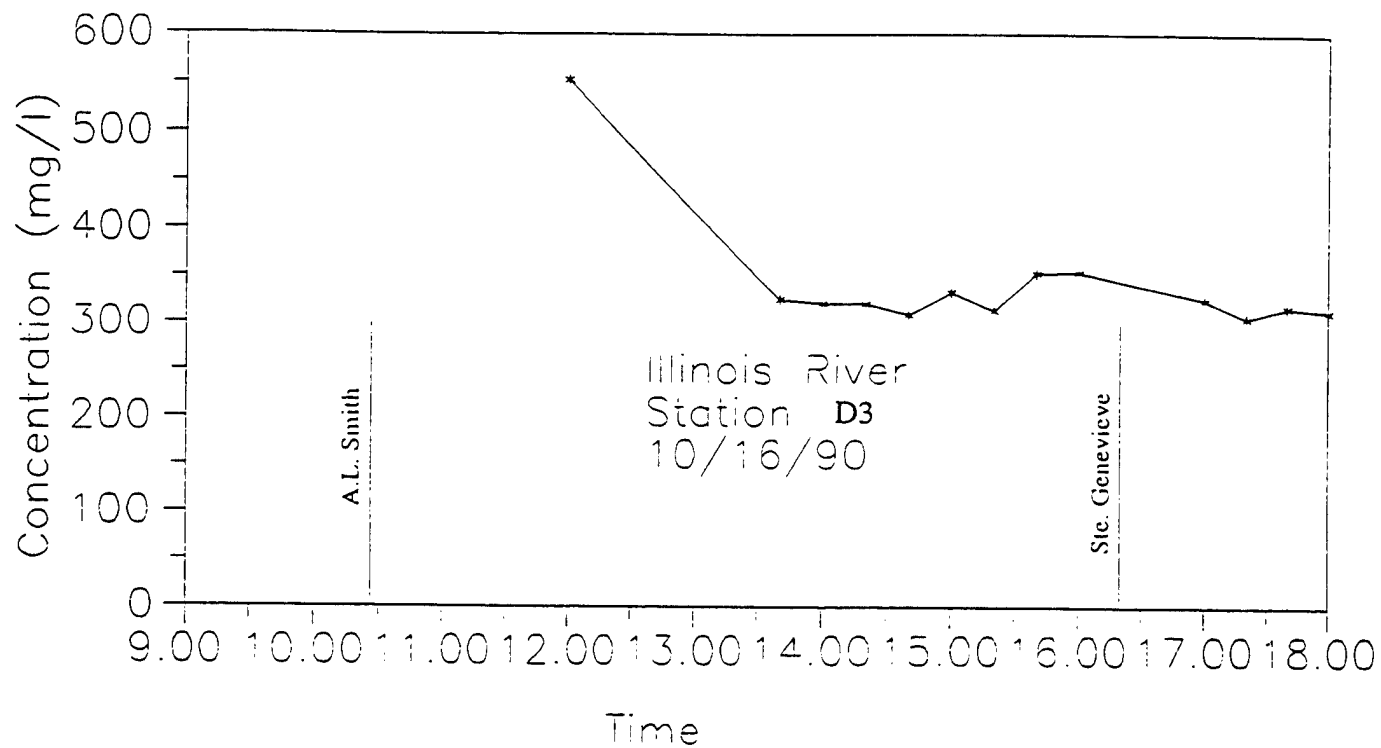
Stations C1 and C2 October 16, 1990



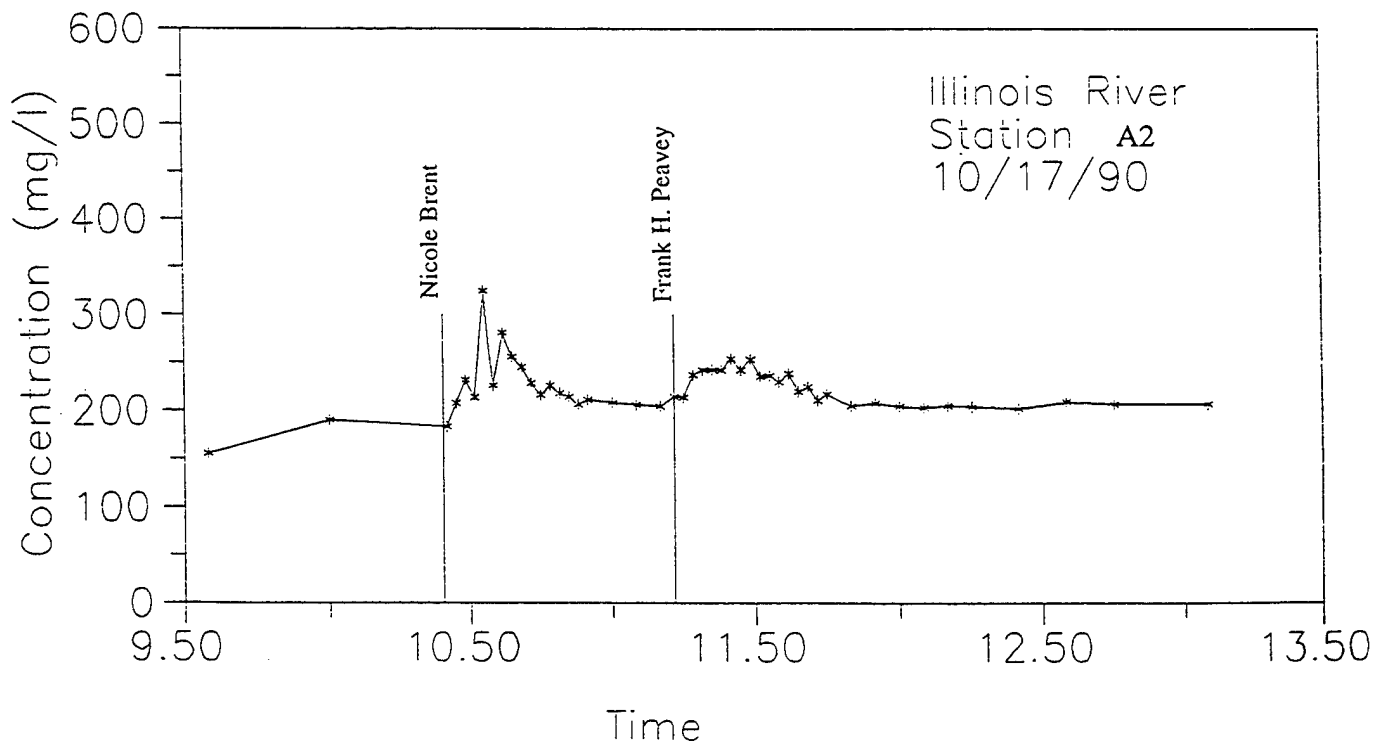
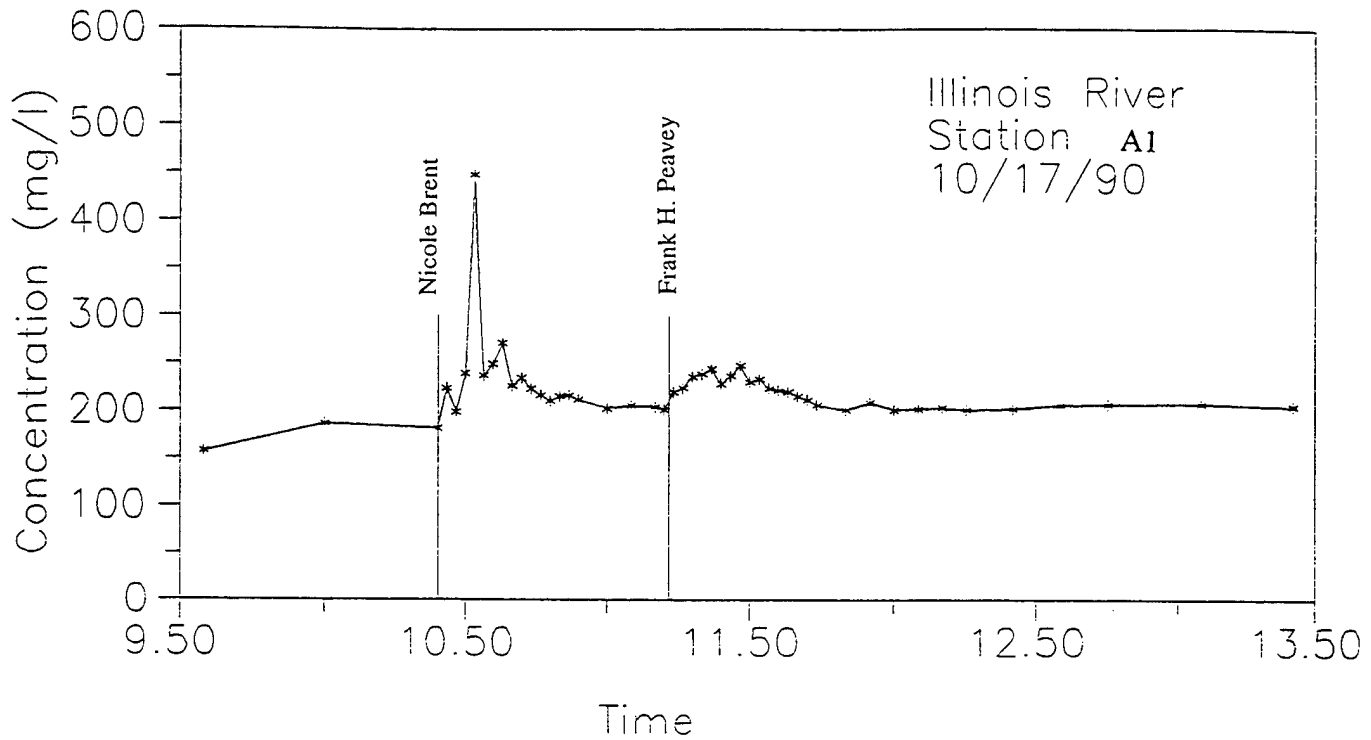
Stations D1 and D2 October 16, 1990



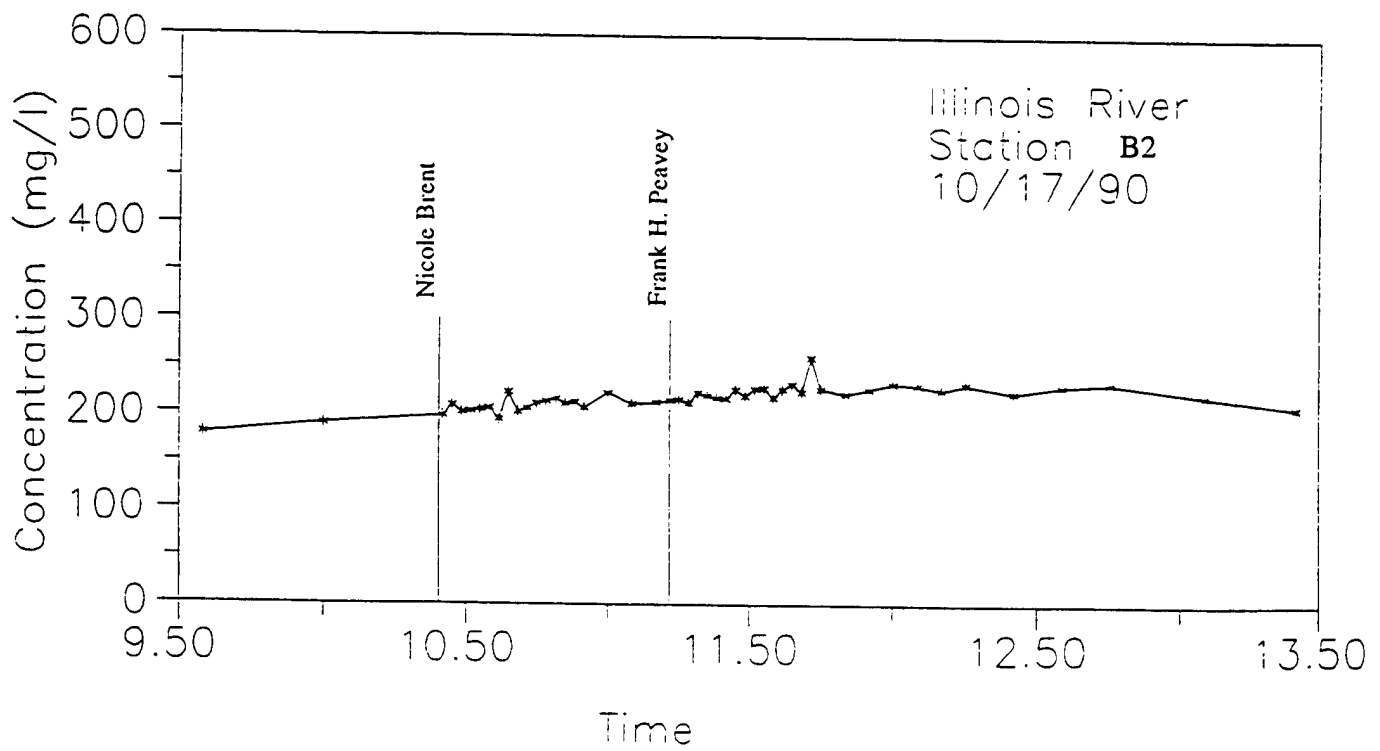
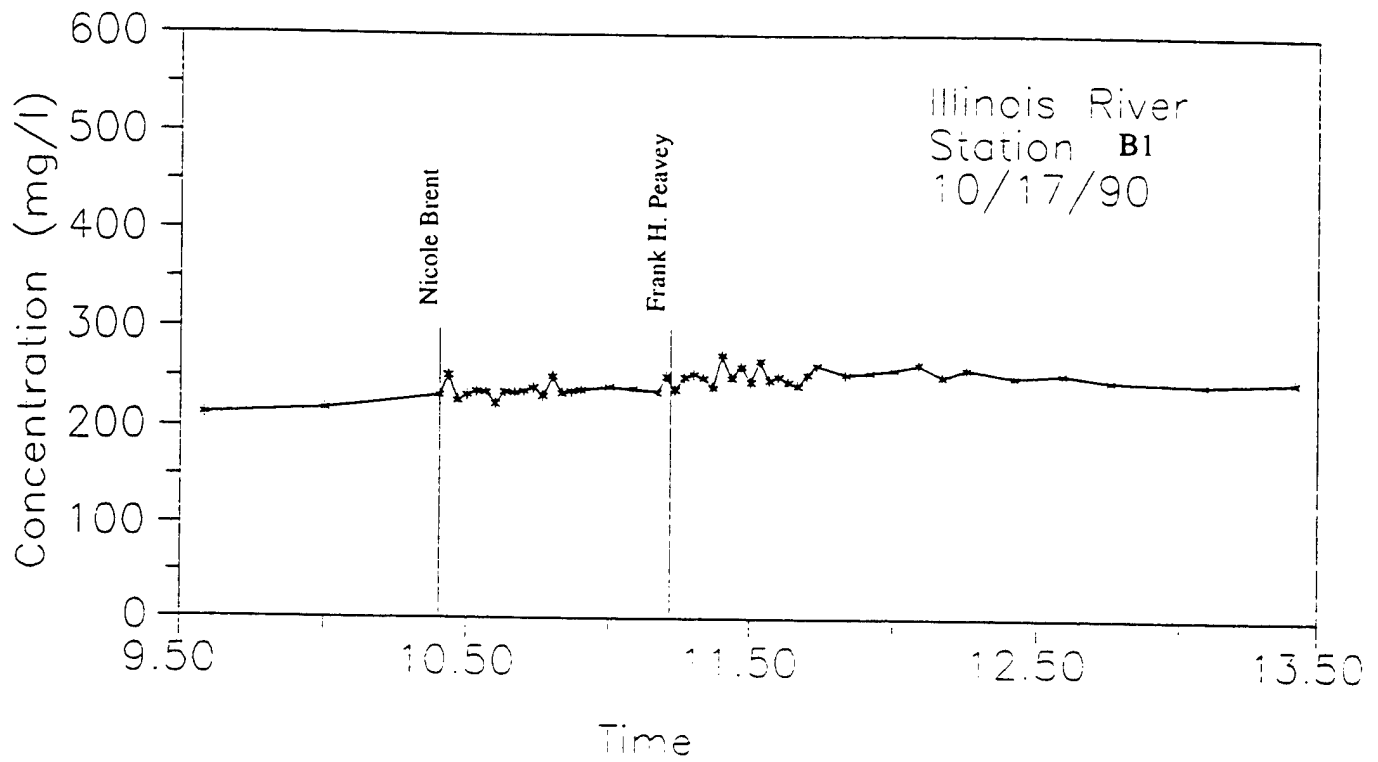
Station D3 October 16, 1990



Stations A1 and A2 October 17, 1990



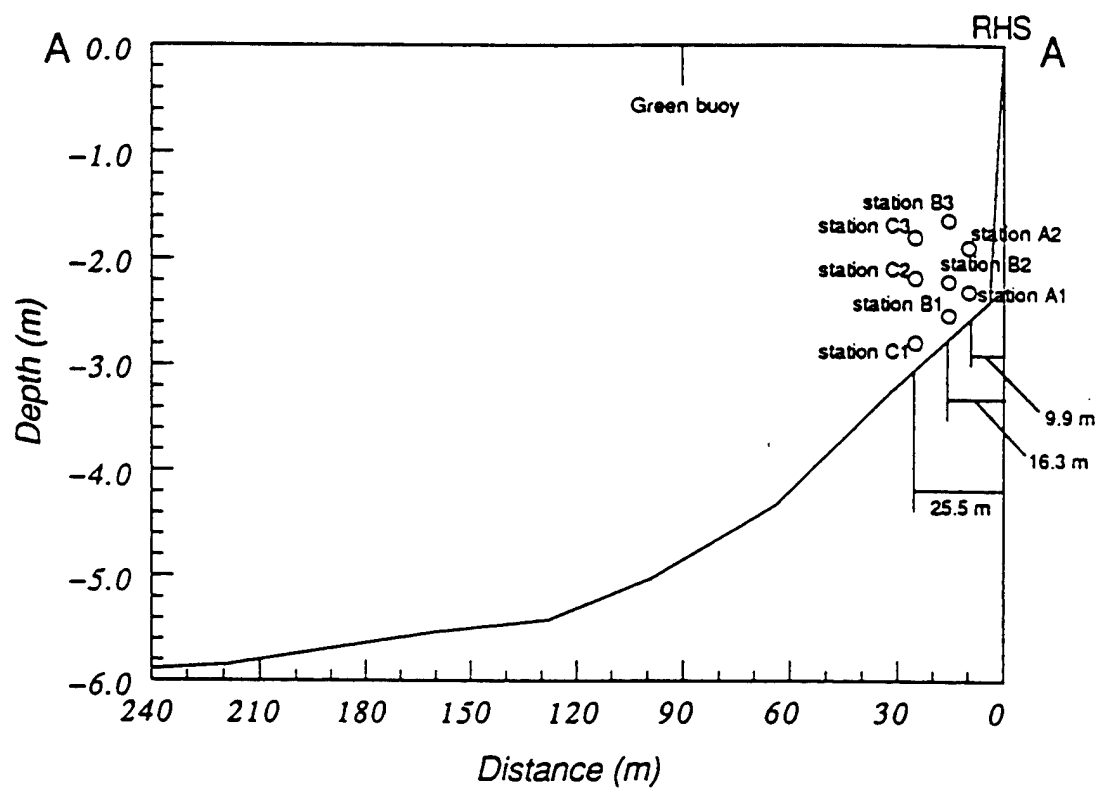
Stations B1 and B2 October 17, 1990



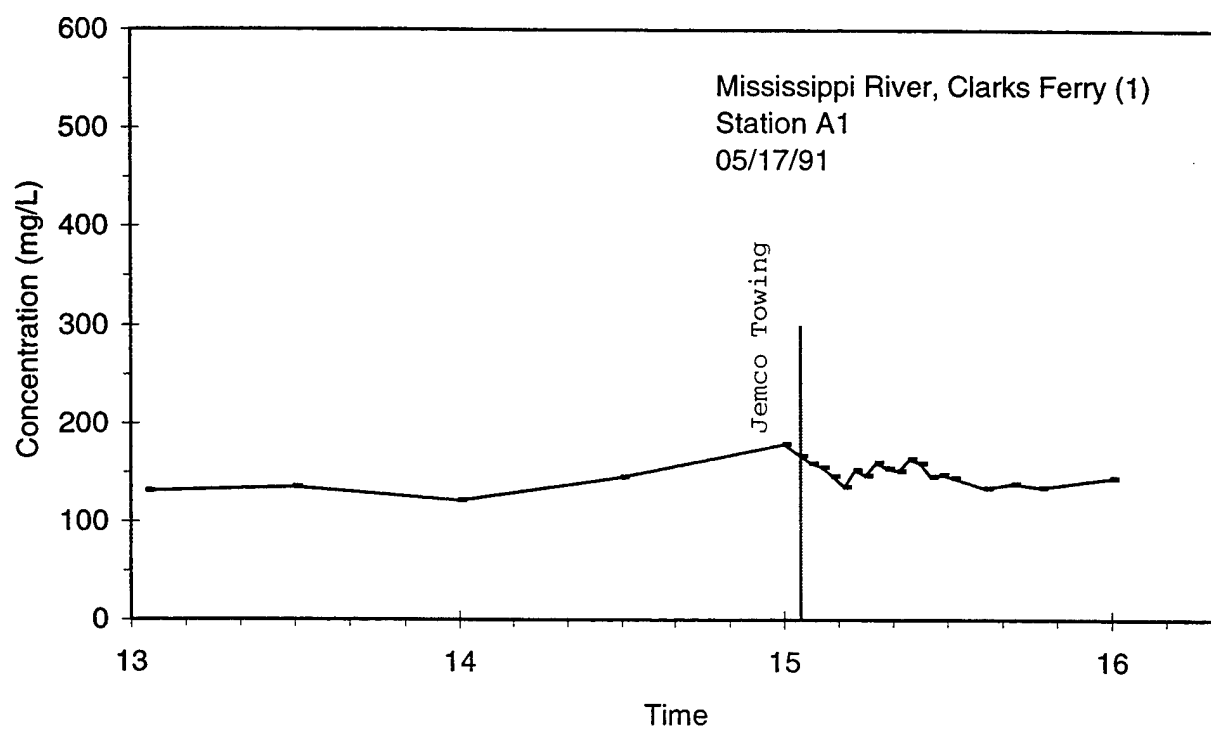


XXV-5. Variation of suspended sediment concentration with time, Clarks Ferry, trip 1

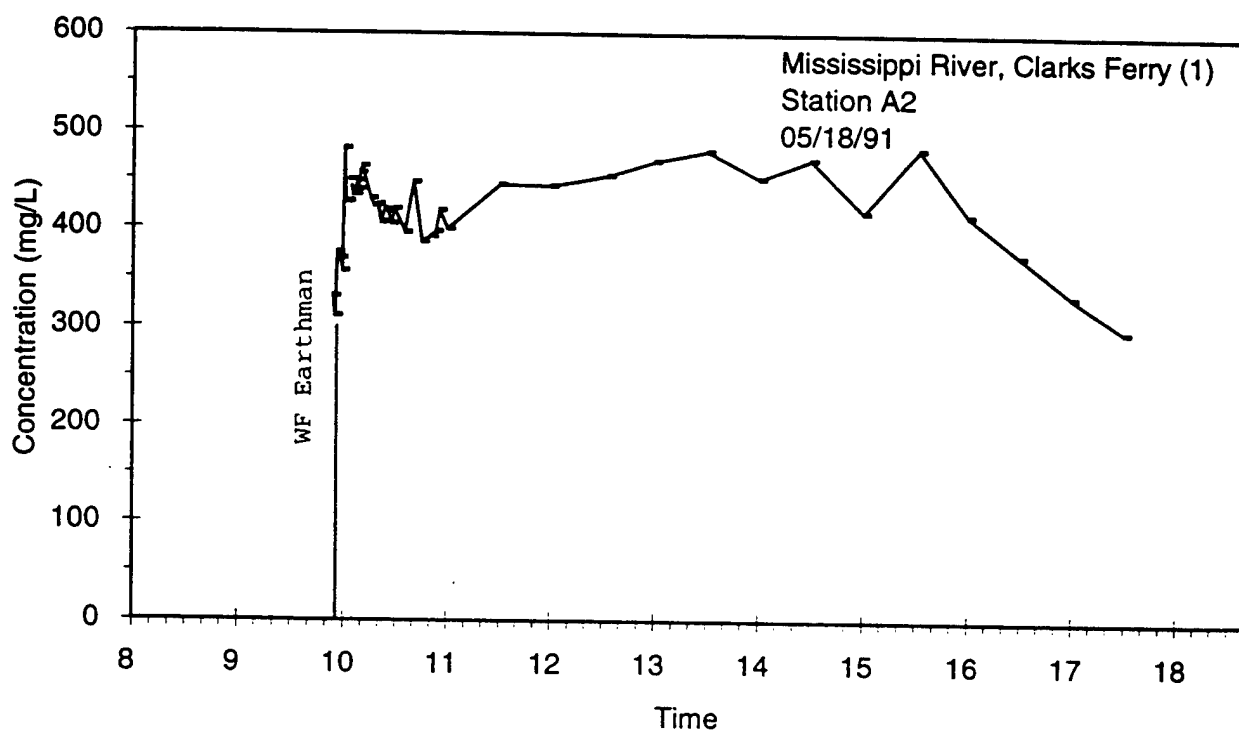
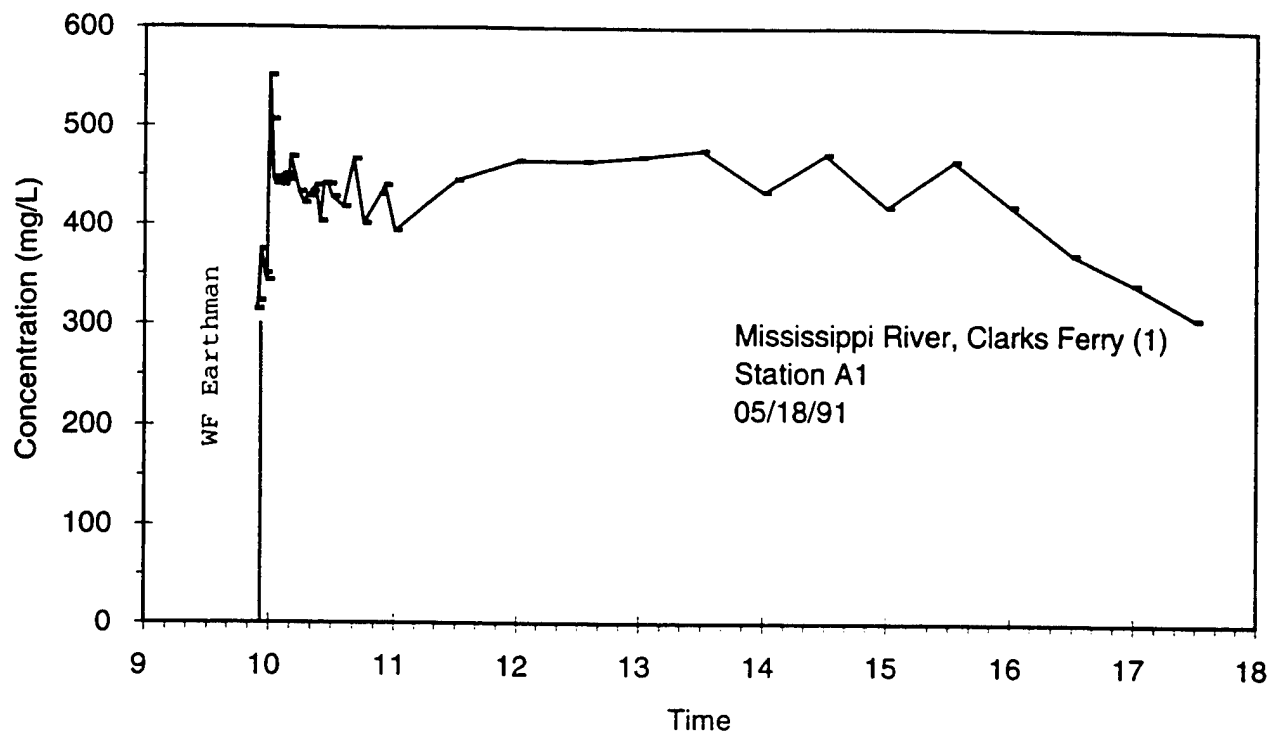
Location of suspended sediment sampling stations on the Mississippi River near the Clarks Ferry site during May 13-23, 1991 (trip 1)



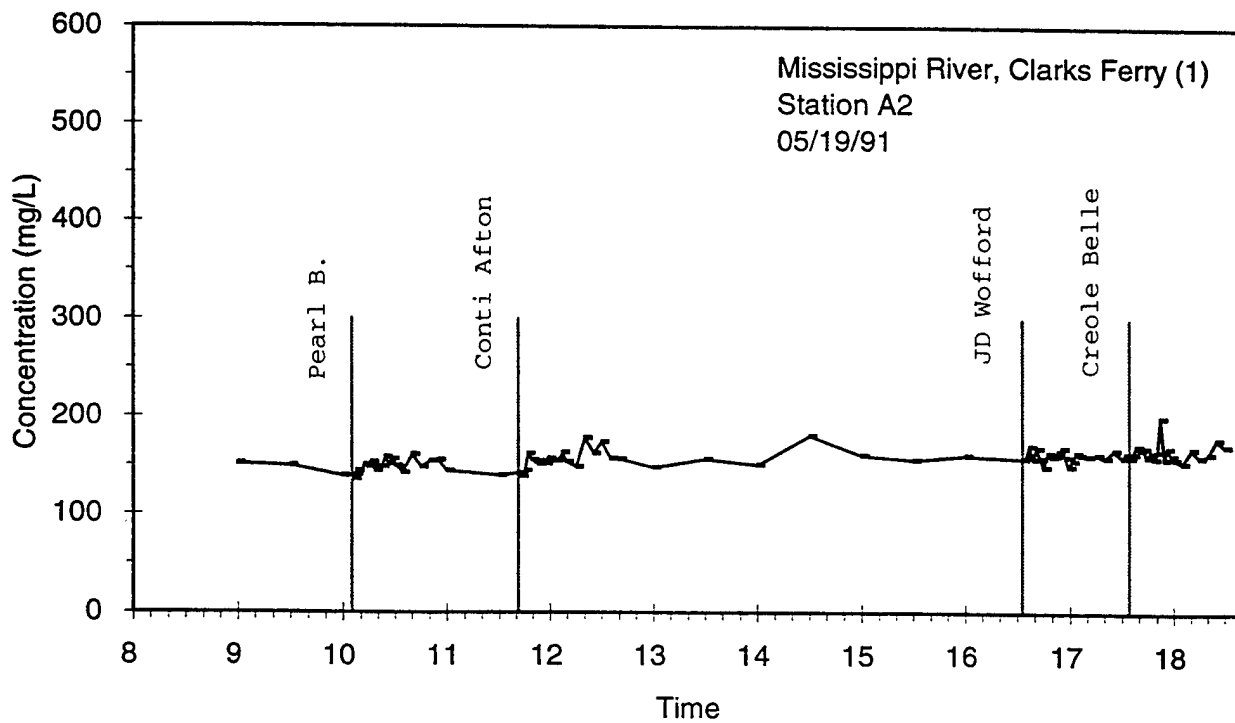
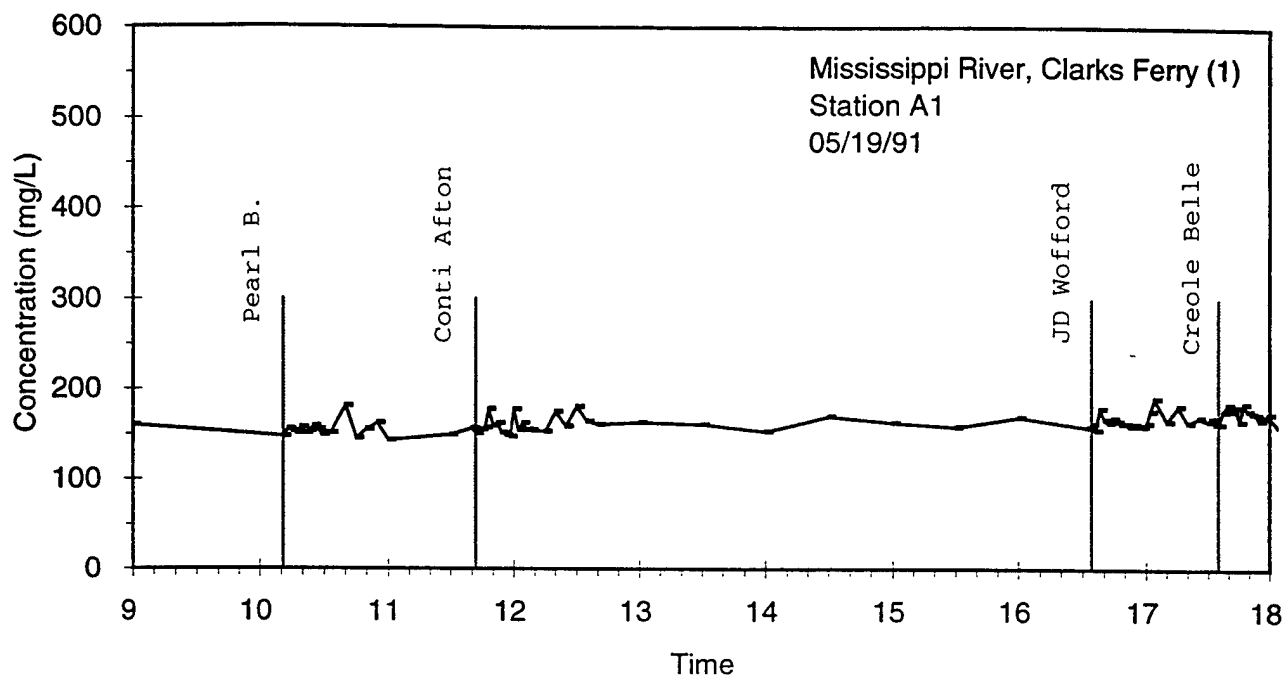
Station A1 May 17, 1991



Stations A1 and A2 May 18, 1991

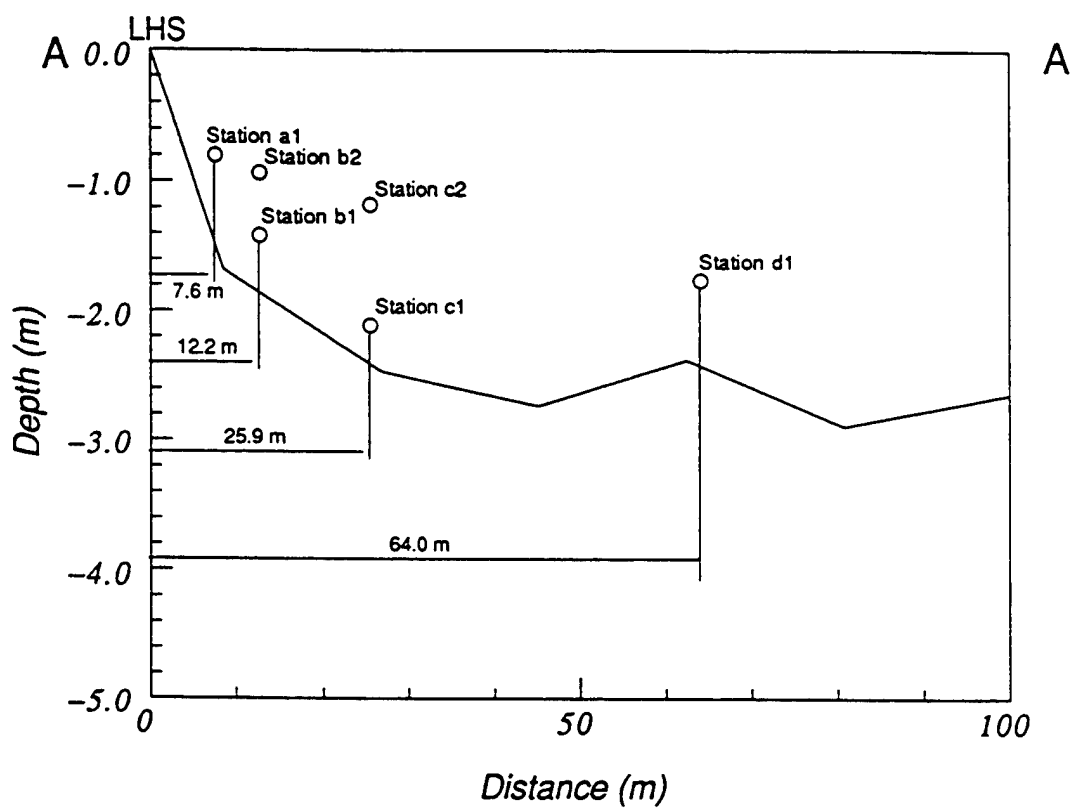


Stations A1 and A2 May 19, 1991

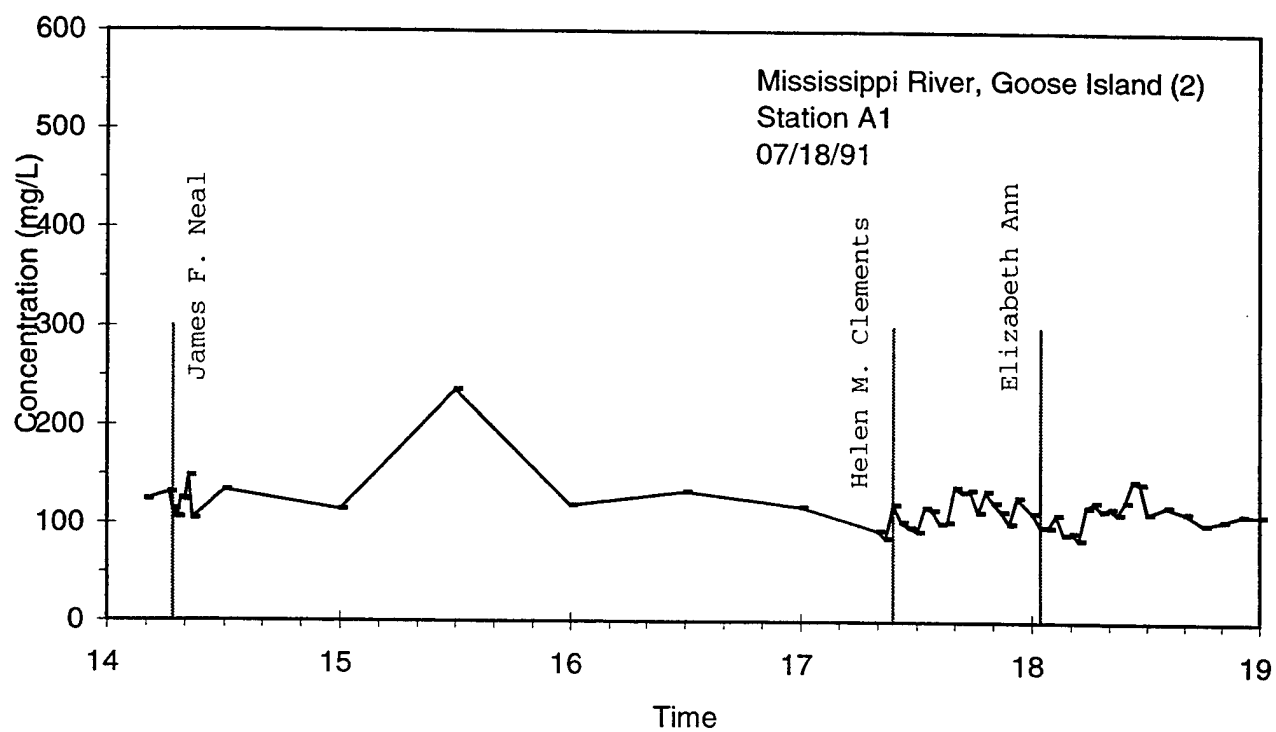


XXV-6. Variation of suspended sediment concentration with time, Goose Island, trip 2

Location of suspended sediment sampling stations on the Mississippi River near the Goose Island site during July 15-25 (trip 2)

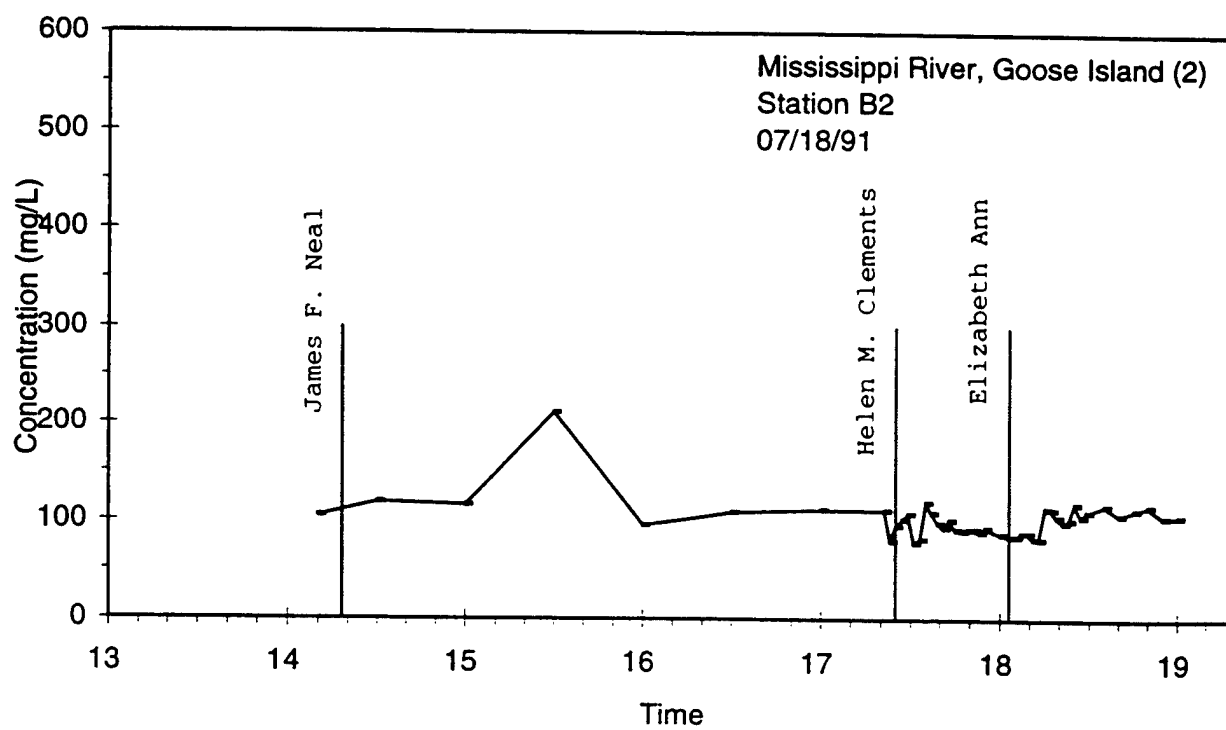
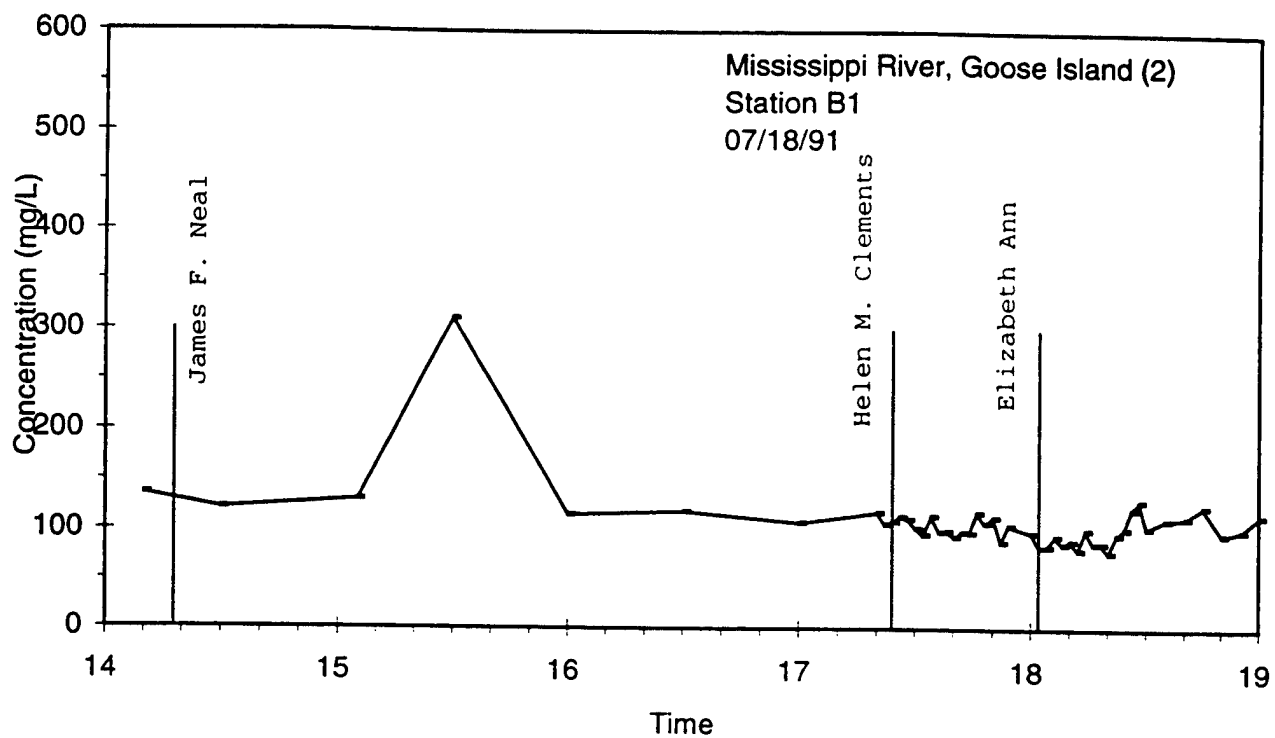


Station A1 July 18, 1991

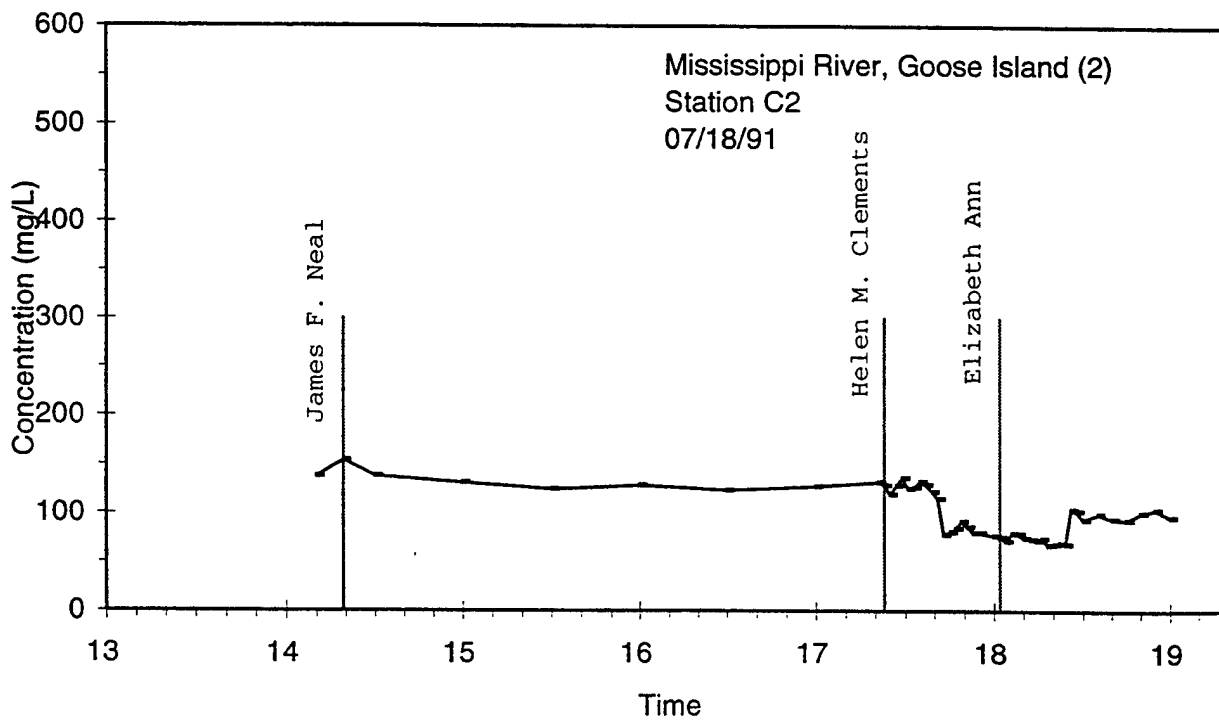
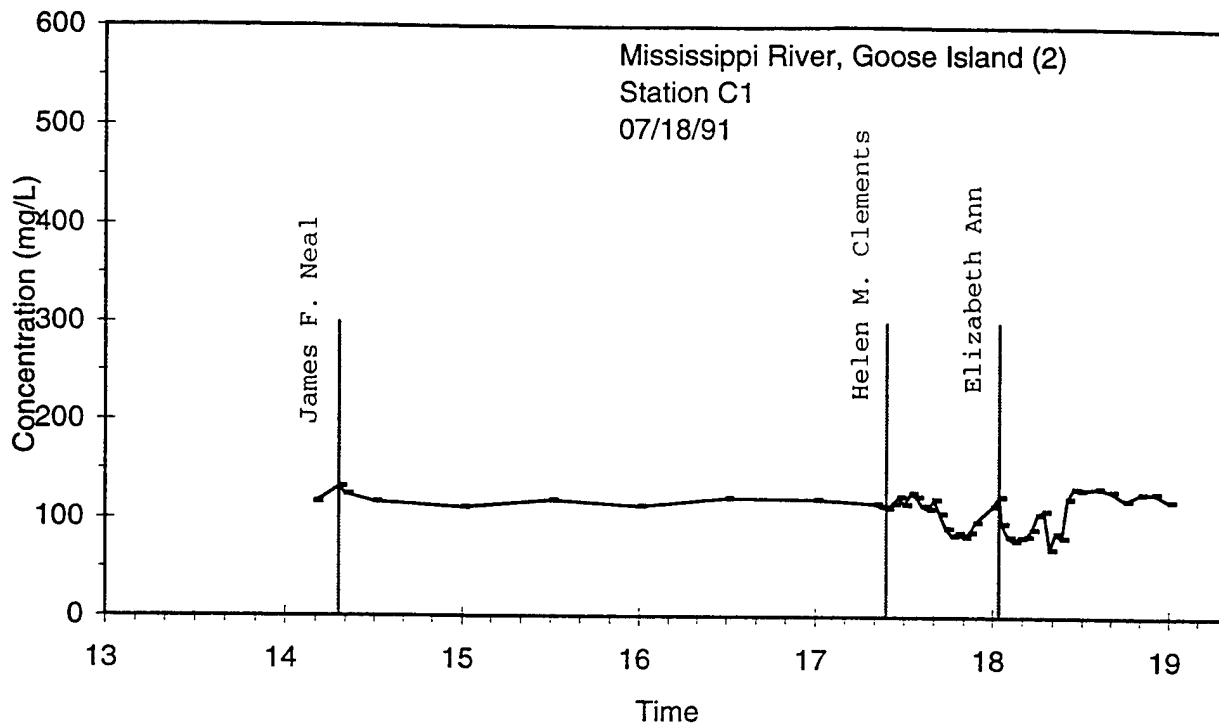




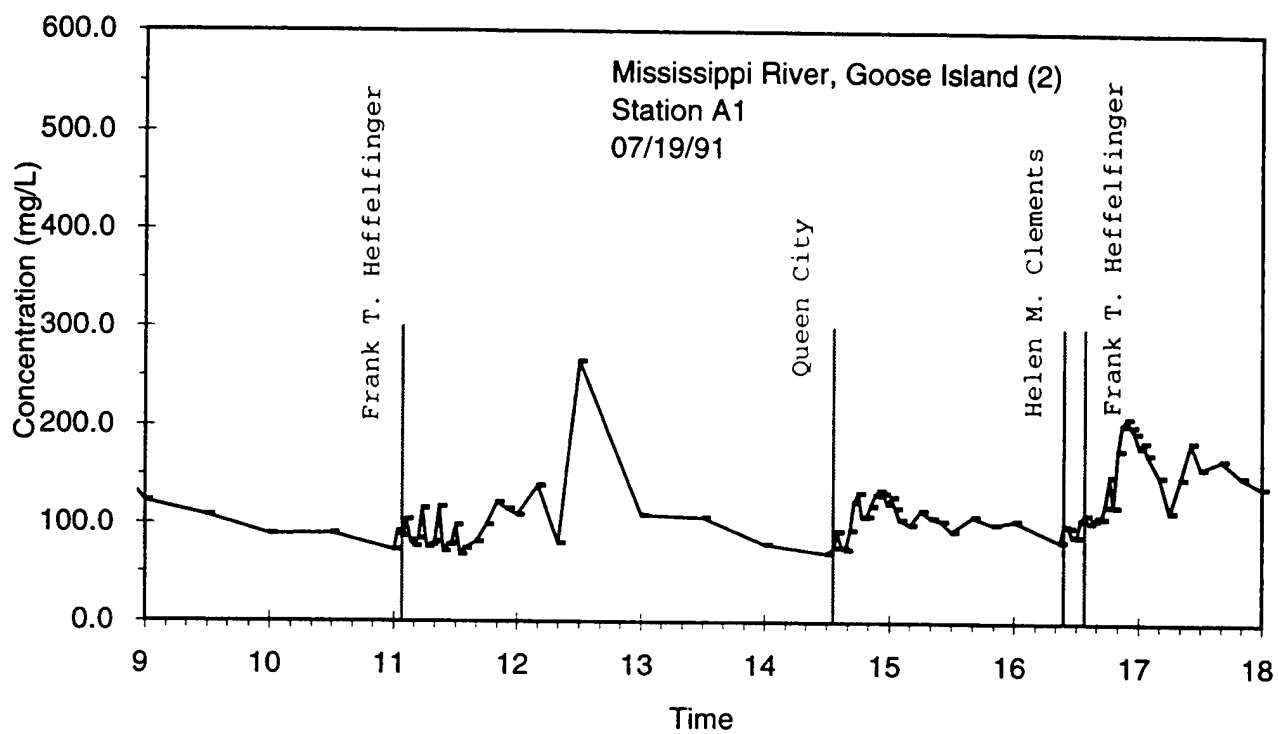
# Stations B1 and B2 July 18, 1991



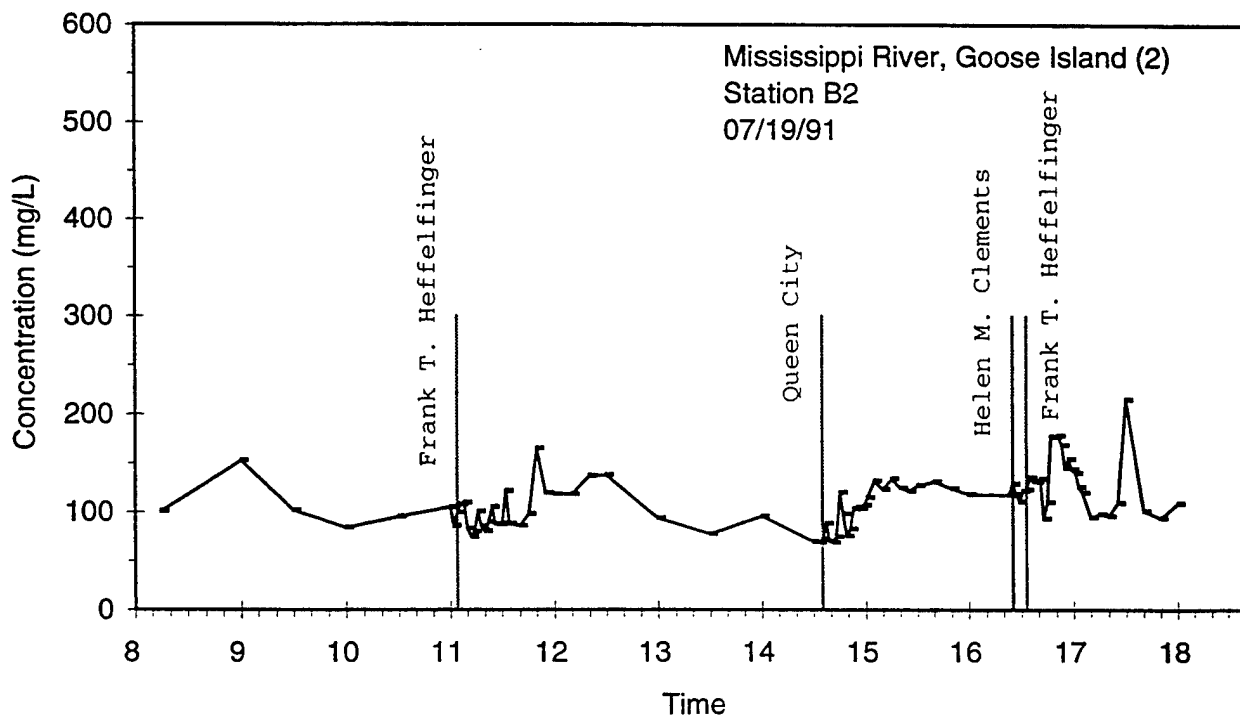
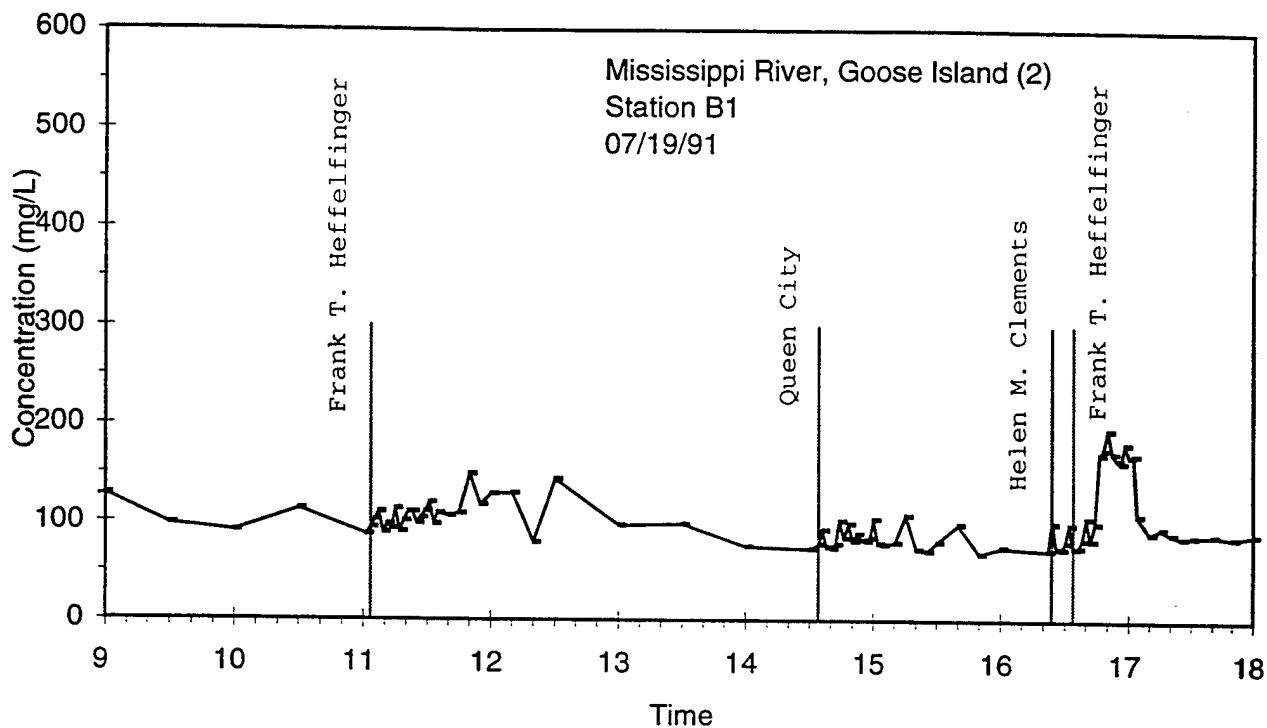
Stations C1 and C2 July 18, 1991



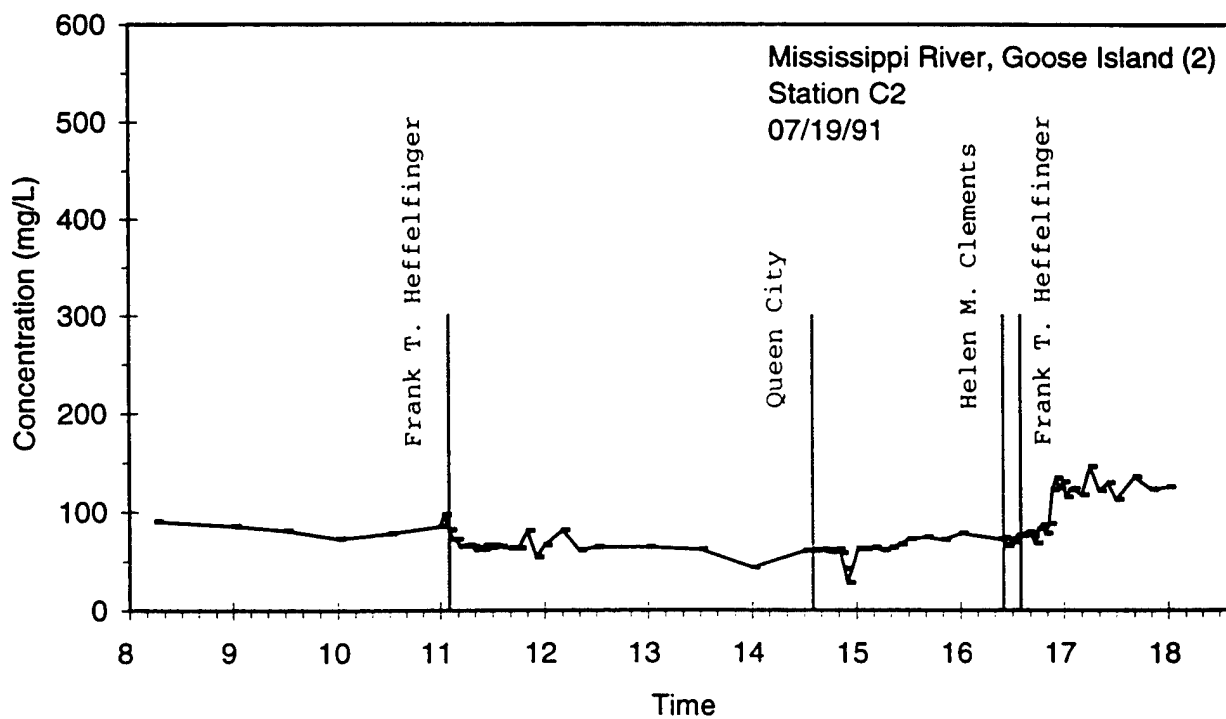
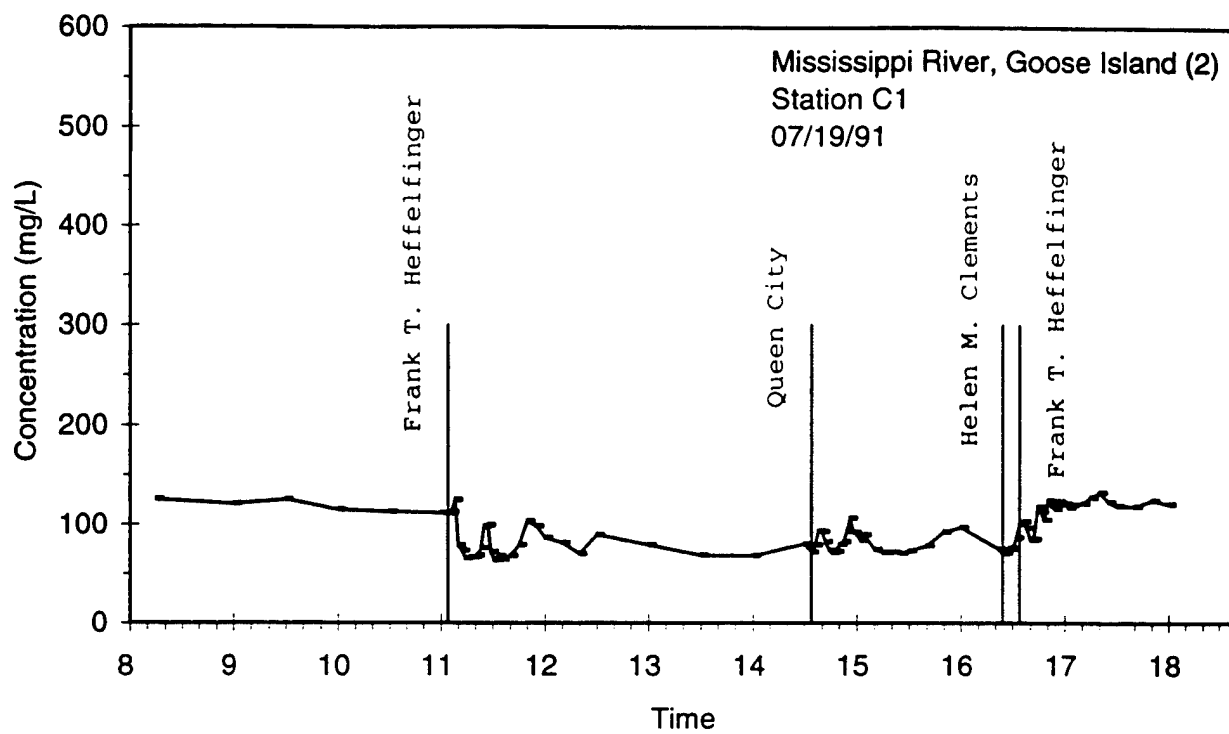
Station A1 July 19, 1991



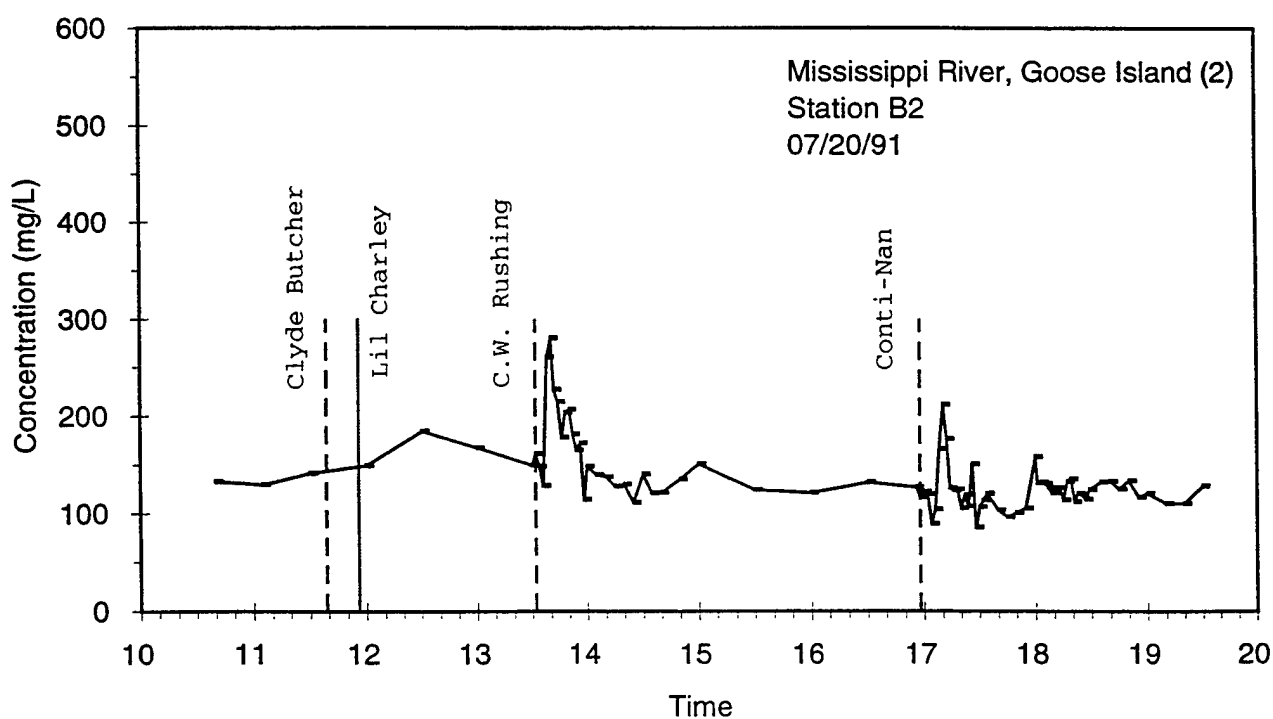
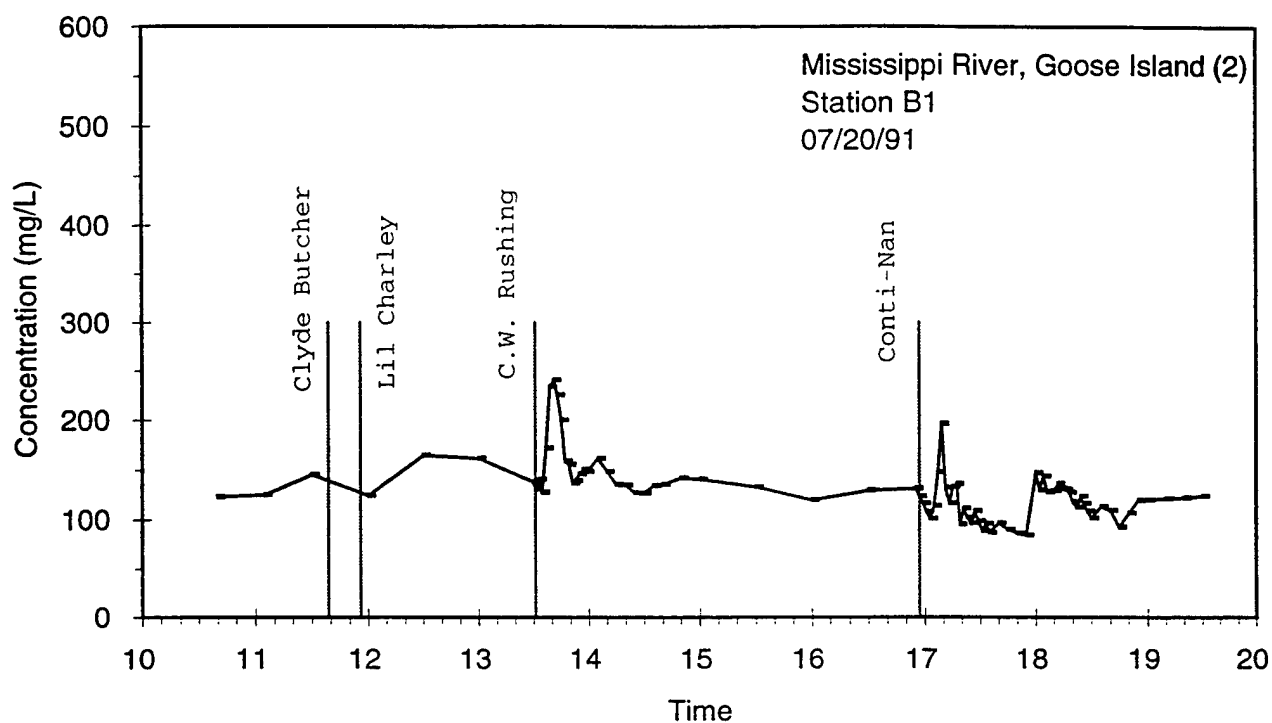
Stations B1 and B2 July 19, 1991



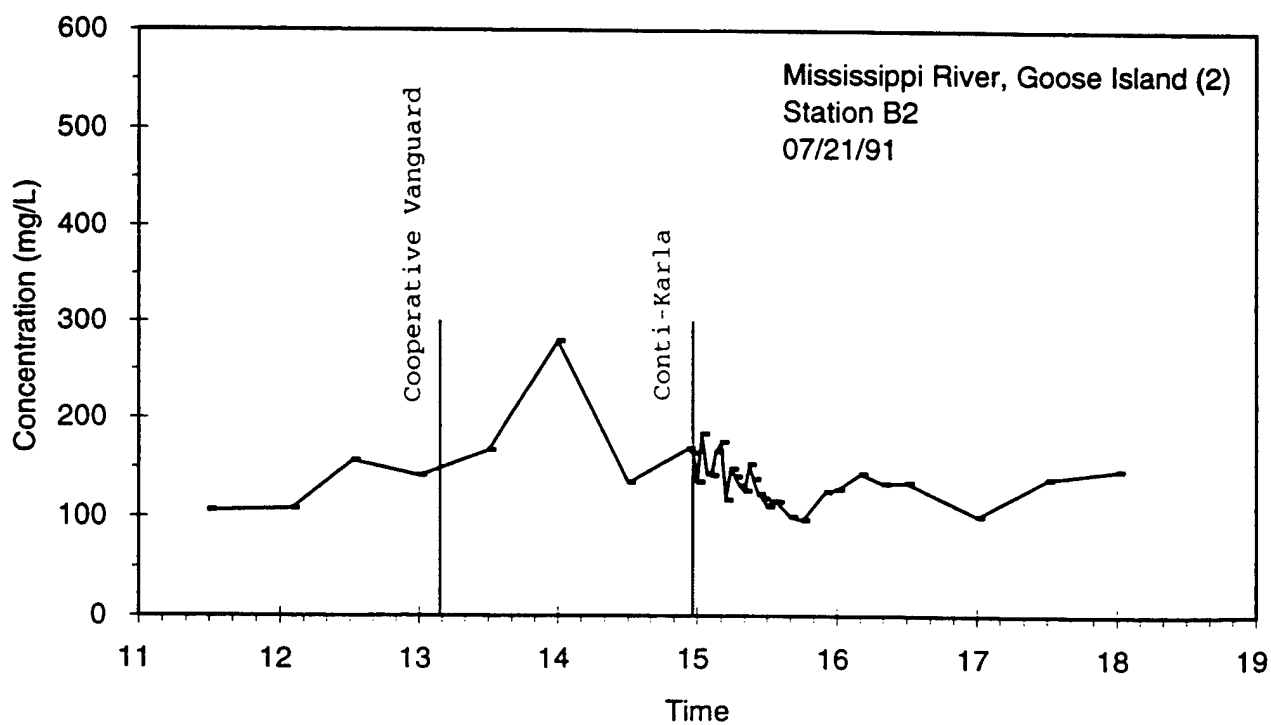
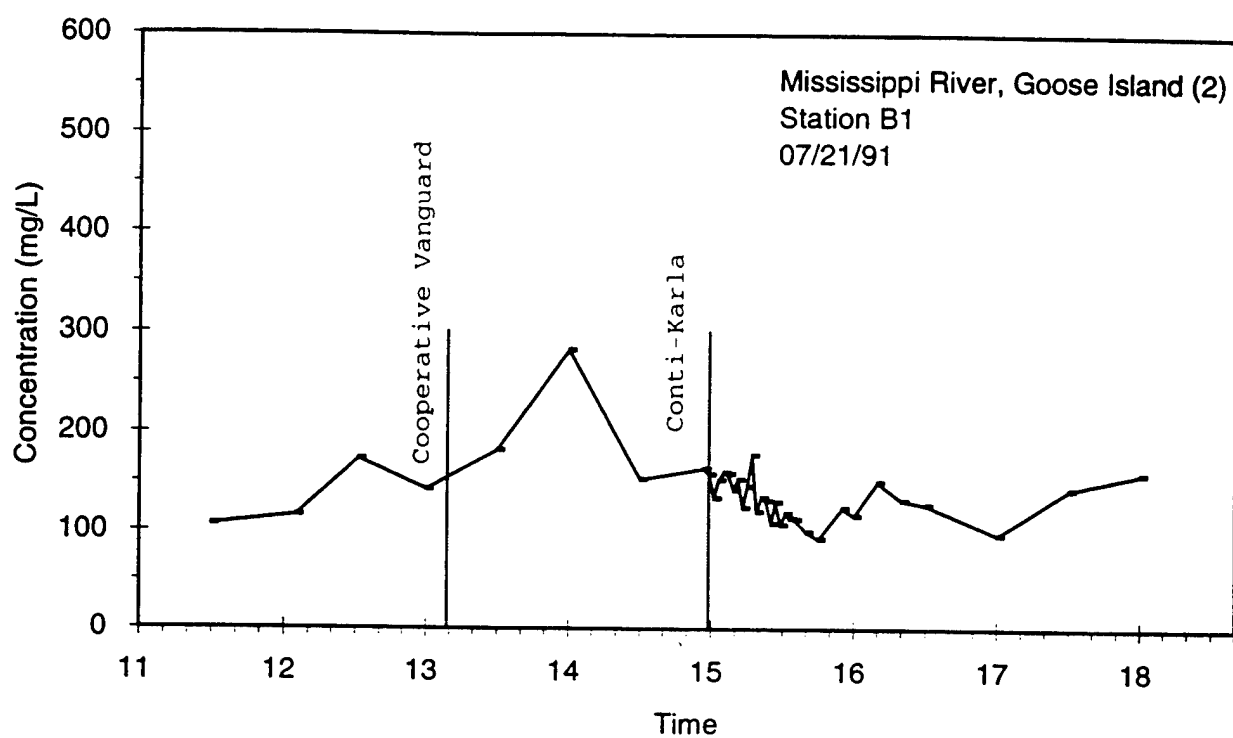
Stations C1 and C2 July 19, 1991



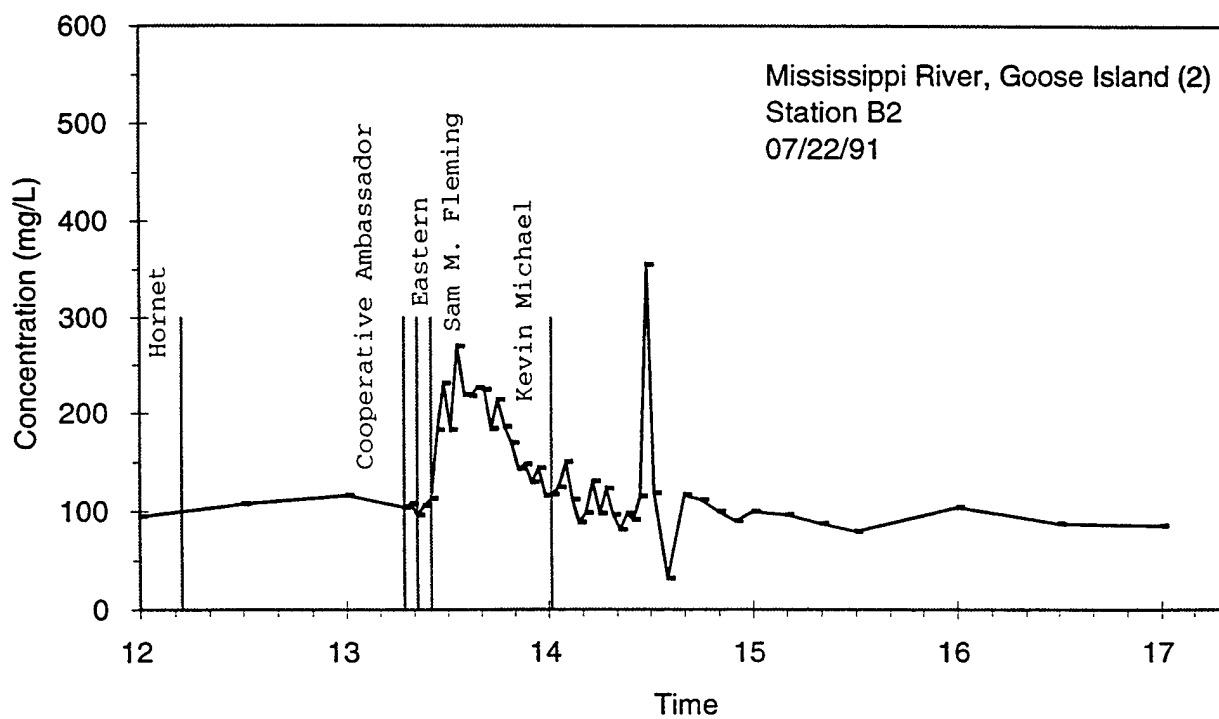
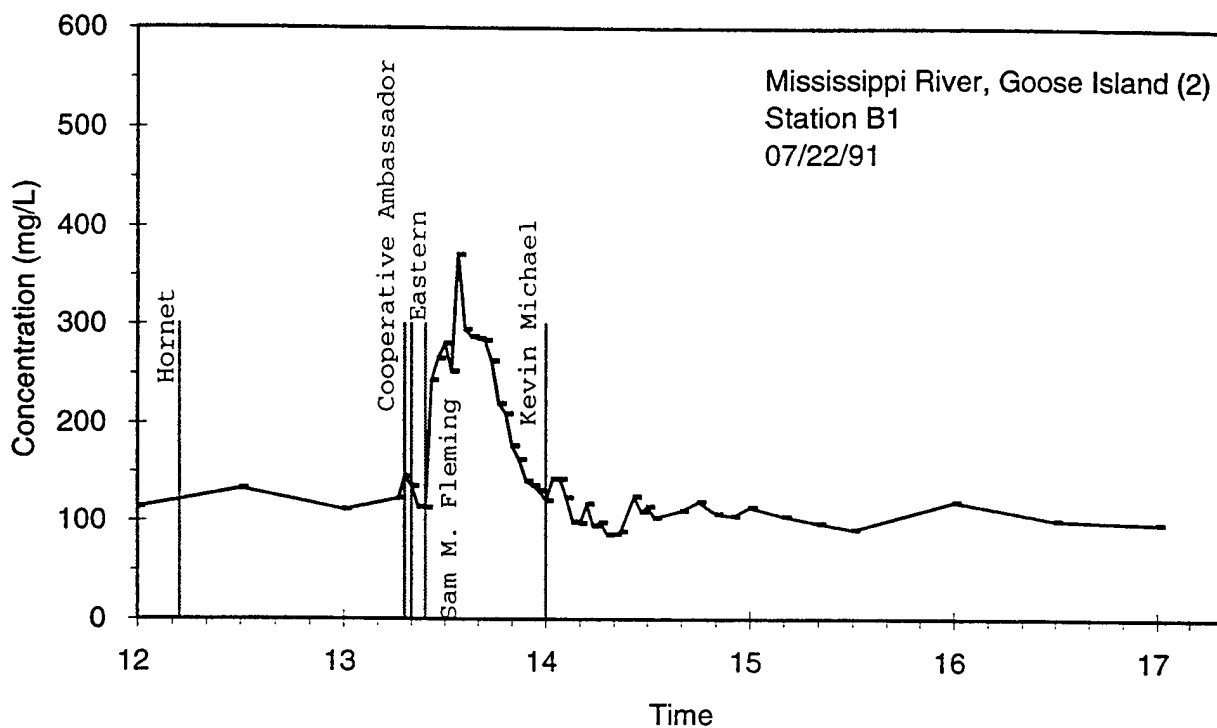
Stations B1 and B2 July 20, 1991



Stations B1 and B2 July 21, 1991

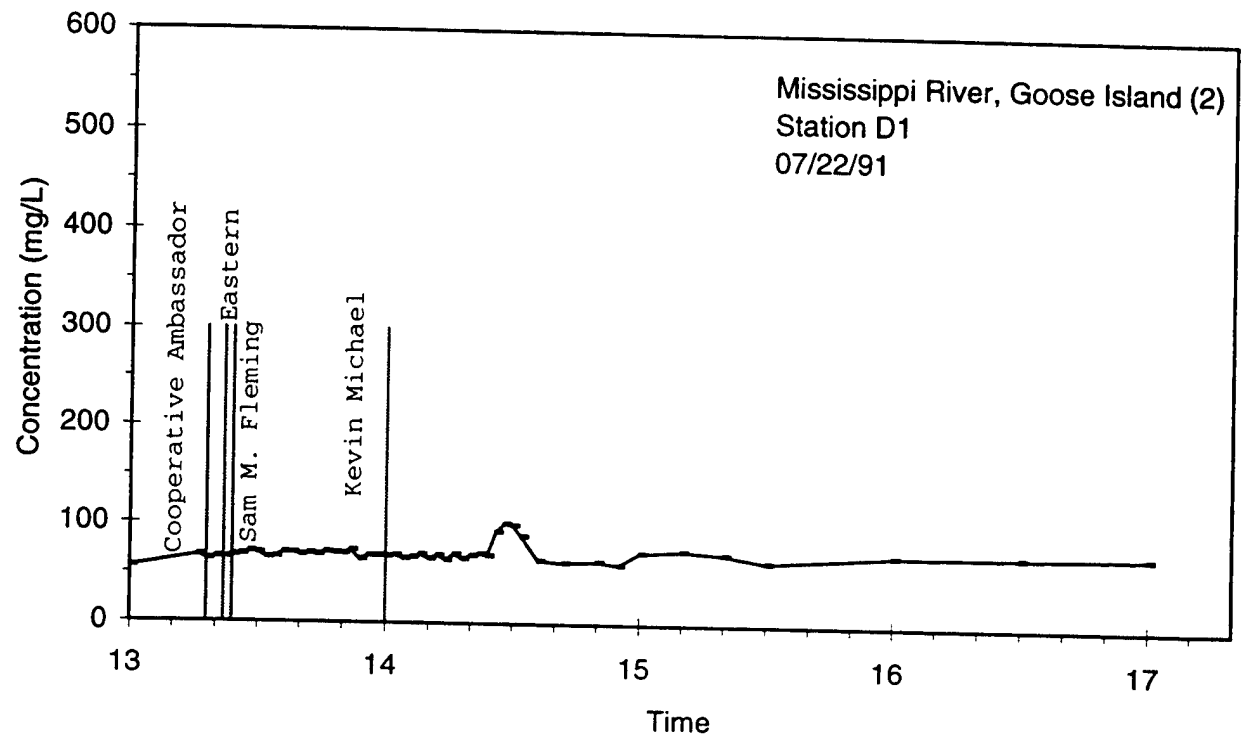


Stations B1 and B2 July 22, 1991

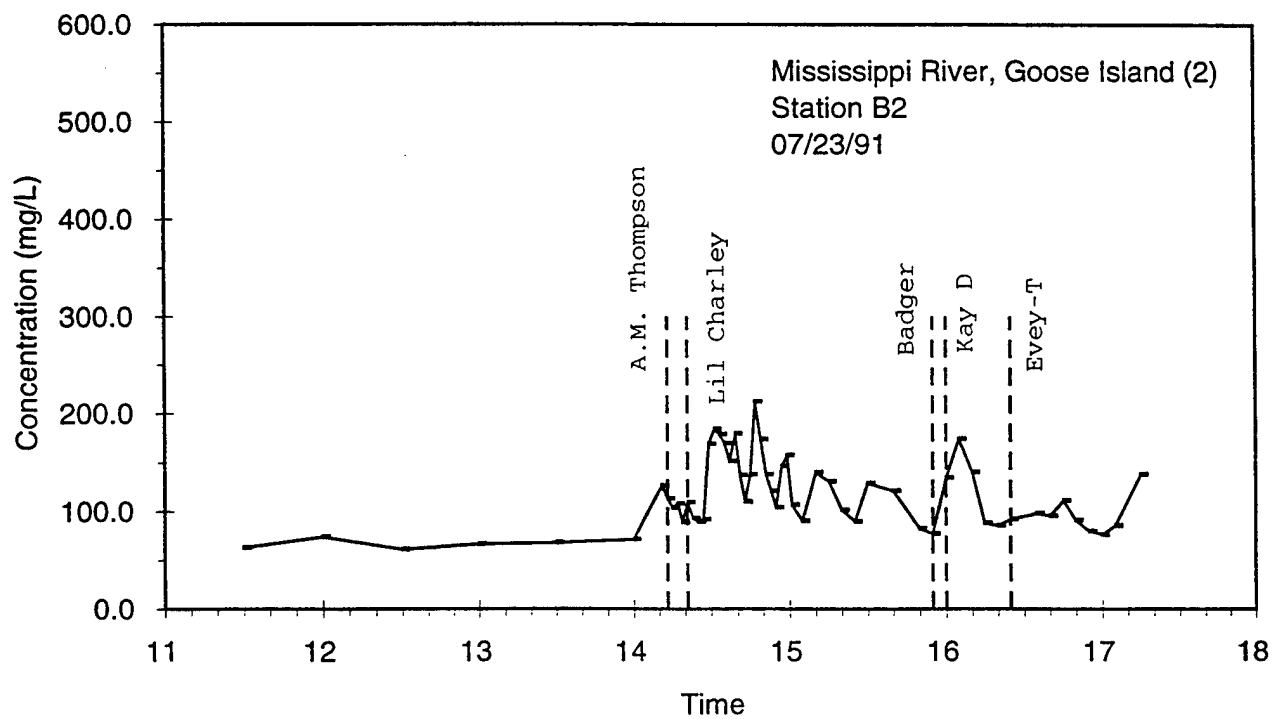
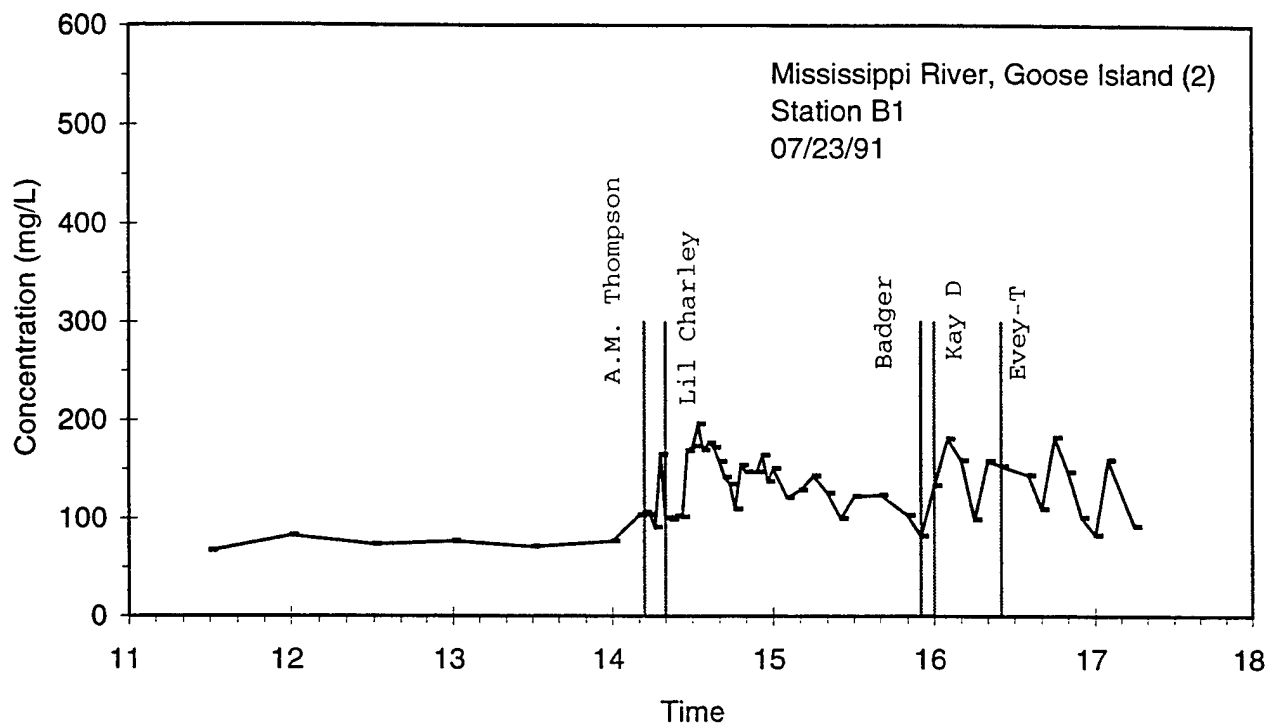




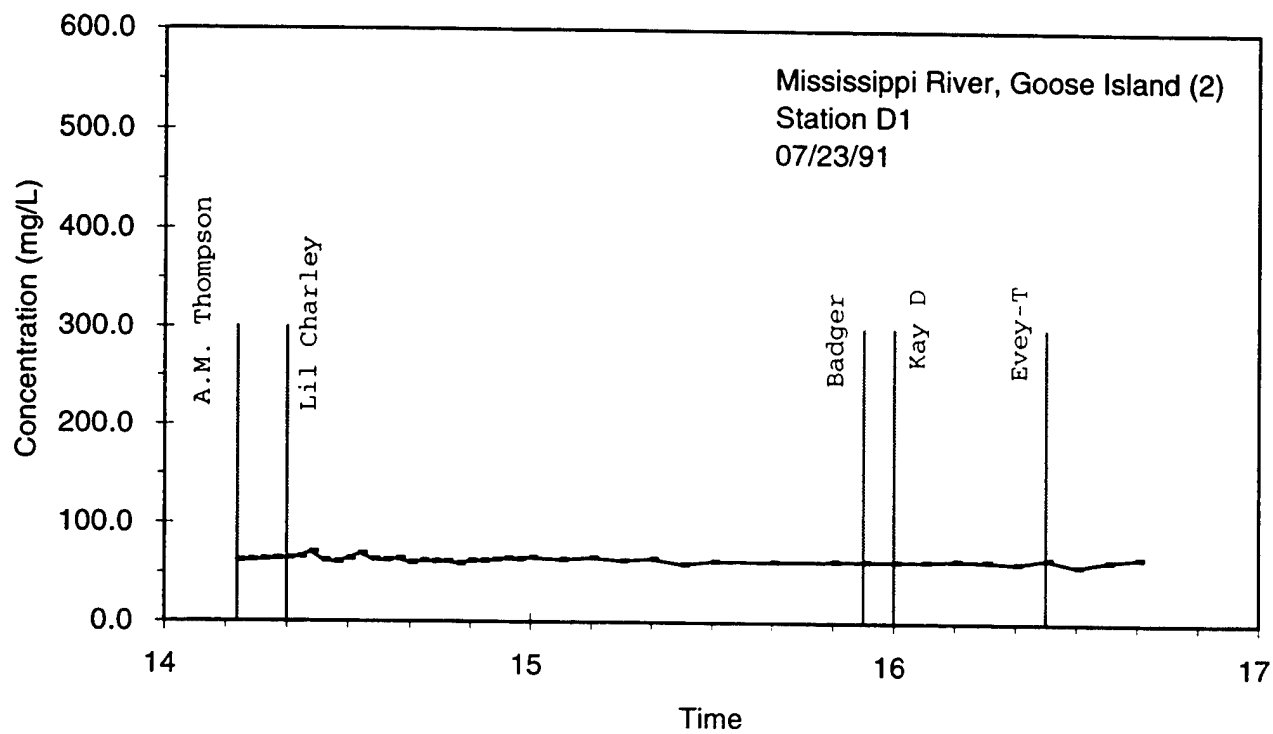
Station D1 July 22, 1991



Stations B1 and B2 July 23, 1991

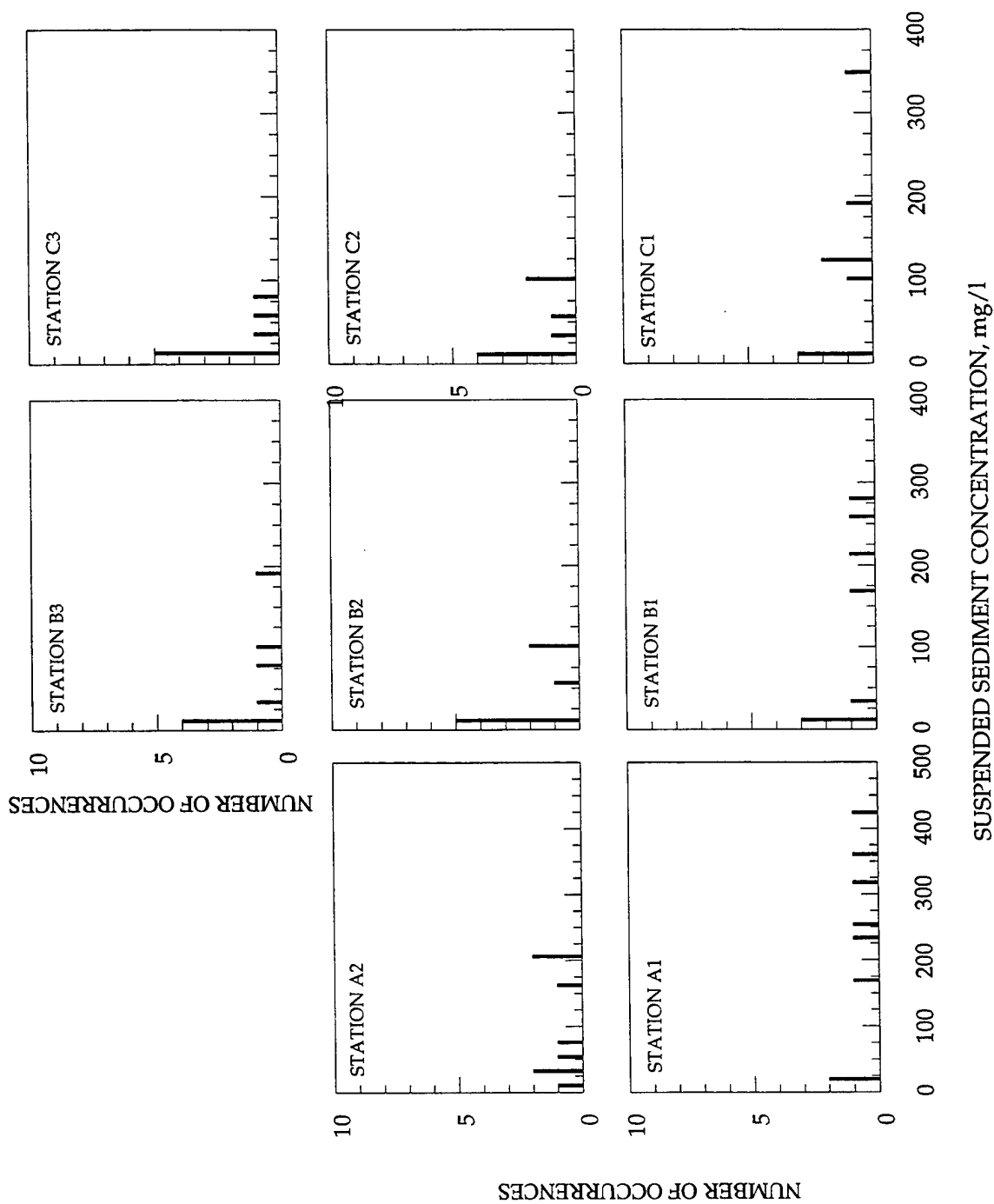


Station D1 July 23, 1991



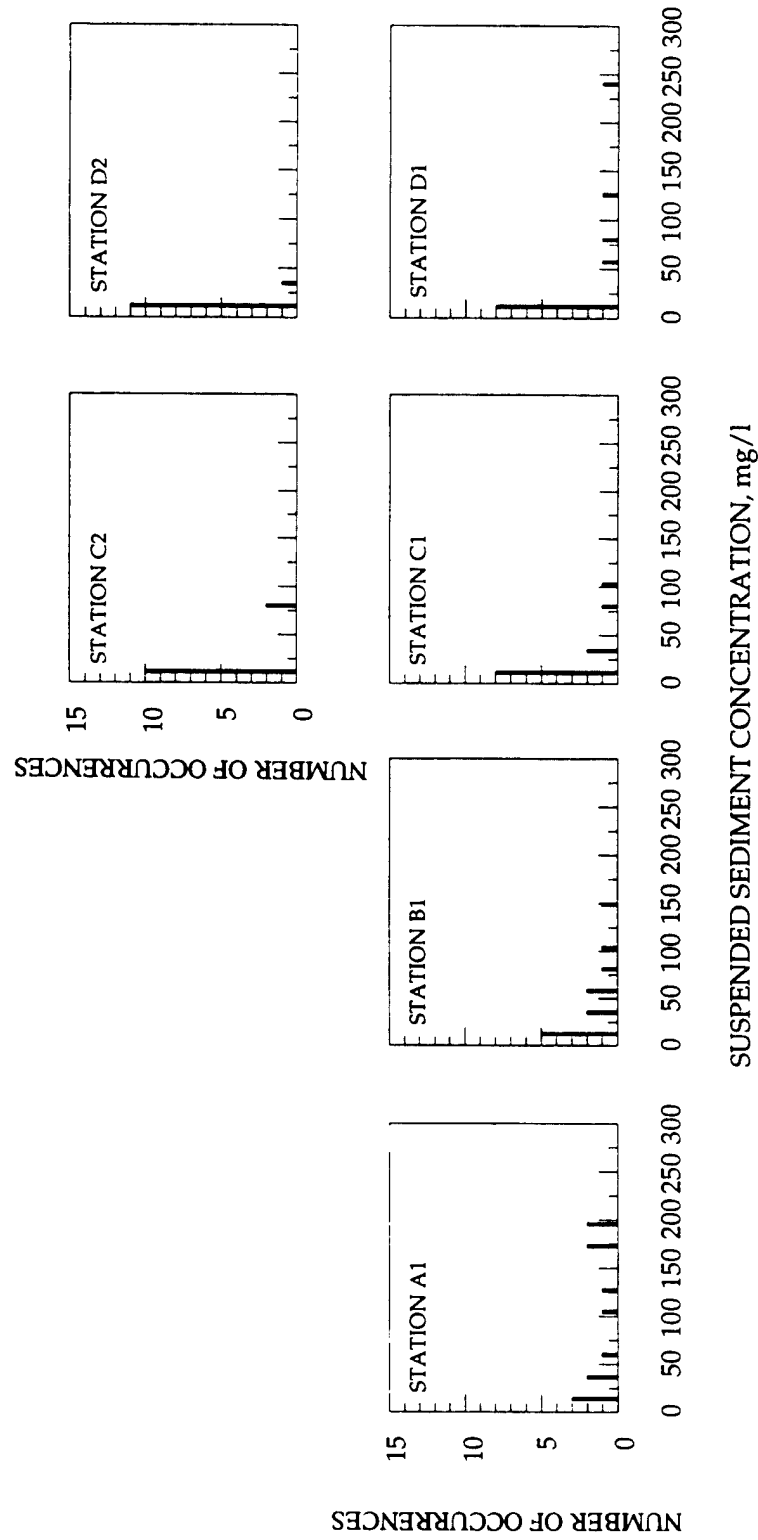
**APPENDIX XXVI.**  
**HISTOGRAMS OF SUSPENDED SEDIMENT CONCENTRATION**

# McEVER'S ISLAND



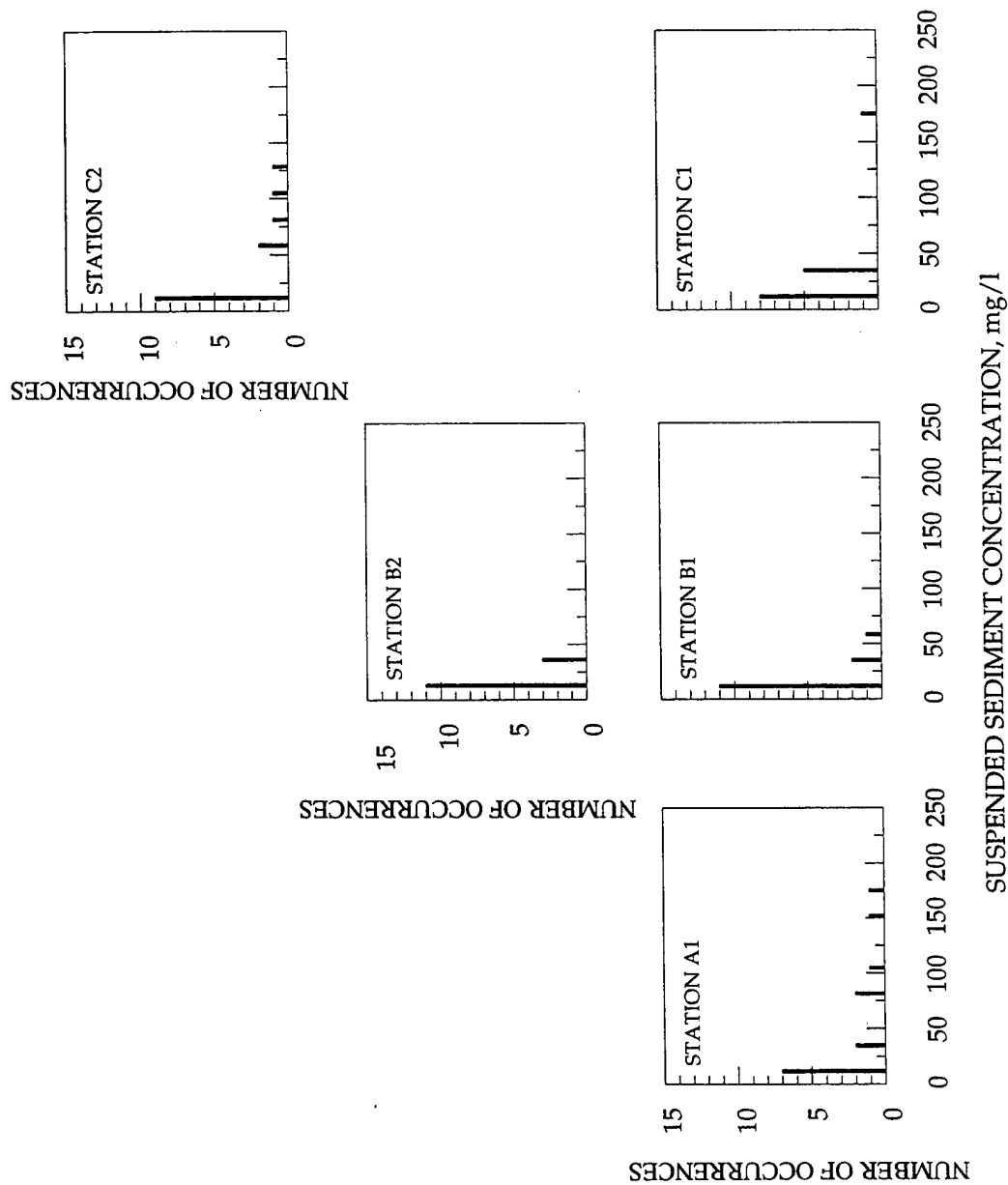
XXVI-1. Histograms of maximum increased suspended sediment concentration, McEver's Island

# APPLE RIVER ISLAND



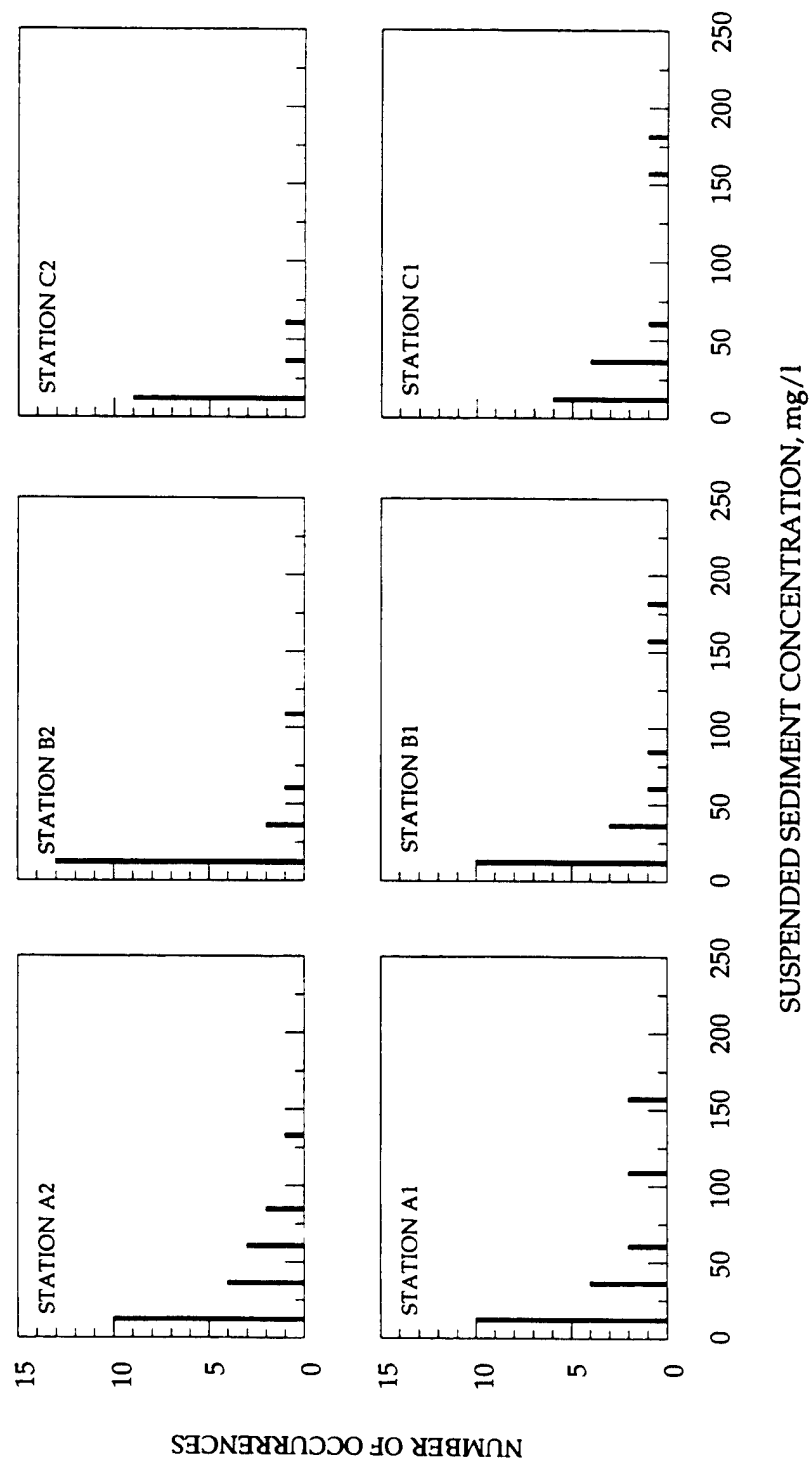
XXVI-2. Histograms of maximum increased suspended sediment concentration, Apple River Island

# GOOSE ISLAND, TRIP 1



XXVI-3. Histograms of maximum increased suspended sediment concentration, Goose Island, trip 1

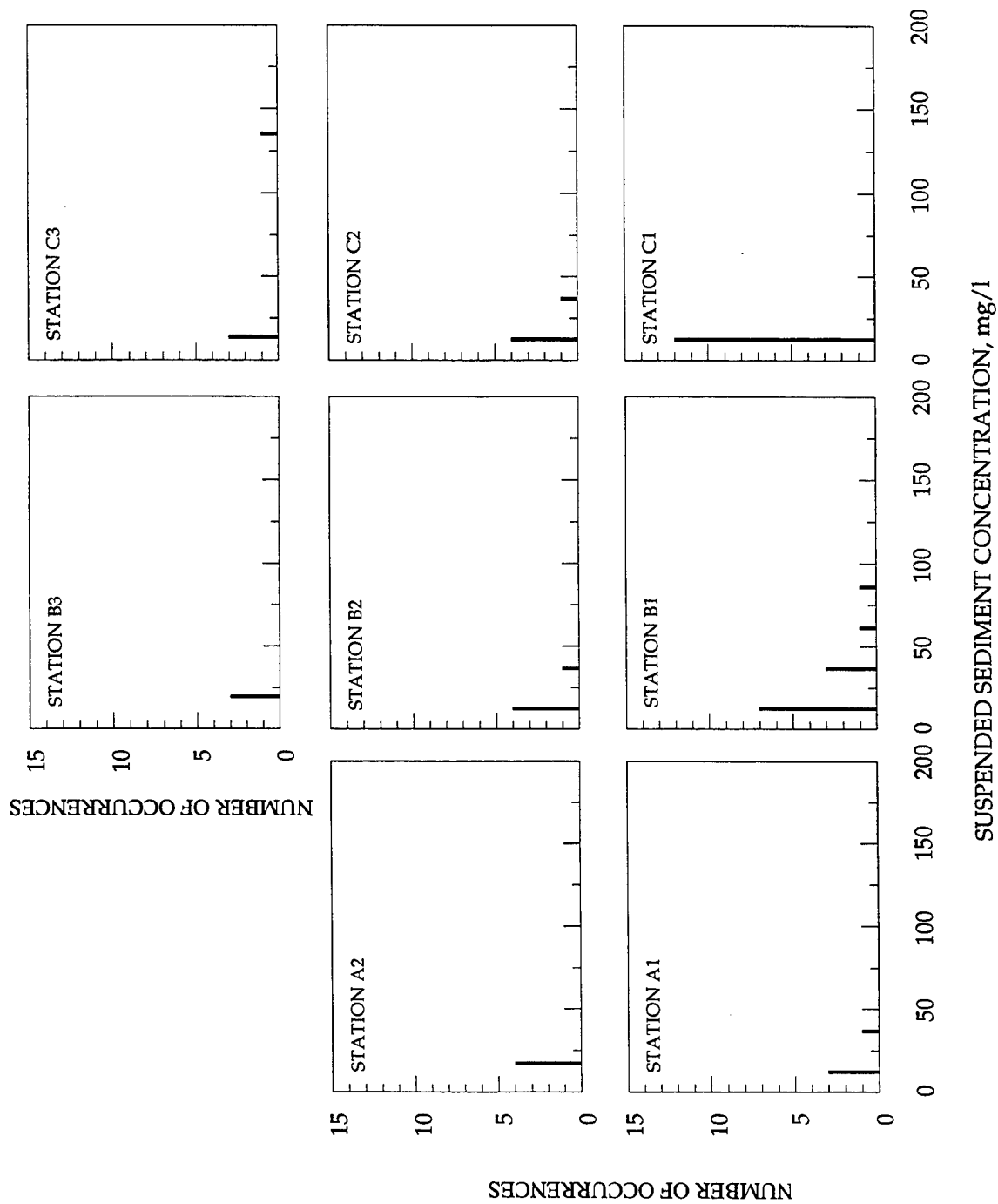
# KAMPSVILLE, TRIP 1



XXVI-4. Histograms of maximum increased suspended sediment concentration, Kampsville, trip 1

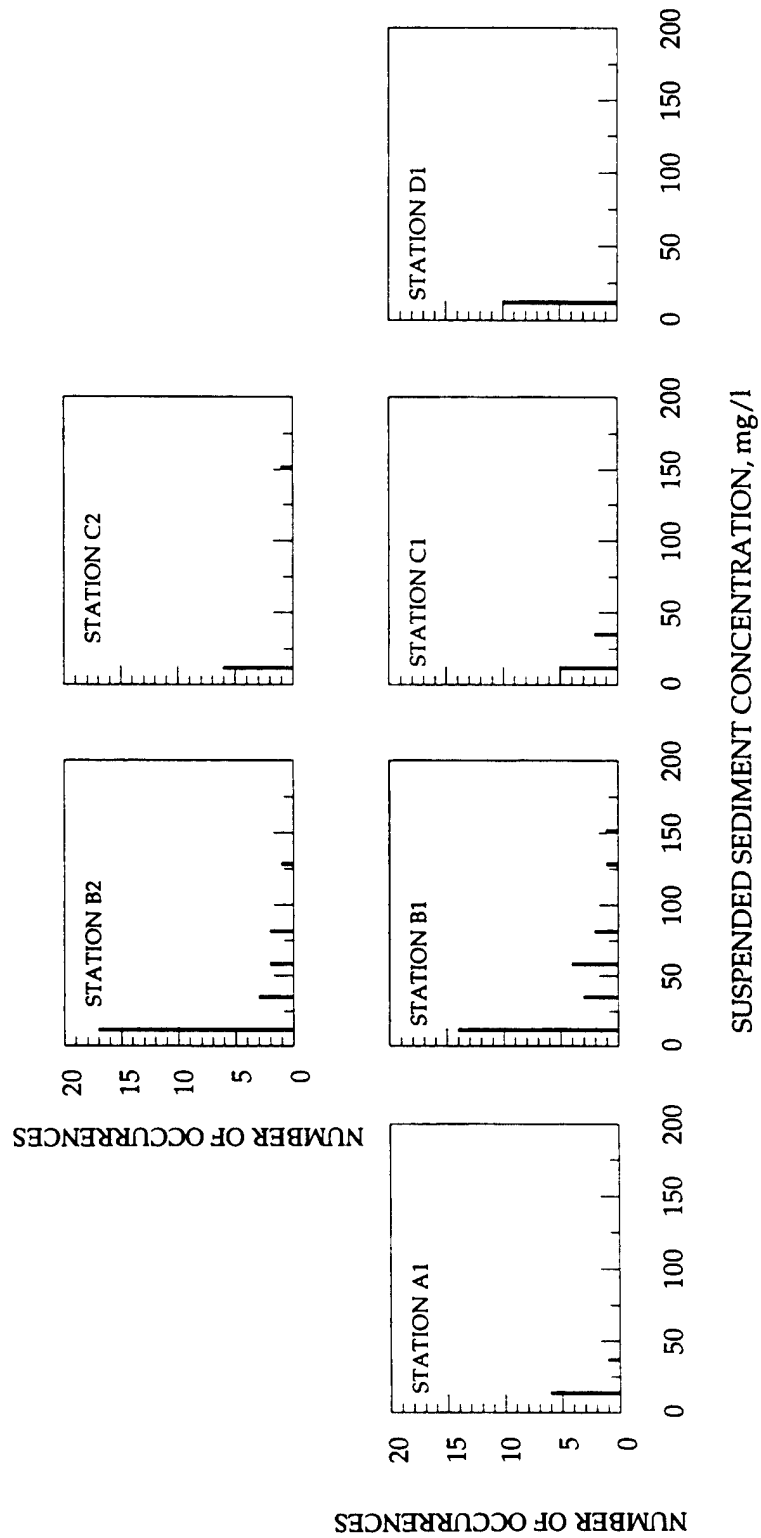


# CLARKS FERRY, TRIP 1



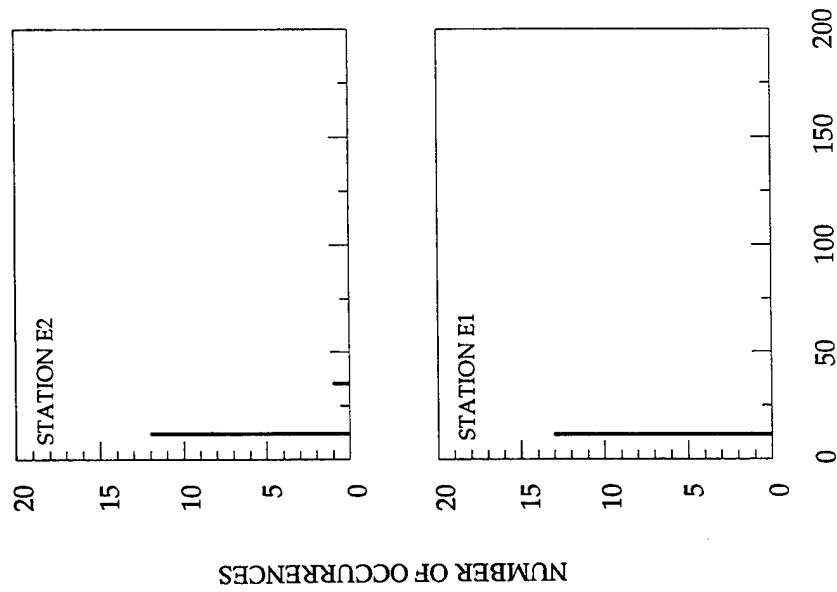
XXVI-5. Histograms of maximum increased suspended sediment concentration, Clarks Ferry, trip 1

GOOSE ISLAND, TRIP 2



XXVI-6. Histograms of maximum increased suspended sediment concentration, Goose Island, trip 2

# GOOSE ISLAND, TRIP 2

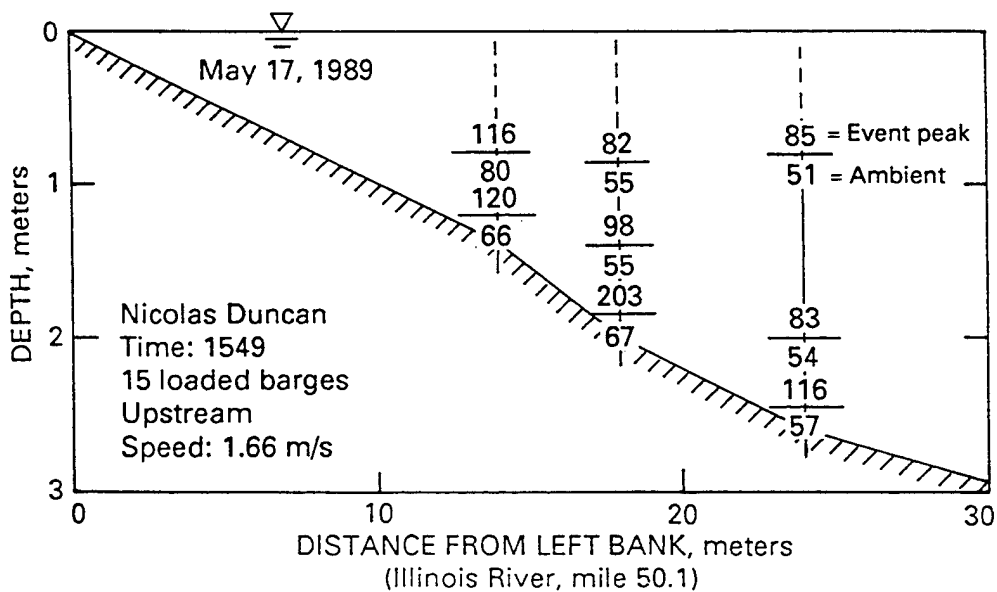
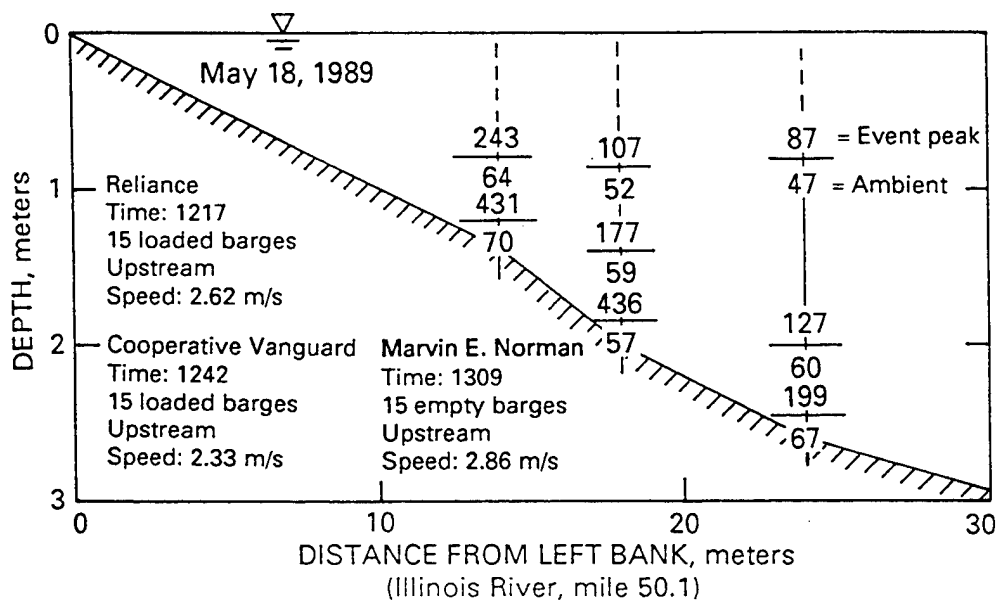


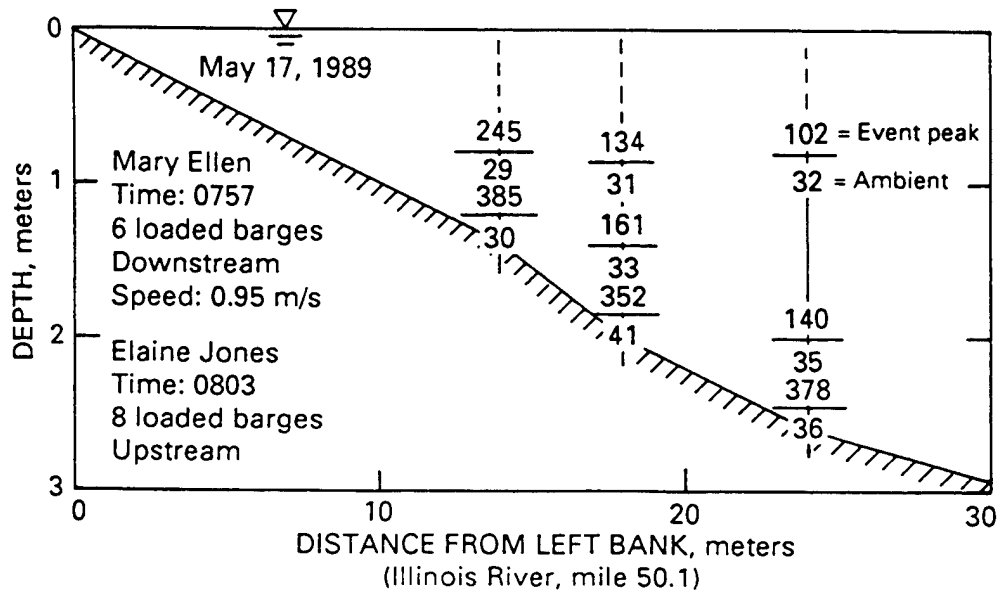
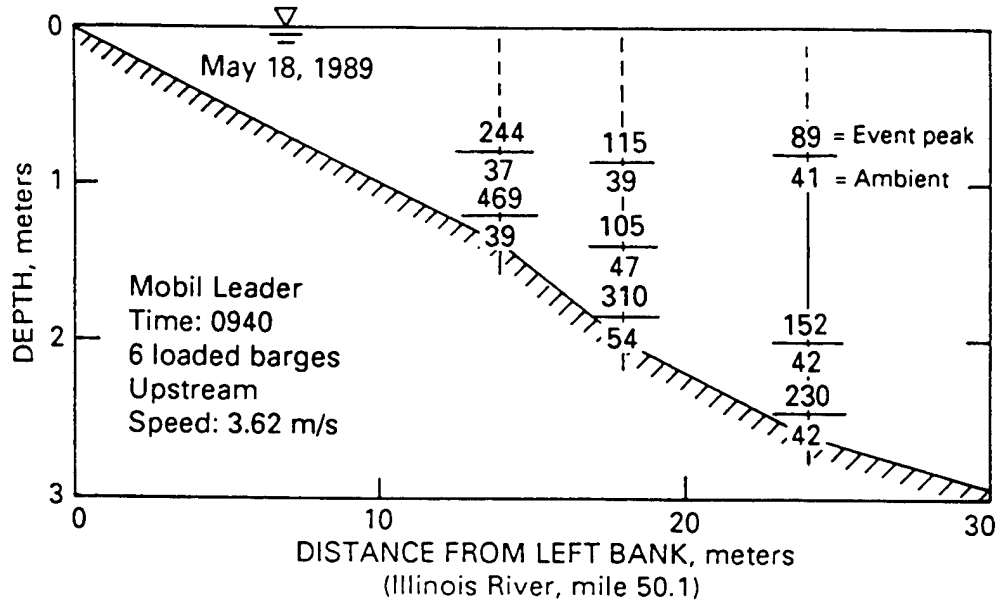
SUSPENDED SEDIMENT CONCENTRATION, mg/l

XXVI-6. Concluded

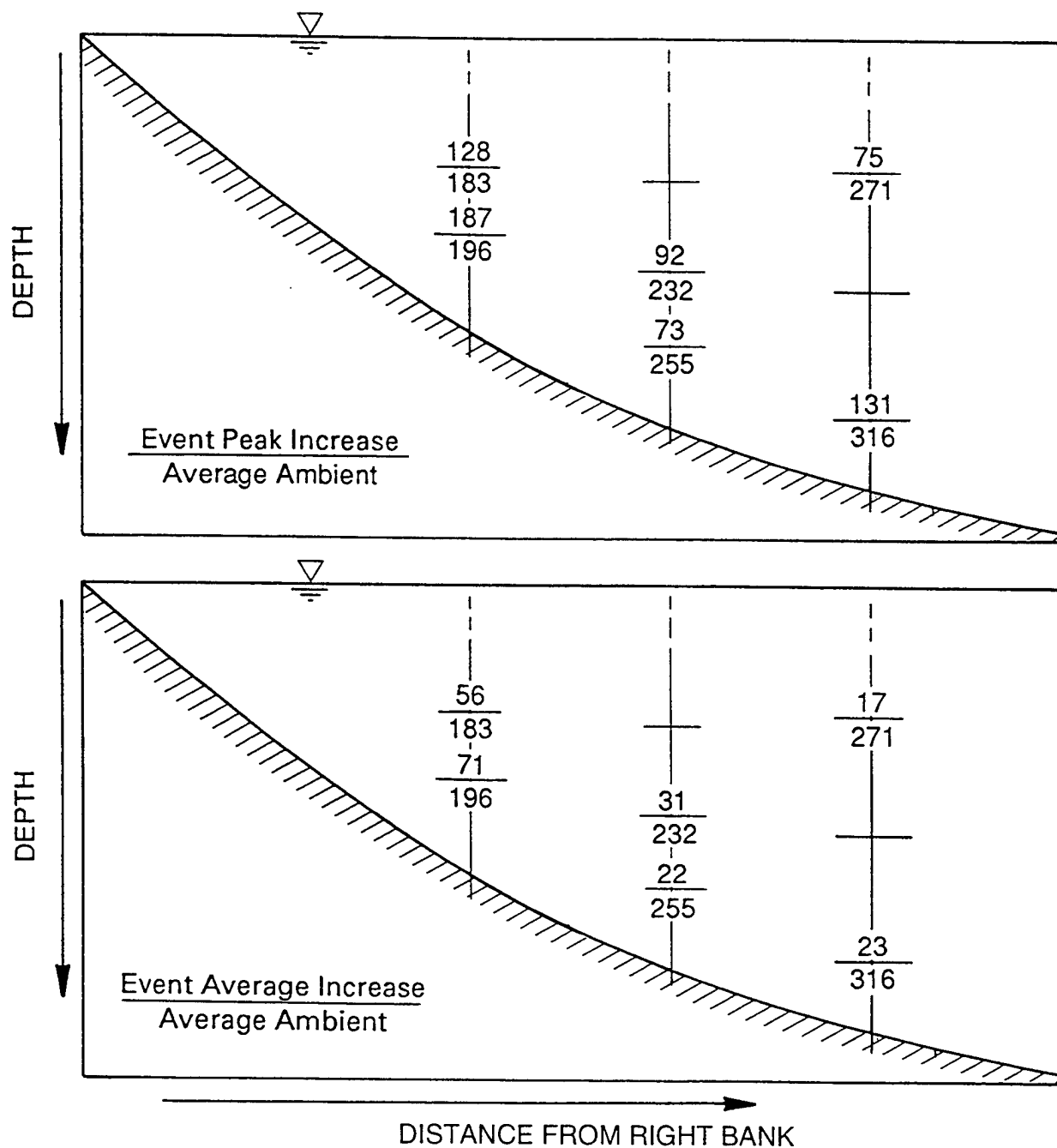
**APPENDIX XXVII.**

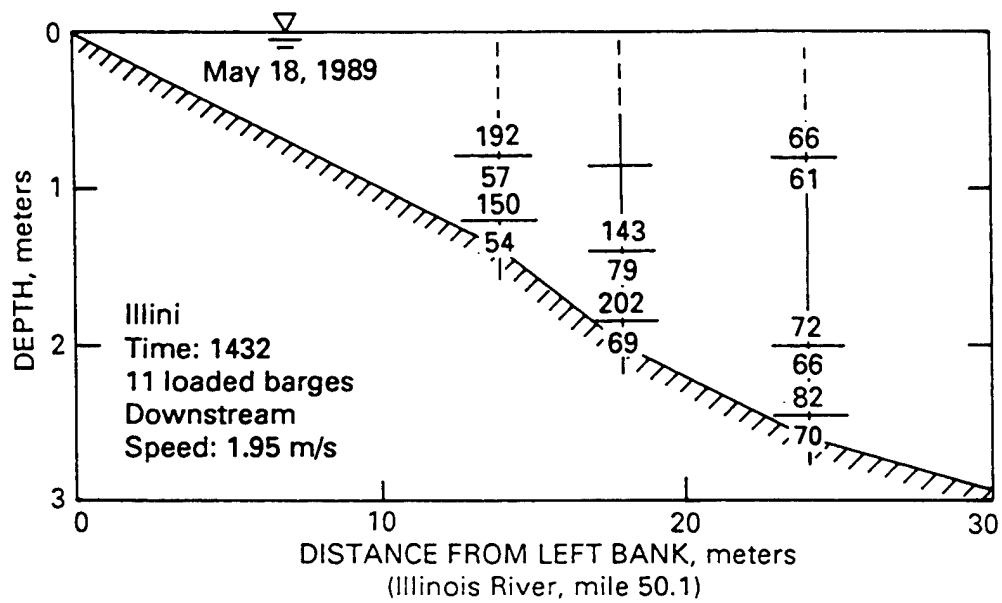
**RATIO OF PEAK TO AVERAGE SUSPENDED SEDIMENT CONCENTRATION  
DUE TO MOVEMENT OF NAVIGATION TRAFFIC**





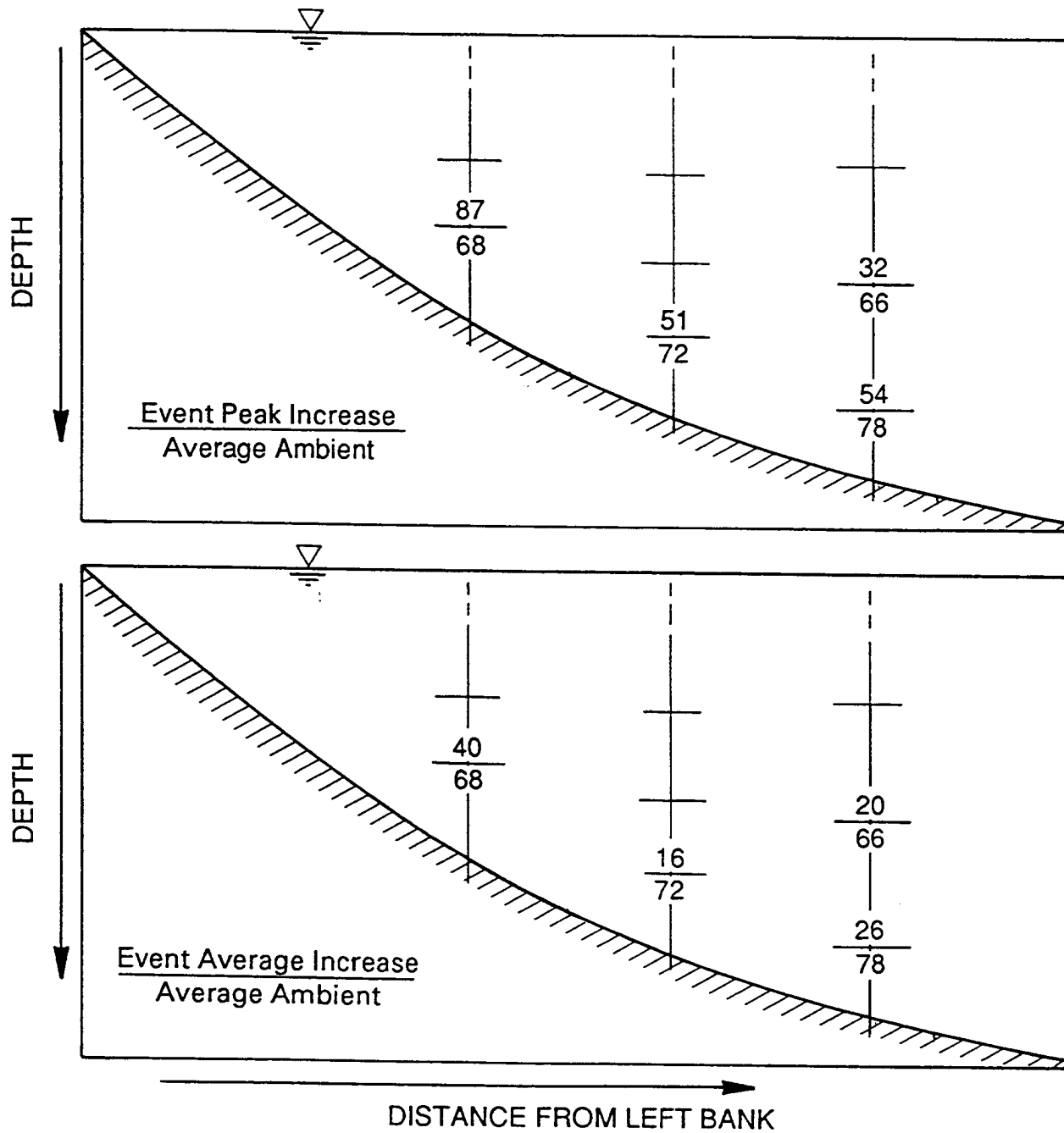
Illinois River, mile 35.3, October 1990  
Average Suspended Sediment Concentrations, mg/L



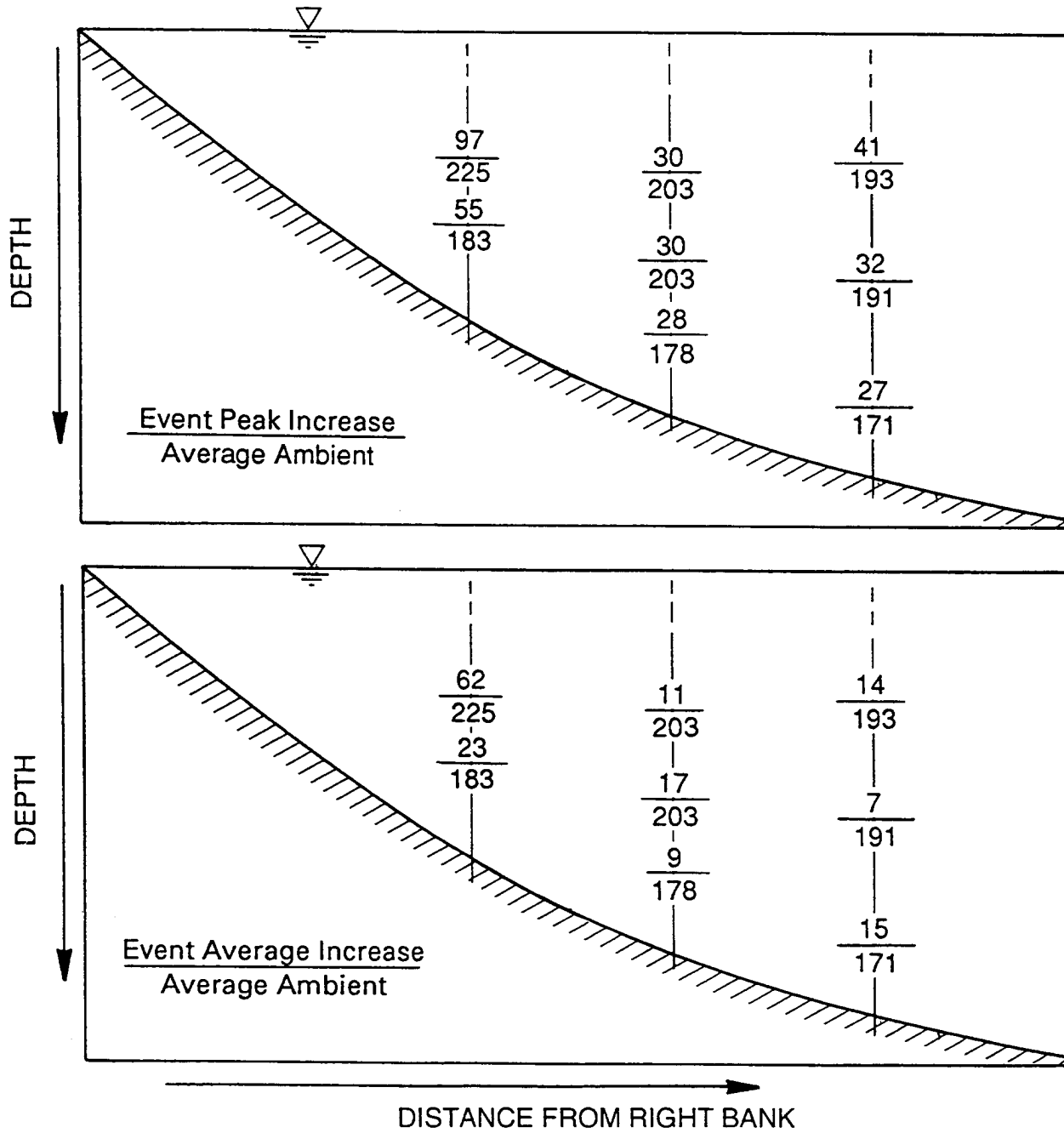




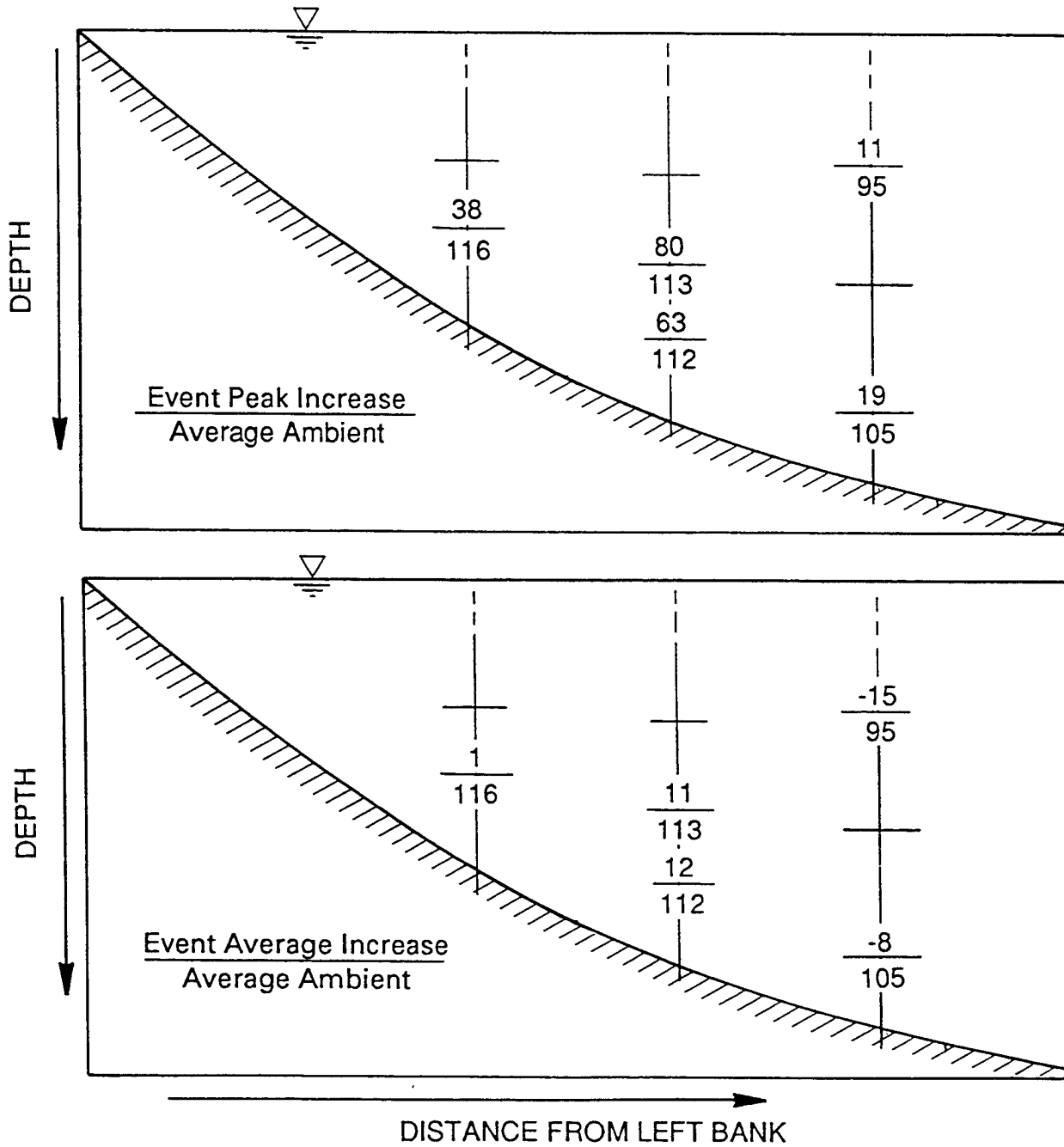
Mississippi River, mile 546.7, May 1990  
Average Suspended Sediment Concentrations, mg/L



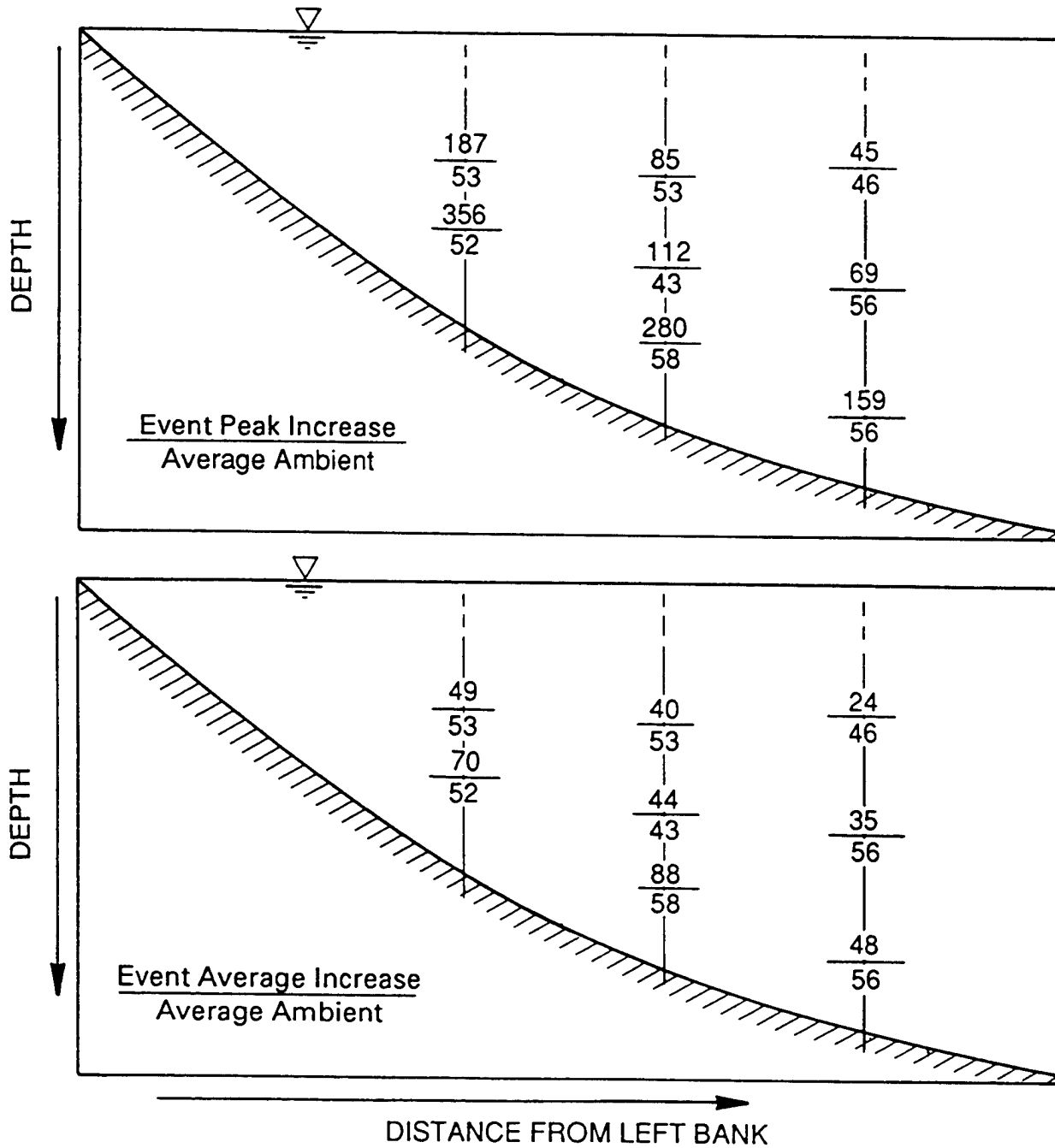
Mississippi River, mile 468.2, May 1992  
Average Suspended Sediment Concentrations, mg/L



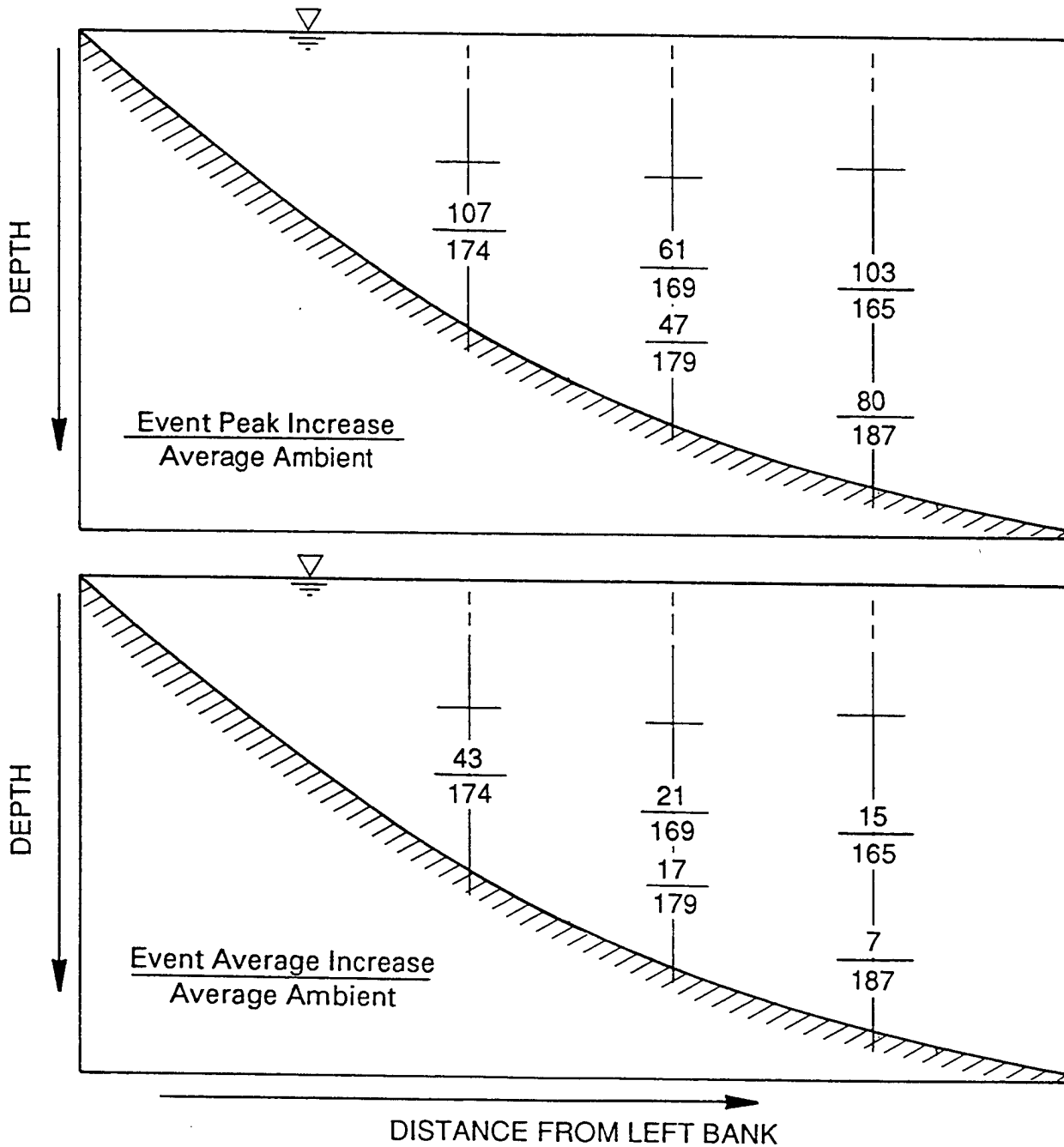
Mississippi River, mile 319.3, July 1991  
Average Suspended Sediment Concentrations, mg/L



Illinois River, mile 50.1, May 1989  
Average Suspended Sediment Concentrations, mg/L



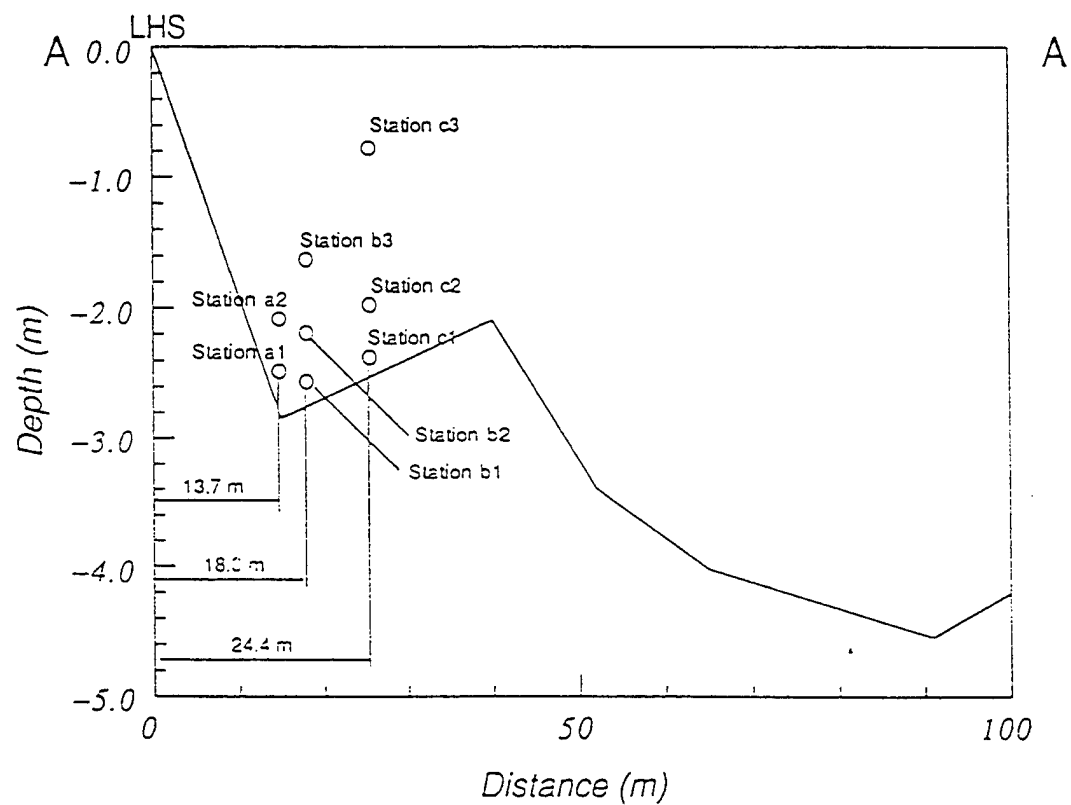
Mississippi River, mile 319.3, August 1990  
Average Suspended Sediment Concentrations, mg/L

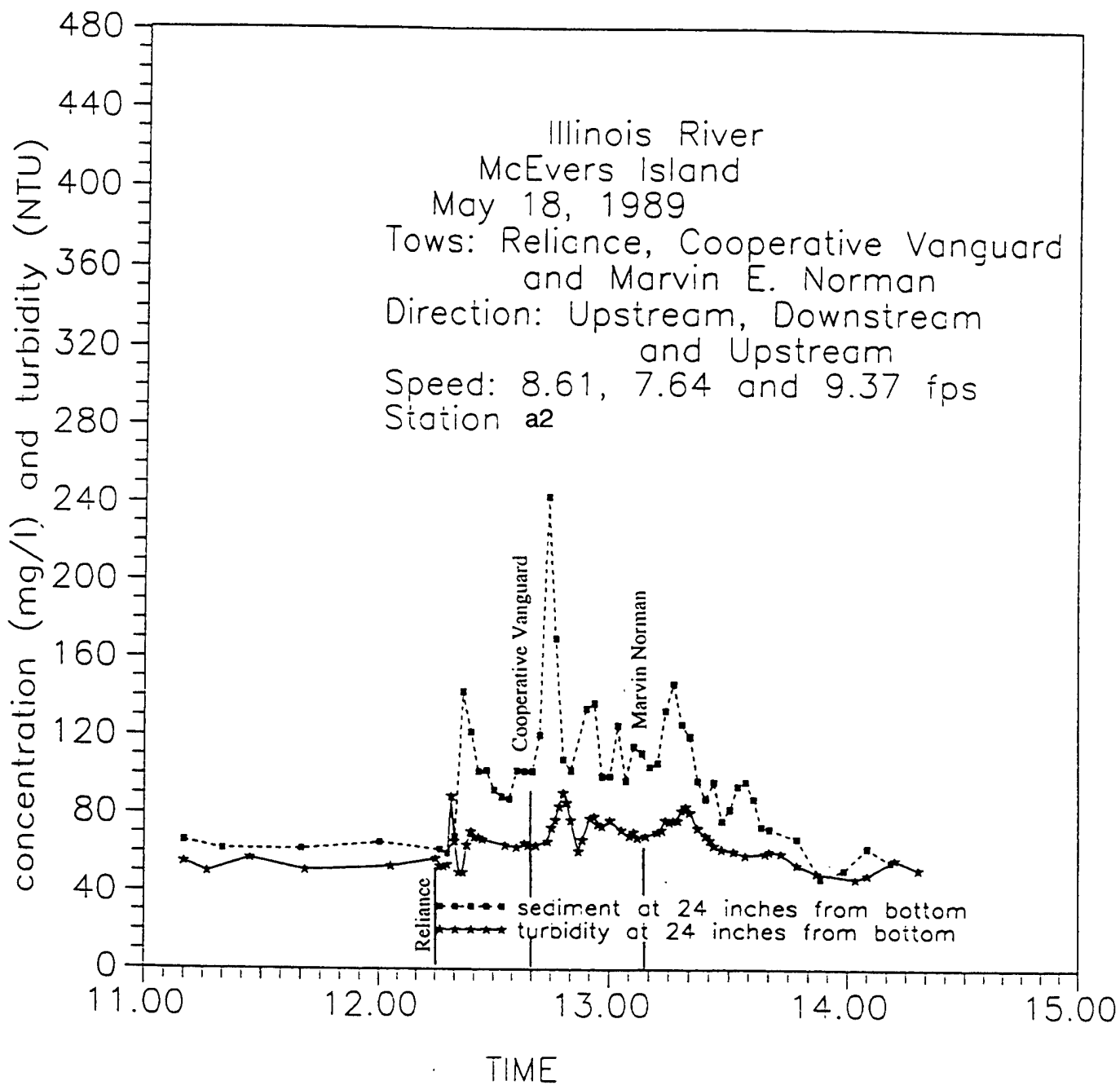


**APPENDIX XXVIII.**

**COMPARISON OF TURBIDITY AND SUSPENDED SEDIMENT CONCENTRATION  
AT MCEVER'S ISLAND**

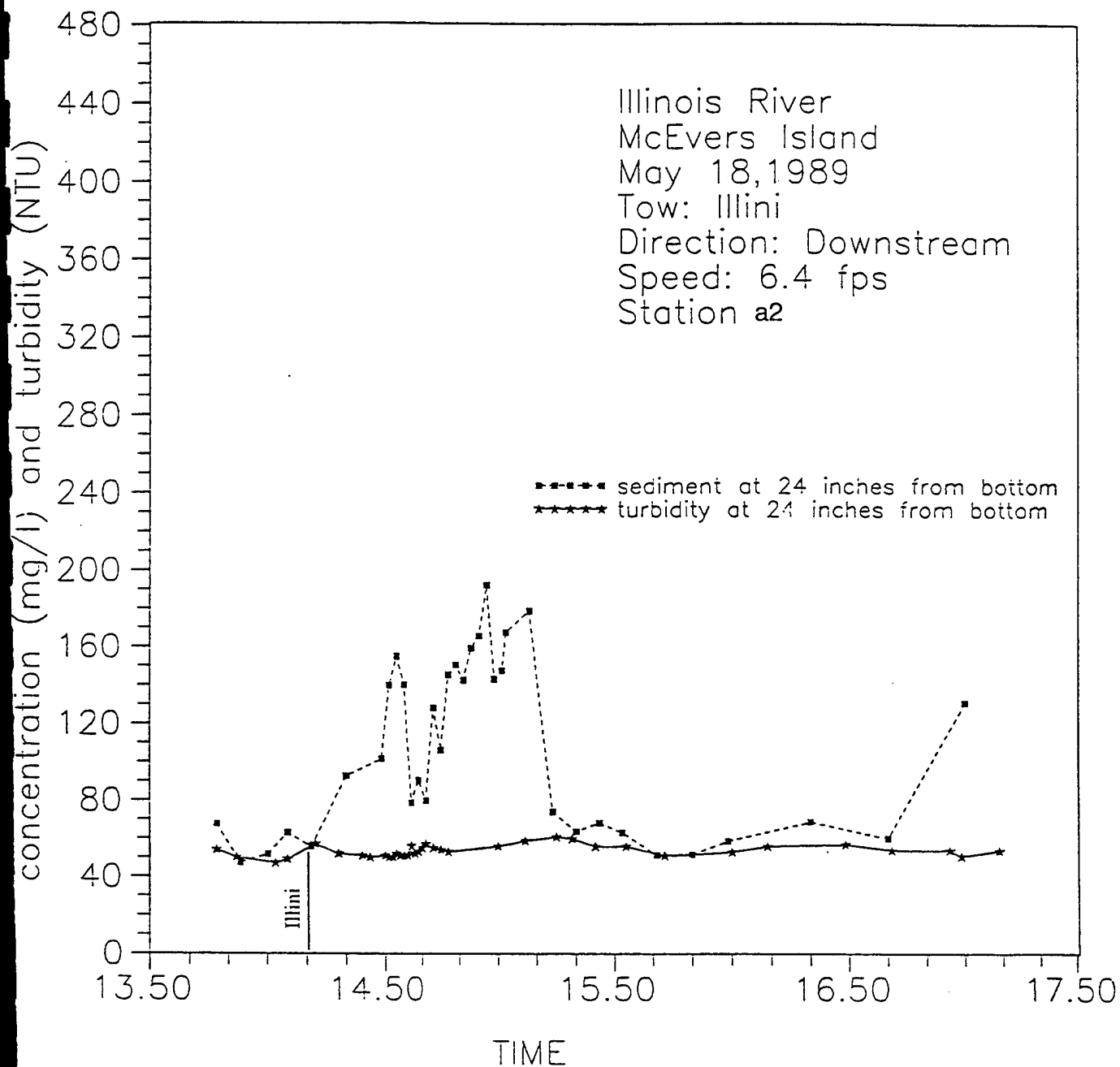
Location of suspended sediment sampling stations  
on the Illinois River near the McEver's Island site



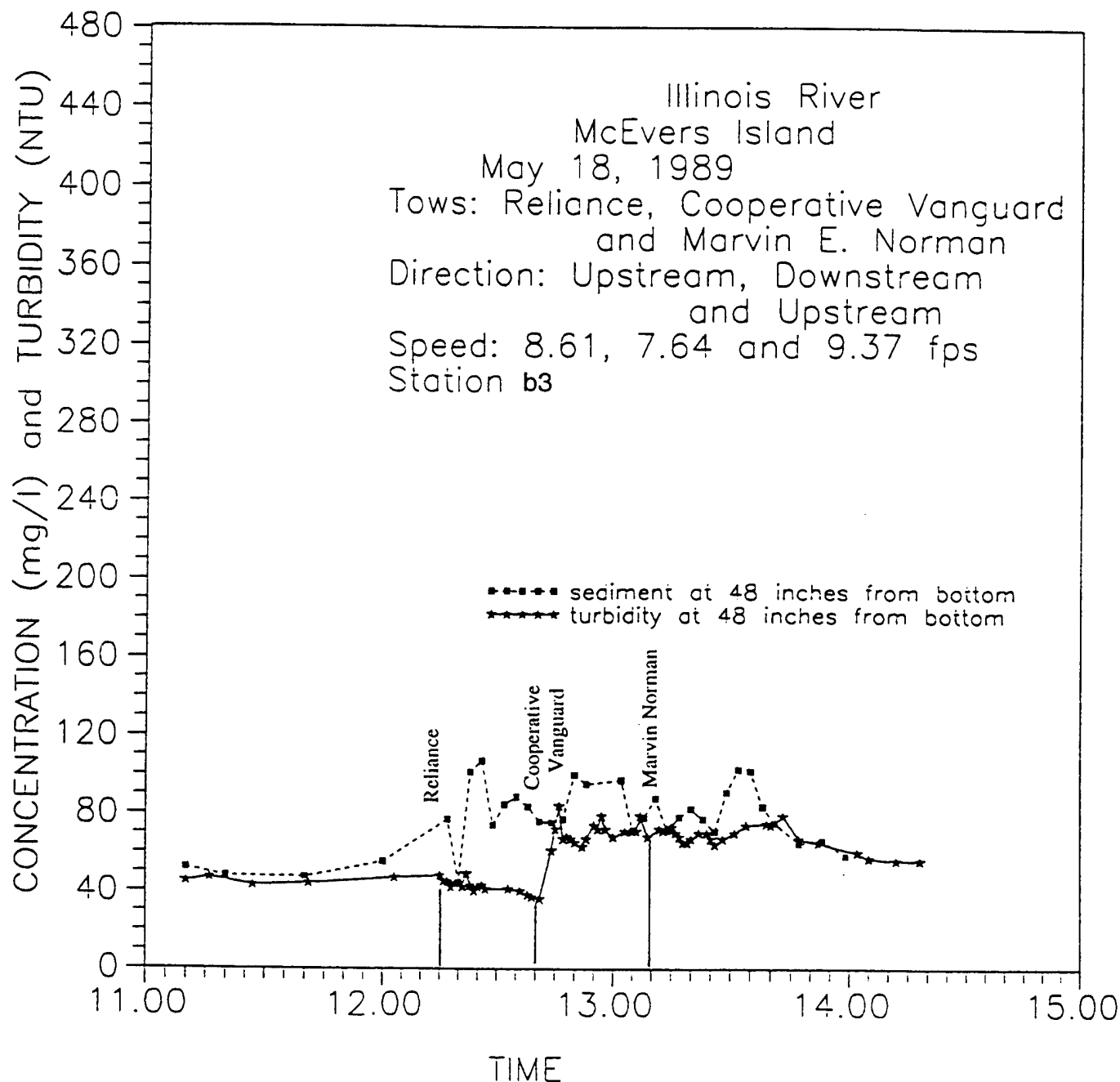


XXVIII-1. Comparison of turbidity and suspended sediment concentration  
at station a2, 11:00 a.m. to 3:00 p.m., May 18, 1989

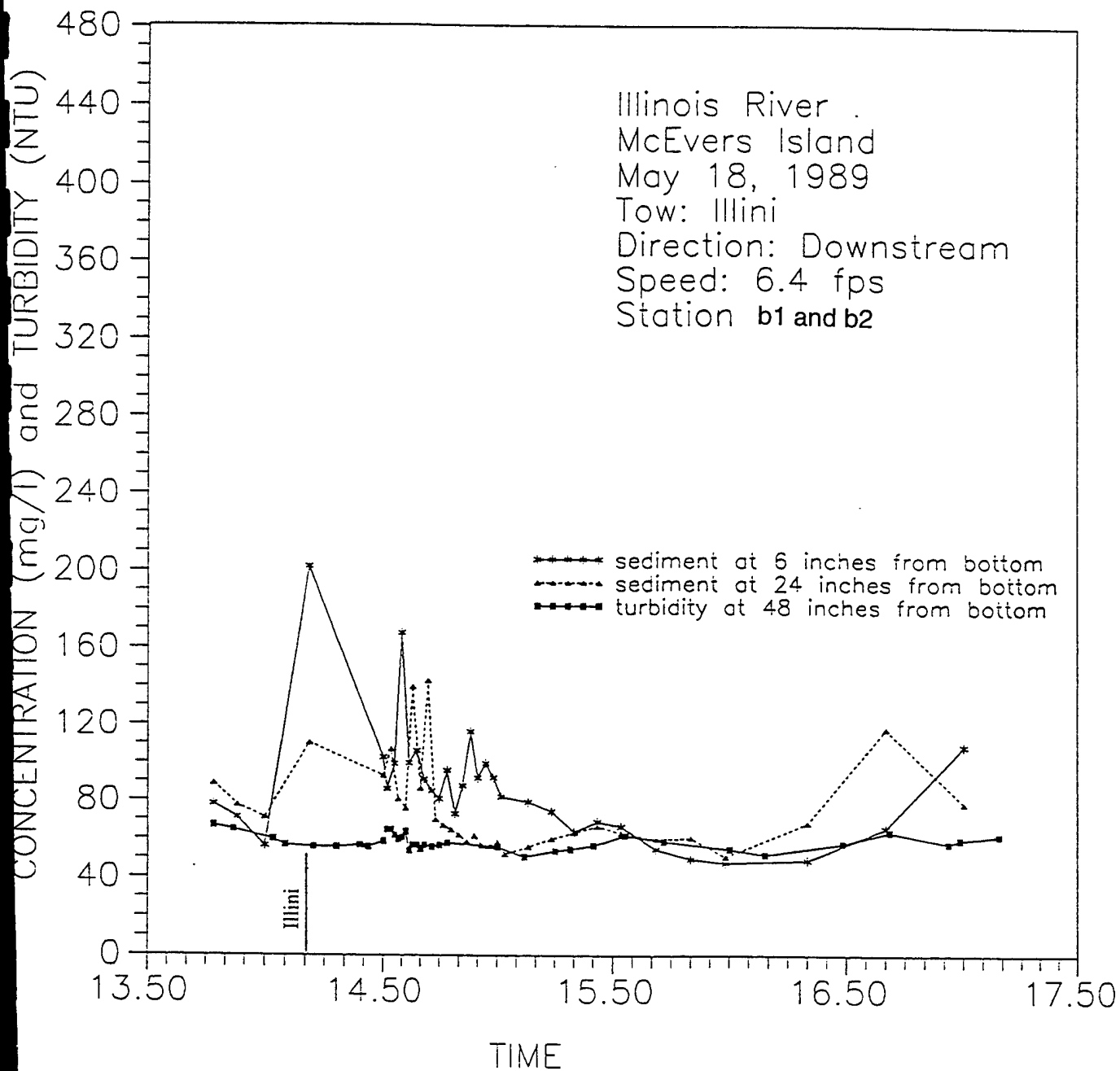




XXVIII-2. Comparison of turbidity and suspended sediment concentration at station a2, 1:50 p.m. to 5:50 p.m., May 18, 1989



XXVIII-3. Comparison of turbidity and suspended sediment concentration  
at station b3, 11:00 a.m. to 3:00 p.m., May 18, 1989



XXVIII-4. Comparison of turbidity and suspended sediment concentration  
at station b1 and b2, 1:50 p.m. to 5:50 p.m., May 18, 1989

**APPENDIX XXIX.**

**SUSPENDED SEDIMENT PARTICLE SIZE DISTRIBUTION**

**List of Suspended Sediment Particles Analyzed,  
Goose Island, Trip 1**

| <i>Date</i> | <i>Time</i>   | <i>Intake<br/>station</i> | <i>Dry<br/>weight, g</i> | <i>Lab No.</i> |
|-------------|---------------|---------------------------|--------------------------|----------------|
| 08/24/90    | 12:42 - 12:53 | a1                        | 1.9958                   | 379            |
|             | 12:42 - 12:53 | b1                        | 1.9637                   | 380            |
|             | 12:42 - 12:53 | b2                        | 2.0393                   | 381            |
|             | 12:42 - 12:53 | c1                        | 1.8865                   | 382            |
|             | 12:42 - 12:53 | c2                        | 2.0263                   | 383            |
| 08/25/90    | 10:21 - 10:34 | a1                        | 2.1207                   | 384            |
|             | 10:21 - 10:38 | b1                        | 1.7704                   | 385            |
|             | 10:21 - 10:32 | c1                        | 2.1242                   | 386            |
|             | 15:29 - 15:43 | a1                        | 1.2947                   | 387            |
|             | 15:29 - 15:39 | b1                        | 1.2450                   | 388            |
|             | 15:29 - 15:39 | c1                        | 1.6579                   | 389            |
| 08/26/90    | 09:48-09:58   | a1                        | 1.9601                   | 390            |
|             | 09:48-10:03   | b1                        | 1.3911                   | 391            |
|             | 09:48-10:03   | c1                        | 1.7110                   | 392            |
| 08/27/90    | 11:56-12:05   | a1                        | 1.7031                   | 395            |
|             | 11:53-12:04   | b1                        | 2.5421                   | 396            |
|             | 11:55-12:06   | c1                        | 1.88051                  | 397            |

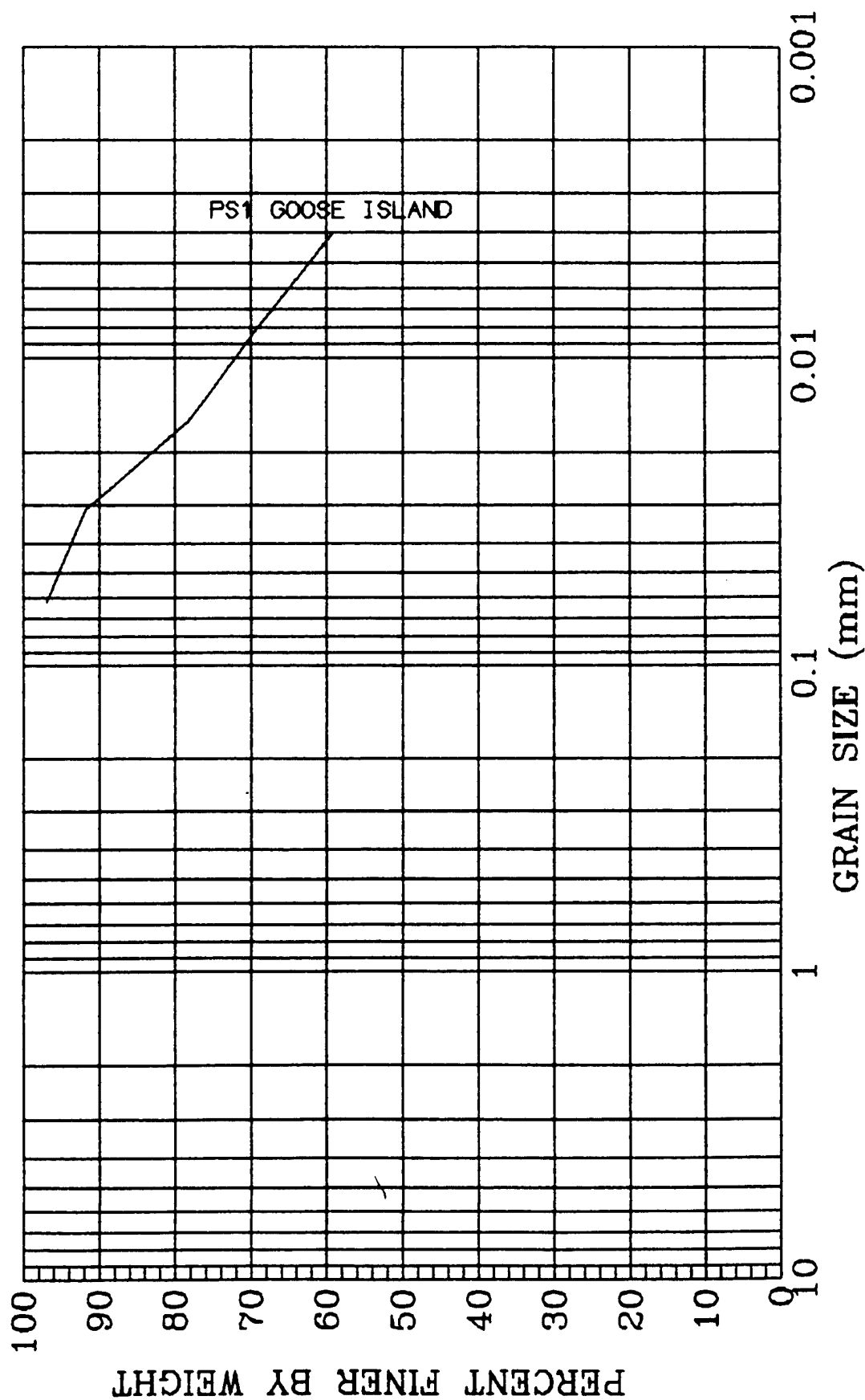
(During Barge-Tow Passage)

| <i>Date</i> | <i>Time</i>   | <i>Barge</i> | <i>Intake<br/>station</i> | <i>Dry<br/>weight, g</i> | <i>Lab No.</i> |
|-------------|---------------|--------------|---------------------------|--------------------------|----------------|
| 08/26/90    | 11:44 - 11:56 | K. Michael   | a1                        | 1.1636                   | 393            |
|             | 13:26 - 13:35 | Sumac        | b1                        | 0.6856                   | 394            |

ILLINOIS STATE WATER SURVEY  
SEDIMENT LABORATORY

LAB. NO. 379

SAMPLE ID: GOOSE ISLAND  
DATE: 08/90  
TIME: 1242-1253  
STATION: 1A 9 FROM BOTTOM  
PROJECT: NAVIGATION IMPACT  
COMMENTS:



# ILLINOIS STATE WATER SURVEY SEDIMENT LABORATORY

SAMPLE ID: GOOSE ISLAND

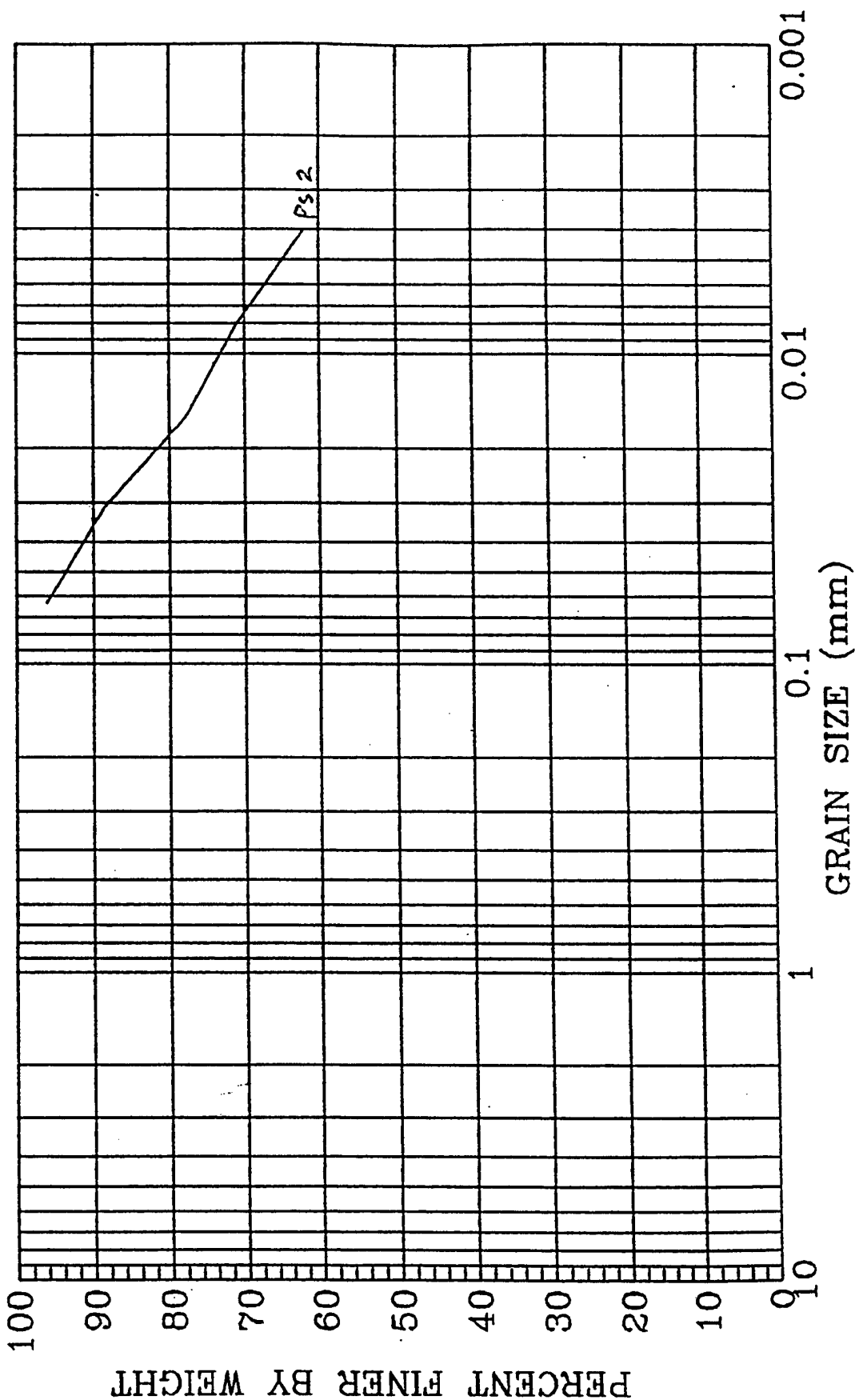
DATE: 08/90

TIME: 1242-1253

STATION: 2A 9 FROME BOTTOM

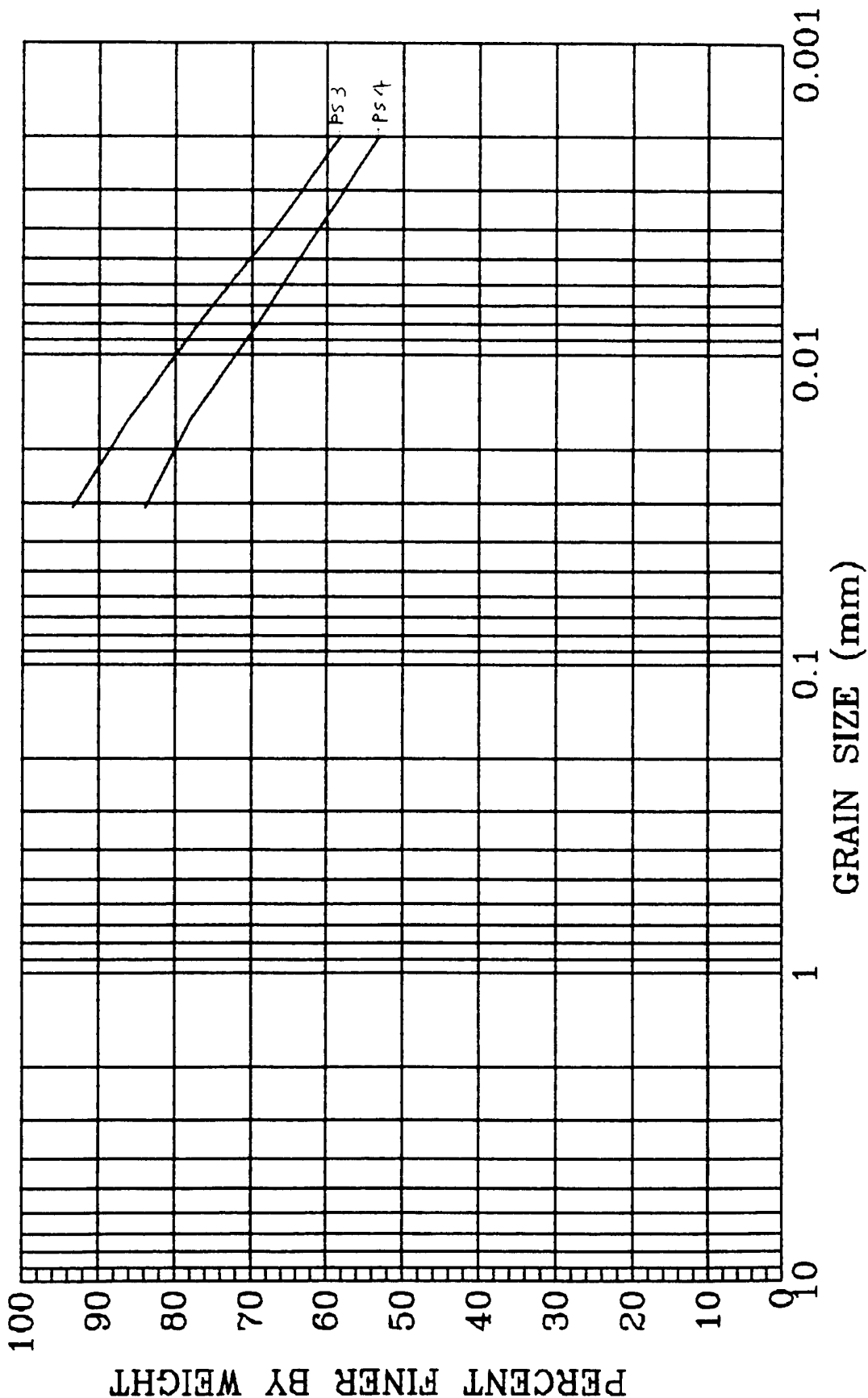
PROJECT: NAVIGATION IMPACT

COMMENTS:



ILLINOIS STATE WATER SURVEY  
SEDIMENT LABORATORY

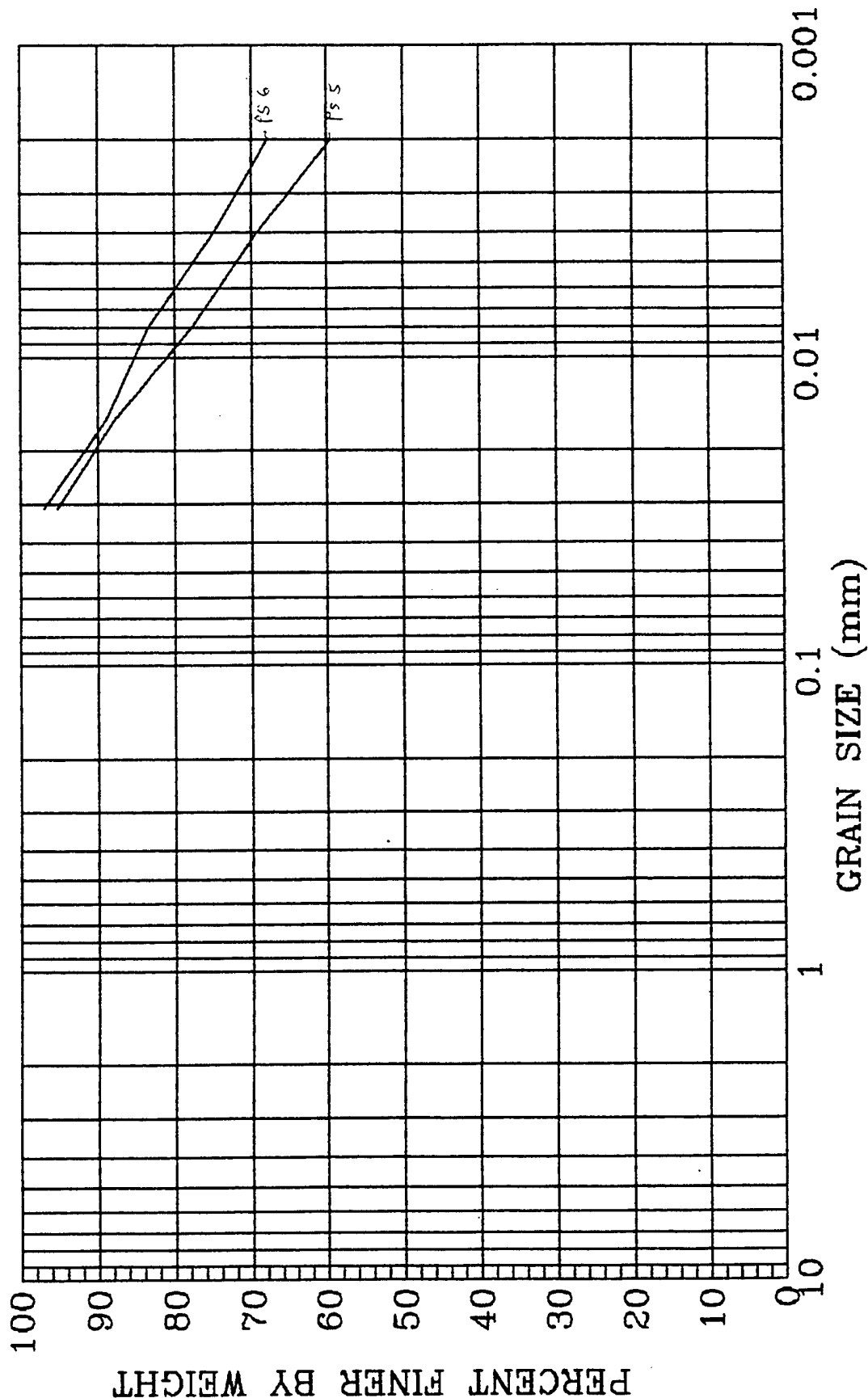
PROJECT: NAVIGATION IMPACT  
ANALYSIS DATE: 04/29/94  
COLLECTED DATE: 08/24/90  
TIME: PS3(1242-1251) PS4(1240-1254)  
SITE: GOOSE ISLAND  
COMMENTS:





ILLINOIS STATE WATER SURVEY  
SEDIMENT LABORATORY

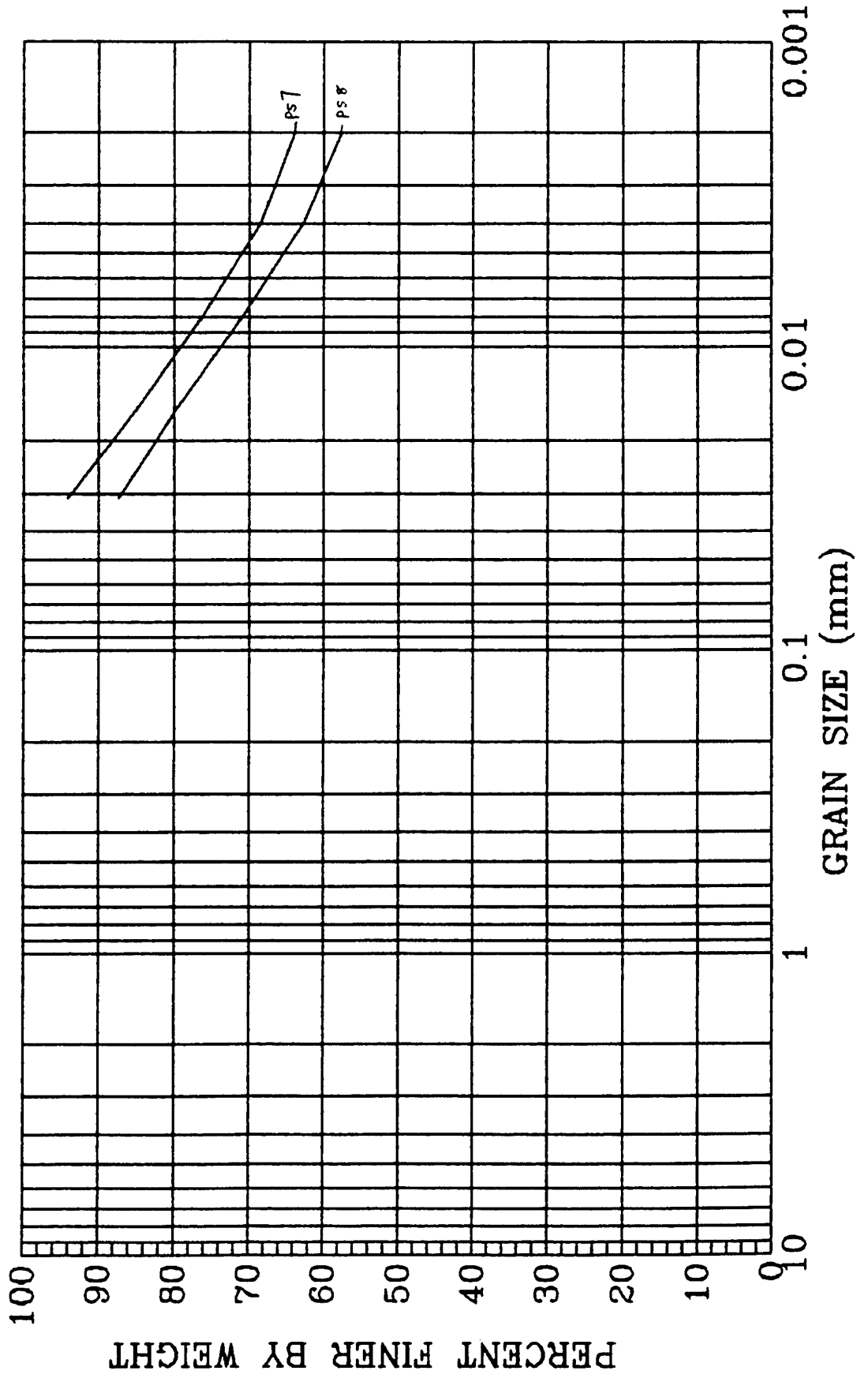
PROJECT: navigation impact  
ANALYSIS DATE: 04/29/94  
COLLECTED DATE: 08/24/90  
TIME: ps5(1240-1253) ps6(1021-1034)  
SITE: goose island  
COMMENTS:



LAB. NO. 385  
LAB. NO. 386

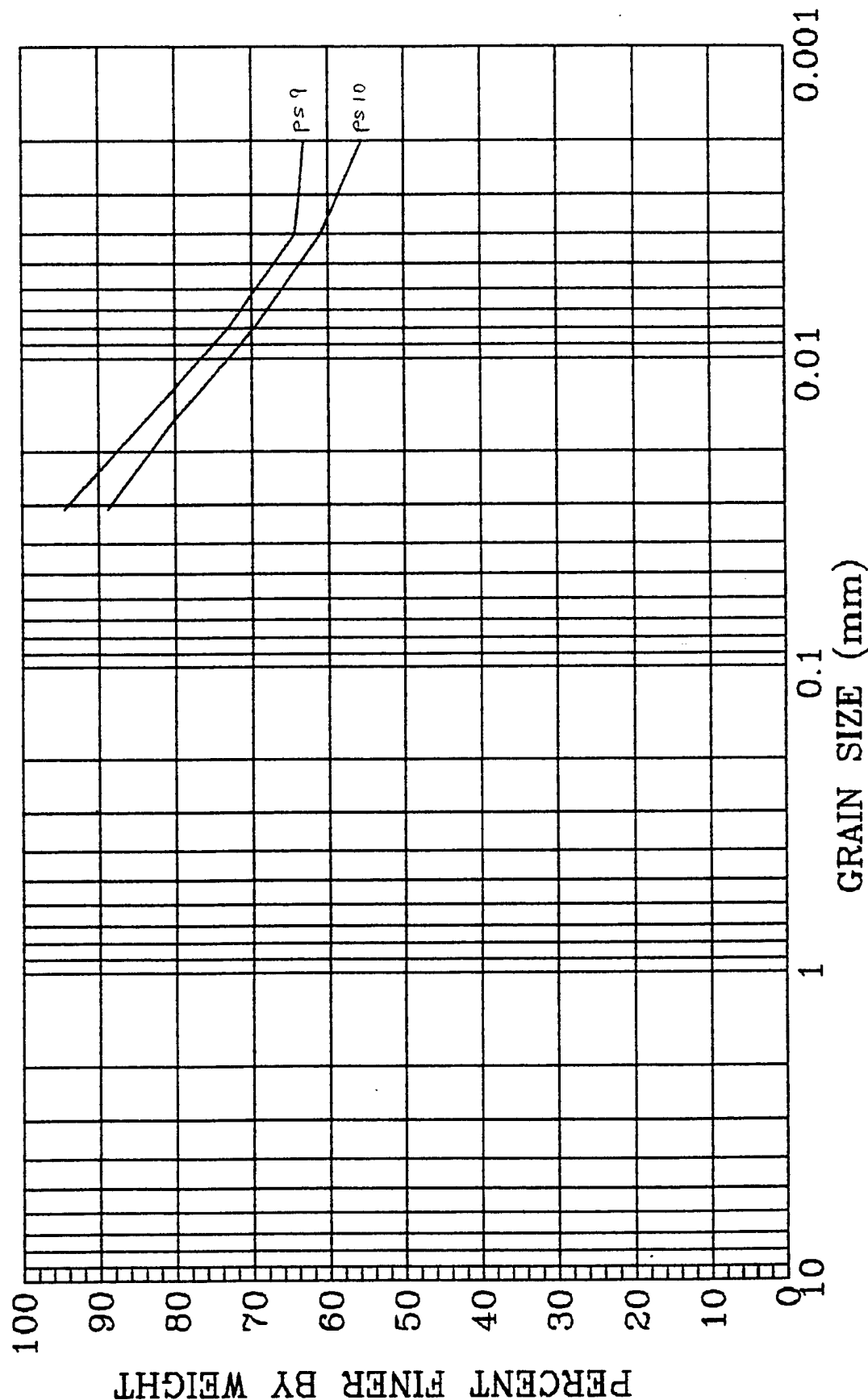
# ILLINOIS STATE WATER SURVEY SEDIMENT LABORATORY

PROJECT: navigation impact  
ANALYSIS DATE: 04/29/94  
COLLECTED DATE: 08/24/90  
TIME: ps7(1021-1036) ps8(1021-1032)  
SITE: goose island  
COMMENTS:



# ILLINOIS STATE WATER SURVEY SEDIMENT LABORATORY

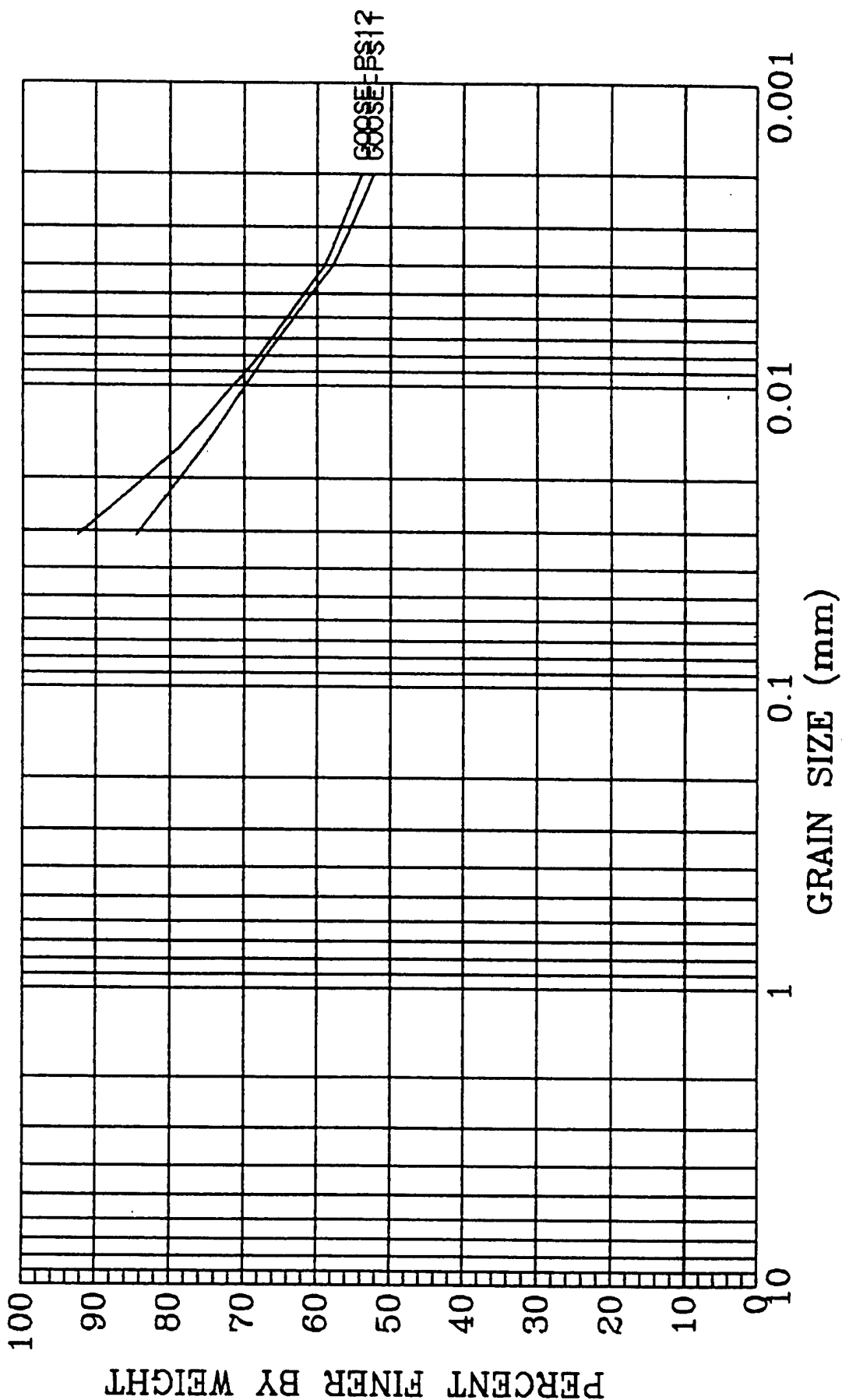
PROJECT: navigation impact  
ANALYSIS DATE: 04/94  
COLLECTED DATE: 08/25/90  
TIME: ps9(1529-1539) PS10(1529-1543)  
SITE: goose island  
COMMENTS:



LAB. NO. 389  
LAB. NO. 390

# ILLINOIS STATE WATER SURVEY SEDIMENT LABORATORY

PROJECT: navigation impact  
ANALYSIS DATE: 04/94  
COLLECTED DATE: 08/25/90  
TIME: ps11(1529-1539) ps12(948-958)  
SITE: goose island  
COMMENTS:



ILLINOIS STATE WATER SURVEY  
SEDIMENT LABORATORY

PROJECT: navigation impact

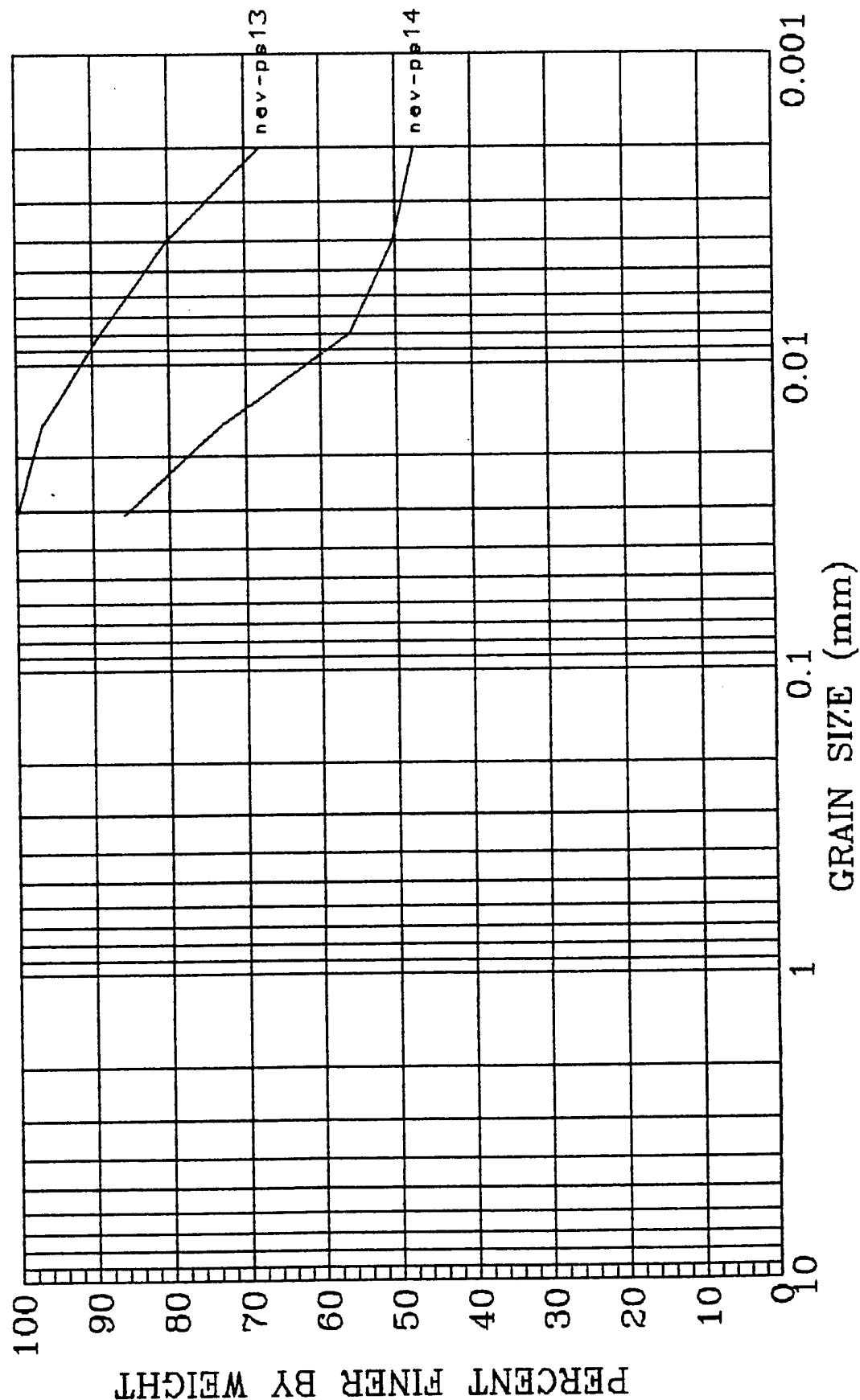
ANALYSIS DATE: 08/31/94

COLLECTED DATE: 08/28/90

TIME: ps13(948-1003) ps14(948-1003)

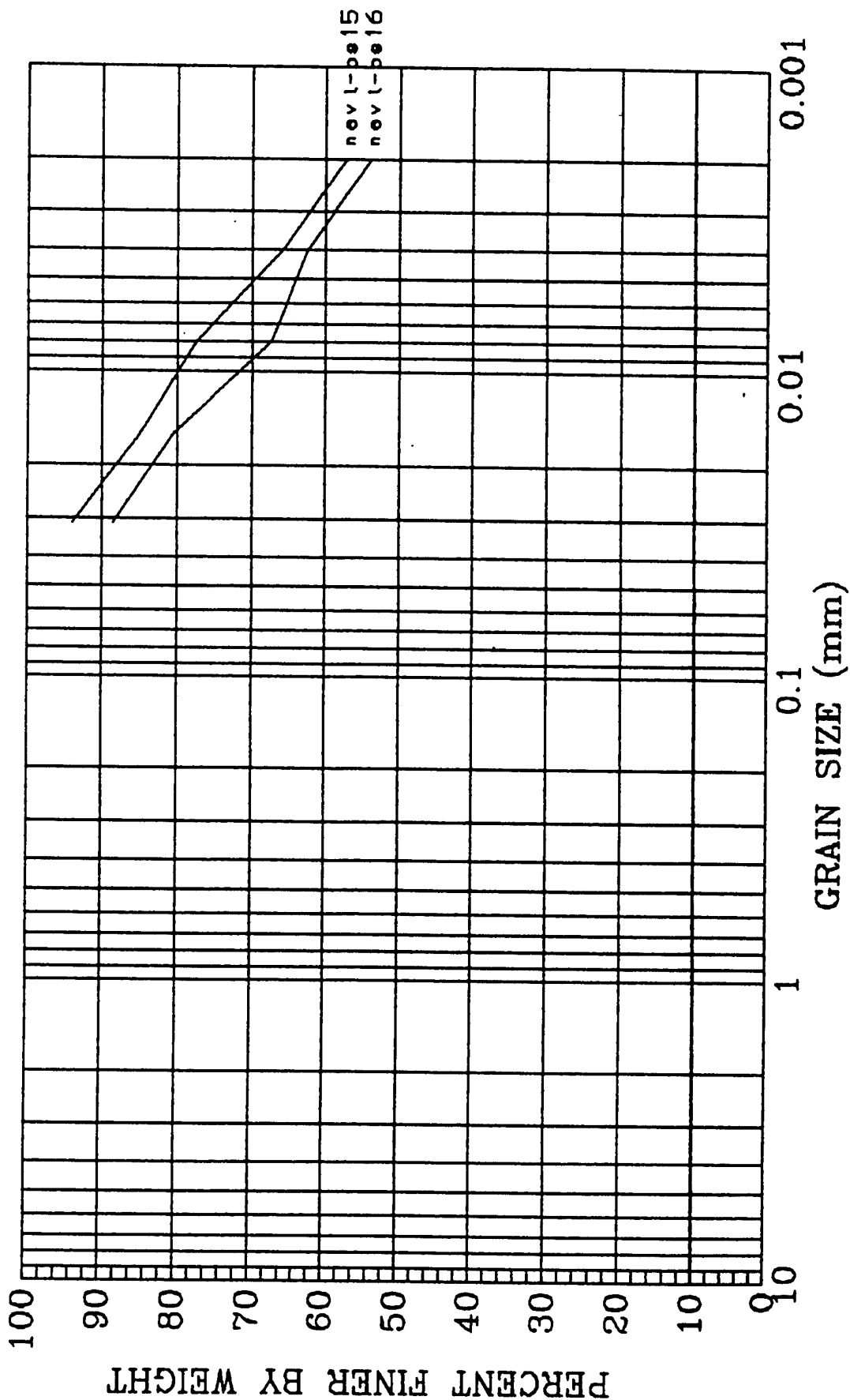
SITE: goose island

COMMENTS:



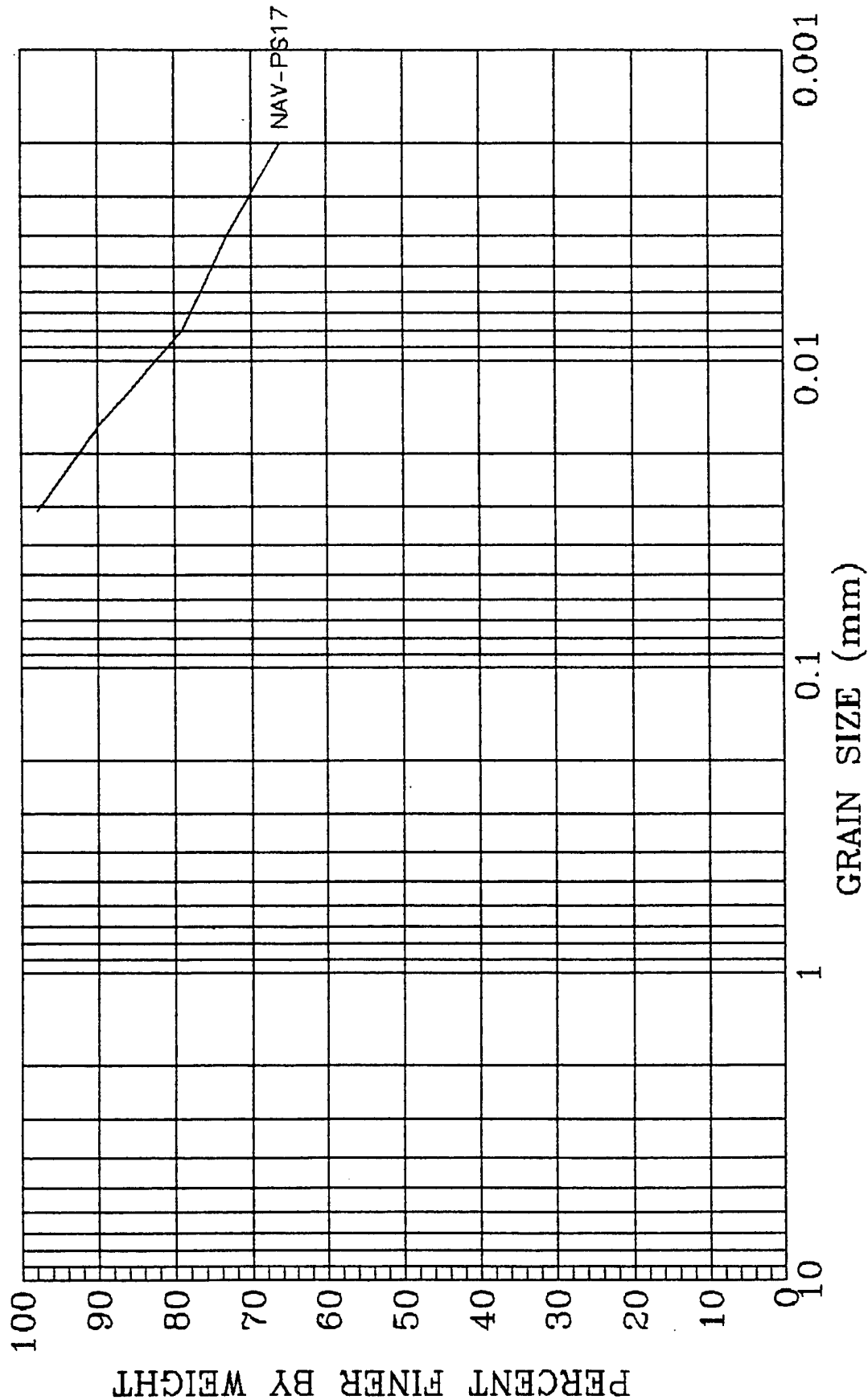
ILLINOIS STATE WATER SURVEY  
SEDIMENT LABORATORY

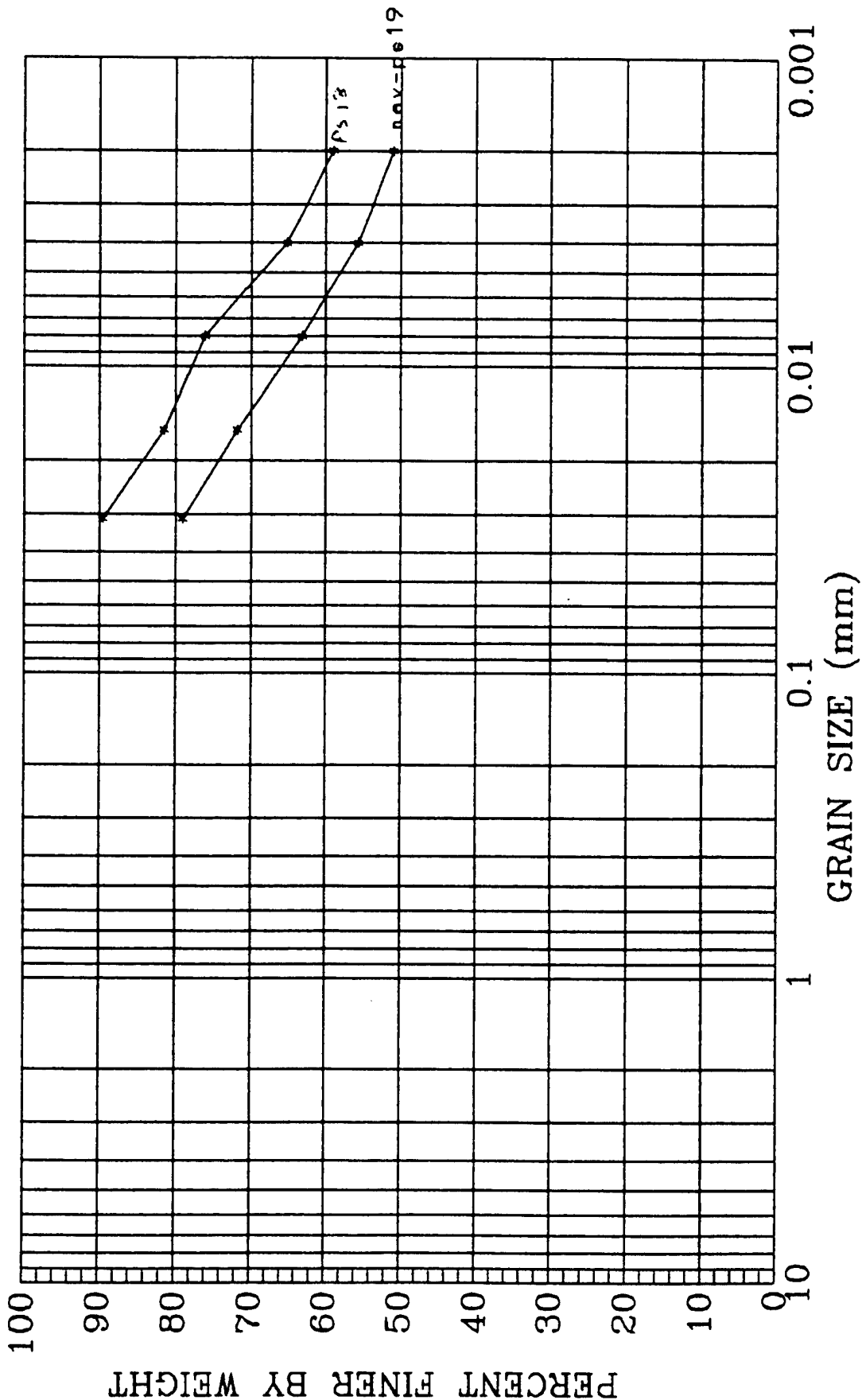
PROJECT: navigation impact  
ANALYSIS DATE: 08/31/94  
COLLECTED DATE: 08/26/90  
TIME: ps15(1144-1156) ps16(1326-1335)  
SITE: goose island  
COMMENTS:



# ILLINOIS STATE WATER SURVEY SEDIMENT LABORATORY

PROJECT: navigation impact  
ANALYSIS DATE: 09/28/94  
COLLECTED DATE: 08/27/90  
TIME: 1156-1205  
SITE:goose island.background  
COMMENTS:1 A 9"from bottom







**List of Suspended Sediment Particles Analyzed,  
Goose Island, Trip 2**

| <i>Date</i> | <i>Time</i>   | <i>Intake<br/>station</i> | <i>Dry<br/>weight, g</i> | <i>Lab No.</i> |
|-------------|---------------|---------------------------|--------------------------|----------------|
| 07/22/91    | 14:38 - 14:45 | d2                        | 0.9599                   | 408            |
|             | 15:00 - 1509  | b1                        | 0.8878                   | 403            |
|             | 15:00 - 1507  | b2                        | 0.8878                   | 404            |
|             | 15:00 - 1509  | e1                        | 0.8180                   | 411            |
|             | 16:36 - 16:42 | d1                        | 0.9958                   | 406            |
|             | 16:37 - 16:42 | d2                        | 1.1943                   | 409            |
|             | 16:50 - 16:59 | b1                        | 1.1237                   | 400            |
|             | 16:50 - 16:57 | b2                        | 0.9955                   | 401            |
|             | 17:10 - ?     | d1                        | 0.833                    | 414            |
| 07/23/91    | 11:31 - 11:39 | b1                        | 0.8299                   | 399            |
|             | 11:45 - ?     | d1                        | 0.7915                   | 416            |
|             | 11:45 - ?     | d2                        | 0.8089                   | 410            |
|             | 11:45 - ?     | e1                        | 0.8180                   | 412            |

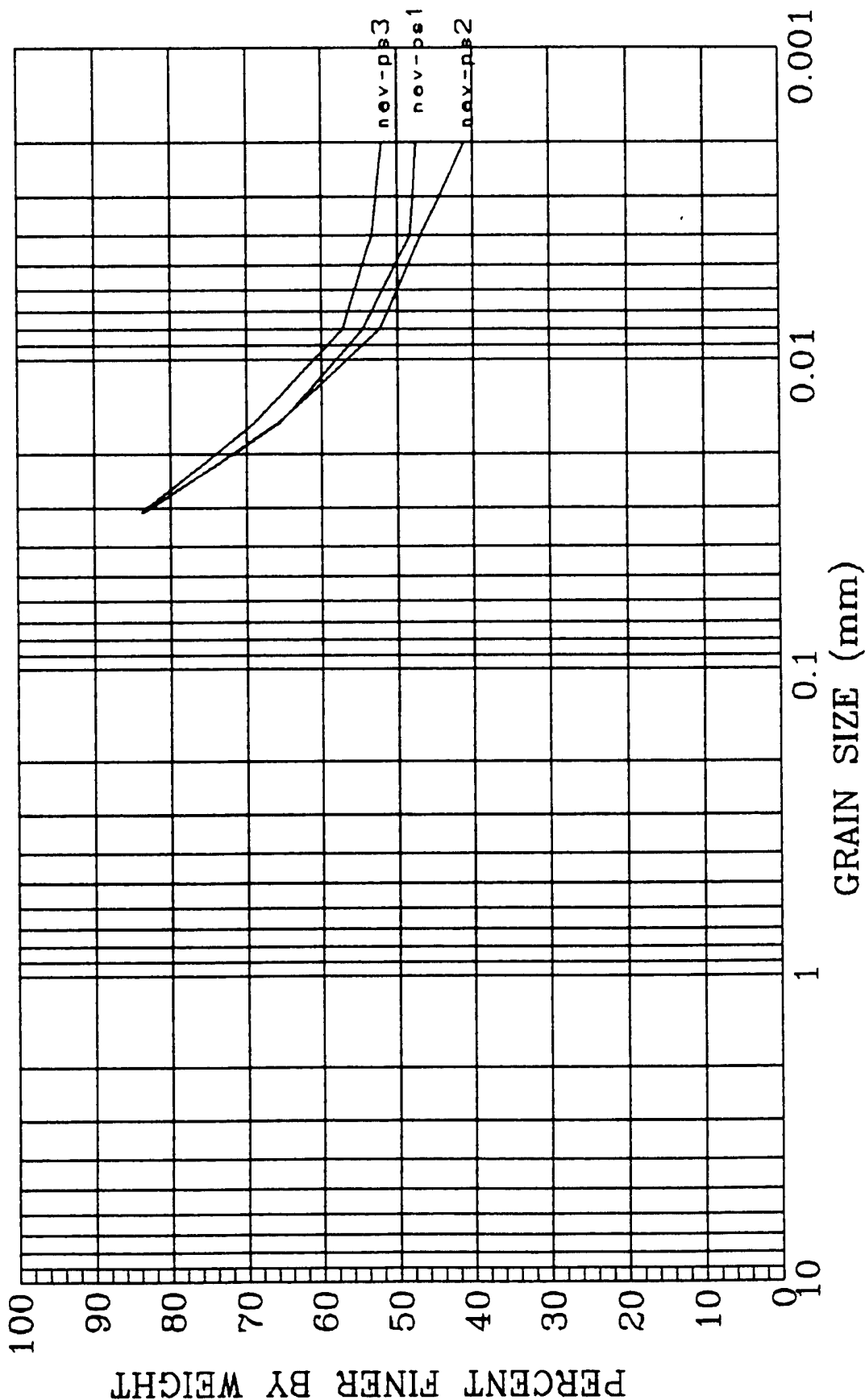
(During Barge-Tow Passage)

| <i>Date</i> | <i>Time</i> | <i>Barge</i> | <i>Intake<br/>station</i> | <i>Dry<br/>weight, g</i> | <i>Lab No.</i> |
|-------------|-------------|--------------|---------------------------|--------------------------|----------------|
| 07/23/91    | 16:25 - ?   | Evey - T     | b1                        | 1.1077                   | 398            |
|             | 16:25 - ?   |              | b2                        | 1.2544                   | 405            |
|             | 16:30 - ?   |              | d1                        | 0.7705                   | 417            |
|             | 16:30 - ?   |              | d2                        | 1.0641                   | 415            |
|             | 16:30 - ?   |              | e1                        | 0.6456                   | 413            |

# ILLINOIS STATE WATER SURVEY SEDIMENT LABORATORY

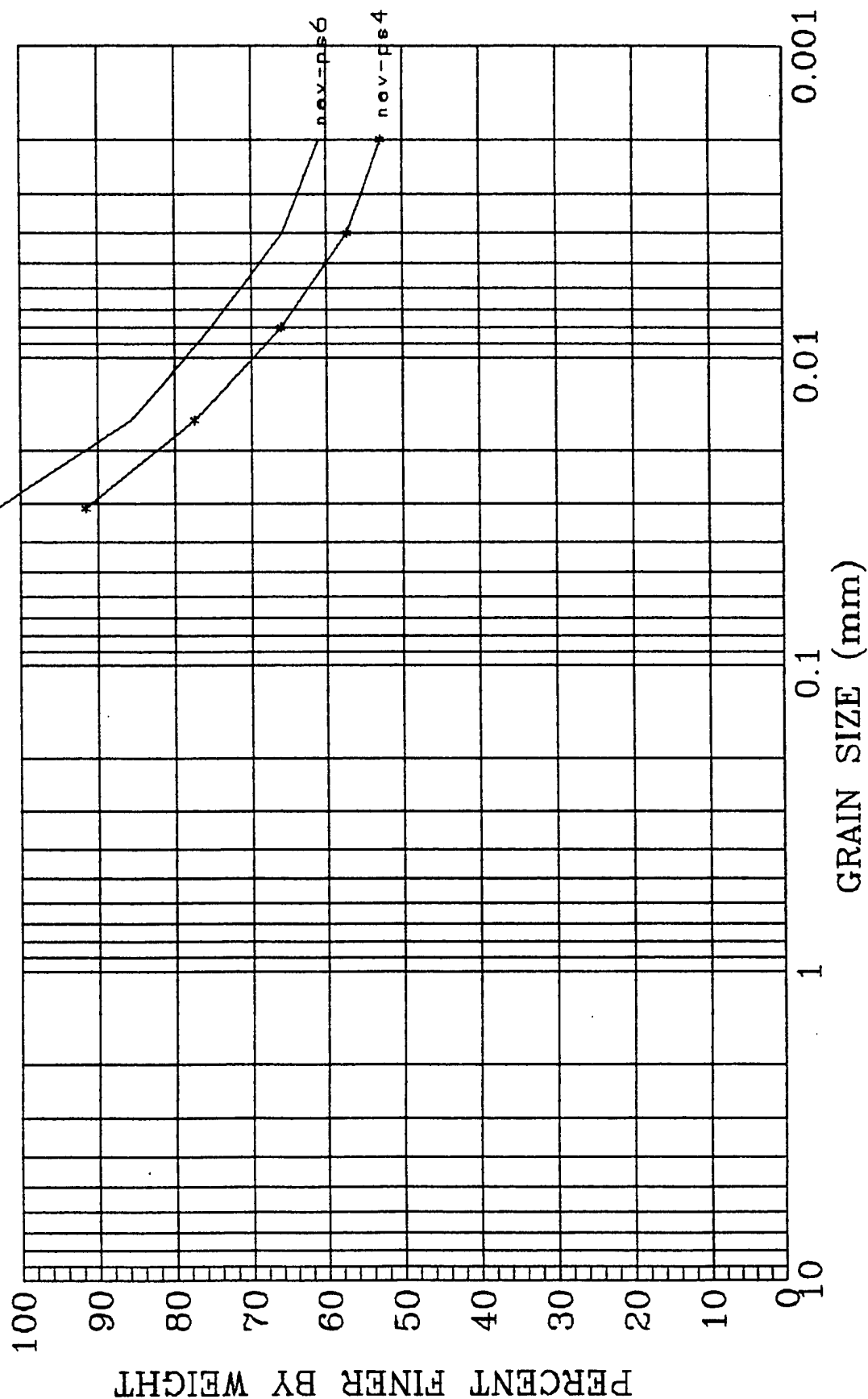
LAB. NO. 398  
LAB. NO. 399  
LAB. NO. 400

PROJECT: navigation impact  
ANALYSIS DATE: 10/94  
COLLECTED DATE: 07/23/91  
TIME: ps1(1625)ps2(1131-1139)  
SITE: goose island station 2A  
COMMENTS: ps3(1650-1659)



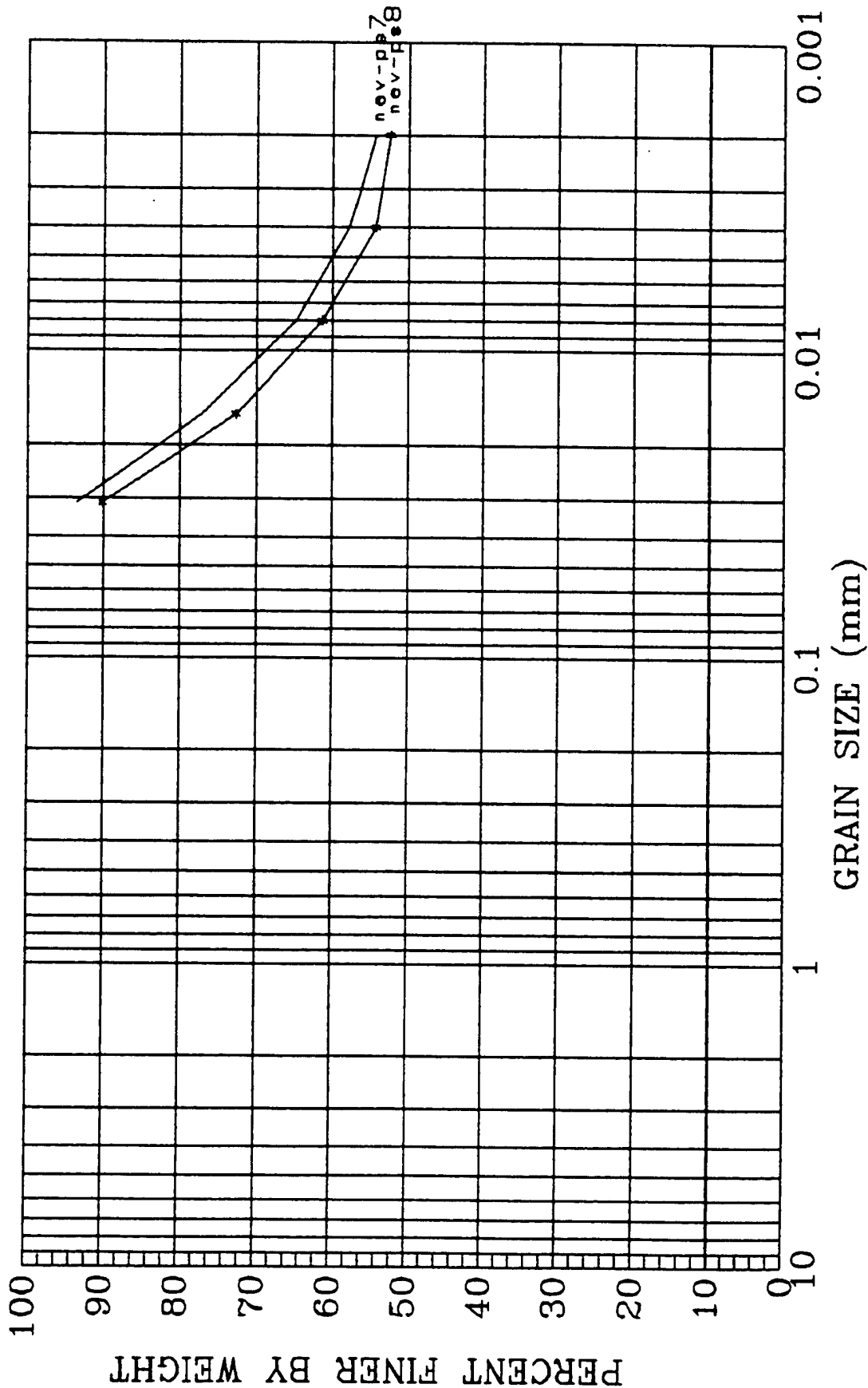
ILLINOIS STATE WATER SURVEY  
SEDIMENT LABORATORY

PROJECT: navigation impact  
ANALYSIS DATE: 10/94  
COLLECTED DATE: 07/22/91  
TIME: ps4(1650-1657)ps6(1500-1509)  
SITE: goose island  
STATION: ps4(2B)ps6(2A)



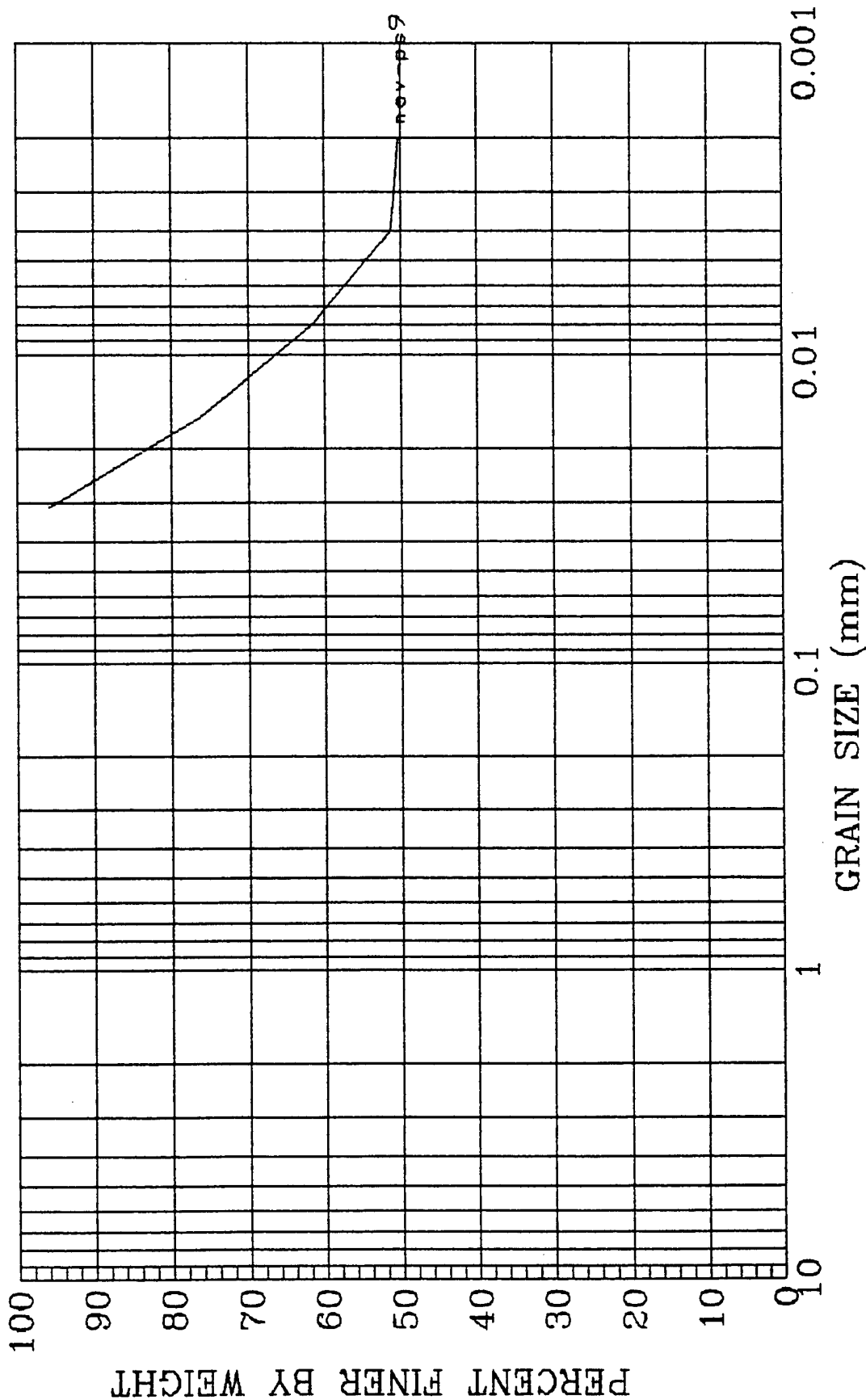
# ILLINOIS STATE WATER SURVEY SEDIMENT LABORATORY

PROJECT: navigation impact  
ANALYSIS DATE: 10/94  
COLLECTED DATE: 07/22.23/91  
TIME: ps7(1500-1507)ps8(1625)  
SITE: goose island  
STATION: 2B



# ILLINOIS STATE WATER SURVEY SEDIMENT LABORATORY

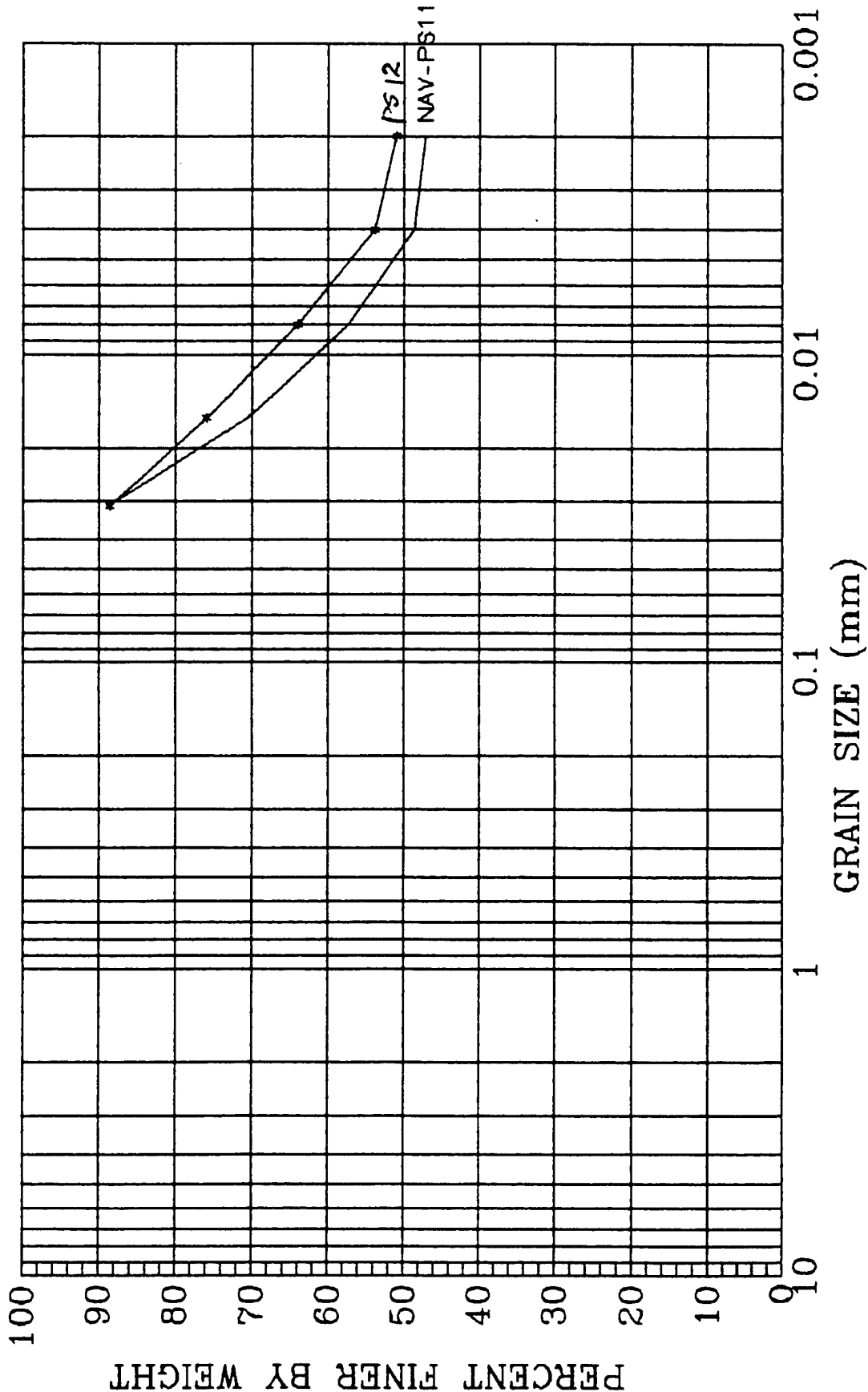
PROJECT: navigation impact  
ANALYSIS DATE: 10/94  
COLLECTED DATE: 07/22/91  
TIME: ps9(1636)  
SITE:goose island.station 4 A  
COMMENTS:



LAB. NO. 408  
LAB. NO. 409

# ILLINOIS STATE WATER SURVEY SEDIMENT LABORATORY

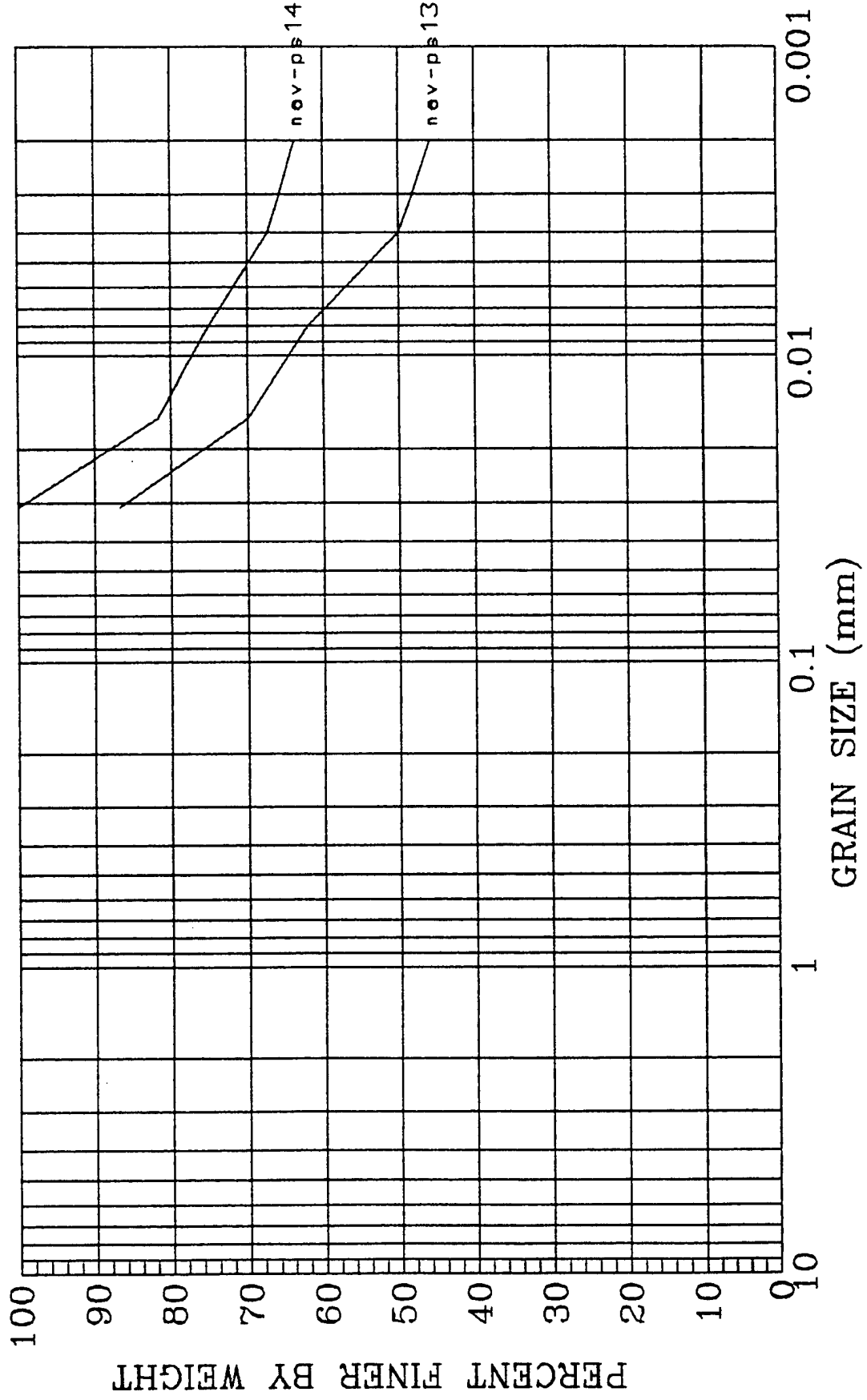
PROJECT: navigation impact  
ANALYSIS DATE: 10/94  
COLLECTED DATE: 07/22/91  
TIME: PS11(1438-1445)PS12(1637-1642)  
SITE: goose island.station 4 B  
COMMENTS:



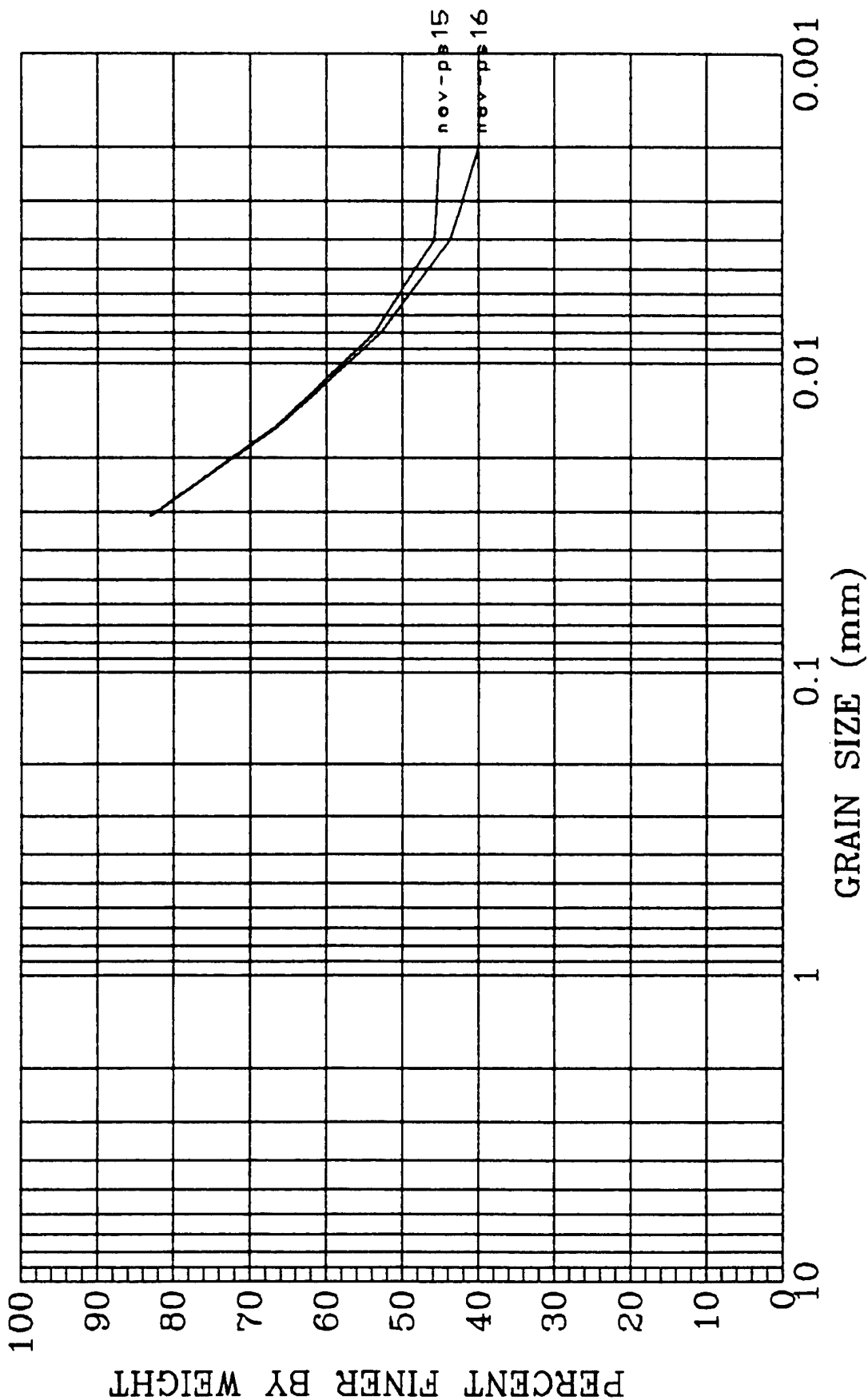
LAB. NO. 410  
LAB. NO. 411

ILLINOIS STATE WATER SURVEY  
SEDIMENT LABORATORY

PROJECT: navigation impact  
ANALYSIS DATE: 10/94  
COLLECTED DATE: 07/23/91  
TIME: ps13(1145)ps14(1500)  
SITE: goose island  
STATION: PS13 4B.ps14 5?



PROJECT: navigation impact  
ANALYSIS DATE: 10/94  
COLLECTED DATE: 07/23/91  
TIME: ps15(1145)ps16(1630)  
SITE: goose island.  
STATION:PS15 5A,PS16 5A

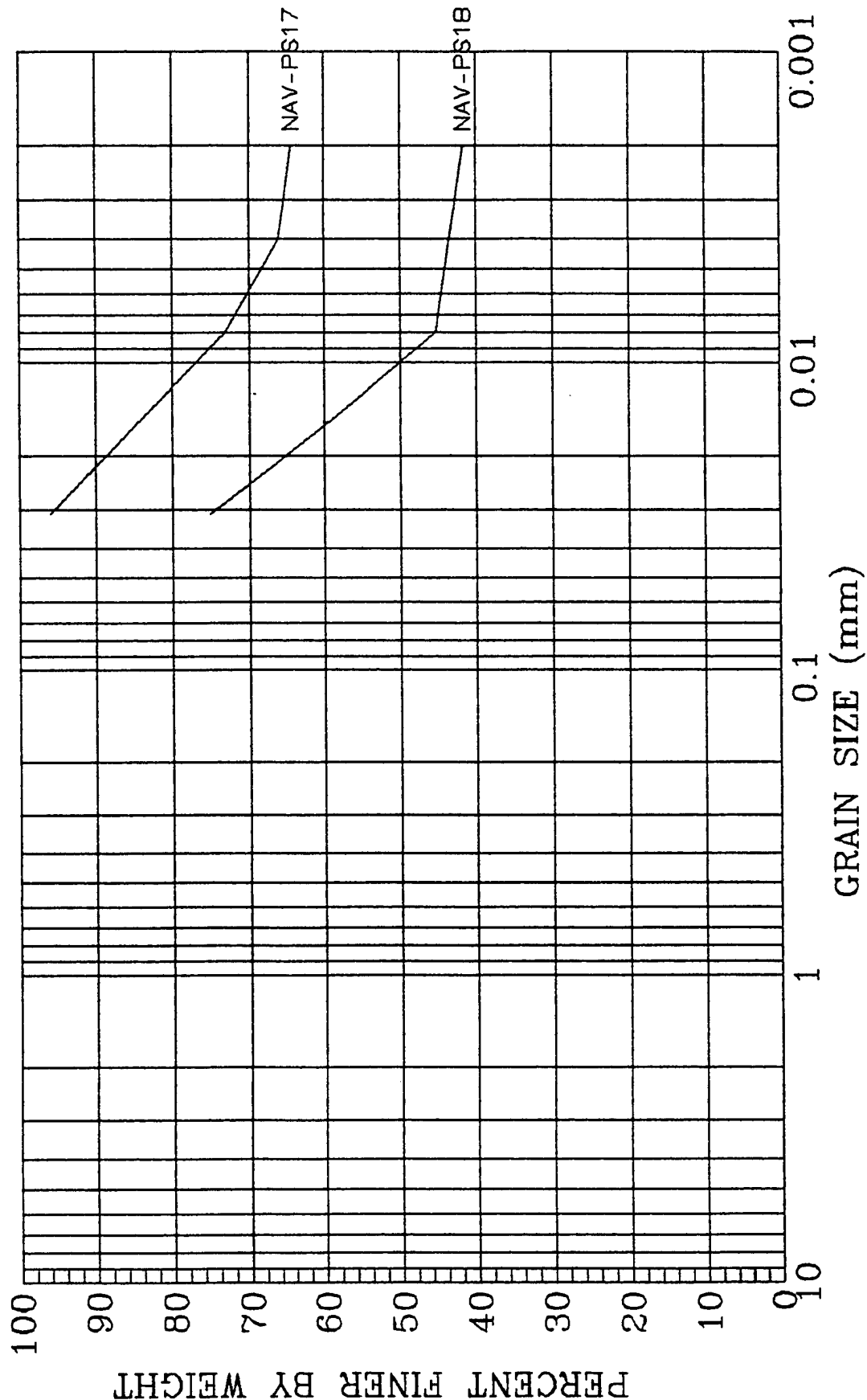




LAB. NO. 414  
LAB. NO. 415

# ILLINOIS STATE WATER SURVEY SEDIMENT LABORATORY

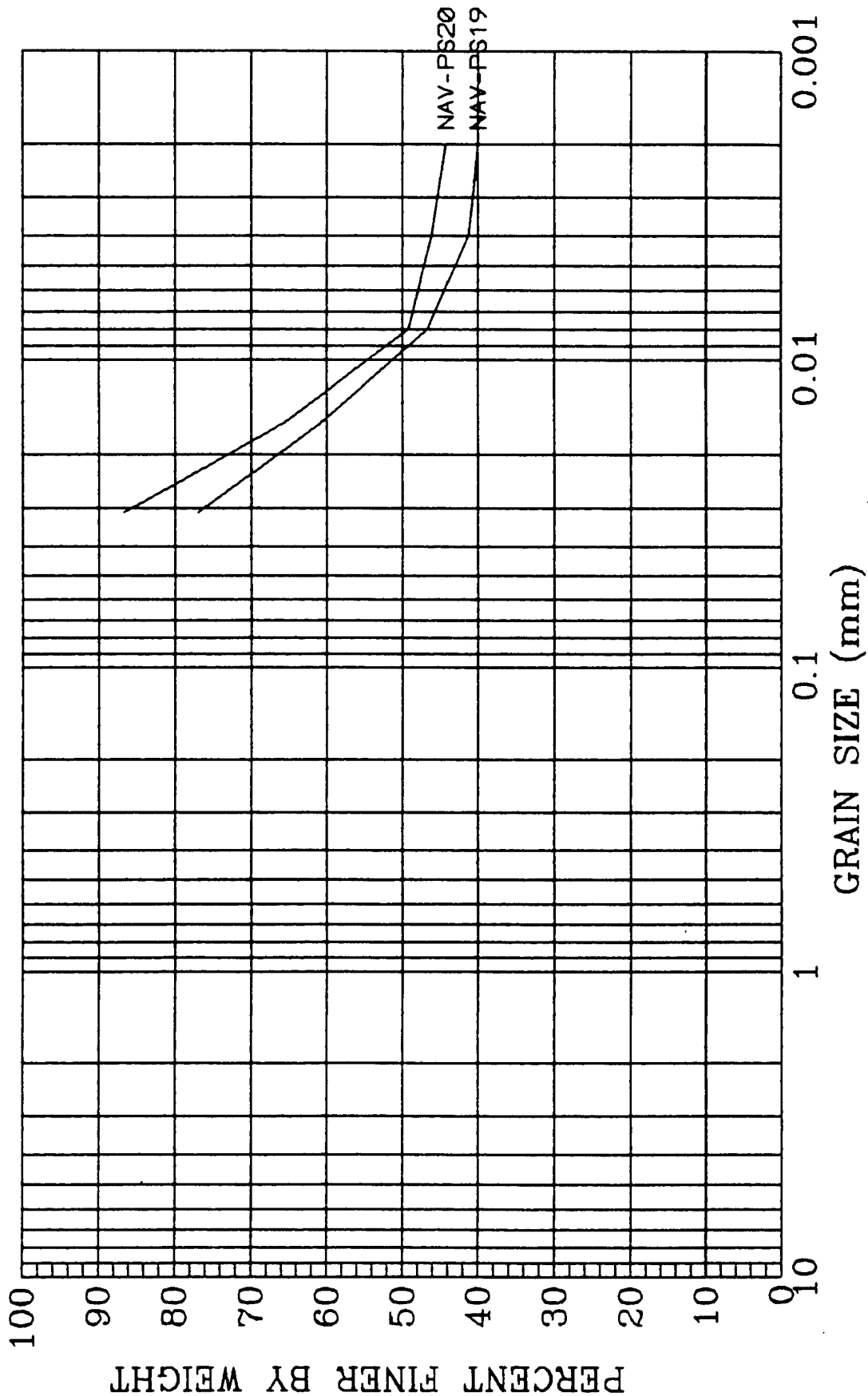
PROJECT: navigation impact  
ANALYSIS DATE: 10/94  
COLLECTED DATE: 07/22/91  
TIME: PS17(1710?)PS18(1630)  
SITE: goose island  
STATION: PS17 4A PS18 4B



LAB. NO. 416  
LAB. NO. 417

# ILLINOIS STATE WATER SURVEY SEDIMENT LABORATORY

PROJECT: navigation impact  
ANALYSIS DATE: 10/94  
COLLECTED DATE: 07/23/91  
TIME: ps19(1145)ps20(1630)  
SITE: goose island  
STATION: PS19 4A PS20 4A



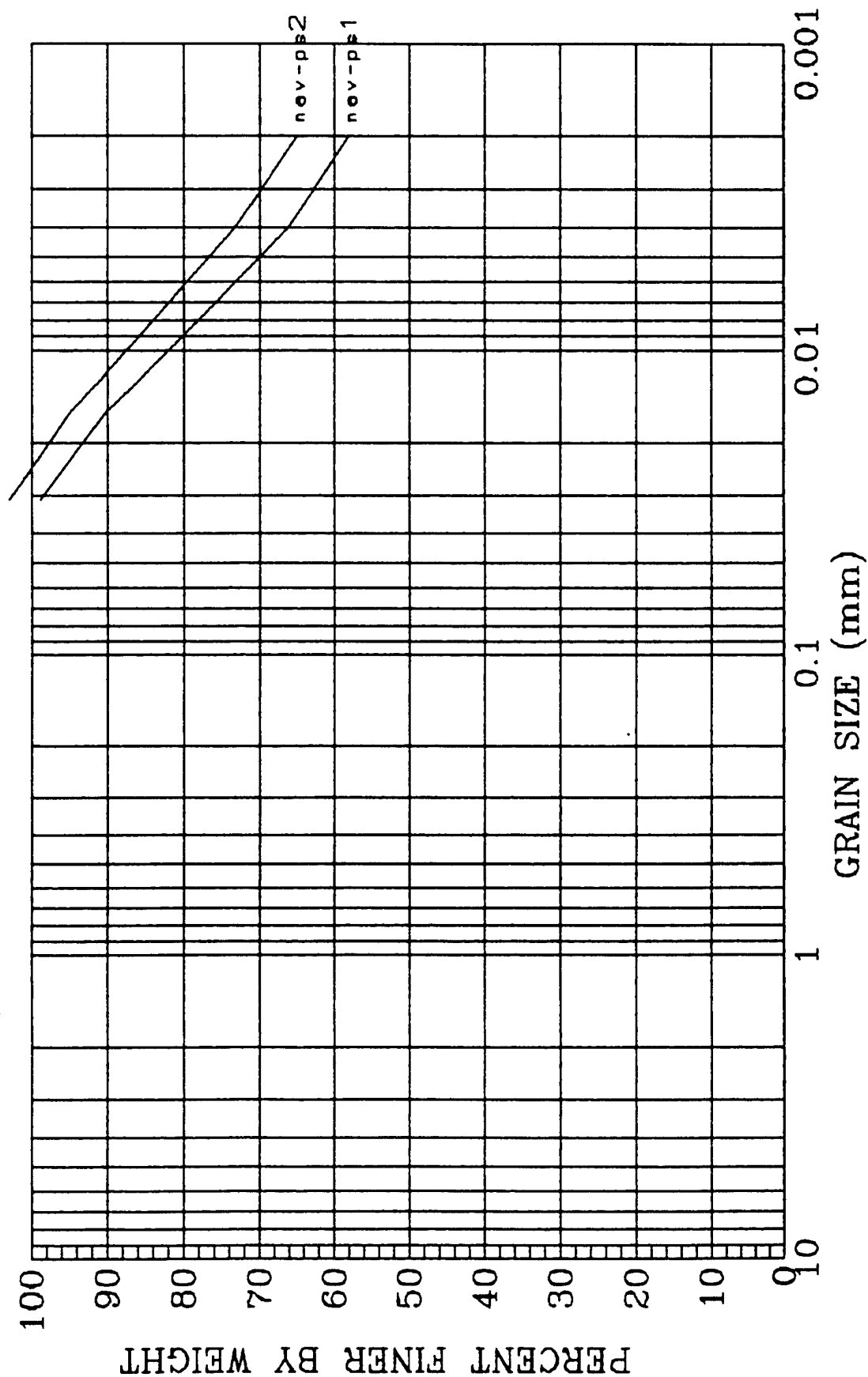
**List of Suspended Sediment Particles Analyzed,  
Clarks Ferry, Trip 1**

| <i>Date</i> | <i>Time</i>   | <i>Intake<br/>station</i> | <i>Dry<br/>weight, g</i> | <i>Lab No.</i> |
|-------------|---------------|---------------------------|--------------------------|----------------|
| 05/18/91    | 11:19 - 11:28 | a1                        | 5.6440                   | 418            |
|             | 11:19 - 11:28 | a2                        | 5.4896                   | 419            |
|             | 11:19 - 11:28 | b1                        | 5.2359                   | 420            |
|             | 11:19 - 11:28 | b2                        | 5.2568                   | 423            |
|             | 11:19 - 11:28 | b3                        | 6.0134                   | 424            |
| 05/20/91    | 16:30 - ?     | b1                        | 1.8645                   | 421            |
|             | 16:30 - ?     | c2                        | 1.6799                   | 425            |
| 05/21/91    | 10:10 - 10:21 | b1                        | 1.4145                   | 422            |
|             | 10:10 - 10:21 | c1                        | 1.5863                   | 426            |
|             | 17:01 - 17:14 | e1                        | 2.9209                   | 427            |
|             | 17:01 - 17:14 | e2                        | 7.6477                   | 428            |

LAB. NO. 418  
LAB. NO. 419

# ILLINOIS STATE WATER SURVEY SEDIMENT LABORATORY

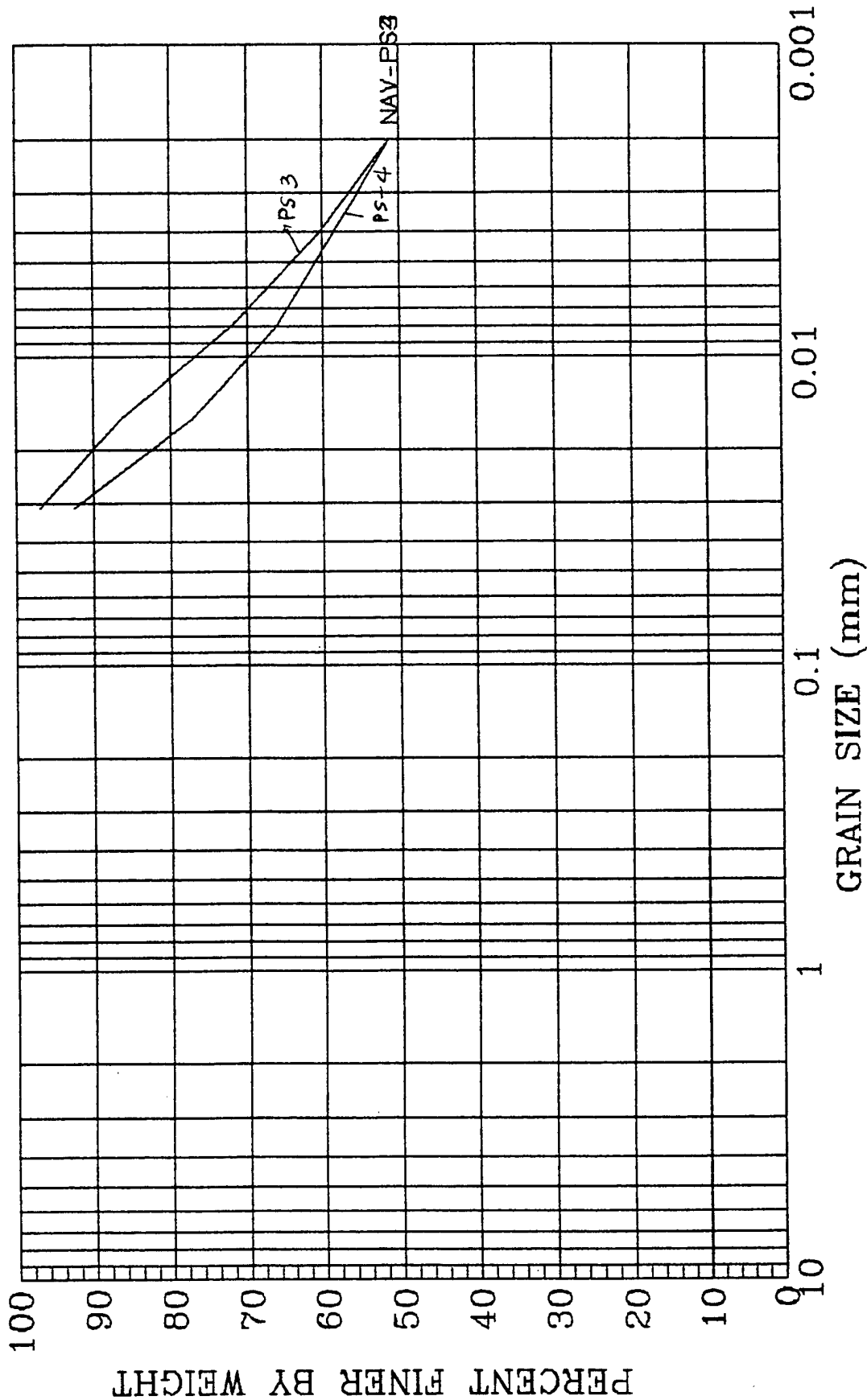
PROJECT: navigation impact  
ANALYSIS DATE: 10/94  
COLLECTED DATE: 05/18/91  
TIME: ps1(1119-1128)ps2(1119-1128)  
SITE: clarks ferry  
STATION: PS1(1A 12")PS2(1B 30")



LAB. NO. 420  
LAB. NO. 421

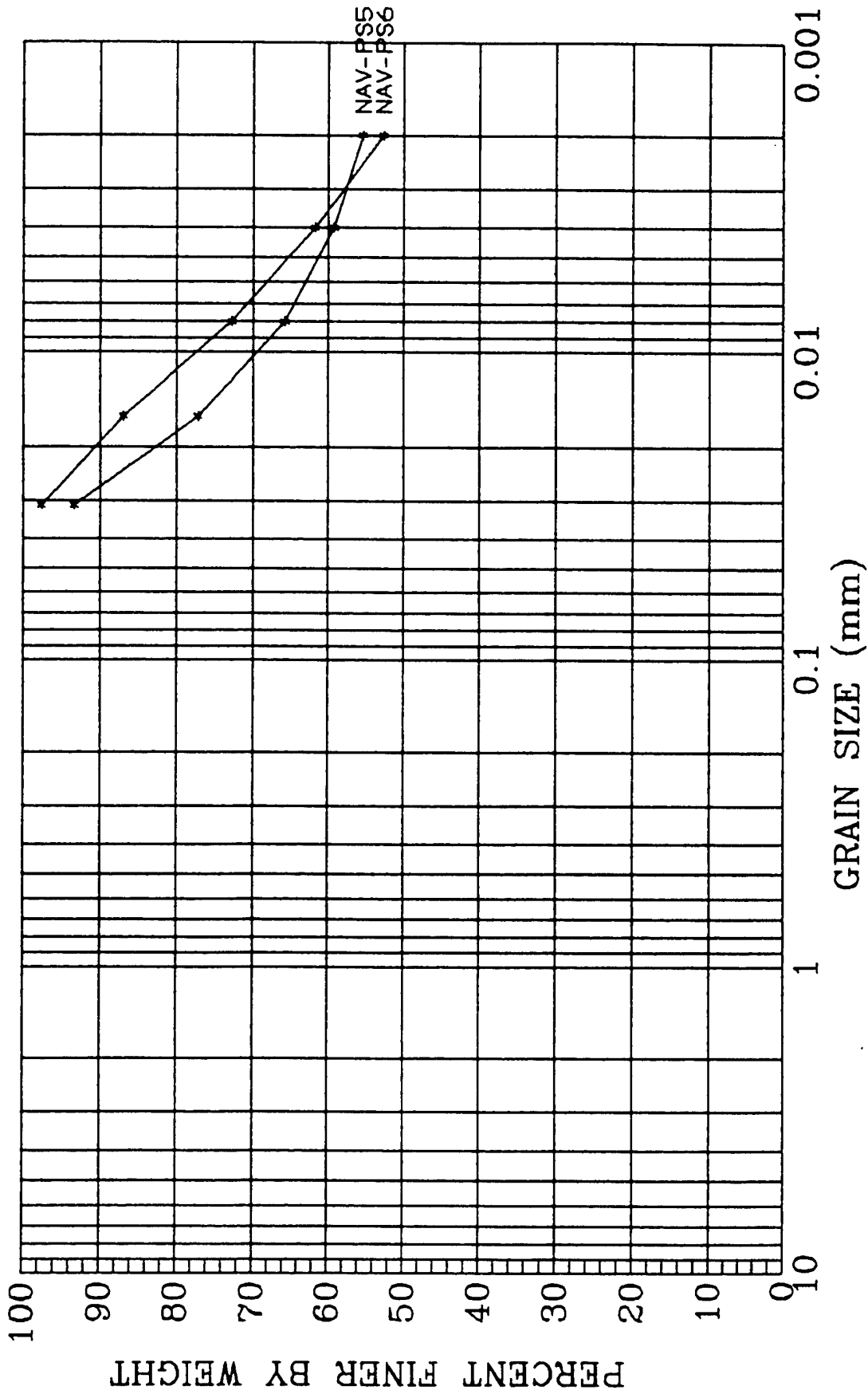
# ILLINOIS STATE WATER SURVEY SEDIMENT LABORATORY

PROJECT: navigation impact  
ANALYSIS DATE: 10/94  
COLLECTED DATE: 05/18.20/91  
TIME: PS3(1119-1128)PS4(1630)  
SITE: Clarks ferry  
STATION: 2A 12"



# ILLINOIS STATE WATER SURVEY SEDIMENT LABORATORY

PROJECT: navigation impact  
ANALYSIS DATE: 10/94  
COLLECTED DATE: 05/21/91  
TIME: PS5(1010-1020)PS6(1119-1128)  
SITE: Clarks ferry  
STATION: PS5(2A 12")PS6(2B 20")



ILLINOIS STATE WATER SURVEY  
SEDIMENT LABORATORY

PROJECT: navigation impact

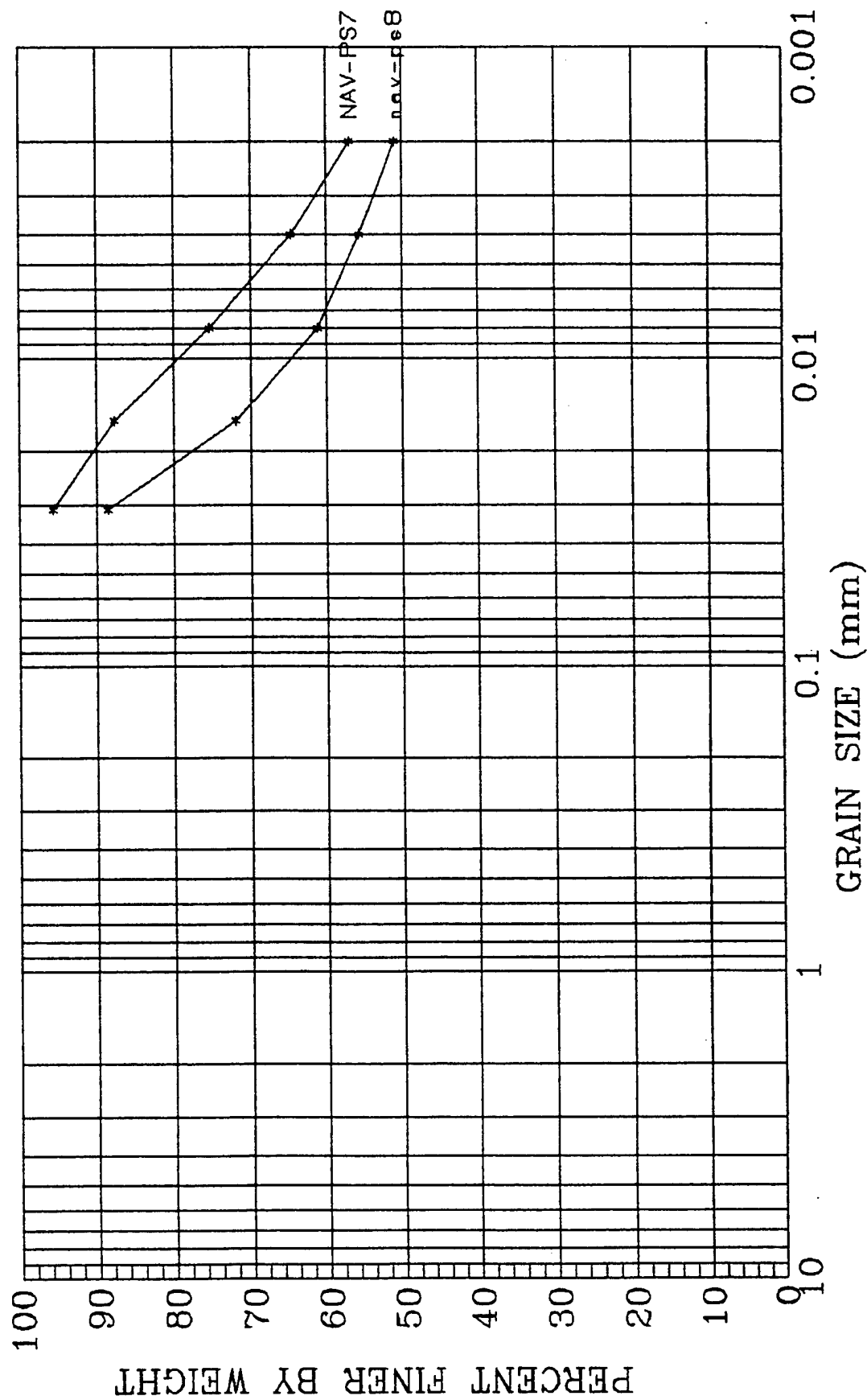
ANALYSIS DATE: 10/94

COLLECTED DATE: 05/20/91

TIME: ps7(1119-1128)ps8(1630)

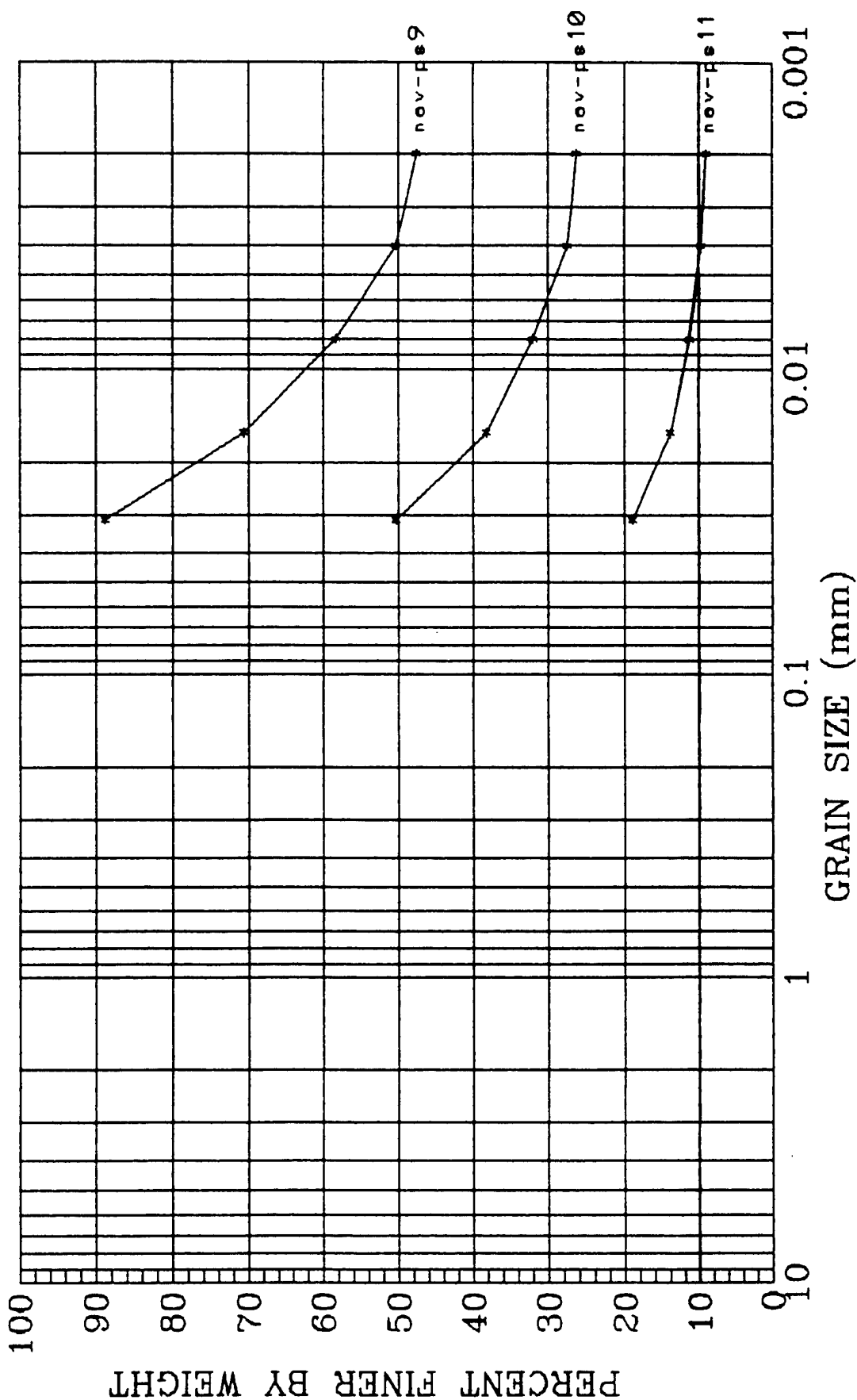
SITE: Clarks Ferry

STATION: PS7(2C 18") PS8(3A 12")



ILLINOIS STATE WATER SURVEY  
SEDIMENT LABORATORY

PROJECT: navigation impact  
ANALYSIS DATE: 10/94  
COLLECTED DATE: 05/21/91  
TIME:PS9(1010-1021)PS10(1701-1714)  
TIME:PS11(1701-1714)station5 66"  
STATION:PS9 3A 12"PS10 5? 12"





**List of Suspended Sediment Particles Analyzed,  
Kampsville, Trip 1**

| <i>Date</i> | <i>Time</i>   | <i>Intake<br/>station</i> | <i>Dry<br/>weight, g</i> | <i>Lab No.</i> |
|-------------|---------------|---------------------------|--------------------------|----------------|
| 10/12/90    | 10:45 - 10:53 | a1                        | 1.1636                   | 429            |
|             | 10:40 - 10:53 | a2                        | 0.6856                   | 432            |
|             | 10:45 - 10:54 | b1                        | 1.2947                   | 435            |
|             | 10:45 - 10:53 | b2                        | 1.2115                   | 438            |
|             | 10:45 - 10:54 | c1                        | 1.1397                   | 440            |
|             | 10:45 - 10:54 | c3                        | 1.1964                   | 443            |
| 10/13/90    | 13:12 - 13:17 | a1                        | 1.1918                   | 430            |
|             | 13:12 - 13:19 | a2                        | 1.3155                   | 433            |
|             | 13:12 - 13:18 | b1                        | 1.6101                   | 436            |
|             | 13:12 - 13:18 | b2                        | 1.4479                   | 439            |
|             | 13:12 - 13:18 | c1                        | 1.8757                   | 441            |
|             | 13:12 - 13:18 | c3                        | 1.6491                   | 444            |

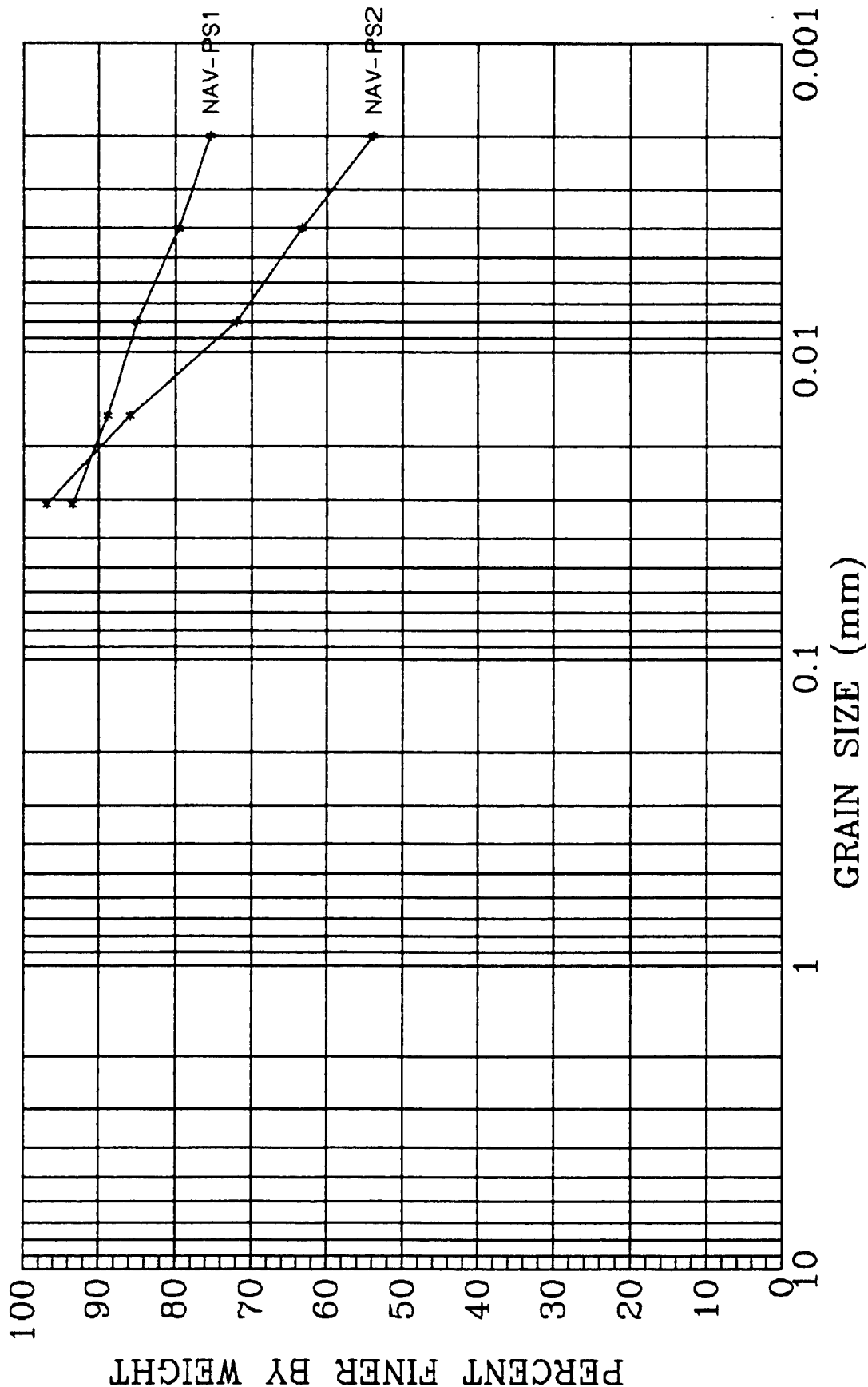
(During Barge-Tow Passage)

| <i>Date</i> | <i>Time</i>   | <i>Barge</i> | <i>Intake<br/>station</i> | <i>Dry<br/>weight, g</i> | <i>Lab No.</i> |
|-------------|---------------|--------------|---------------------------|--------------------------|----------------|
| 10/15/90    | 09:48 - 09:54 | A. Randall   | a1                        | 1.8782                   | 431            |
|             | 09:48 - 09:54 | A. Randall   | a2                        | 1.8800                   | 434            |
|             | 09:48 - 09:54 | A. Randall   | b1                        | 1.9839                   | 437            |
|             | 09:48 - 09:54 | A. Randall   | c1                        | 2.0329                   | 442            |
|             | 09:48 - 09:54 | A. Randall   | c3                        | 1.8598                   | 445            |

LAB. NO. 429  
LAB. NO. 430

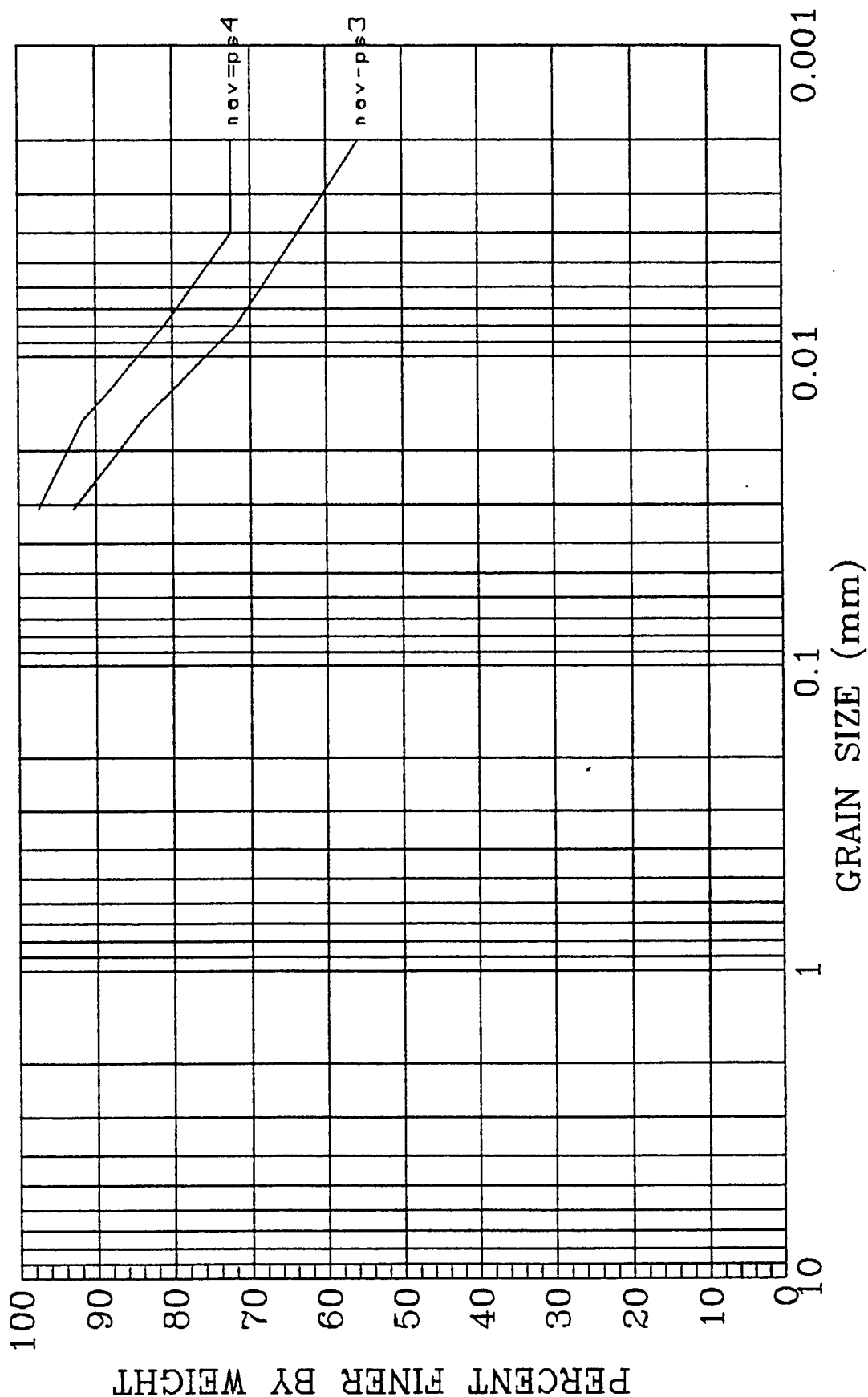
ILLINOIS STATE WATER SURVEY  
SEDIMENT LABORATORY

PROJECT: navigation impact  
ANALYSIS DATE: 12/94  
COLLECTED DATE: 10/12/90  
TIME: PS1(1045-1053)PS2(1312-1317)  
SITE: Kampsvill  
STATION: PS1(1A 6" Background)  
ps2(1A Background)



# ILLINOIS STATE WATER SURVEY SEDIMENT LABORATORY

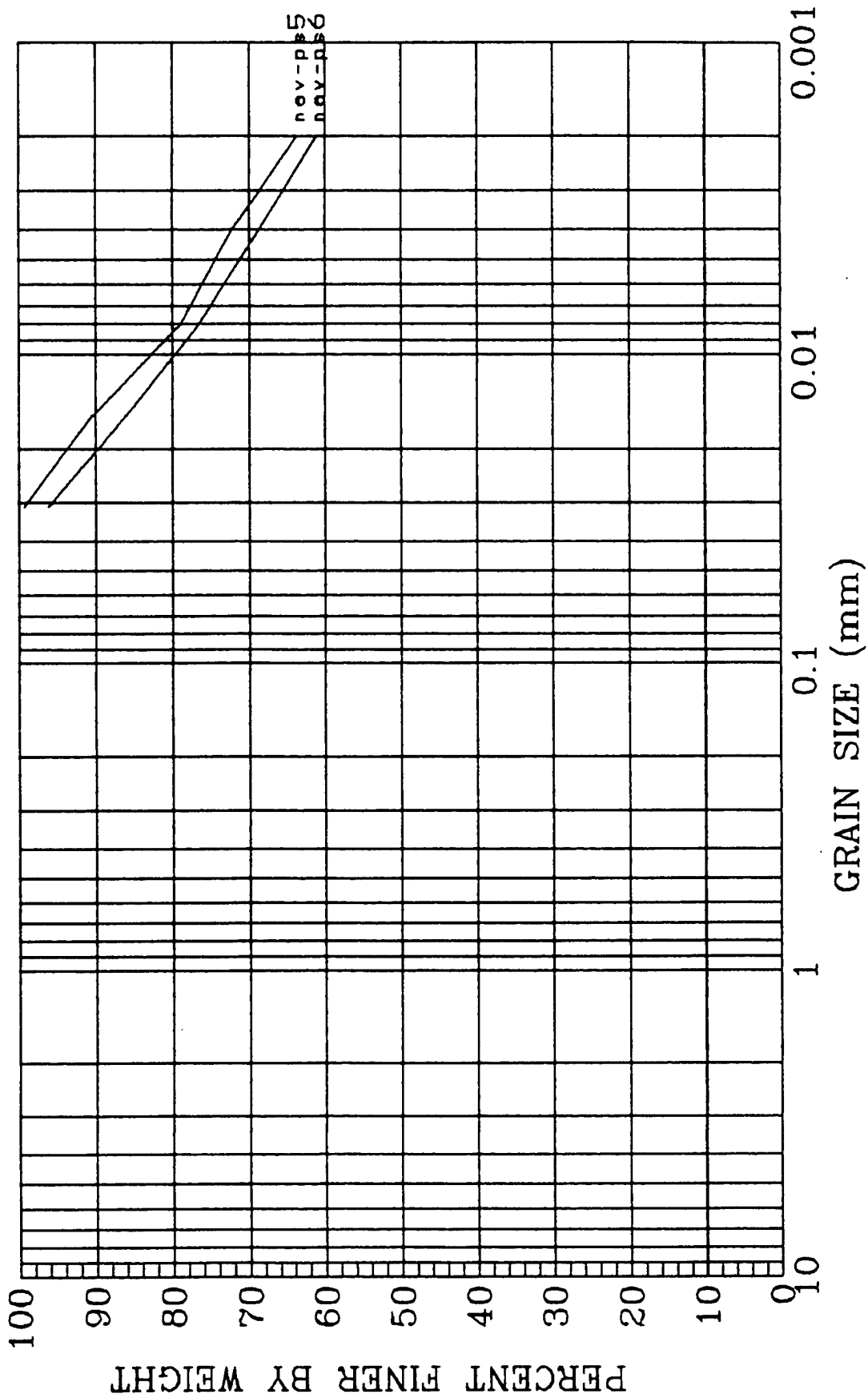
PROJECT: navigation impact  
ANALYSIS DATE: 01/06/95  
COLLECTED DATE: 10/90  
TIME: ps3(948-954)ps4(1040-1053)  
SITE: kampsvill  
STATION: ps3(1A event)ps4(1B Background)



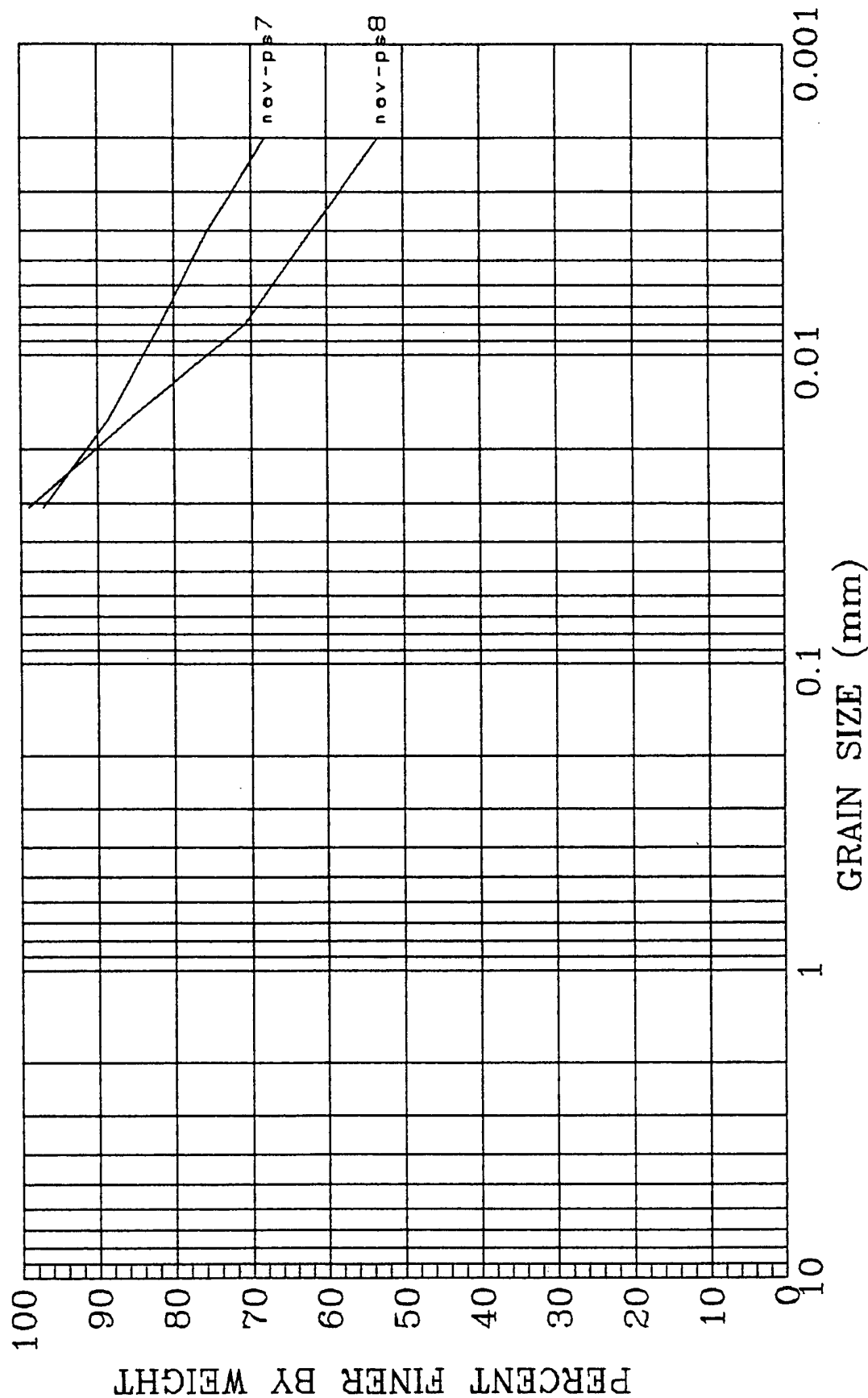
LAB. NO. 433  
LAB. NO. 434

# ILLINOIS STATE WATER SURVEY SEDIMENT LABORATORY

PROJECT: navigation impact  
ANALYSIS DATE: 01/95  
COLLECTED DATE: 10/90  
TIME: ps5(1312-1319)ps6(948-954)  
SITE: Kampsvill  
STATION: PS5(1B Background)ps6(1B Event)



PROJECT: navigation impact  
ANALYSIS DATE:01/95  
COLLECTED DATE:10/90  
TIME:ps7(1045-1054)ps8(1312-1318)  
SITE:Kampsvill  
STATION:PS7(2A Background)



LAB. NO. 437  
LAB. NO. 438

# ILLINOIS STATE WATER SURVEY SEDIMENT LABORATORY

PROJECT: navigation impact

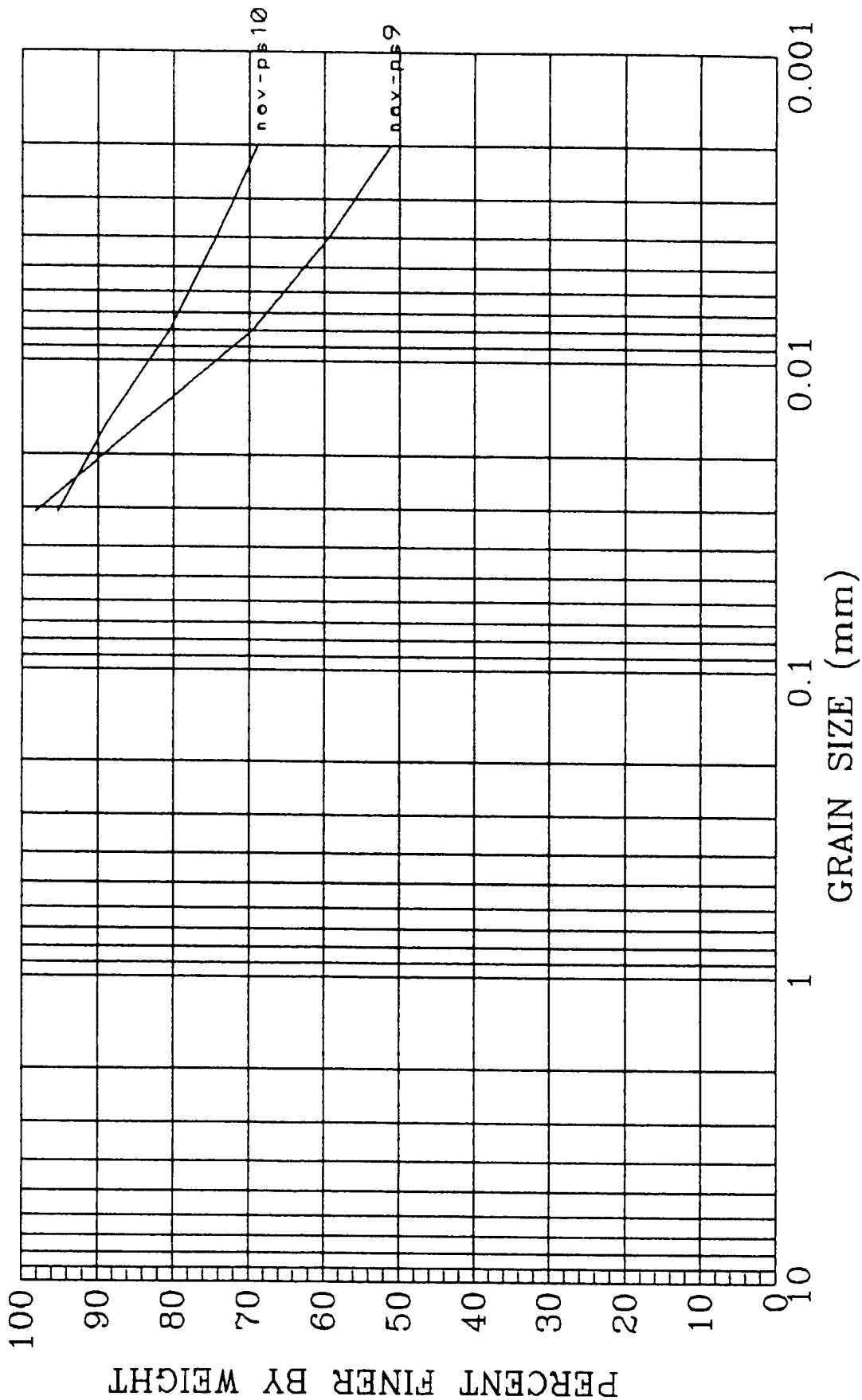
ANALYSIS DATE: 01/95

COLLECTED DATE: 10/90

TIME: ps9(948-954)ps10(1045-1053)

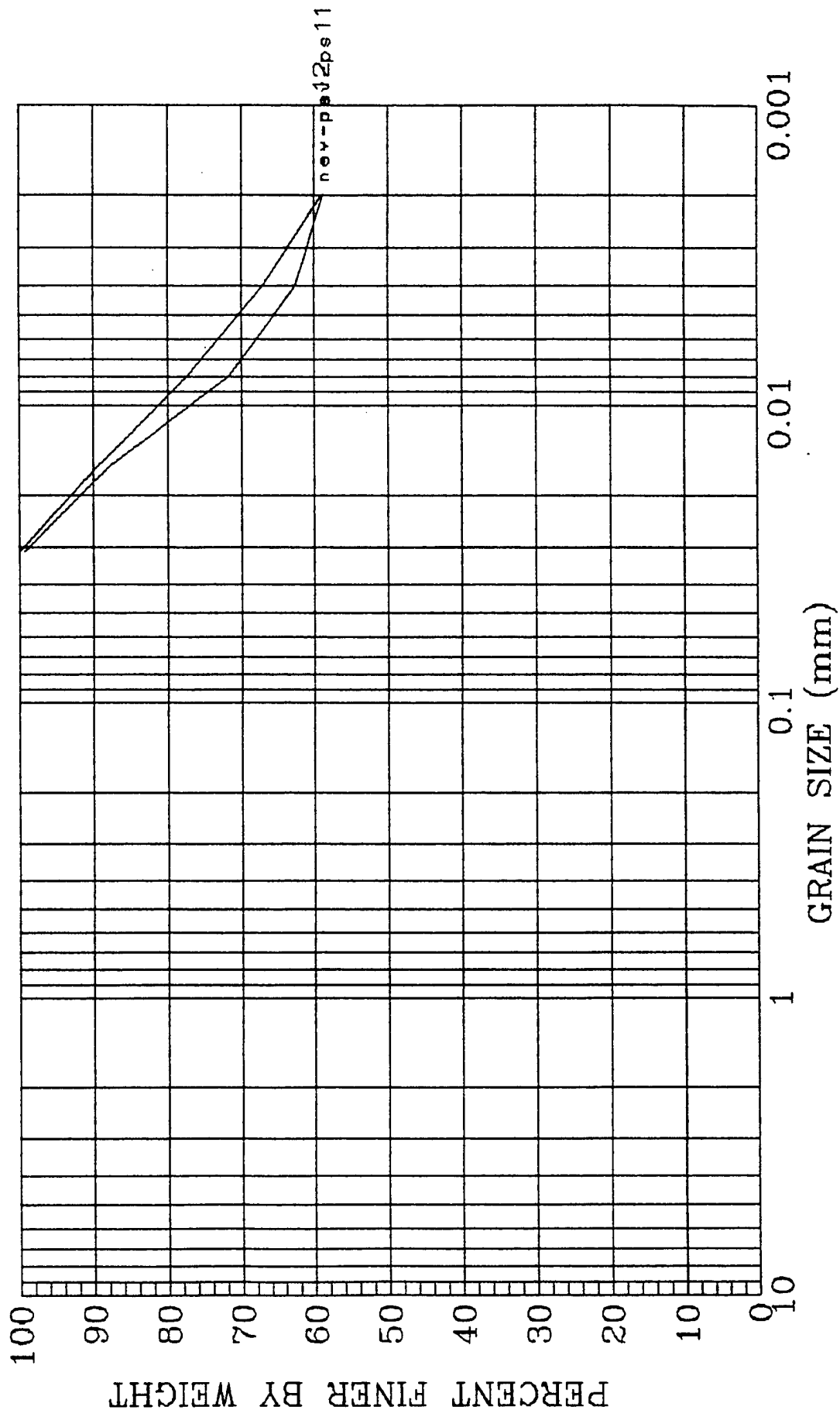
SITE: Kampsvill

STATION: ps9(2A Event)ps10(2B Background)



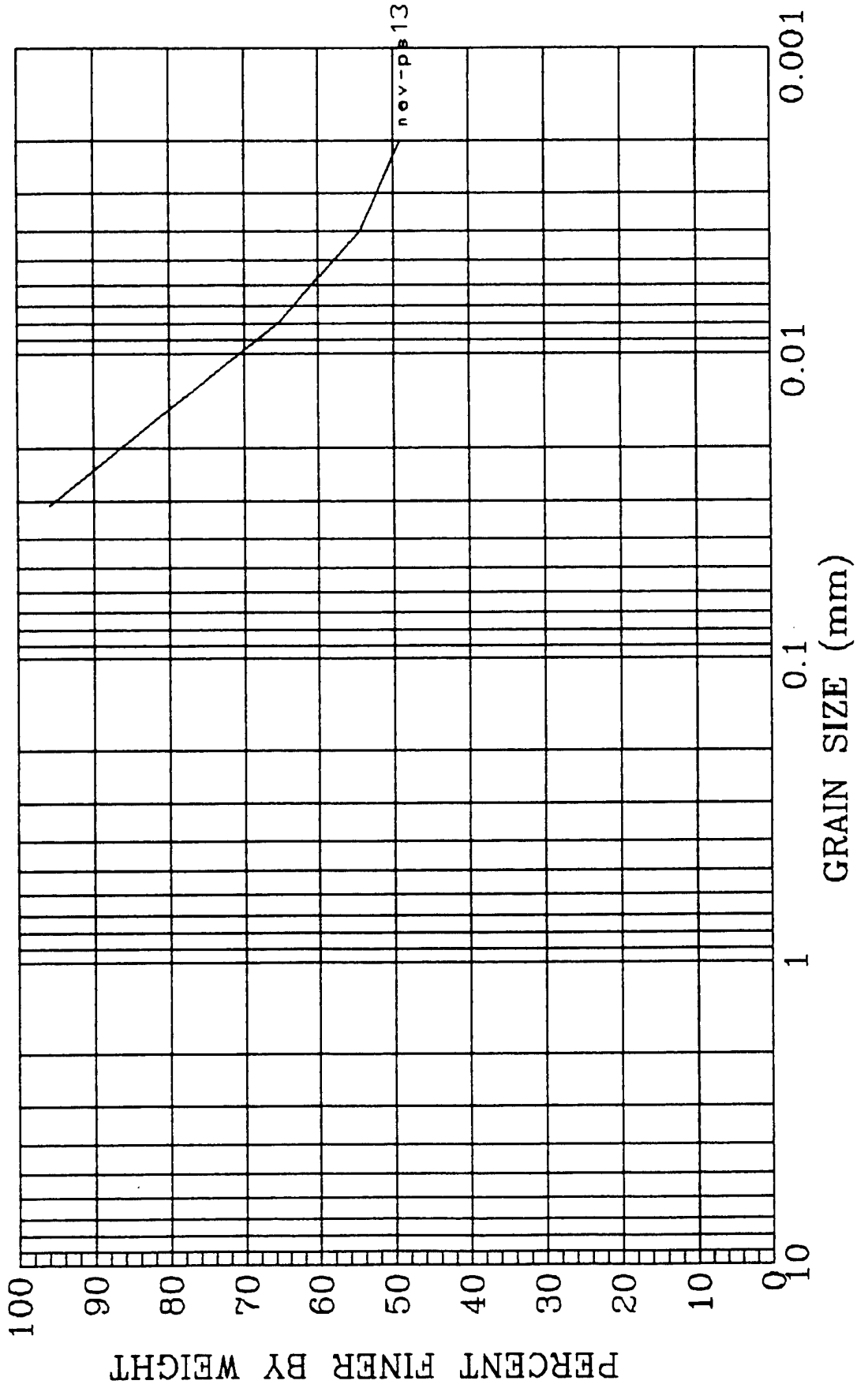
ILLINOIS STATE WATER SURVEY  
SEDIMENT LABORATORY

PROJECT: navigation impact  
ANALYSIS DATE: 01/95  
COLLECTED DATE: 10/90  
TIME: ps11(1312-1318)ps12(1045-1054)  
SITE: Kampsvill  
STATION: PS11(2B Background)  
ps12(3A Background)



# ILLINOIS STATE WATER SURVEY SEDIMENT LABORATORY

PROJECT: navigation impact  
ANALYSIS DATE: 01/95  
COLLECTED DATE: 10/90  
TIME: 1312-1318  
SITE: Kampsvill  
STATION: 3A Background





ILLINOIS STATE WATER SURVEY  
SEDIMENT LABORATORY

PROJECT: navigation impact

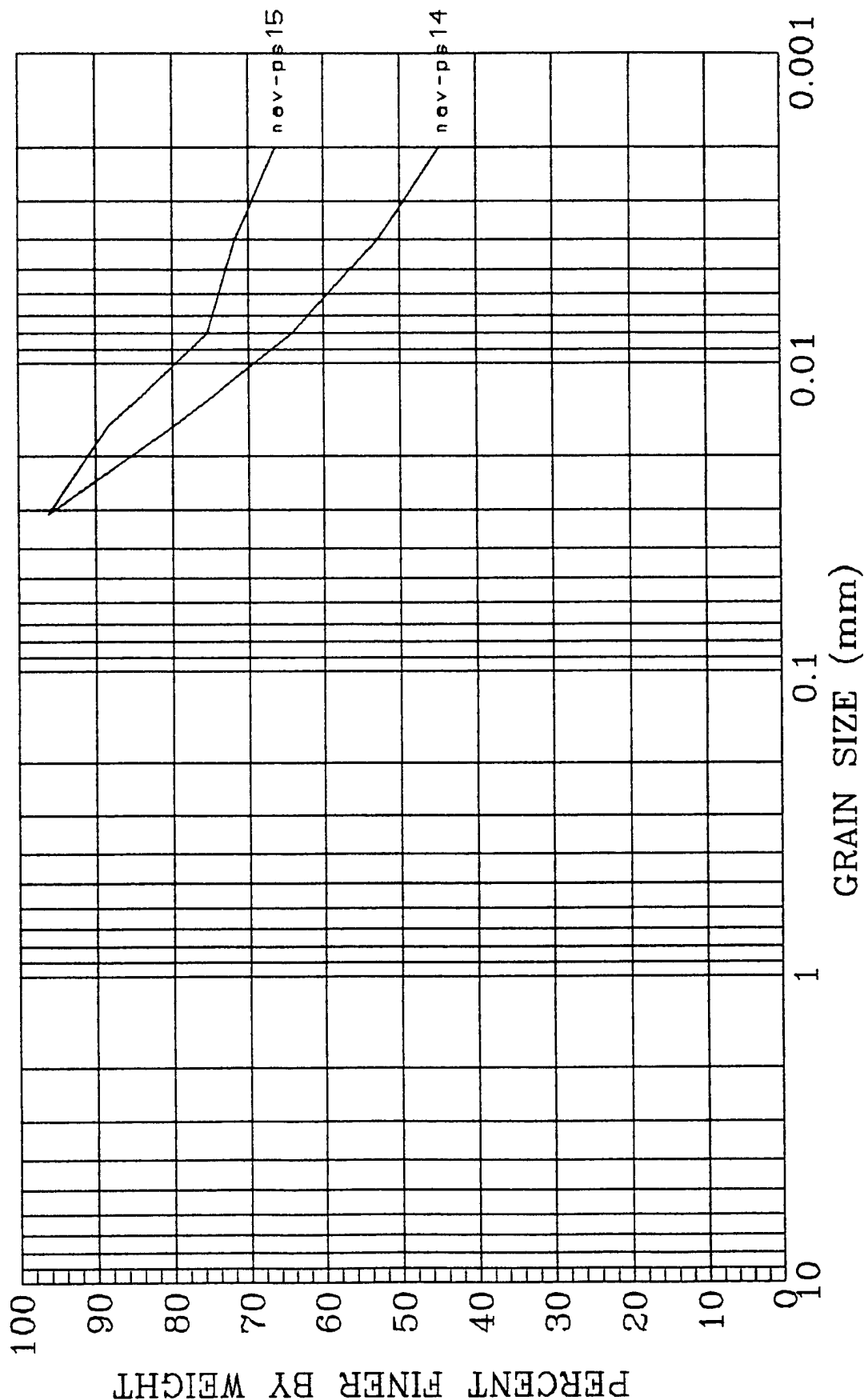
ANALYSIS DATE: 01/95

COLLECTED DATE: 10/90

TIME: ps14(948-954)ps15(1045-1054)

SITE: Kampsvill

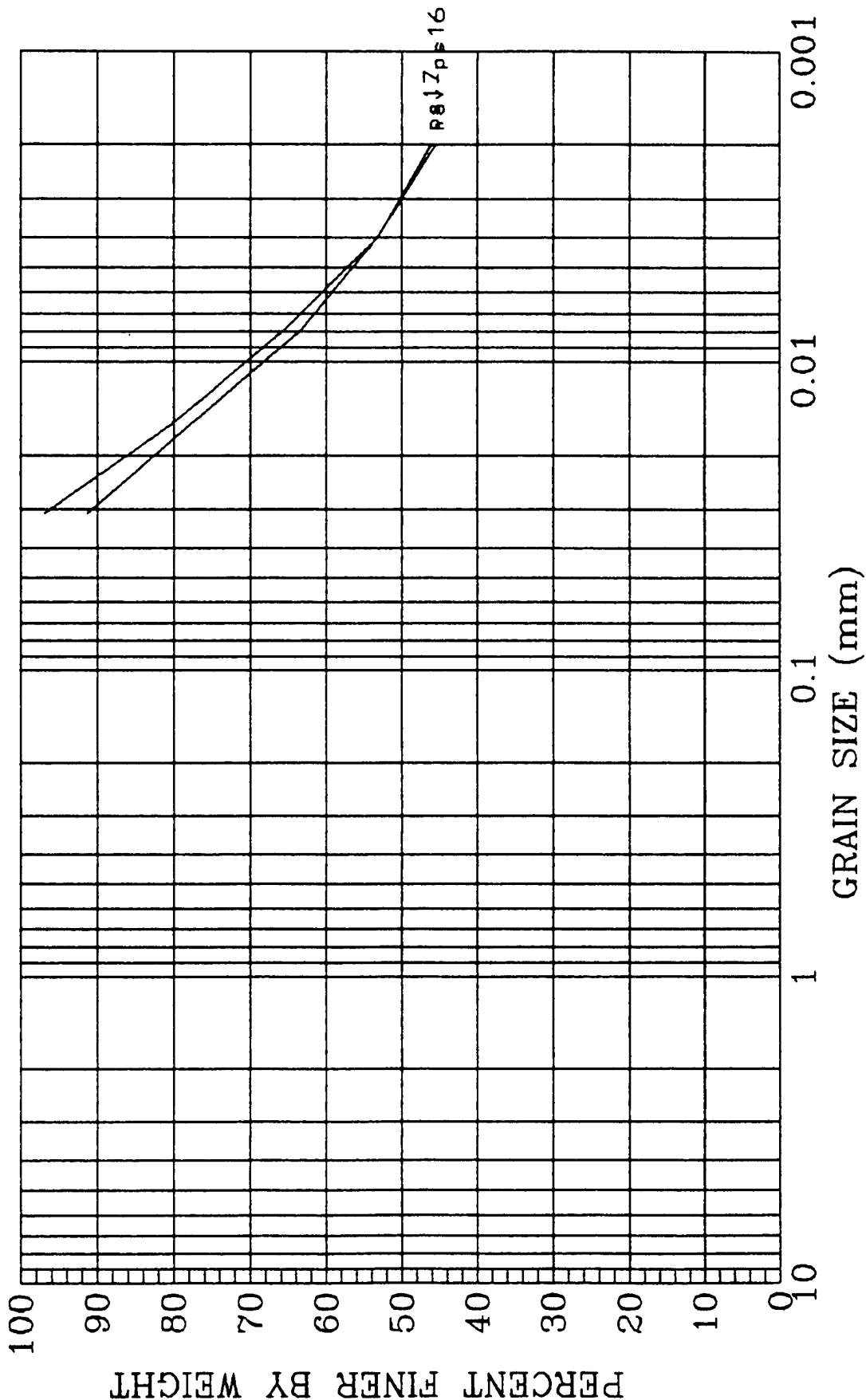
STATION: PS14(3A Event)ps15(3c Background)



LAB. NO. 444  
LAB. NO. 445

ILLINOIS STATE WATER SURVEY  
SEDIMENT LABORATORY

PROJECT: navigation impact  
ANALYSIS DATE: 01/95  
COLLECTED DATE: 10/90  
TIME: ps16(1312-1318)ps17(948-954)  
SITE: Kampsvill  
STATION: PS16(3C Background)ps17(3c Event)



**APPENDIX XXX.**

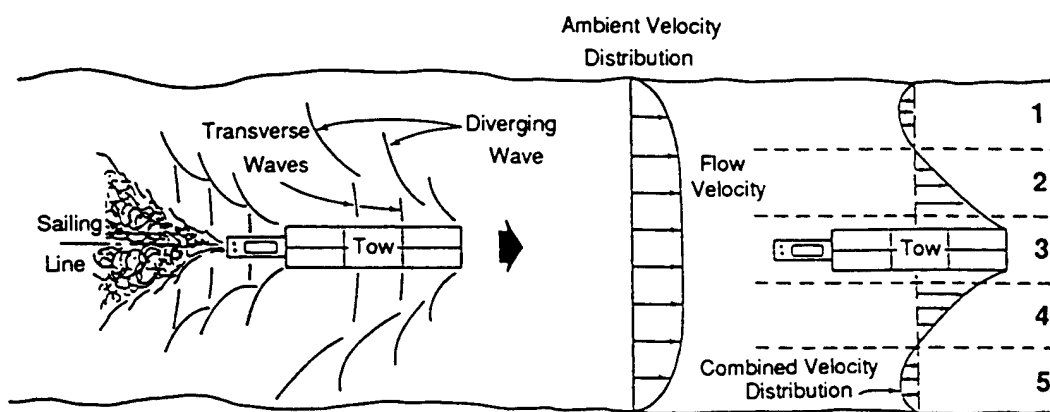
**A PREDICTIVE METHOD FOR MAXIMUM RETURN VELOCITY**

## CROSS-SECTIONAL DISTRIBUTION OF RETURN FLOW

The variation of flow velocity from barge to bank is important for any study on the physical changes caused by navigation traffic. There are few available methods to compute the shape of the lateral velocity distribution. In all the methods, the predicted return velocity distributions decrease exponentially with distance from the barge to the shoreline.

However, using velocity data collected from a natural river such as the Illinois River, a distinct lateral distribution of the return flow can be observed. It is seen that barge movements either upstream or downstream generate a pronounced return current that has a much broader width from the shoreline and moves in the direction opposite the motion of the barge. On the other hand, the velocity at the wall of the barge should be equal to the barge speed, because of the no-slip condition. Thus, based on the continuity relationship, there should exist a location, probably near the barge, where the return velocity is zero. For the purpose of determining the lateral velocity distribution and the development of an equation, the channel is conceptually subdivided into four lateral subchannels, each extending from the water surface to the river bed (figure XXX-1). In this figure, it is assumed that the channel geometry is symmetrical. Most of the velocity data were collected from subchannel 4 at four lateral locations at the Kampsville site.

Figure XXX-1 indicates that subchannels 2 and 3 located on either side of the barge are narrow. Thus water probably moves along with the barge. A quantification of the velocity distribution within these two subchannels must be done within a laboratory setup since it is almost impossible to collect field data in a natural river within such close proximity to the barge. The flow within subchannels 2 and 3 may be called shear flow. At the wall of the barge, current velocity should be equal to the barge speed. Away from the barge boundary, it is assumed that the flow velocity decreases almost linearly and becomes zero at a certain lateral location. This location can



XXX-1. Conceptual distribution of return velocity across the width of a channel due to barge-tow movement

be approximated by using the conservation of water volume. The volume of water moving at any instant in subchannel 4 or 1 should be equal to the volume of water in subchannel 3 or 2. Using this concept, it is possible to predict the location along the width of the river away from the barge where the flow velocity is equal to zero. In other words, the width of subchannel 3 or 2 can be determined. Introducing  $\eta = y/W_s$  as the nondimensional width of the channel and  $t_s$  as the width of subchannel 3 or 2, where  $y$  is the distance from the barge and  $W_s$  is the distance of the barge from the shoreline, the region of these two subchannels extends from  $\eta = 0$  to  $\eta = \eta_0 = t_s/W_s$ . The values of  $\eta_0$  should be dependent on the barge-tow configuration, barge speed, and barge draft. Thus,  $\eta_0$  can be related with the barge length Froude number  $u_s/(gL)^{0.5}$  and draft Froude number  $u_s/(gd)^{0.5}$ , where  $L$  is the barge length.

Figure XXX-2 shows the relationship between  $\eta_0$  and the product of the above two Froude numbers for either upstream or downstream-bound barges. Based on data from the 11 events, Eqs. (1) and (2) for determining  $\eta_0$  have been developed as:

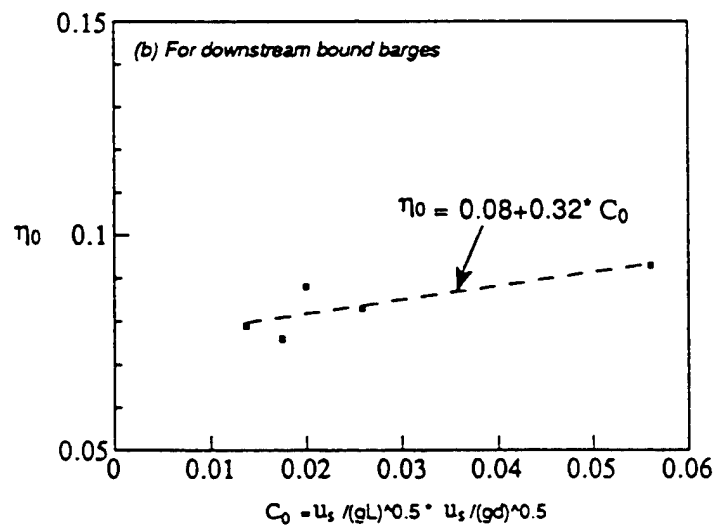
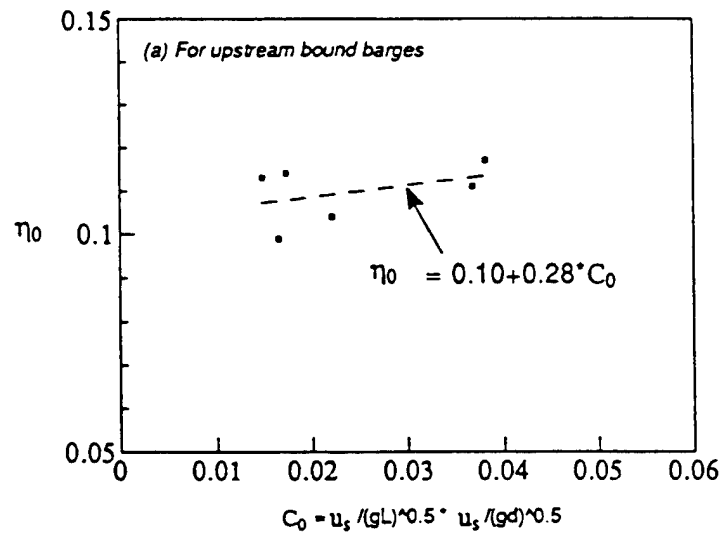
$$\eta_0 = 0.10 + 0.28 C_0 \quad (\text{upstream-bound barges}) \quad (1)$$

and

$$\eta_0 = 0.08 + 0.32 C_0 \quad (\text{downstream-bound barges}) \quad (2)$$

where  $C_0 = \{u_s/(gL)^{0.5}\} \{u_s/(gd)^{0.5}\}$ .

Subchannels 1 and 4 located near the shore are fairly wide. In these two subchannels, all the fluid particles are assumed to move in one direction, which is opposite that of the barge motion from the zone of higher pressure to lower pressure. This flow within subchannels 1 and 4 is return flow, or parallel flow, and its distribution follows a parabola-like shape. The region of subchannels 4 and 1 extends from  $\eta_0 = t_s/W_s$  to  $\eta = 1$ . Thus, it appears that two different types of velocity distribution do exist within two different subchannels when a barge moves within a natural channel.



XXX-2. Variations of  $\eta_0$  for upstream and downstream bound barges

With this concept in mind, it is postulated that in subchannel 3 or 2, the flow velocity decreases almost linearly from the barge speed  $u_s$  at  $\eta = 0$  to zero at  $\eta = \eta_0$ . The lateral distribution of flow velocity can be thought of as a quasilinear profile within these two zones and expressed as:

$$u_1(\eta) = u_s(1 - \eta/\eta_0)(1 - \eta) \quad (0 \leq \eta \leq \eta_0) \quad (3)$$

In subchannel 4 or 1, the flow velocity is zero at the bank boundary ( $\eta = 1$ ) to satisfy the no-slip condition, then gradually increases with the distance from the shoreline, and finally decreases to zero at  $\eta = \eta_0$ . The lateral velocity distribution of this return flow in these two subchannels is parabola-like and can be expressed as:

$$u_2(\eta) = a_1(1 - \eta)(\eta_0 - \eta)\exp(a_2\eta)/(a_2\eta)^m \quad (\eta_0 \leq \eta \leq 1) \quad (4)$$

where  $a_1$  and  $a_2$  are coefficients to be determined based on field data. The coefficient  $a_1$  physically represents the pressure gradient. Thus,  $a_1$  is related to the blocking factor,  $A_m/A_c$ , and the barge draft Froude number,  $u_s/(gd)^{0.5}$ . Figure XXX-3 shows the relationship between  $a_1$  and the product of the blocking factor and draft Froude number,  $C_1$ , for upstream- and downstream-bound barges. Based on data from the 11 events, Eqs. (5) and (6) for determining  $a_1$  have been developed as:

$$a_1 = -0.27 + 52.1 C_1 \quad (\text{upstream-bound barges}) \quad (5)$$

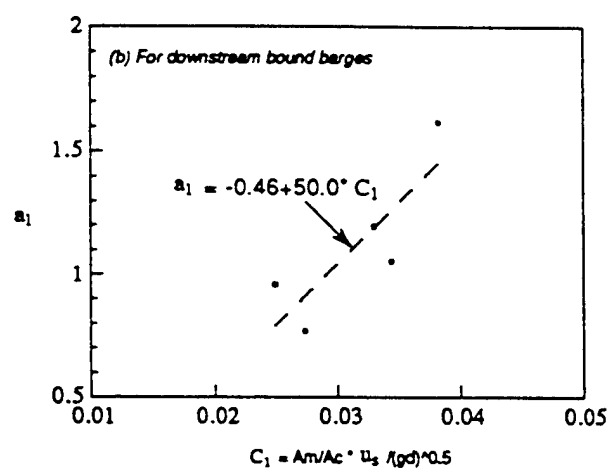
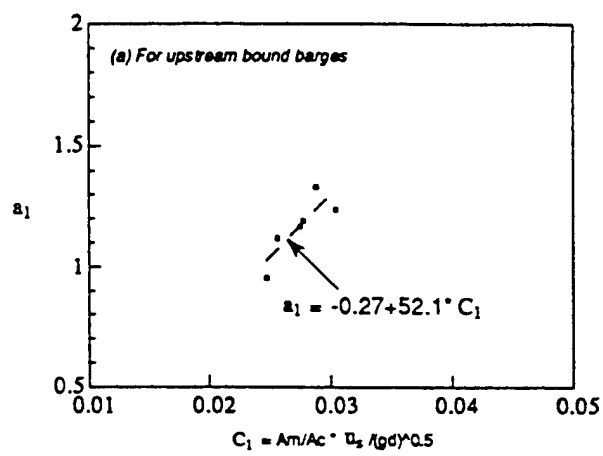
and

$$a_1 = -0.46 + 50.0 C_1 \quad (\text{downstream-bound barges}) \quad (6)$$

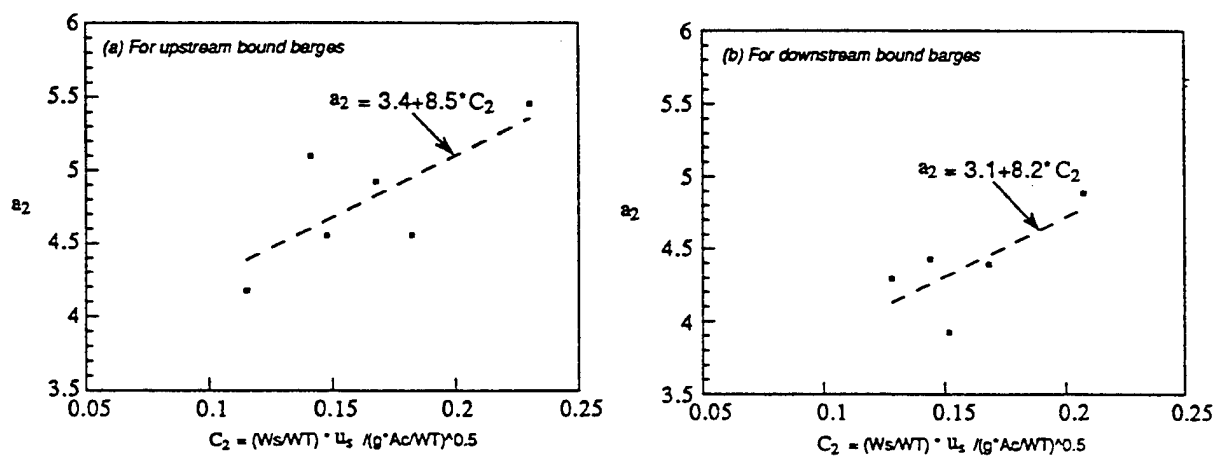
where  $C_1 = (A_m/A_c)\{u_s/(gd)^{0.5}\}$ .

The coefficient  $a_2$  physically represents the effects of the nonuniformity of the lateral velocity distribution. Thus  $a_2$  is dependent on the relative distance  $W_s/W_T$  and the channel Froude number  $u_s/(gA_c/W_T)^{0.5}$ . The relationship between  $a_2$  and the product of the relative distance and channel Froude number,  $C_2$ , is shown in figure XXX-4 for upstream- and downstream-bound barges. Thus, based on data from the 11 events, Eqs. (7) and (8) for determining  $a_2$  are as follows:





XXX-3. Variations of  $a_1$  for upstream and downstream bound barges



XXX-4. Variations of  $a_2$  for upstream and downstream bound barges

$$a_2 = 3.4 + 8.5 C_2 \quad (\text{upstream-bound barges}) \quad (7)$$

and

$$a_2 = 3.1 + 8.2 C_2 \quad (\text{downstream-bound barges}) \quad (8)$$

where  $C_2 = (W_s/W_T) \{u_s/(gA_c/W_T)^{0.5}\}$ .

Exponent  $m$  in Eq. (4) relates to the existence of the nonuniformity of the velocity distribution across the width of the channel. Thus it is reasonable to expect it to be related with the relative distance and channel Froude number. Such relationships between  $m$  and the product of the relative distance and channel Froude number,  $C_m$ , are shown in figure XXX-5 for upstream- and downstream-bound barges. Eqs. (9) and (10) describe these relationships as:

$$m = 2.1 + 3.5 C_m \quad (\text{upstream-bound barges}) \quad (9)$$

and

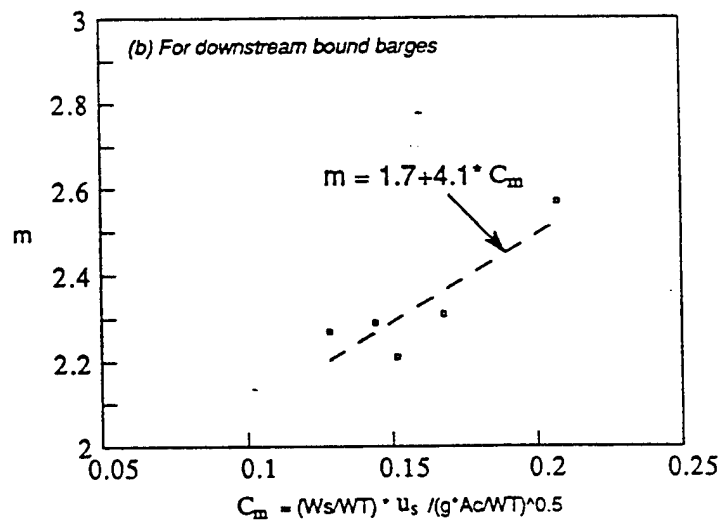
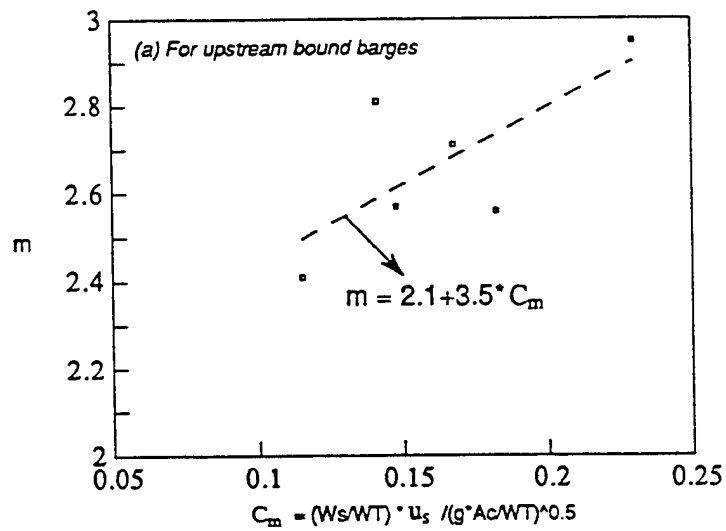
$$m = 1.7 + 4.1 C_m \quad (\text{downstream-bound barges}) \quad (10)$$

where  $C_m = (W_s/W_T) \{u_s/(gA_c/W_T)^{0.5}\}$ .

The final boundary conditions for the determination of the velocity distribution profile between the barge and the shoreline are: (a)  $u = u_s$  at the barge boundary; (b)  $u \approx 0$  at  $\eta_0$ ; and (c)  $u = 0$  at the shoreline. The flow velocity distribution across the width of the channel between the barge and the shoreline can thus be written as:

$$\begin{aligned} u_{us}(\eta) &= u_1 + u_2 \\ &= u_s(1 - \eta/\eta_0)(1 - \eta) + a_1(1 - \eta)(\eta_0 - \eta)\exp(a_2\eta)/(a_2\eta)^m \end{aligned} \quad (11)$$

where  $u_{us}(\eta)$  is the flow velocity generated by a barge-tow moving upstream. For a downstream-bound barge, the velocity profile will be negative, i.e.,  $u_{ds}(\eta) = -u_{us}(\eta)$  where  $u_{ds}(\eta)$  is the flow velocity generated by the downstream-moving barge-tow. Therefore, it can be stated that the lateral flow velocity distribution between the barge and the shoreline is a combination of shear flow in subchannel 3 or 2 and parallel flow (return flow) in subchannel 4 or 1 (see figure XXX-1).



XXX-5. Variations of  $m$  for upstream and downstream bound barges

**APPENDIX XXXI.**

**TECHNICAL PAPERS PUBLISHED BY WATER SURVEY RESEARCHERS  
IN REFEREED JOURNALS**

# TURBULENCE IN RIVERS DUE TO NAVIGATION TRAFFIC<sup>a</sup>

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Ta W. Soong,<sup>3</sup> Member, ASCE

**ABSTRACT:** This paper presents the research results of statistical parameters associated with turbulence in a natural river caused by the movement of navigation traffic. Movement of navigation traffic within restricted inland waterways, such as the Illinois, Mississippi, or Ohio Rivers, changes their flow characteristics temporarily in space and time. These spatial and temporal changes must be quantified in order to assess their effects on biologically sensitive areas, and they have seldom been evaluated for natural waterways. Data are collected from the Illinois River to evaluate these changes. The longitudinal and lateral components of fluctuating velocity ( $u'$ ,  $v'$ ), Reynolds stress ( $-\rho u'v'$ ), turbulent intensities ( $\sigma_u$ ,  $\sigma_v$ ), turbulent kinetic energy (TKE), and maximum return velocity generated by navigation traffic are analyzed here. Results have shown that significant changes occur in all of these parameters. The largest changes take place in a zone within 10% of the channel width from the shore.

## INTRODUCTION

Movement of barge traffic in a restricted waterway is associated with physical changes in flow parameters limited in space and time. A thorough understanding of navigation impacts on riverine habitats requires a thorough understanding of these physical processes. Field data have been collected and analyzed to determine changes in velocity structures in the channel border areas due to commercial navigation on the Upper Mississippi River System (UMRS).

Physical changes associated with barge-tow movement can be explained schematically, as shown in Fig. 1 [after Blaauw et al. (1984); Bhowmik and Mazumder (1990)]. These physical changes include return flow, waves, drawdown, and screw wash. If the barge tow moves in stagnant surroundings, the wave pattern will move with the barge, as shown in Fig. 1 by the front wave at (A). Due to the movement of the barge, flow velocity beside the barge will accelerate in the opposite direction (return current), and the water level will drop within the channel to maintain the continuity of flow, as shown by drawdown (h) or water-level depression. The resulting velocity structure is composed of two parts: barge-induced displacement velocities and tow-induced propeller jet velocities. The turbulent jet flow behind the vessel is generated through the direct action of the propellers, its velocity distribution is normally assumed to be symmetrical around the axis of the

<sup>a</sup>Part of this paper was presented at the 1991 ASCE National Conference on Hydraulic Engineering in Nashville, TN.

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Note. Discussion open until October 1, 1993. To extend the closing date one month, a written request must be filed with the ASCE Manager of Journals. The manuscript for this paper was submitted for review and possible publication on October 8, 1991. This paper is part of the *Journal of Hydraulic Engineering*, Vol. 119, No. 5, May, 1993. ©ASCE, ISSN 0733-9429/93/0005-0581/\$1.00 + \$.15 per page. Paper No. 2787.

A basic explanation of physical changes due to navigation was presented as a technical paper at the 1990 *National Conference on Hydraulic Engineering* (Bhowmik and Mazumder 1990). Some results on turbulence and Reynolds stress associated with navigation traffic were presented at the 1991 *National Conference on Hydraulic Engineering* (Mazumder et al. 1991).

Many researchers, such as Raichlen (1967), McQuivey and Richardson (1969), Nakagawa and Nezu (1981), and Nezu and Rodi (1986), have conducted experiments to determine mean flow and turbulent characteristics in open-channel flow. Recently, the laser doppler anemometer has been used for advanced investigations of turbulent structures in compound channels (Knight and Shiono 1990) and in submerged hydraulic jumps (Long et al. 1990) in laboratory settings. However, no detailed investigation has been performed with an array of 2-D current meters in a riverine environment other than the present research conducted by the Illinois State Water Survey (ISWS).

#### INSTRUMENTATION AND FIELD DATA COLLECTION

Data were collected from two sites on the Illinois River. The first site is near McEver's Island at river mile (RM) 50.1 (80.2 km). The second site is near Kampsville at RM 35.4 (56.6 km) River miles on the Illinois River start from the confluence of the Illinois and Mississippi Rivers. Cross-section profiles for these two sites with the instrument configuration are shown in Fig. 2. Both cross sections are trapezoidal, but the McEver's Island site was approximately 100 m narrower than the Kampsville site.

Fig. 2 also shows the coordinate system used for this research. It should be noted that the data from McEver's Island were collected on the left-descending bank (LDB) of the river while data from the Kampsville site

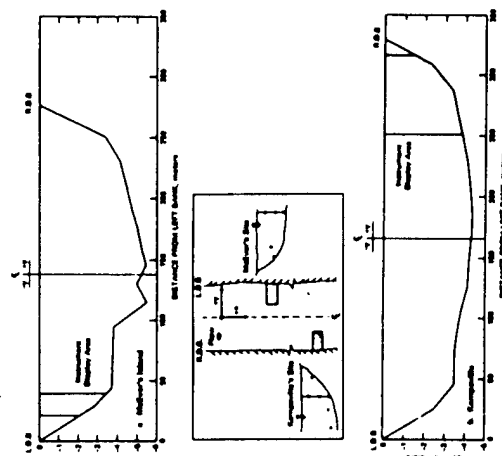


FIG. 2. Definition Sketch of Coordinate System and Cross-Sectional Profiles of Two Sites

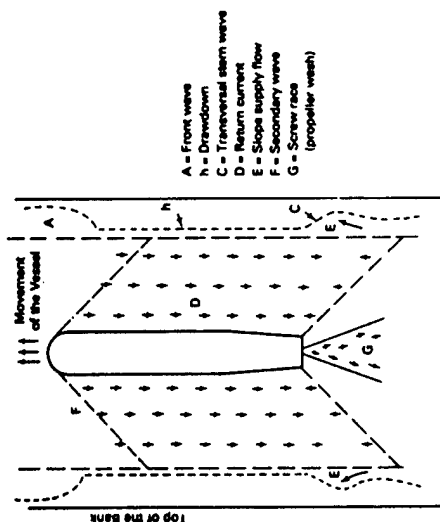


FIG. 1. Schematic Design Showing Water Motion Generated by Moving Ship in Stagnant Water (after Blaauw et al. 1984)

propeller, similar to a three-dimensional jet flow. The schematic diagram in Fig. 1 represents ideal conditions only. In a real waterway, the return flow patterns are not parallel to the vessel or the shoreline, and a complex flow pattern is generated. The present research addresses some of these phenomena.

Previous investigations on traffic effects in restricted waterways were mostly concentrated on return flows, drawdown, waves, and propeller jet velocities. Several methods have been developed by researchers such as Schijf and Jansen (1953), Tothill (1966), Sharp and Fenton (1968), and Bouwmeester (1977) to compute drawdown and return flows beside the barge on the basis of conservation of mass, momentum, and/or energy. Empirical formulas to compute return flows beside the barge have been developed by Fuehrer and Romisch (1977), Simons et al. (1981), Berger et al. (1981), and Hochstein and Adams (1989). Blaauw and van der Knaap (1983) reviewed methods for computing the drawdown and average return flow. Tow-induced propeller jet velocities were computed through an analogy with a turbulent jet with a symmetrical Gaussian distribution from the axis of the propeller (Blaauw and van de Kaa 1978; Verhey 1983).

However, other parameters, such as turbulent characteristics due to barge traffic, have been elusive because of lack of data. And previous studies emphasized canal systems, so the basic assumptions must be re-examined to apply to a large natural river. The main objective of this paper is to analyze the turbulent characteristics of flows induced by barge traffic in a natural river. Turbulent characteristics in large rivers due to the movement of the barge traffic are fundamental to the study of sediment resuspension and the effects, if any, of these changed physical processes on aquatic habitats. Parameters analyzed included the cross-sectional and vertical distribution of return velocity, turbulent Reynolds stress,  $(-\rho u'v')$ ; turbulence intensities  $(\sigma_u, \sigma_v)$ ; and turbulent kinetic energy (TKE). These parameters are compared for both background conditions and barge passage conditions.

Flow in a large river is essentially one-directional (with three-dimensional resolution) with fluctuating components in the lateral and vertical directions. At the initiation of the present project, the ISWS researchers discussed the applicability of Marsh-McBirney meters and the frequency of sampling with others working on the Mississippi and Ohio River systems: Ken Lubinski, U.S. Fish and Wildlife Service; Drew Miller, Waterways Experiment Station, who is also collecting data from the Mississippi River; and Terry Siemsen, U.S. Army Corps of Engineers, Louisville District, who is collecting data from the Ohio River. It was collectively decided that Marsh-McBirney meters were probably among the most rugged commercial meters available for river environments with continuous flows of drifting debris. Moreover, a frequency of one sample per second provides an excellent resolution of the fluctuating components of the velocities. At present, all the researchers mentioned previously are sampling at a frequency of one sample per second. Marsh-McBirney meters were also used by Demissie et al. (1986) to collect secondary circulation data from natural rivers and by hydrologists from Environmental Science and Engineering, Inc. ("Navigation Impact" 1981), to collect data on turbulent fluctuations of velocities from the Illinois River.

#### ANALYSIS OF VELOCITY DATA

Changes in velocity during barge passage are the combined result of the ambient velocity, return flow, and the propulsive jets of the tow. Because of the return flow, the velocity vector changes temporarily with space and time in the zone between the barge and the shoreline. Apparently the velocity vector and the duration of return flow depend on the barge-tow characteristics. It is imperative to understand the changes in return flows with time and space from the barge to the shoreline.

Two components of velocity were measured at different locations between the shore and the barge. An example of typical resultant velocity is presented in Fig. 3, which demonstrates velocity vectors for 30-min periods at three different locations for a single barge-tow convoy with a draft of 2.74 m moving downstream at a speed of 2.3 m/s. The barge-tow convoy was 180 m from the LDB. This very interesting example is typical of what was observed at other locations.

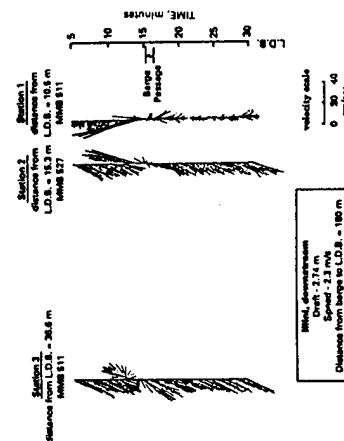


FIG. 3. Resultant Velocity Vectors during Downstream Barge Passage

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were collected on the right-descending bank (RDB). The x-axis is along the main stem of the river, positive in the downstream direction. The y-axis is perpendicular to the x-axis and positive toward the LDB of the river. The z-axis is normal and upward from the xy plane. Thus, two sets of data were collected from two separate sides of the river at two different cross sections. Because of these differences, notations on various figures along the y-axis (to be discussed later) may show plus (McEver's Island) or minus (Kampsville), depending on the location of the survey.

Velocity data were collected using a set of two-dimensional (2-D) electromagnetic current meters installed along a cross section from the shore to the sailing line, manufactured by Marsh-McBirney, Inc. (MMB). The water-velocity sensor is based on the Faraday principle of electromagnetic induction, where a conductor, such as water moving in a magnetic field, produces a voltage that is proportional to the velocity of the water. The ISWS used two different types of meters in the field experiment, MMB 511 and MMB 527. At the McEver's Island site, four MMB 511s and one MMB 527 were used. At the Kampsville site, they used four MMB 511s and two MMB 527s. The accuracy of these meters and their basic capabilities are given in Table 1. Further information can be obtained from the user's manual (*Instruction Manual* 1991).

The data collection scheme focused on information closer to the channel bed as well as on lateral variations. Therefore, the current meters were installed about 1 m above the bottom and aligned in a transect. However, the vertical distributions of the u and v components were also measured at one station at each site (Fig. 2). The lateral distances from the LDB for the McEver's Island site were 10.5, 15.3, and 36.6 m. At 36.6 m from the LDB, three MMB 511s were arranged to measure the vertical distributions of horizontal velocities. The height of the probes was 0.15, 0.92, and 1.9 m above the bed. The depth of water at this vertical point was 3 m.

Data from the Kampsville site were collected at four stations near the RDB. The lateral distances from the RDB were 13.0, 33.6, 47.3, and 65.6 m. At 33.6 m from the RDB, a vertical array of three MMB 511s heights were 0.20, 1.22, and 2.44 m from the bottom. The total water depth at this vertical point was 3 m. The sampling rate at both sites was one sample per second, regardless of barge passage. This resolution has been proved sufficient for determining overall velocity changes and turbulent characteristics within a large river such as the Illinois.

It should be understood that in a laboratory setting, data on turbulent fluctuations of velocities could be collected at 0.3–0.1-s intervals. In a project on velocity fluctuations in oceanic environment, Soulsby (1980) discussed a relationship that may exist between sampling rates, size of sensors, and response time. He also suggested a relationship between these variables that may be valid for oceanic environments.

TABLE 1. Specifications of Current Meters

| Instrument (1) | Parameters (2)    | Range (3)            | Accuracy (4)             | Probe diameter (cm) (5) |
|----------------|-------------------|----------------------|--------------------------|-------------------------|
| MMB 527        | u, v<br>Direction | ± 300 cm/s<br>0–360° | ± 2% of reading<br>± 10° | 10.3                    |
| MMB 511        | u, v              | 300 cm/s             | ± 2% of reading          | 3.9                     |

Note: u and v are velocity components in x- and y-direction, respectively.

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Analyses such as this show the overall changes in velocity over one-half the width of the river (116 m wide at this location). Each line in Fig. 3 is a vector plot indicating the magnitude of resultant velocity averaged over 15-s intervals and its directional changes due to barge passage. This figure clearly shows that with the downstream movement of the barge, the flow moves towards the bank, and then rotates counterclockwise to an upstream direction. The rotation of flow is visible for the MMB 527 and 511 meters located 15.3 and 36.6 m, respectively, from the LDB. For the meter located 10.5 m from the LDB, even though the rotation is visible, the flow direction more or less goes back and forth in the downstream direction after the passage of the barge-tow convoy. Being close to the shoreline, this meter was obviously affected by the breaking waves in this shallow area.

For upstream barge movement, the flow initially moved toward the sailing line and then rotated counterclockwise to the downstream direction. Data collected from other events have shown similar patterns, with the magnitudes of the velocity vectors changing the speed, direction, and river flow characteristics of the test area.

#### Temporal Variations of Velocities and Reynolds Stress

Analyses of the temporal variations of the velocities and Reynolds stress are described briefly in this section. Velocity measured during a 10–15-min period just before the barge passage is called “background velocity,” and the disturbances created due to the barge passage in the cross section are called the “event.” The flow characteristics of background velocity, and their direct comparisons with net velocity changes due to the event that involves removing the mean background velocity, are discussed for three different lateral distances from the shore. This includes evaluation of the longitudinal and lateral velocity components and the turbulent shear stress at particular points between the barge and the shoreline.

Denoting the time-averaged  $x$  component of velocity by  $u$  and its fluctuation by  $u'$ , the following relations for three velocity components ( $u$ ,  $v$ ,  $w$ ) can be written as

$$u = \bar{u} + u', \quad v = \bar{v} + v', \quad w = \bar{w} + w' \quad \dots \dots \dots (1)$$

The time-averaged velocities at a fixed point in space are given by

$$\bar{q} = \frac{1}{T} \int_0^T q \, dt, \quad \text{where } q = (u, v, w) \quad \dots \dots \dots (2)$$

where  $T$  = duration of the background velocity or event; and the time-averages of all fluctuating components equal zero. Fig. 4 shows the periodic variation of turbulent fluctuating velocity components ( $u'$ ,  $v'$ ) and the shear stress ( $-\rho u'v'$ ) at a point 10.5 m from the shore when barge moves downstream at the McEver's Island site shown in Fig. 2(a). The  $x$  component of return flow beside the barge changes significantly for both upstream and downstream traffic and increases in magnitudes by 0.2–0.6 m/s. This increase in velocity can last for 4–8 min and even 15 min near the shore before ambient flow conditions return. This longer time needed for the nearshore station to reach ambient flow conditions is a result of: (1) Chaotic water motion near the shoreline due to the irregular boundary; (2) amplified drawdown and waves in shallower water; and (3) the effects of the refraction and diffraction of waves. This complex velocity behavior near the irregular boundary may also be due to the combined efforts of bowpush and propeller

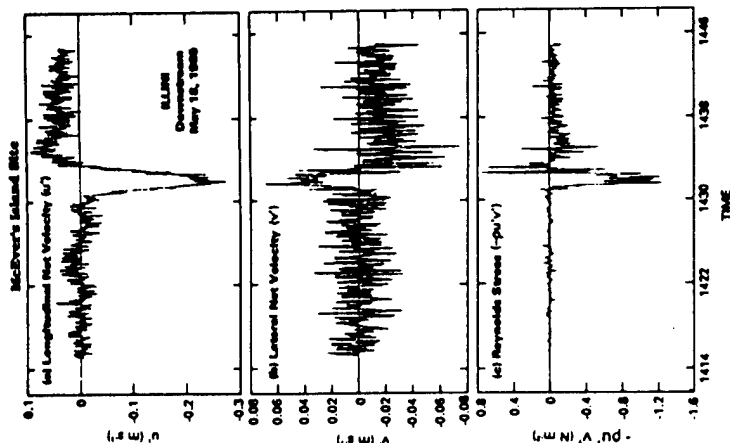


FIG. 4. Temporal Variations of Turbulent Fluctuating Velocities and Reynolds Stress for Downstream Barge

jet behind the barge tow. The lateral velocity ( $y$  component) increases, then decreases and becomes negative before reaching a stationary state. This indicates that for the downstream barge, fluid initially moves toward the shore and then back toward the sailing line [Fig. 4(b)]. The reverse seems to happen for upstream-bound events. The  $x$  component of the return flow can last longer than the  $y$  component beside the barge. The maximum velocity changes due to navigational traffic at this location can be as much as three to ten times the background mean velocity. The maximum velocities, durations of events, and turbulent shear stress generated by the barge movement mainly depend on barge dimension, river cross section, tow speed, draft, and the distance of the barge from the shoreline.

#### Cross-Sectional and Vertical Velocity Distributions

When the barge moves upstream, the natural flow condition is superimposed by the downstream components of return flow beside the barge, which result in increased velocity between the barge and the shore. When the barge moves downstream, the return flow beside the barge moves in the opposite direction to the ambient flow, and the overall velocity becomes zero near the midpoint between the barge and the shoreline and negative

near the shore. The fluid velocity at the boundary of the barge is assumed to be equivalent to the barge speed. At increasing distance from the barge, the fluid velocity decreases; that is, the dragging action exerted on the fluid particles farther from the barge gradually decays. Fig. 5 shows the cross-sectional variation of the longitudinal component of maximum net return flow velocity (removing the background mean) for a set of upstream and downstream events. These changes have been plotted against one-half the width of the river  $y/(W/2)$  in one cross section. The return flow increases in the positive or negative directions due to the respective upstream and downstream movement of the barges. The effects of return flow for both cases are prominent, especially near the shore, creating higher turbulent shear and larger eddies. Fig. 5 also shows that velocity increases significantly at a point about 20% of the distance to the middle of the river (10% of the total width) and then decreases to zero at the midpoint between the shore and the boundary of the barge. The velocity distribution is parabolic in this zone. Because velocity data were not collected beyond this, they could not be presented in this figure.

The vertical distribution of mean background velocities ( $u$ ,  $v$ ) and the maximum return velocities due to the movement of navigational traffic were also analyzed for various barge configurations at a site on the Illinois River near Kampsville (the vertical station at the McEver's Island site had one meter malfunction). Velocity data were collected at three different heights ( $z$ ), 0.20, 1.22, and 2.44 m above the bed. The depth of water at this location was 3.0 m. The current meters were located at a distance of 33.6 m from the shore, which was about 15% of one-half of the width of the river from the RDB. Data for two barge events, one moving upstream and another moving downstream, are presented in Fig. 6. For both events and background conditions, the figure shows that the vertical velocity distributions remained nonlinear and probably follow the logarithmic law. Moreover, the increasing velocities of the barge tow *Conti Karla*, moving upstream, remained fairly constant at all three levels. The magnitude of the increase was about 100%. This shows that in longitudinal velocities changes at all levels due to the movement of barge traffic, and that the increases in velocities

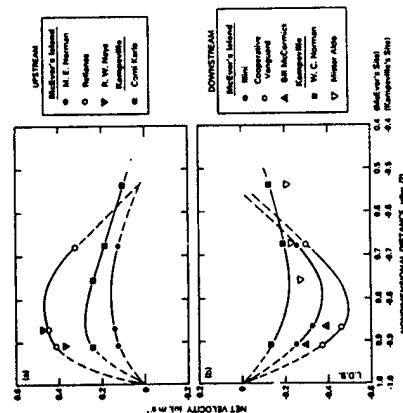


FIG. 5. Net Longitudinal Velocity Distributions due to Movement of Navigation Traffic

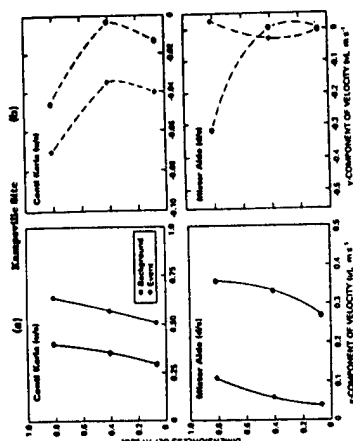


FIG. 6. Variations of Velocity with Depth before and during Upstream and Downstream Barge Movements; (a) Longitudinal Velocity; and (b) Transverse Velocity at the Kampsville Site

are fairly uniform. On the other hand, when the barge tow *Mister Aldo* was moving downstream, the return flow essentially decreased the main flow velocity from about 0.28 m/s near the bed to 0.03 m/s. At an elevation of 2.44 m above the bed, the velocity decreased from about 0.37 to 0.11 m/s. These changes in ambient velocities due to barge movement are quite dramatic and follow the basic concept that the return flow moves in the opposite direction of the barge.

Fig. 6(b) shows the variations in the lateral ( $y$ ) component of the velocity for both barge tows, the *Conti Karla* and the *Mister Aldo*. For the *Conti Karla*, which was moving upstream, the lateral velocity increases at all levels in the vertical, indicating that the water moved toward the shore. The absolute magnitude of these velocity differences is approximately 0.02 m/s at all elevations. Note that the negative sign in the velocity scale indicates that flow is toward the shore.

The changes in the lateral velocities observed for the upstream movement of the barges at the Kampsville and McEver's Island sites are similar. A comparison of Fig. 6(b) (the *Conti Karla*) with similar data from the McEver's Island site has shown that at an equivalent distance from the shore and for both sites, upstream barge movement causes water to move laterally, essentially toward the shoreline. Thus, the actual behavior of the water movement is similar at both sites and at fixed distances from the shore or the centerline. This is extremely important, showing that the physical changes associated with the movement of barge traffic in large rivers are essentially similar, even though the absolute magnitudes of these changes may change for different river configurations.

Fig. 6(b) also shows the plot of transverse velocity changes in the vertical for the barge-tow configuration *Mister Aldo* moving downstream. Even at elevations of 0.2 and 1.22 m above the bed, no significant alterations in velocities occurred. But at an elevation of 2.44 m above the bed ( $z/D = 0.8$ ), the magnitude of velocity decreases from about 0.32 m/s to zero. This indicates that for downstream barge movement, the transverse component of the velocity at a distance of about 15% of the half-width of the channel is essentially toward the centerline of the channel. This is exactly what was

observed for the barge tow *Illini* at the McEver's Island site at an equivalent distance from the shore.

The similarity in the altered velocity structures between the two sites, one 232 m wide (McEver's Island) and the other 330 m wide (Kampsville) indicates that the data and the subsequent analysis performed for each site may be transferred to other sites where field data are not available.

The cross-sectional variation of transverse fluctuating velocity  $v'$  generated by the upstream and downstream barges has also been analyzed. For the upstream barge, transverse velocity  $v'$  decreases near the shore, indicating the movement of fluid toward the sailing line. Then it increases at a distance of 15% of the half-width from the shore due to the fluid movement toward the shore. Again, for the downstream barge, the transverse velocity

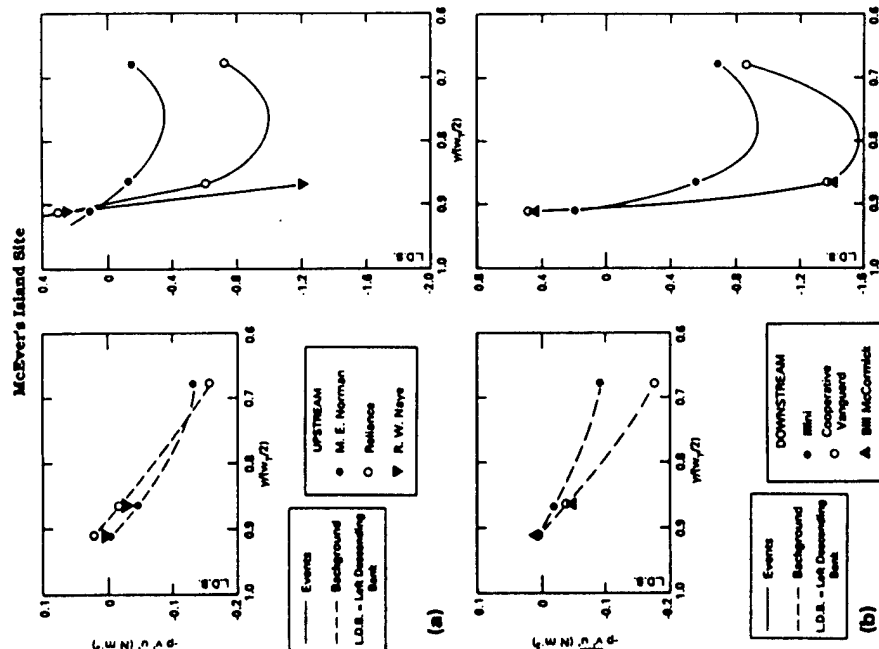


FIG. 7. Lateral Reynolds Stress Distributions before and during Series of Events at McEver's Island Site

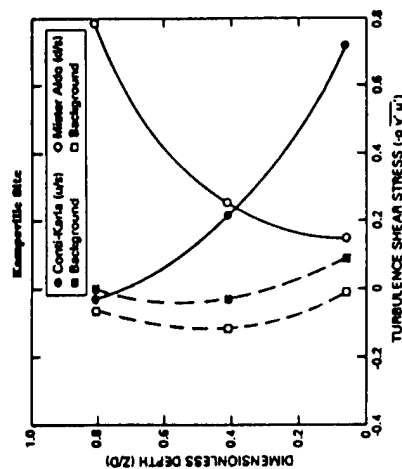


FIG. 8. Vertical Variations of Reynolds Stress for Longitudinal Component of Velocity: Background and Events

( $v'$ ) increases near the shore and then decreases, which means that water moves toward both the shore and sailing line. Therefore, at a particular instant, fluid can be stretched toward the shore and toward the sailing line due to the movement of barge traffic.

#### Reynolds Stress Distribution

Time-averaged Reynolds stress or turbulence shear stress is defined by

$$\tau_{xy} = -\rho \overline{u'v'} = -\rho \frac{1}{T} \int_0^T u'v' dt \quad (3)$$

which can be interpreted as the transport of  $x$  momentum through a surface normal to the  $y$ -axis. Fig. 7 shows the variation of turbulent shear stress distributions ( $-\rho \overline{u'v'}$ ) averaged over the duration 10–15 min before the barge passage and over the duration of the disturbance (event) generated by each barge against one-half of the river's cross section  $y/(W/2)$  for three upstream- and three downstream-bound barges. The Reynolds stress distribution averaged over the duration of the background velocity varies approximately linearly with the distance from the shore, whereas during the events it varies nonlinearly with distance from the shore. The qualitative behavior of Reynolds stress distribution can be compared with distributions measured in closed channels or in wind tunnels (Schlichting 1966; Hinze 1975). There is also a close similarity with the corresponding results obtained in boundary layer flow. The correlation coefficient,  $\psi$ , between the longitudinal and transverse fluctuation at the same point can be defined as [Schlichting (1966) page 533]

$$\psi = \frac{\overline{u'v'}}{\sqrt{\overline{u'^2} \sqrt{\overline{v'^2}}}} \quad (4)$$

The existence of an apparent shearing stress due to velocity fluctuations always implies a correlation between the turbulent velocity components in two different directions. Fig. 7 shows that the turbulent shear stress reaches

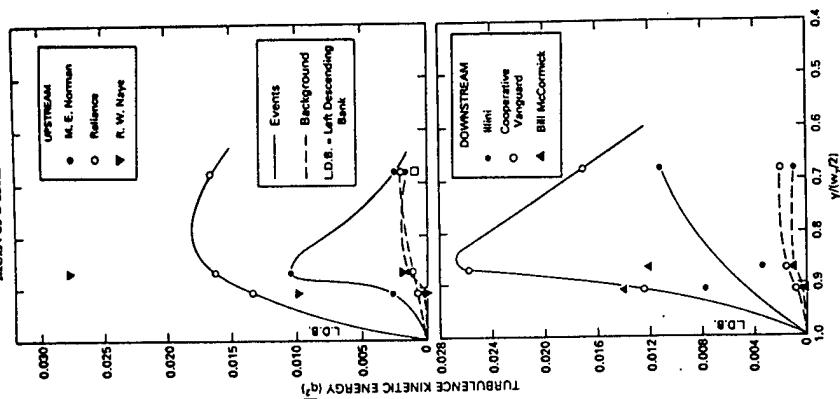


FIG. 10. Lateral Variations of Turbulent Kinetic Energy for Upstream and Downstream Events: Background and Events

#### Turbulence Intensities

The intensity of turbulence or standard deviation  $\sigma_z$  and  $\sigma_y$ , and the relative intensity of turbulence,  $\sigma_z/u$  and  $\sigma_y/v$ , were also computed and analyzed. The distributions of  $\sigma_z$  for both background velocity and barge event have been plotted in Fig. 9 against one-half width of the cross section of the river for six different barges moving upstream and downstream. The distribution of longitudinal turbulence intensity for both upstream- and downstream-bound barges is similar, whereas the distribution of transverse turbulence intensity for the upstream and downstream barges is somewhat different. The intensities of the two turbulence velocities, one for the event and the other for the background, differ appreciably from one another over the half-width of the river. Between 0.8 and 0.9 of  $y/(w_r/2)$ , the differences are substantial. However, the differences appear to decrease as one moves

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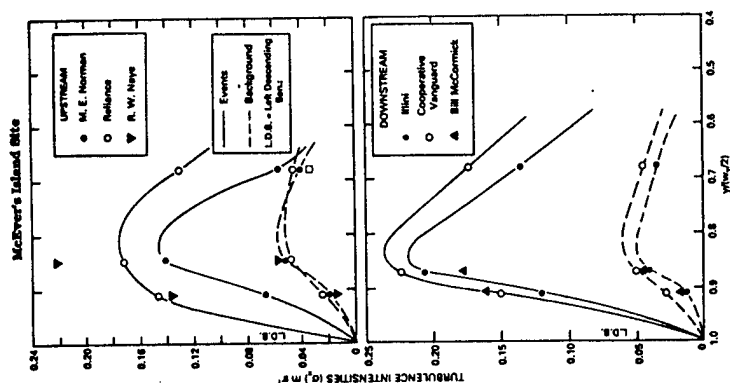


FIG. 9. Lateral Variations of Turbulence Intensities for Upstream and Downstream Barge Movement: Background and Events

to maximum value at  $y/(w_r/2) \approx 0.8$  and then decreases to almost zero in the central zone between the bank and the barge where the turbulent fluctuations decay. The maximum Reynolds stress generated by the movement of navigational traffic is as much as ten times larger than the background velocity. And the movement of barge traffic in a river appears to generate larger eddies and more transverse turbulence shear than the background flows. As there is a linear variation in Reynolds stress for the background velocity, the transfer of energy takes place from the higher shear zone to the lower one.

Fig. 8 shows the vertical variations of the time-averaged Reynolds stress  $(-\rho u'v')$  for the background velocity and two events, one upstream and one downstream barge movement of the Kampsville site. For the upstream barge, the turbulence shear stress is large near the bed and decreases to zero toward the water surface, which is consistent with the increment of depth  $(z/D)$ , shown in Fig. 6. At the same time, for the downstream barge, the turbulence shear stress increases toward the surface, which is also consistent with the vertical variation of velocity due to barge events, as shown in Fig. 6.

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either toward the shore or away from it from this range. The intensity of the longitudinal turbulent velocity component has a higher value than the transverse component, which is comparable to the closed-channel flow or the turbulent boundary layer near the wall (Hinze 1975).

An analysis of the variations of  $\sigma_x$  and  $\sigma_y$  with depth for background velocities and for events (the two upstream and downstream barges shown in Figs. 6 and 8) has shown that the turbulence intensities in both directions due to the movement of barges are higher than the background velocities for both upstream and downstream barges. The x component of turbulence intensities throughout the depth generated by the navigational traffic is as much as four times higher than the background velocity, which is almost uniform with depth.

### Turbulent Kinetic Energy

Turbulent kinetic energy (TKE) per unit mass is defined by

$$TKE = \frac{u'^2 + v'^2}{2} \dots\dots\dots (5)$$

The TKE distribution generated by the velocity changes across the half-width of the river  $y(W/2)$  has been plotted in Fig. 10 for various upstream and downstream events. The TKE distribution for the background velocity averaged over 10–15 min before the barges passages is also shown. These variations in TKE are similar to those shown for the turbulence intensity. TKE increases, reaches a maximum value around 0.8–0.9 of  $y(W/2)$ , and then decreases. It shows that the maximum TKE gathered by the velocity changes due to the barge passage is significantly higher than that for the background velocity. Thus, at a distance of 10–20% of the half-width of the channel from the shore, the TKE becomes highest for both the upstream and downstream barge events.

The analysis presented so far for the velocity and Reynolds stress distributions, including the turbulence intensities and TKE, indicates a significant difference in a large river before and during an event associated with the movement of barge traffic. The critical zone where changes in velocities, turbulence, and TKE occur is at a point about 10–20% of the distance from the shoreline to the half-width of the channel. Additional data collected by ISWS researchers are being analyzed now to quantify these changes and to develop methods for estimating these variations.

### CONCLUSIONS

The movement of barge traffic in a restricted waterway such as the Illinois, Mississippi, or Ohio Rivers can change the velocity structure within the main channel and the channel border area. The changes of velocity (both x and y components) can last for 4–8 min and even 15 min near the shoreline before ambient conditions return. The x component of return flow can last longer than the y component in general. The return flow changes significantly for both upstream and downstream barge movement, increasing in magnitudes (in absolute value) by 0.2–0.6 m/s. These changes occur mostly within a zone of about 10% of the width of the river from the shoreline. The maximum velocity changes due to navigation can be as much as three to ten times the mean background velocity. The effects of return flow for both upstream and downstream barge movements are prominent, especially near the shore where higher turbulent shear and larger eddies are created.

An examination of vertical velocity distributions shows that the increased and decreased velocities for upstream and downstream barge movements, respectively, are quite measurable at all levels from the bed. The changes in velocities observed in the lateral direction for upstream and downstream barge movements at Kampsville are similar to those observed at McEver's Island.

The maximum turbulence shear stress generated by barge movement at a dimensionless distance of about 0.8–0.9 from the centerline of the channel is as much as 10 times higher than that averaged over the duration of background velocity. The movement of barge traffic in a river can generate larger eddies and more transverse shear than can natural flows in the river.

The qualitative behavior of axial turbulence intensity distribution for both upstream and downstream barges movements is similar, whereas the behavior of the transverse turbulence intensity is somewhat different. The intensity of the axial turbulence velocity component has a higher value than the transverse component. This is quite comparable to the turbulent boundary layer near the wall in a closed channel. In fact, the turbulence intensities following events in both axial and transverse directions are as much as four times higher than the background turbulence intensities.

The TKE generated by the event increases, reaches a maximum value between 0.8 and 0.9 of  $y(W/2)$ , and then decreases. This shows that the maximum TKE produced by the velocity changes is significantly higher than the background TKE in the natural river.

### ACKNOWLEDGMENTS

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## APPENDIX II. NOTATION

The following symbols are used in this paper:

- $D$  = local depth of river;  
 $g$  = acceleration due to gravity;  
 $h$  = water-level depression/drawdown;  
 $q$  = velocity vector,  $q = (u, v, w)$ ;  
 $T$  = duration of time period;  
 $t$  = time;  
 $u, v, w$  = velocity components;  
 $u', v', w'$  = fluctuating velocity components;

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- $\bar{u}, \bar{v}, \bar{w}$  = time averaged velocities;  
 $W_r$  = width of river;  
 $x$  = axial coordinate;  
 $y$  = lateral coordinate;  
 $z$  = vertical coordinate;  
 $\rho$  = density of water;  
 $-\rho u'v'$  = turbulent shear stress;  
 $\sigma_x, \sigma_y$  = turbulence intensities ( $x$  and  $y$  components); and  
 $\tau_{xy}$  = turbulent shear stress.

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# RETURN FLOW IN RIVERS DUE TO NAVIGATION TRAFFIC

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Bijoy S. Mazumder,<sup>3</sup> and Ta Wei Soong,<sup>4</sup> Member, ASCE

## INTRODUCTION

Movement of navigation traffic (barges-tows) in restricted waterways such as the Illinois or Mississippi Rivers can generate rapid return flow and water-level depression (drawdown) between the barge and the shoreline. Consequently, the velocity distribution in the zone between the barge and the shoreline changes temporarily in space and time. Many investigators have developed methods to compute the return velocity based on the concept of one-dimensional conservation of mass, momentum, or energy. Some investigators have also discussed methods of computing the return-velocity distribution across the channel between the barge and the shoreline. All the methods predict an exponential velocity distribution that decreases laterally with distance from the barge. However, from the field data, it has been observed that existing models do not exactly represent field conditions. The objective of the present study is to use existing models to compute the average return flow and the lateral return flow distribution, and compare them with the observed data to test the validity of these models.

## RETURN FLOWS

Schijf and Jansen (1953) and Tothill (1966) developed the following equations to predict average return flow in connection with the movement of barge traffic in a narrow channel with a rectangular or trapezoidal cross section based on the conservation of energy and mass:

$$2gh = (u_s + u_{ar})^2 - u_s^2 \quad (1)$$

and

$$u_s A_s = (u_s + u_{ar})(A_s - A_m - W_T h) \quad (2)$$

where  $h$  = drawdown;  $u_s$  = barge speed;  $u_{ar}$  = average return velocity along the river flow direction;  $g$  = acceleration due to gravity;  $A_s$  = wetted cross-sectional channel area;  $A_m$  = average submerged cross-sectional area of the vessel; and  $W_T$  = top width of the channel

Sharp and Fenton (1968) and Bouwmeester (1977) developed methods to predict return flow beside the barge on the basis of one-dimensional momentum and continuity equations as

$$F_1 - F_2 - F_3 = \rho A_s (u_{ar} + \bar{U})(u_{ar} - \bar{U}) \quad (3)$$

and

$$A_s(u_{ar} + \bar{U}) = A_1(u_{ar} + u_{ar}) \quad (4)$$

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where  $u_s$  = barge speed with respect to bank;  $\bar{U}$  = average ambient velocity;  $\rho$  = density of fluid;  $F_1$ ,  $F_2$ , and  $F_3$  = forces acting on a control volume of water; and  $A_1 = W_T(D - h) - s(D^2 - h^2) - A_m$ , where  $D$  = average water depth and  $s$  = slope of embankment expressed as tangent of bank inclination.

Blauuw and van der Knaap (1983) modified the Bouwmeester's method and developed the equations for the conservation of momentum and mass as

$$F_1 - F_2 - F_3 = \frac{\rho A_s (A_m + W_T h) u_s^2}{A_s - A_m - W_T h} \quad (5)$$

and

$$A_s u_s = A_s (u_s + u_{ar}) \quad (6)$$

where  $A_s = A_s - A_m - W_T h$  is defined as the wetted cross-sectional area of the channel after drawdown minus area of midvessel section

Hochstein and Adams (1989) developed a method to directly compute average return flow  $u_{ar}$  as

$$u_{ar} = u_s \{[(a + 1)B + 1]^{1/(n+1)} - 1\} \quad (7)$$

where  $a = [n/(n + 1)]^{2/3}$ ; and  $B =$  either  $0.3e^{1/(n+1)}$  for  $u_s/u_{cr} \leq 0.65$  or 1 for  $0.65 < u_s/u_{cr} \leq 1$ , where  $n = A_s/A_m$  and  $u_{cr}$  = the so-called first critical velocity, given by Hochstein (1967)

## RETURN FLOW DISTRIBUTIONS

Hochstein and Adams (1989) assumed that the shape of lateral return flow distribution from the barge to the shoreline is exponential and is expressed by

$$u_r(y) = k_1 e^{-k_2 y} \quad (8)$$

where  $y$  = distance measured from the barge;  $k_1 = \alpha u_{ar} d$ ; and  $k_2 = W_T/\alpha[1 - e^{-\alpha F(\alpha)}]$ , where  $d$  = barge draft,  $F(\alpha) = 0.42 + 0.5 \ln \alpha$ ,  $W_T$  = distance from the barge to the shoreline,  $\alpha =$  either 1 or  $W_T/b \leq 2.5$  or  $0.114W_T/b + 0.715$  for  $W_T/b > 2.5$ , and  $b$  = beam width of barge.

Simons et al. (1981) used the one-dimensional velocity equation proposed by Hochstein (1967) to determine an exponential distribution of the return velocity from the barge to the shoreline as

$$u_r(y) = \alpha u_s (\sqrt{a} - 1) e^{-k(y)} \quad (9)$$

where  $k(y) = 1 + \alpha^2 y e^{-\alpha F(\alpha)/W_T}$ .

Berger et al. (1981) determined an exponential variation of the return velocity from the barge to the shoreline as

$$u_r(y) = u_{r,max} e^{-y/k_2} \quad (10)$$

where  $u_{r,max}$  = average local maximum return velocity over the depth beside the barge recommended by Fuehrer and Römisch (1977).

More recently, Maynard and Siemsen (1991) developed an exponential equation to compute the cross-sectional return velocity distribution from the tow to the shoreline as

$$u_r(y) = u_{r,m} e^{C(y-b)/(W_T-b)} \quad (11)$$

where  $C = 1.2[0.024(2A_{side}/A_m) - 0.266]$ ; and  $u_{r,m} = u_{r,side}[0.024(2A_{side}/A_m) + 0.734]$ , where  $A_{side}$  = cross-sectional area of the river from the centerline of the tow to the

shoreline,  $u_{rside} = u_{ur}[0.36(A_c/2A_{side}) + 0.64]$ , and  $u_{ur}$  = average return velocity computed by using Schijf and Jansen's (1953) equation.

## FIELD DATA COLLECTION

Field data were collected from the Illinois River at river mile 35.2, near Kampsville. The average width of the river at this location is about 320 m during the data collection period. The river flow characteristics are presented in Table 1. Fig. 1 shows a schematic diagram of this site and relative locations of two-dimensional electromagnetic current meters (Marsh-McBirney, Inc., models MMB511 and MMB527) used to collect field data. The current meters were programmed to continuously measure  $x$  and  $y$  components of flow velocity at a rate of one sample per second. The  $x$ -axis is along the longitudinal direction of the river and positive in the downstream direction. The  $y$ -axis is perpendicular to the sailing line and positive toward the right bank of the river. Data from six upstream and five downstream bound barges (total of 11 events) were used in this study. Characteristics of these

TABLE 1. River Flow Characteristics

| (1)                       | 10/10/90<br>(2) | 10/15/90<br>(3) | 10/18/90<br>(4) |
|---------------------------|-----------------|-----------------|-----------------|
| $Q_w$ (m <sup>3</sup> /s) | 413             | 772             | 817             |
| $\bar{U}$ (m/s)           | 0.36            | 0.58            | 0.61            |
| $D$ (m)                   | 3.44            | 3.64            | 3.91            |

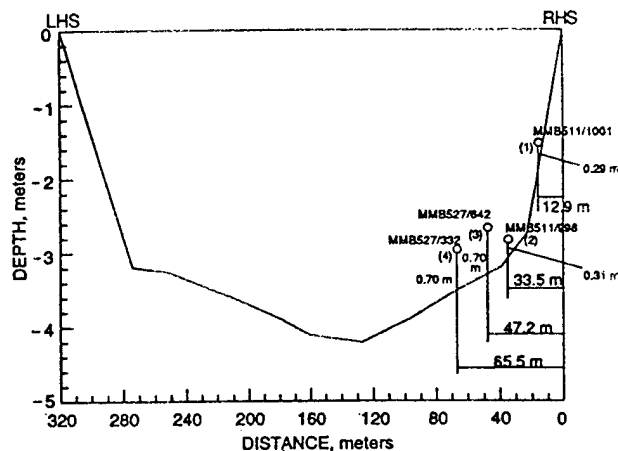


FIG. 1. Field Site on Illinois River at Kampsville and Relative Locations of Two-Dimensional Electromagnetic Current Meters

TABLE 2. General Barge-tow Information

| Barge name<br>(1) | Direction<br>(2) | Configuration<br>(3) | Speed<br>(m/s)<br>(4) | Draft<br>(m)<br>(5) | Distance<br>from right<br>bank<br>(m)<br>(6) |
|-------------------|------------------|----------------------|-----------------------|---------------------|----------------------------------------------|
| Sugarland         | upstream         | 3 × 4                | 2.25                  | 2.29                | 168                                          |
| Conti Karla       | upstream         | 3 × 5 + 1            | 2.05                  | 2.35                | 143                                          |
| Mr. Lawrence      | upstream         | 3 × 5                | 2.92                  | 1.74                | 168                                          |
| Charles Lehman    | upstream         | 3 × 4 + 1            | 2.20                  | 2.74                | 143                                          |
| Nicholas Duncan   | upstream         | 3 × 3                | 1.89                  | 2.74                | 130                                          |
| Mr. Paul          | upstream         | 3 × 5                | 2.81                  | 1.62                | 130                                          |
| Mr. Aldo          | downstream       | 2 × 1 + 3 × 4        | 2.36                  | 2.74                | 130                                          |
| William C. Norman | downstream       | 3 × 4                | 2.54                  | 2.74                | 137                                          |
| Rambler           | downstream       | 3 × 4                | 2.09                  | 2.74                | 147                                          |
| Ardyce Randall    | downstream       | 3 × 5                | 1.96                  | 2.74                | 143                                          |
| Margaret O.       | downstream       | 3 × 4                | 3.48                  | 2.04                | 130                                          |

events are given in Table 2, in which vessel speed is relative to the streamflow.

## VELOCITY ALTERATION

Mazumder et al. (1991, 1993) and Bhowmik and Xia (1993) discussed the turbulence characteristics of ambient velocity and compared them with those generated by barge-tow passage within the channel border area of a natural river. These analyses have shown that various turbulence parameters do increase and a return current in the direction opposite the barge motion is generated during barge-tow passages.

Figs. 2 and 3 show the temporal variations of turbulent fluctuating velocity components  $u'$  and  $v'$ , that is, return velocity components  $u_r$  and  $v_r$ , for an upstream (Nicholas Duncan) and a downstream bound barge (Mr. Aldo), respectively. An 11-point moving average technique was used to smooth out the fluctuations of the velocities. The selection of the 11-point moving average was done by experimenting with the data either to smooth out the fluctuations or to preserve the peak values of the velocities. The values of  $u_r$  and  $v_r$  can be determined by subtracting the ambient mean velocities  $\bar{u}$  and  $\bar{v}$  from the measured flow velocities  $u$  and  $v$ , respectively. The data shown in Figs. 2 and 3 are taken from a current meter installed 33.5 m from the shoreline at an elevation 0.31 m above the bed.

From Figs. 2 and 3, the effects of an event are either to increase the longitudinal return velocity  $u_r$  for upstream-bound barges or decrease it for downstream-bound barges. There is

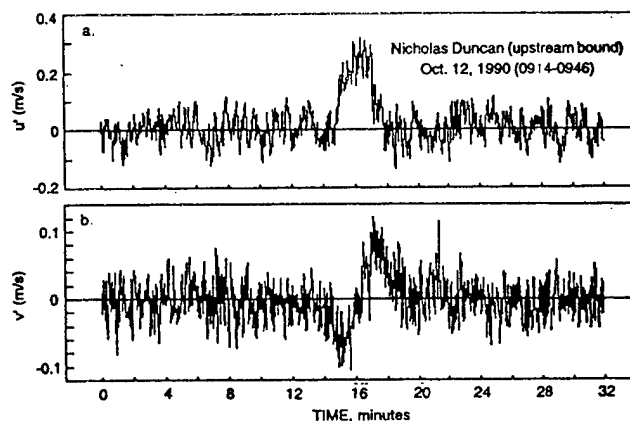


FIG. 2. Return Velocity Changes during Upstream Barge Movements: (a) Longitudinal; (b) Lateral

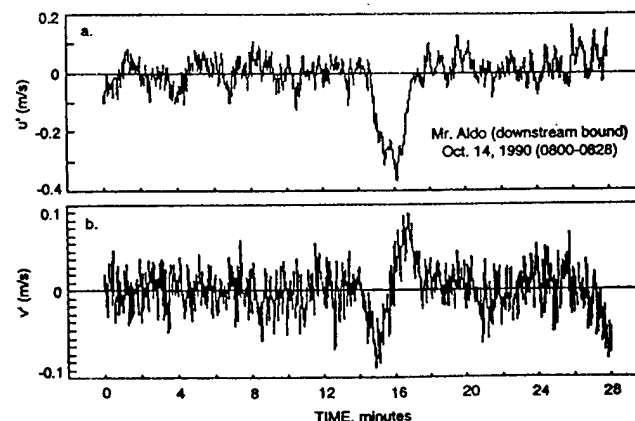


FIG. 3. Return Velocity Changes during Downstream Barge Movement: (a) Longitudinal; (b) Lateral



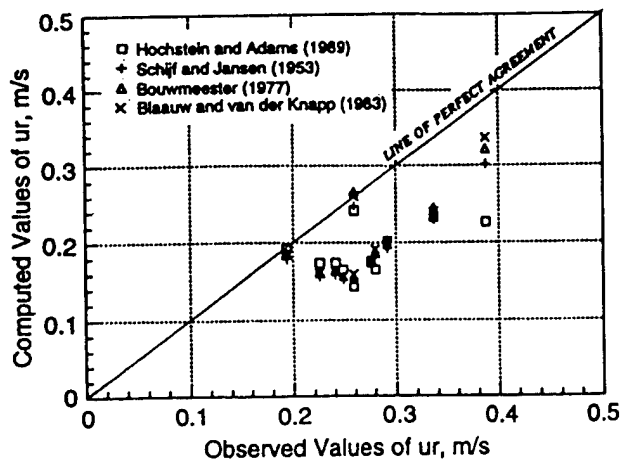


FIG. 4. Computed and Measured Values of Average Return Velocities

a maximum or minimum value of  $u_r$  for an upstream or downstream bound barge [see Figs. 2(a) and 3(a)], which actually reflects the maximum impact of the barge passage on the flow-velocity structure. Analysis of the lateral return velocity  $v_r$  shows the presence of a somewhat rotating flow field [see Figs. 2(b) and 3(b)]. This is because there is a change in the

direction of the lateral velocities during an event. This study only considers the  $u_r$  related to the maximum impact of the navigation traffic in order to compare the field data with the existing return flow models.

#### AVERAGE RETURN VELOCITY

Four existing models (Schijf and Jansen 1953; Bouwmeester 1977; Blauuw and van der Knaap 1983; and Hochstein and Adams 1989) can be used to predict the average return velocity. In this analysis, return velocities measured at all data collection locations at the Kampsville site on the Illinois River for each event were averaged to obtain an average return velocity within the width between the barge and the shoreline. These average return velocities for all 11 events were compared with the predicted average return velocities computed from the four existing models. These results then are shown in Fig. 4. Examination of this figure shows that all the methods proposed by the previous investigators tend to underestimate the average return velocity and this underestimation can reach up to about 30%.

#### LATERAL DISTRIBUTION OF RETURN VELOCITY

The variation of flow velocity from the barge to the river bank is also important for any study on the physical changes due to navigation traffic. The methods proposed by Simons et al. (1981), Berger et al. (1981), Hochstein and Adams

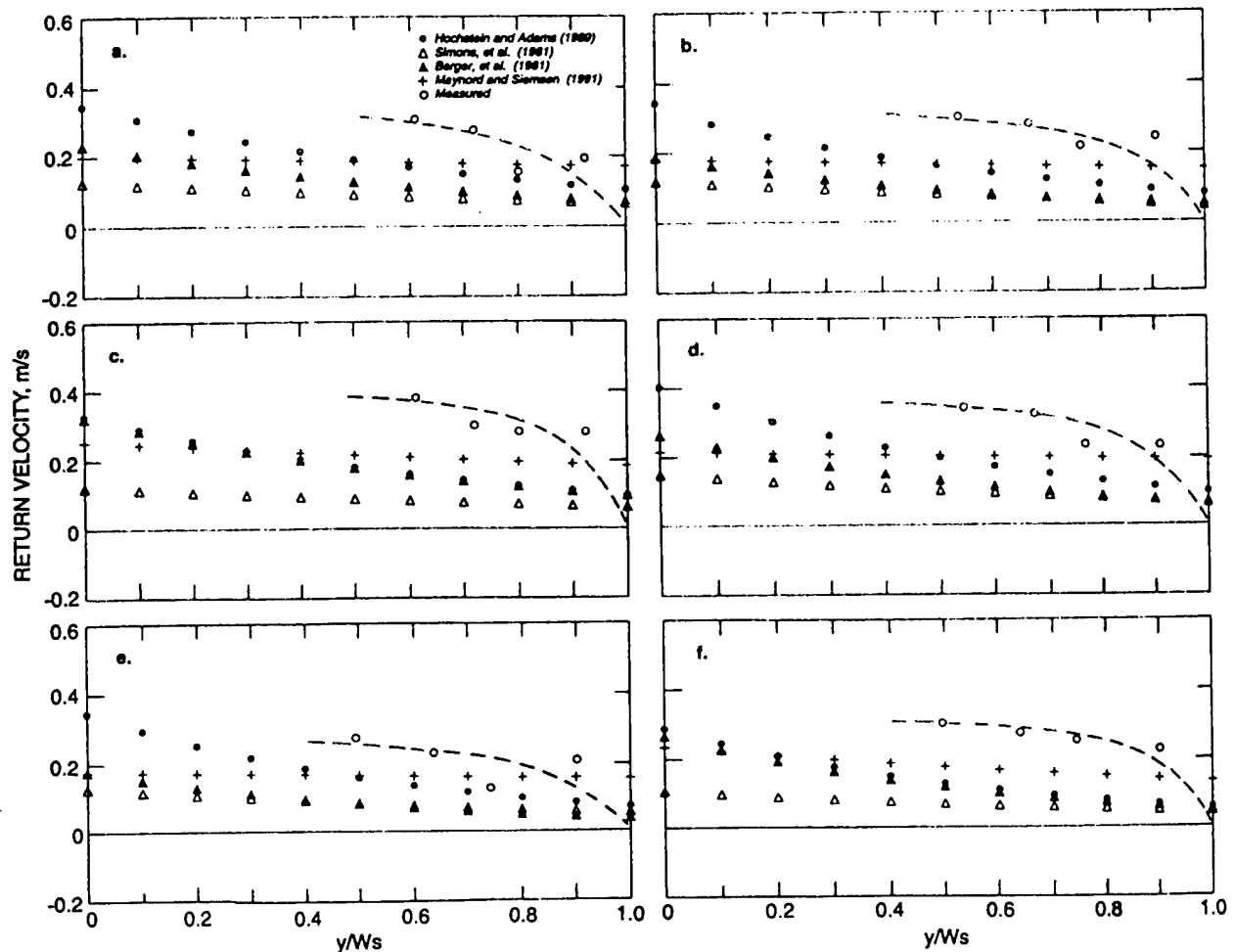


FIG. 5. Comparison between Computed and Measured Lateral Velocity Distribution for Upstream Bound Barges: (a) Sugarland; (b) Cont'l Karla; (c) Mr. Lawrence; (d) Charles Lehman; (e) Nicholas Duncan; (f) Mr. Paul

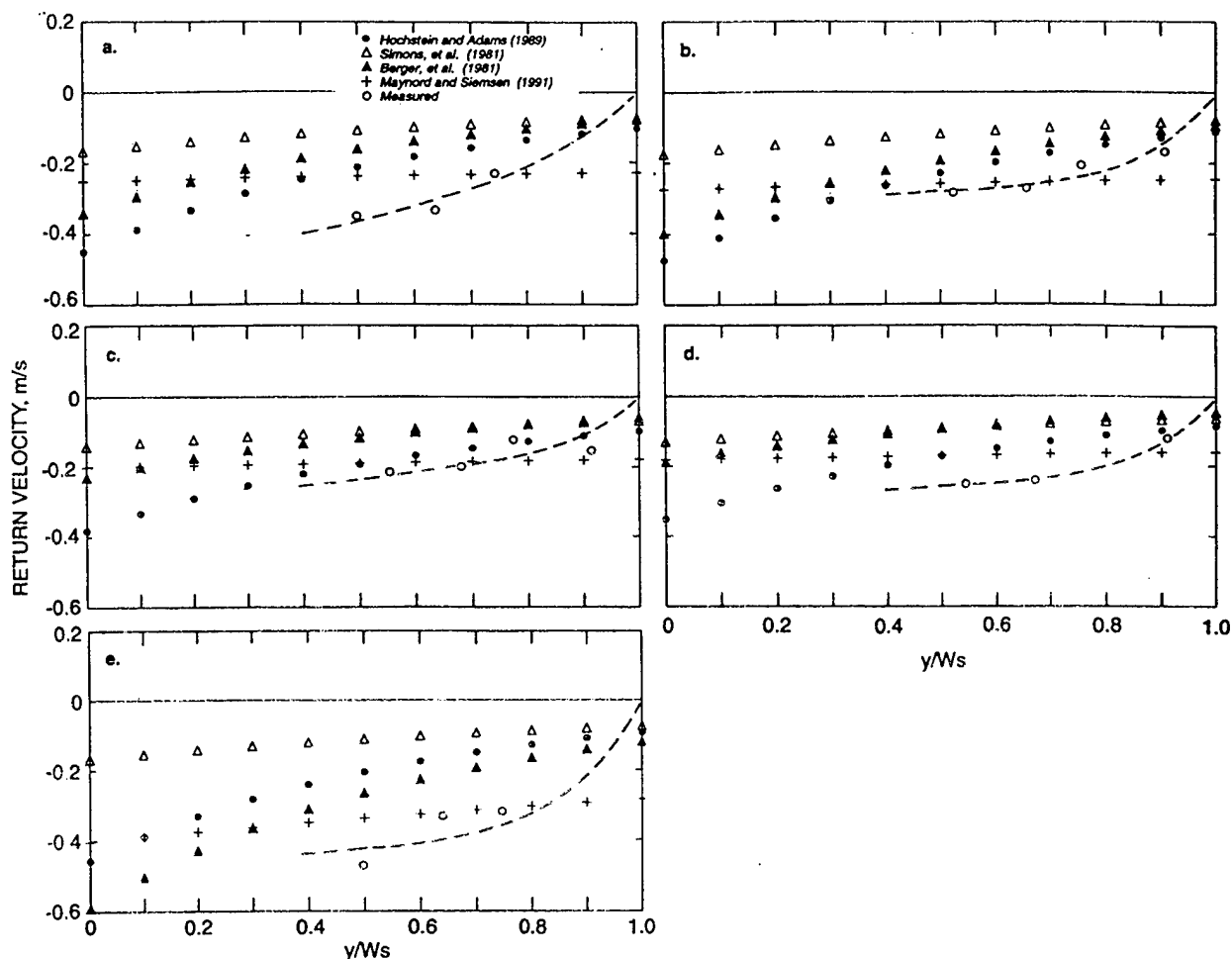


FIG. 6. Comparison between Computed and Measured Lateral Velocity Distribution for Downstream Bound Barges: (a) Mr. Aldo; (b) William C. Norman; (c) Rambler; (d) Ardyce Randall; (e) Margaret O

(1989), and Maynard and Siemsen (1991) can be used to determine the shape of the lateral return flow distribution. In all of these methods, predicted return velocity distributions decrease exponentially with distance from the barge to the shoreline. However, the field data collected from the Illinois River show a different lateral distribution of the return flow.

Figs. 5 and 6 show the predicted (dashed line) and measured lateral return velocity distributions for six upstream and five downstream bound barges. An examination of these plots for the 11 events shows that none of the existing models correlates well with the field data. For either the upstream or downstream bound barges, the return flow generated by barge-tows increases with distance from the shoreline and appears to have a parabolic-like distribution in the lateral direction. All the existing models underpredict the magnitude of the return velocities within the zone where velocity data were collected in the field for the present project.

## CONCLUSIONS

Movement of navigation traffic in natural rivers is normally associated with a set of physical changes, including a return current and altered vertical and lateral velocity regimes. The changes of flow-velocity structure are important in the evaluation of sensitive biologist habitats within the channel border areas. Many investigators have developed methods to predict the return flow. However, a comparison of these methods

with field data shows that the existing models do not predict the return flow that well.

In this analysis, it was found that all the existing models underestimate the average return flow velocity by as much as 30%. It was also found that the exponential return flow distribution across the width between the barge and the shoreline described by the existing models are not supported by the field data. An examination of the field data indicates that the return flow due to the movement of navigation traffic may have a parabolic-like distribution. Therefore, it may be necessary to develop a more realistic model to predict the return flow in natural rivers due to the movement of navigation traffic.

## ACKNOWLEDGMENTS

This research project was partially supported by the U.S. Army Corps of Engineers and the National Biological Service (NBS) through the Environmental Management Program for the UMRS. The project was administered by the NBS Environmental Management Technical Center, Onalaska, Wisconsin, with Ken Lubinski at the Project Director. Many Illinois State Water Survey staff assisted in field-data collection and processing of the data, including Rodger Adams, Bill Bogner, Jim Slowikowski, and Ed Delisio. The writers express sincere thanks to all of them for the outstanding efforts in this endeavor.

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## APPENDIX II. NOTATION

The following symbols are used in this paper:

- $A_c$  = wetted cross-sectional channel area;  
 $A_m$  = average submerged cross-sectional area of vessel;  
 $A_{side}$  = cross-sectional area from tow centerline to shoreline;  
 $a$  = ratio of cross-sectional areas;  
 $B$  = empirical parameter;  
 $b$  = vessel beam;  
 $D$  = average depth of water;  
 $d$  = vessel draft;  
 $F_1, F_2, F_3$  = forces acting on control volume of water;  
 $g$  = acceleration due to gravity;  
 $h$  = water-level depression (drawdown);  
 $k_1, k_2$  = constraint factors;  
 $Q_w$  = flow discharge;  
 $s$  = slope of embankment;  
 $\bar{U}$  = average ambient velocity;  
 $u, v$  = velocity components;  
 $u', v'$  = fluctuating velocity components;  
 $\bar{u}, \bar{v}$  = time average velocity components;  
 $u_{rr}$  = average return velocity along flow direction;  
 $u_{cr}$  = critical velocity;  
 $u_r, v_r$  = return velocity components;  
 $u_s$  = vessel speed with respect to bank;  
 $u_t$  = vessel speed;  
 $W_l$  = lateral distance from vessel to bank;  
 $W_T$  = top width of river;  
 $\alpha$  = correction factor; and  
 $\rho$  = density of water.

# Distribution of turbulent velocity fluctuations in a natural river

## Distribution des fluctuations de vitesse turbulente dans une rivière naturelle

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### SUMMARY

Turbulent characteristics of flow velocity in a natural river were systematically analyzed in this study. Flow velocities were measured with time at six different lateral locations and at three different vertical elevations on a major navigable waterway in the United States. Analyses of the velocity data include the cross-sectional and vertical distributions of longitudinal and transverse velocity components ( $u$ ,  $v$ ), the fluctuating velocity components ( $u'$ ,  $v'$ ) and their frequency-distribution curves, turbulent intensities ( $\sigma_u$ ,  $\sigma_v$ ), and turbulent shear stress ( $-\rho \overline{u'v'}$ ). These analyses have shown that the strongest velocity fluctuation occurs near the main channel area above the river bed.

### RÉSUMÉ

Cet article analyse systématiquement les caractéristiques turbulentes de la vitesse d'écoulement dans une rivière naturelle. Les vitesses d'écoulement ont été enregistrées en fonction du temps en 6 positions différentes sur la largeur et à trois profondeurs d'une des principales voies navigables des USA. Les analyses des mesures de vitesse comprennent les distributions horizontale et verticale des composantes longitudinale et transversale du vecteur vitesse ( $u$ ,  $v$ ), les composantes fluctuantes ( $u'$ ,  $v'$ ), leurs spectres de distribution d'énergie, leurs intensités turbulentes ( $\sigma_u$ ,  $\sigma_v$ ) et leurs contraintes de cisaillement turbulentes ( $-\rho \overline{u'v'}$ ). Ces analyses ont montré que la plus importante fluctuation de vitesse est observée au voisinage du chenal principal à la verticale du lit de la rivière.

### 1 Introduction

When flow at a high Reynolds number moves between fixed boundaries, the longitudinal and transverse components of flow velocity, as well as the normal and tangential stresses, must be expected to fluctuate with time and space. Although these nonperiodic fluctuations are generally secondary in magnitude compared to the mean motion, they have profound effects on properties of the primary mean motion. Over the years several experimental studies have been performed using

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various techniques [10,11,12,13] in order to understand the mean flow and turbulent characteristics of open channel flow. Recently, the use of Laser Doppler Anemometers has also greatly advanced the investigation of turbulent structures in compound channels [7] and submerged hydraulic jumps [8]. However, turbulence and shear stresses in natural river systems are elusive subjects, and they have not yet been studied in great detail [1,2,3,5,6,15]. Scientists from the Illinois State Water Survey have been involved in collecting and analyzing detailed velocity data from a large river system using 2-D electromagnetic current meters. The goal of this research is to understand the turbulent velocity structure in natural river systems, especially near the channel border areas. An understanding of turbulence in natural rivers is important for the sediment transport, bank erosion, and evaluation of biological habitats as they relate to the physical and hydraulic characteristics of a river. The present investigation is aimed at presenting and identifying the temporal fluctuations of velocity components and turbulent shear stress for natural river flow. It addresses cross-sectional and vertical variations of velocity components ( $u, v$ ), velocity fluctuation components ( $u', v'$ ), turbulent intensities ( $\sigma_u, \sigma_v$ ), and turbulent shear stress ( $-\rho \overline{u'v'}$ ).

## 2 Equipment and data collection

A site-specific field study was conducted to investigate changes of velocity and turbulent shear stress in the Illinois River, a large natural river. Figure 1 shows a schematic diagram of the field set-up used in this investigation on the Illinois River at Kampsville, river mile (RM) 35.2. The  $x$ -axis is the longitudinal direction of river flow;  $y$ -axis is perpendicular to the sailing line, with the positive direction toward the left-hand side (LHS) of the river; and  $z$ -axis is normal to the  $xy$ -plane. The origin is set at the right-hand side (RHS) of the river. This study is part of a major research undertaking focusing on changes in hydrodynamic characteristics of the Upper Mississippi River System (UMRS) due to navigation traffic (the Illinois River is part of the UMRS). The present paper will concentrate on the turbulent characteristics of natural rivers without considering external disturbances such as the movement of navigation or recreational traffic.

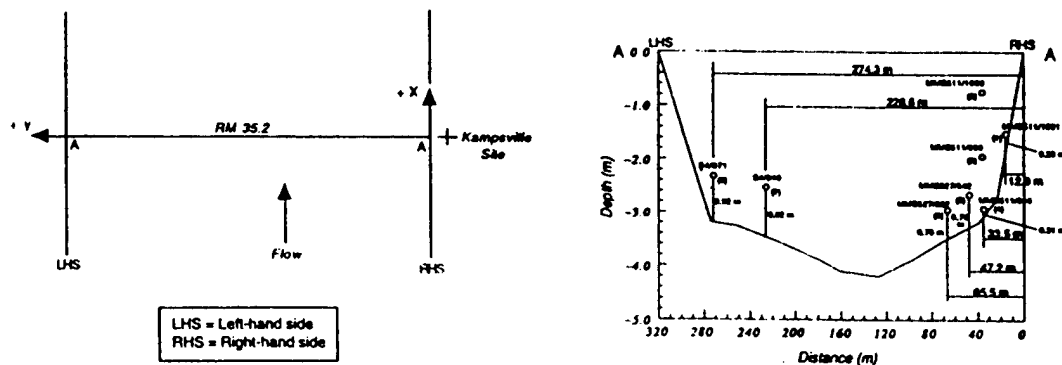


Fig. 1. Schematic diagram showing the data collection set-up on the Illinois River at Kampsville.

Velocity data were collected using eight 2-D electromagnetic current meters (six Marsh McBirney MMB511 and MMB527 meters and two Inter Ocean S4 meters). The relative locations of these meters are also shown in Figure 1. Current meters MMB511, MMB527, and S4 have spherical sensors of 3.9, 10.3, and 25.0 centimeters, respectively. All the meters have four probes and separate housings for electronics. The signal processing unit in each meter provides visual readings for the

$x$  and  $y$  components of flow velocity. The accuracy and basic capabilities for these meters are presented in table 1. Figure 2 shows one MMB527 meter, along with a panoramic view of the field site.

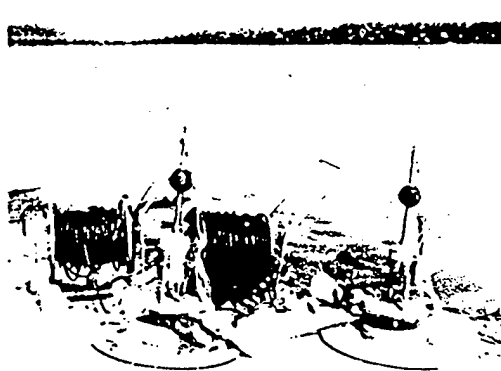


Fig. 2a. MMB527 meter used in the field.

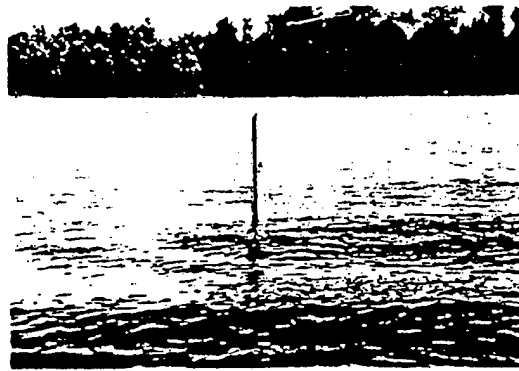


Fig. 2b. Panoramic view of the field set-up.

The  $x$  and  $y$  components of flow velocity ( $u$ ,  $v$ ) were continuously measured with time by two MMB511, two MMB527, and two S4 current meters at six lateral locations at distances of 12.9, 33.5, 47.2, 65.5, 228.6, and 274.3 meters (m) from the RHS of the river. The six meters were located at depths from 0.29 to 0.92 m above the river bed to measure the velocity fluctuation close to the bed in the cross-sectional direction. Three MMB511 current meters were also mounted at three vertical heights of 0.31, 1.22, and 2.44 m above the river bed, at a lateral distance of 33.5 m from the RHS. The three meters were used to detect the variations of velocity fluctuation in the vertical direction. To show real variations of flow velocity both in the lateral and vertical directions, the ideal approach would be to install a series of current meters (about 40 to 50) along a river cross section, and then draw isovels based on data measured. However, in the field conditions, this approach was not feasible because it required a substantial amount of money and personnel. In this study, velocity data were collected at the rate of one sample per second to study the turbulent velocity fluctuations.

Table 1. Meter specifications

| Meter  | Manufacturer      | Parameters                                                  | Range                                                     | Accuracy                                         |
|--------|-------------------|-------------------------------------------------------------|-----------------------------------------------------------|--------------------------------------------------|
| MMB527 | Marsh<br>McBirney | $u, v$<br>direction                                         | +300 cm/sec<br>0–360°                                     | +2% of<br>reading                                |
| MMB511 | Marsh<br>McBirney | $u, v$<br>direction                                         | +300 cm/sec                                               | +2% of<br>reading                                |
| S4     | Inter<br>Ocean    | $u, v$<br>direction<br>depth<br>temperature<br>conductivity | 0–350 cm/sec<br>0–360°<br>0–70 m<br>–5–45°C<br>1–70 mS/cm | 0.2 cm/sec<br>0.5°<br>4 mm<br>0.5°C<br>0.1 mS/cm |

### 3 Analysis of velocity data

The longitudinal and transverse components of flow velocity ( $u, v$ ), turbulent intensities ( $\sigma_u, \sigma_v$ ), and turbulent shear stress ( $-\overline{u'v'}$ ) were computed to better understand the turbulent velocity fluctuations in natural rivers. The velocity data were collected on three consecutive days (October 13 through 15, 1990). Four time slots were selected during which disturbances due to navigation or recreational traffic were absent:

| Date       | Time      | Flow discharge, $Q$ (m <sup>3</sup> /s) |
|------------|-----------|-----------------------------------------|
| October 13 | 1230–1330 | 732.5                                   |
| October 14 | 1345–1445 | 758.6                                   |
| October 15 | 1100–1200 | 771.7                                   |
| October 15 | 1230–1330 | 776.0                                   |

The one-hour time interval was selected based on an evaluation of the turbulent velocity fluctuations (to be described later). The 60-minute duration essentially eliminates the variability due to short-term natural fluctuations in velocity within a river.

The temporal variations of longitudinal and lateral velocities and turbulent shear stress at any particular point in the river are of equal importance to those variations in space. The variation of velocities with time indicates acceleration, and the variation of turbulent shear stress with time indicates the transfer of momentum. These changes generate secondary currents and eddies. Denoting the instantaneous flow velocity into two parts, a time-averaged component and a fluctuating component, the relationships for the three velocity components ( $u, v, w$ ) can be written:

$$u = \bar{u} + u'; \quad v = \bar{v} + v'; \quad w = \bar{w} + w' \quad (1)$$

The time-averaged component at a fixed point in space is given by:

$$\bar{A} = \frac{1}{T} \int_0^T A dt \quad (\bar{A} = \bar{u} \text{ or } \bar{v} \text{ or } \bar{w}) \quad (2)$$

where  $T$  must be a relatively longer time in comparison to the time scale of turbulence. Under the given time interval,  $T$ , the time-averaged value of the fluctuating component should be zero, i.e.:

$$\bar{A}' = \frac{1}{T} \int_0^T A' dt = 0 \quad (\bar{A}' = \bar{u}' \text{ or } \bar{v}' \text{ or } \bar{w}') \quad (3)$$

In order to determine the optimum time interval,  $T$ , the data collected during the four selected time slots were evaluated and tested. The values of  $u'$  and  $v'$  according to equation (3) were computed for each set of data for different time intervals. Figure 3 gives the results of the analysis of the data set for October 13, 1990, 1230 to 1330 hours. The time-averaged values of  $u'$  and  $v'$  normally stay high for time intervals of 5 to 20 minutes. After that, the values of  $\bar{u}'$  and  $\bar{v}'$  start to decrease asymptotically toward zero, and attain a value of about zero after 60 minutes. Similar variability and asymptotic natures were also observed for the other three time slots.

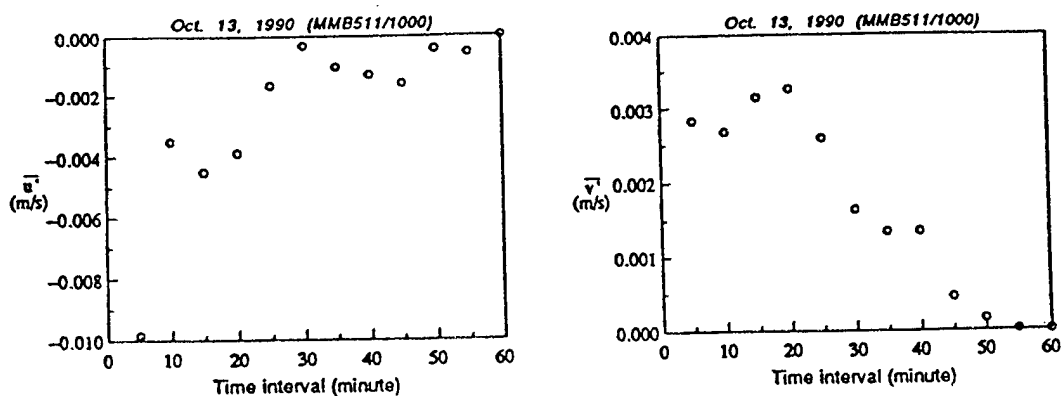


Fig. 3. Variations of  $\bar{u}$  and  $\bar{v}$  with time.

This analysis indicates that the 60-minute interval is probably quite appropriate for the determination of turbulent velocity fluctuations in large rivers such as the Illinois River.

Figure 4 shows the time series plots of flow velocity for the  $u$  and  $v$  components and their respective fluctuations,  $u'$  and  $v'$ , for a period of 60 minutes for the October 13 data set. A comparison of the magnitude of  $u$  with that of  $v$  shows that the transverse velocity component  $v$  is much less than the longitudinal velocity component  $u$ . These differences are approximately one order in magnitude. This is normally expected in open channel flow where the overall motion of the flow is in the direction of the longitudinal  $x$ -axis.

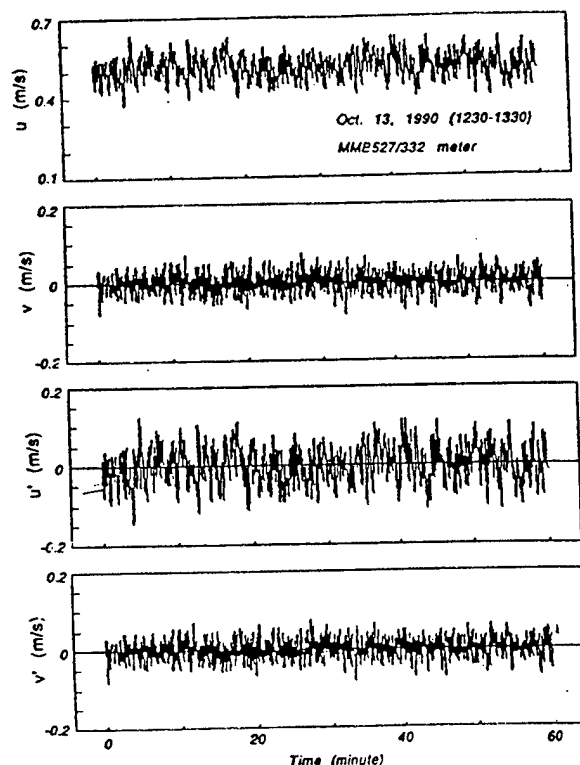


Fig. 4. Variations of measured  $u$  and  $v$  and  $u'$  and  $v'$  with time.



### 3.1 Cross-sectional and vertical velocity distributions

The longitudinal and transverse velocity components, each averaged over 60 minutes for four time slots on three consecutive days, have been plotted against the relative width ( $y/W$ ) of the river in Figure 5, where  $y$  is the distance of each current meter from the RHS of the river and  $W$  is the cross-sectional top width of the river. This plot shows how the  $x$  and  $y$  components of time-averaged velocities change from one side of the river to the other and also with the flow discharge on each of the three days. The cross-sectional distribution of the time-averaged longitudinal velocity component,  $\bar{u}$ , which was measured from depths close to the river bed, shows that the maximum value of  $\bar{u}$  occurs near the sailing line of the river and that its value gradually decreases toward the shoreline. On the other hand, the lateral distribution for the time-averaged transverse velocity component,  $\bar{v}$ , is irregular, and its magnitudes are one order less than those of  $\bar{u}$ .

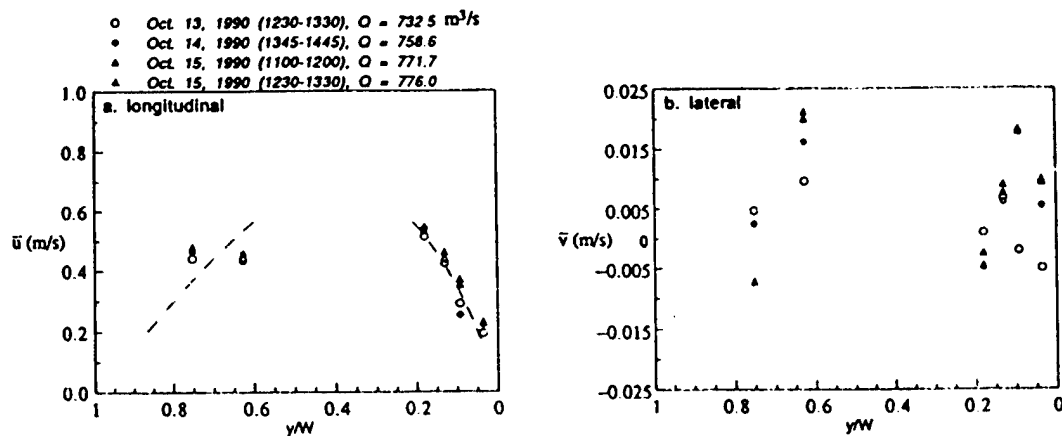


Fig. 5. Variations of time-averaged longitudinal and lateral velocities across the width of the river.

The river discharge for the three days varied from 732.5 cubic meters per second ( $\text{m}^3/\text{s}$ ) to 776.0  $\text{m}^3/\text{s}$ . However, the distribution pattern of  $\bar{u}$  for the four different discharges does not change appreciably, indicating the existence of a stable flow pattern at this site. On the contrary, the variation of  $\bar{v}$  with flow discharge seems more sensitive than that of  $\bar{u}$ . With increasing flow discharge, the variation in  $\bar{v}$  increases.

The vertical variations of the time-averaged velocity components,  $\bar{u}$  and  $\bar{v}$ , at a location of 33.5 m from the RHS of the river are shown in Figure 6 for the same three days and four time slots. The water depth at this location was 3.43 m, and the flow velocities were measured at heights of 0.31, 1.22, and 2.44 m above the river bed. This plot shows that the time-averaged longitudinal velocity component,  $\bar{u}$ , increases with depth toward surface. The distribution is approximately parabolic in nature. On the other hand, the magnitudes of the time-averaged transverse velocity component,  $\bar{v}$ , vary randomly with depth.

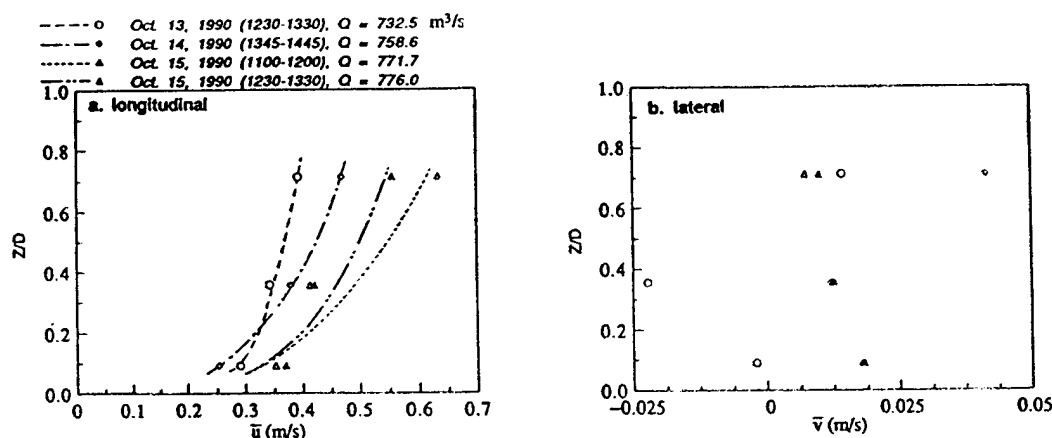


Fig. 6. Variations of time-averaged longitudinal and lateral velocities in the vertical direction.

### 3.2 Variability of turbulent fluctuations across river width

Fluctuations of flow velocity at any fixed location can be studied by developing a frequency-distribution curve of the differences between the instantaneous velocity and the mean velocity [14]. Since velocity data were collected at a rate of one sample per second and a 60-minute time interval was selected for the study of turbulent velocity fluctuations, there were a total of 3600 measurements for each 60-minute time slot. These 3600 data points were used to develop frequency-distribution curves for both  $u'$  and  $v'$ . Here, the frequency is defined as the number of occurrences of a certain value of  $u'$  or  $v'$  in 3600 measurements. This analysis, when applied to each measured point in a river cross section, can depict the strong or weak turbulent fluctuations of the flow velocity at different lateral and vertical locations.

Figure 7 shows such a set of frequency-distribution curves for the longitudinal velocity fluctuation,  $u'$ , across the width of the river (RM 35.2) at six locations and over the depth at three elevations (see Figure 1) for the October 13 data set. When the measured values of  $u'$  ( $u' = u - \bar{u}$ ) are small, their frequency distribution is clustered close to zero on the x-axis, indicating that the fluctuation is weak. Conversely, when the measured values of  $u'$  are large, their frequency distribution will spread out, indicating a strong fluctuation. Thus, Figure 7 indicates that the velocity fluctuation is relatively weak near the shoreline and quite strong near the main channel area of the river.

Figure 8 shows the variability of the frequency-distribution curves for the lateral velocity fluctuation,  $v'$ , for the same eight points used in Figure 7. The distributions of these frequency plots are similar to those shown in Figure 7 for  $u'$ . The lateral velocity fluctuation is also quite small near the channel border areas compared to that near the main channel area. Thus, both Figures 7 and 8 indicate that turbulence is strong in the main channel near the river bottom and quite weak near the channel border areas.

Statistical parameters associated with these frequency-distribution curves are given in table 2 for the longitudinal and lateral velocity fluctuations,  $u'$  and  $v'$ , across the width of the river and in the vertical direction, respectively. These statistical parameters indicate that the velocity fluctuations can be fitted by a normal (Gaussian) distribution and that the selection of the 60-minute time interval is correct since the mean values of  $u'$  and  $v'$  are almost equal to zero.

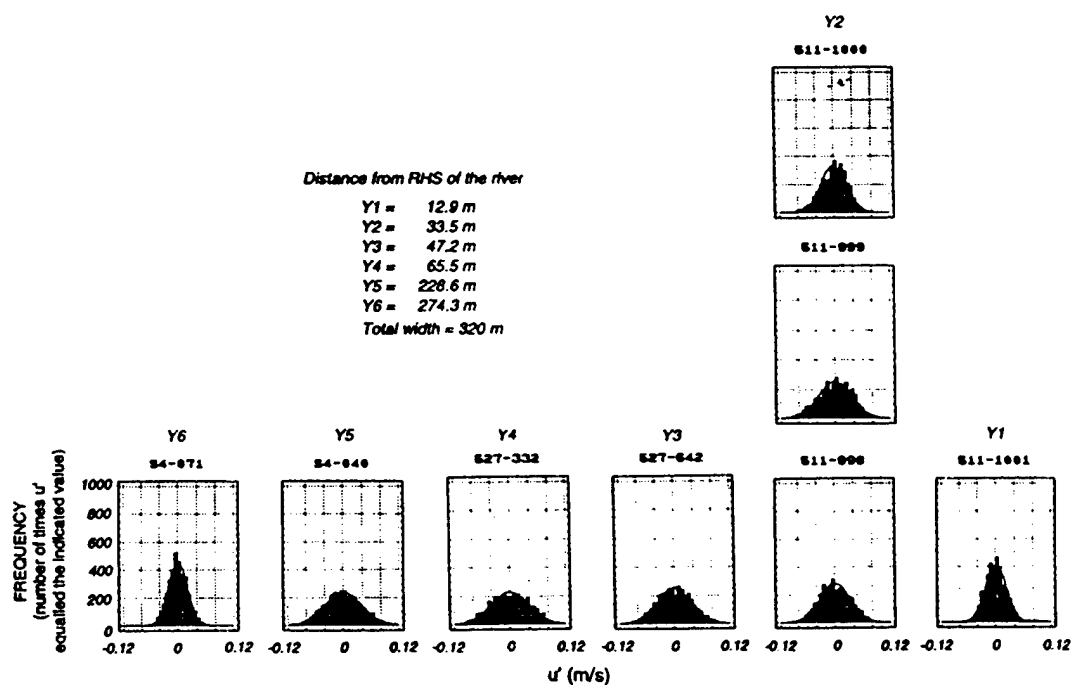


Fig. 7. Frequency distribution of longitudinal turbulent velocity fluctuation,  $u'$ , in the river cross section

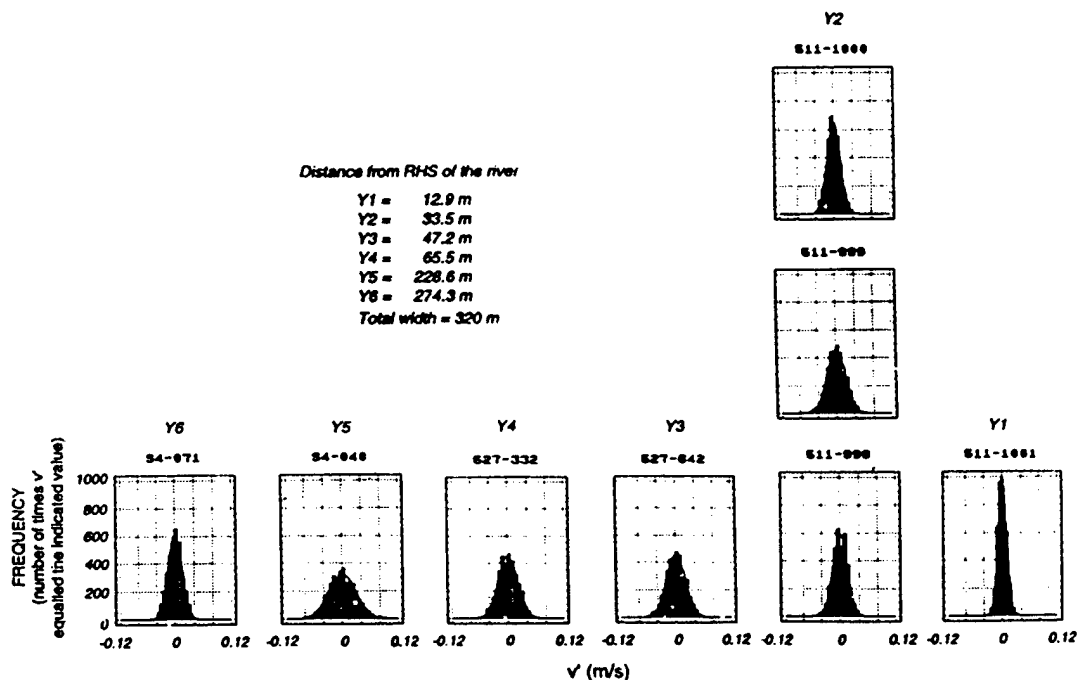


Fig. 8. Frequency distribution of lateral turbulent velocity fluctuation,  $v'$ , in the river cross section.

Table 2. Statistical parameters for  $u'$  and  $v'$   
(a) Transverse direction

| Statistical parameters |             | Meter number |        |                |                |                |                 |
|------------------------|-------------|--------------|--------|----------------|----------------|----------------|-----------------|
|                        |             | S4/071       | S4/040 | MMB527/<br>332 | MMB527/<br>642 | MMB511/<br>998 | MMB511/<br>1001 |
| $u'$                   | mean        | 6E-07        | 9E-07  | 5E-07          | 3E-07          | -1E-07         | 7E-07           |
|                        | stand. dev. | 0.021        | 0.041  | 0.042          | 0.038          | 0.034          | 0.023           |
|                        | range       | 0.151        | 0.262  | 0.266          | 0.229          | 0.235          | 0.164           |
|                        | skewness    | 0.09         | 0.11   | -0.08          | 0.03           | 0.08           | 0.57            |
| $v'$                   | mean        | 2E-08        | 2E-07  | 2E-07          | 4E-07          | -8E-06         | -2E-06          |
|                        | stand. dev. | 0.016        | 0.029  | 0.021          | 0.021          | 0.016          | 0.010           |
|                        | range       | 0.110        | 0.293  | 0.156          | 0.148          | 0.124          | 0.069           |
|                        | skewness    | -0.12        | 0.11   | -0.07          | -0.09          | -0.17          | 0.07            |

(b) Vertical direction

| Statistical parameters |             | Meter number |            |             |
|------------------------|-------------|--------------|------------|-------------|
|                        |             | MMB511/998   | MMB511/999 | MMB511/1000 |
| $u'$                   | mean        | -1E-07       | 6E-07      | 3E-07       |
|                        | stand. dev. | 0.034        | 0.037      | 0.028       |
|                        | range       | 0.235        | 0.240      | 0.177       |
|                        | skewness    | 0.08         | -0.15      | -0.34       |
| $v'$                   | mean        | -8E-06       | -6E-06     | 6E-08       |
|                        | stand. dev. | 0.016        | 0.020      | 0.014       |
|                        | range       | 0.124        | 0.156      | 0.104       |
|                        | skewness    | -0.17        | -0.14      | 0.04        |

### 3.3 Turbulent intensity

The turbulent intensity or variance in the  $x$ -direction can be defined by the root-mean-square value of the  $x$  component  $u'$  as:

$$\sigma_x = \sqrt{u'^2} = \left[ \frac{1}{T} \int_0^T u'^2 dt \right]^{1/2} \quad (4)$$

A similar expression can be written for the  $y$  component,  $\sigma_y$ .

The cross-sectional variations of turbulent intensity for both the longitudinal and lateral velocity fluctuation components ( $\sigma_x$ ,  $\sigma_y$ ) for the three days and four time slots are shown in Figure 9. Again, these values of  $\sigma_x$  and  $\sigma_y$  were averaged over 60 minutes. Figure 9 indicates that the maximum

magnitude of  $\sigma_x$  or  $\sigma_y$  occurs in the main channel area and that their magnitudes decrease gradually toward the channel border areas. The qualitative behaviors of the distributions of longitudinal and transverse turbulent intensities across the width of the river are similar, except that the magnitude of  $\sigma_y$  at any location is about 50 to 70 percent of  $\sigma_x$ .

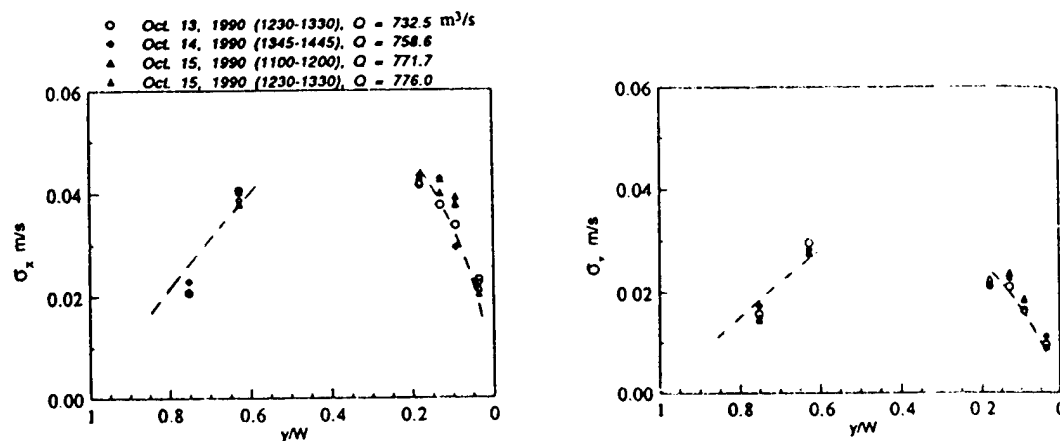


Fig. 9. Variabilities of turbulent intensities,  $\sigma_x$  and  $\sigma_y$ , across the width of the river

The variability of  $\sigma_x$  across the width of the river is almost identical to that observed for  $u$  (see Figure 5). The similarity of the cross-sectional variability of  $u$  and  $\sigma_x$  also indicates that the flow, on average, is fairly stable at this reach.

Figure 10 shows the change in the values of  $\sigma_x$  and  $\sigma_y$  in the vertical direction for the same four time slots. In general, turbulent intensity increases from the surface toward the bottom, with a sharp increase at an elevation of 10 to 20 percent of the depth from the bed; then it decreases asymptotically closer to the bed. As expected, Figure 10 shows that turbulent intensity is likely highest at an elevation of 10 to 20 percent of the depth from the river bed.

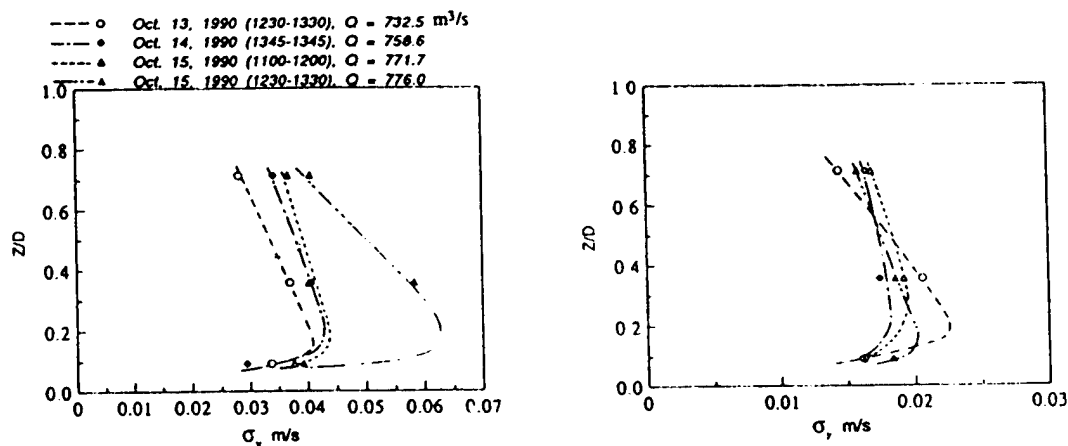


Fig. 10. Variabilities of turbulent intensities  $\sigma_x$  and  $\sigma_y$  in the vertical direction

### 3.4 Turbulent shear stress

For two-dimensional turbulent flow, turbulent shear stress or Reynolds stress is defined as:

$$\tau_{xy} = -\rho \overline{u'v'} = -\frac{\rho}{T} \int_t^{t+T} u'v' dt \quad (5)$$

which can be interpreted as the transport of  $x$ -momentum through a surface normal to the  $y$ -axis [4,9]. Data collected from this research were used to compute the instantaneous turbulent shear stress,  $-\rho u'v'$ . Figure 11 shows the variations of  $-\rho u'v'$  with time at six locations across the width of the river (see Figure 1) for the October 13, 1990, data set. This Figure illustrates that the magnitudes of  $-\rho u'v'$  are relatively small near the river bank in the channel border areas compared to those measured far from the bank. Similar results were also observed for other flow discharge conditions.

The cross-sectional variation of the time-averaged turbulent shear stress,  $-\overline{\rho u'v'}$ , for four time slots on the three days, has been plotted in Figure 12(a) against the relative width of the river. Note that the absolute magnitude of  $-\overline{\rho u'v'}$  decreases toward the shoreline, which indicates that the transfer of the  $x$  component of the momentum normal to the  $y$ -axis is higher in the area away from the river bank. Also note that the turbulent shear stress in Figure 12(a) has different signs in the left and right halves of the river and must go through zero somewhere in the middle of the river where the time-averaged longitudinal velocity component,  $\bar{u}$ , has a maximum magnitude and hence zero gradient. Since it is impossible to gather velocity data from the central part of the river due to heavy commercial navigation traffic, Figure 12(a) could not display this location for the zero turbulent shear stress; however, it is certain to occur at this location.

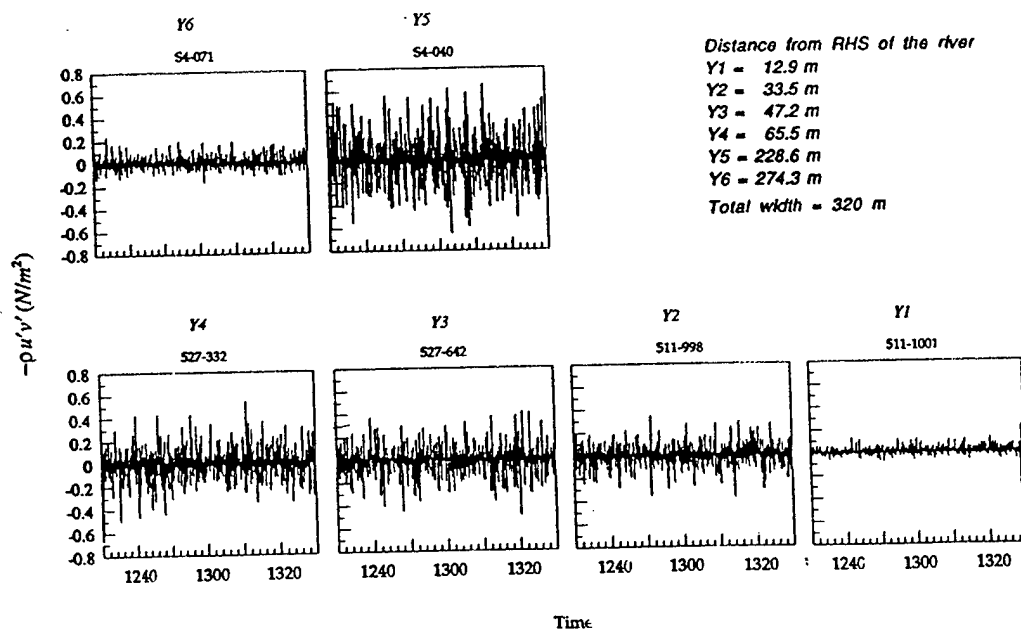


Fig. 11. Variation of instantaneous turbulent shear stresses with time for October 13, 1990 from 1230 to 1330 h.

Figure 12(b) shows the vertical variation of the time-averaged turbulent shear stress. This Figure shows that the maximum turbulent shear stress also occurs at an elevation of about 10 to 20 percent of the depth from the river bed with an associated decrease in the vertical direction. This variability is also similar to that observed for  $\sigma_x$  and  $\sigma_y$ .

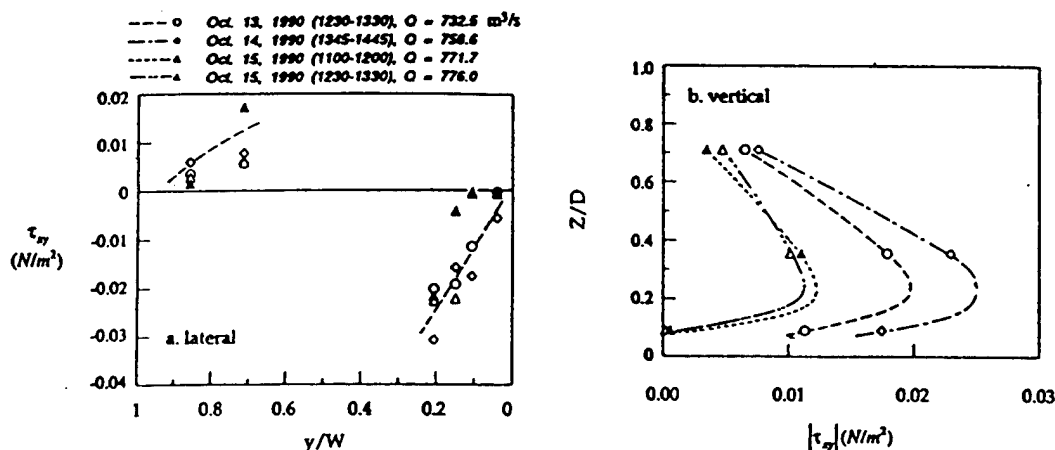


Fig. 12. Variability of turbulent shear stresses across the width of the river and in the vertical direction.

#### 4 Conclusions

Turbulent fluctuations of flow velocities in a natural river were investigated to understand the turbulence characteristics of large rivers. The investigation included the distributions of turbulent velocity fluctuations near the bank and bed of the river. The analyses presented for  $u$ ,  $v$ ,  $\sigma_x$ ,  $\sigma_y$ , and  $\tau_{xy}$  have significant implications for the evaluation of biotic habitats in large river environments. It appears that the velocity, velocity fluctuation, turbulent intensity, and turbulent shear stress are all relatively high toward the main channel area. Moreover, all of these flow parameters decrease toward the channel border areas. Therefore, the main channel area above the river bed is the most active zone as far as turbulence is concerned. These observations are important in understanding the creation of turbulent eddies, sediment transport processes, and bank erosion mechanisms. It should also be noted that the values of  $\sigma_x$ ,  $\sigma_y$ , and  $\tau_{xy}$  were found to be high at elevations of 10 to 20 percent of the depth above the bed. Thus, any external disturbance that may increase or alter these natural conditions could affect the natural aquatic habitats existing at those locations during normal conditions.

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## Notations

|                                            |                                   |
|--------------------------------------------|-----------------------------------|
| $t$                                        | Time                              |
| $T$                                        | Time interval                     |
| $u, v, w$                                  | Velocity components               |
| $u', v', w'$                               | Fluctuating velocity components   |
| $\overline{u}, \overline{v}, \overline{w}$ | Time-averaged velocity components |
| $-\rho u'v'$                               | Turbulent shear stress            |
| $x$                                        | Longitudinal coordinate           |
| $y$                                        | Lateral coordinate                |
| $z$                                        | Vertical coordinate               |
| $\sigma_x, \sigma_y$                       | Turbulent intensities             |
| $\tau_{xy}$                                | Turbulent shear stress            |

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**APPENDIX XXXII.**

**LIST OF RELEVANT TECHNICAL REPORTS AND PRESENTATIONS  
PREPARED BY WATER SURVEY RESEARCHERS**

**Technical Reports and Presentations**  
**Prepared by Illinois State Water Survey Researchers**

- Adams, J.R. 1991 *Identification of Study Approaches to Determine Physical Impacts of Commercial Navigation on the Upper Mississippi River System*. Illinois State Water Survey Contract Report 531.
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