PORTABLE SCOUR MONITORING RESEARCH

NCHRP PROJECT 21-07

James D. Schall, Ph.D., P.E.

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Introduction

- Many bridges have or will encounter problems with scour and stream instability
- In 2002, over 26,000 bridges scour critical in U.S.
- Many of these bridges will require monitoring

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NCHRP Project 21-07

Research Objective

Develop improvements and/or alternatives to existing portable scour monitoring equipment and techniques

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Operational Requirements

- Velocities > 11 fps (3.5 m/s)
- High sediment
- Floating debris
- Ice
- Air entrainment
- Pressure flow
- Limited Clearance
- Overhanging geometry
- Bridge decks > 50 ft (15 m) off water
- Easily used and affordable
- Transportable by pickup/van
- 12 in (30 cm) accuracy

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Articulated Arm Truck

- Articulated arms, knuckle booms or folding cranes are common in the construction industry
- Needed one with long reach, but small size
- Palfinger PK3501C
  - Lift 250 kg (600 lbs) at 11 m (36 ft)
  - Can be mounted on Ford F450

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PALFINGER
PK 4501

Crane Modifications

- Mounted on back of truck
- Rotator added, with modified mounting bracket to allow tilt capability
- Controls moved to flat bed
- High load castors added to outriggers
- Variety of sensors added to track position

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1.8'
0.75'
Lion 2500
Hydraulic
Cylinder
Aluminum Compression
Bracket to Hold
10-Turn Potentiometer
Sprocket to
Measure Rotation
COLORADO

Tracking Position

- Position information provided by
  - Tilt meters
  - Draw Wires
  - Potentiometers
  - Survey wheel
- Data managed with
  - Data Loggers
  - Wireless modems
  - Laptop computer

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LAND TITLE

DANGE
DEATH, SERIOUS INJURY
INSTABILITY OR
STRUCTURAL DAMAGE

138-CWG

PALFINGER
PK 4501

PALFINGER
PK 4501
Campbell CR10
Data Logger
Inverter
12V Light
Wireless Modem
Voltage Convertor for
Acoustic Stage Sensor
MAXX
1000 WATT

Scour Measurement Devices

- Streamlined Sonar Probe
- Sonar in Sounding weight
- Sonar in kneeboard, with cable or rigid frame deployment
- Physical probe

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HALFINGER

PALFINGER
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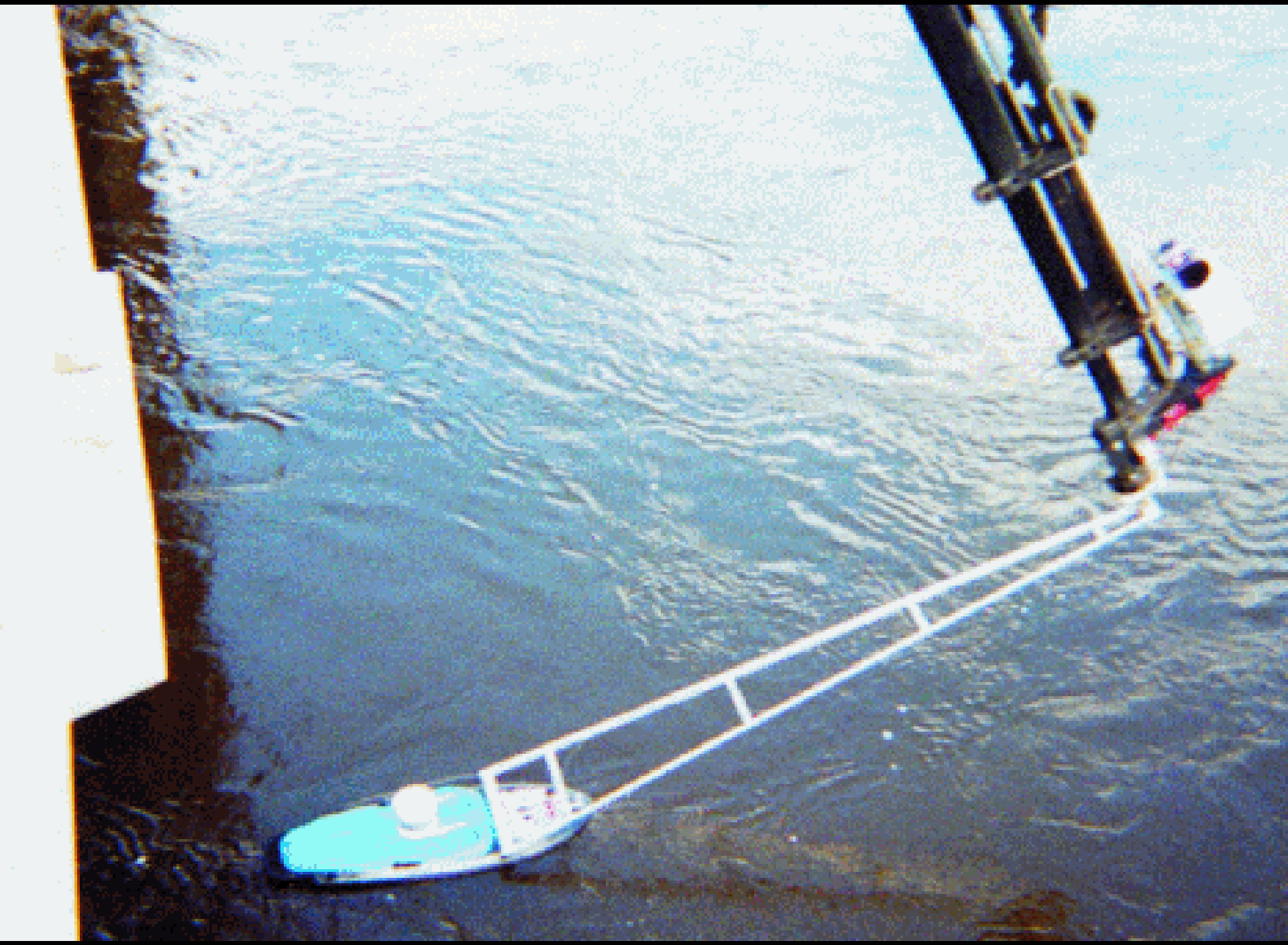

Data Collection

- Visual Basic program written to coordinate data collection process
- Truck coordinates vs bridge coordinates
- Sweeping arc's upstream of pier
- Driving a cross section
- Real time results can be compared directly to bridge plans to assess scour criticality

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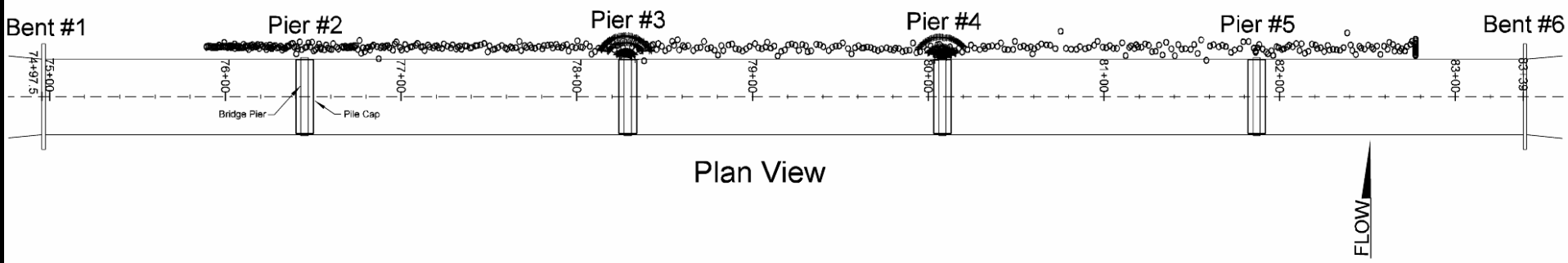
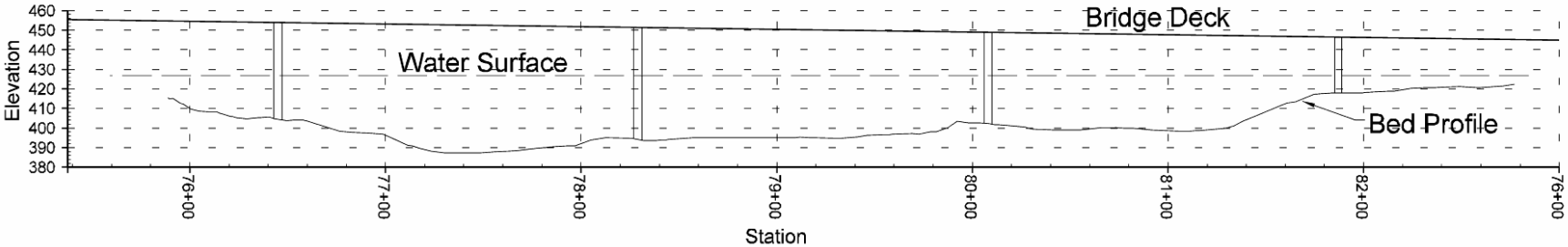
Indiana State Route 61 Over the White River
(Upstream)
Survey Date: 5/22/02



Plan View

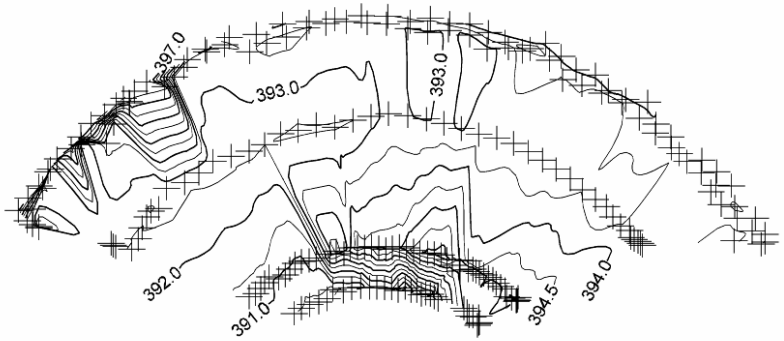


Upstream Continuous Cross Section Profile

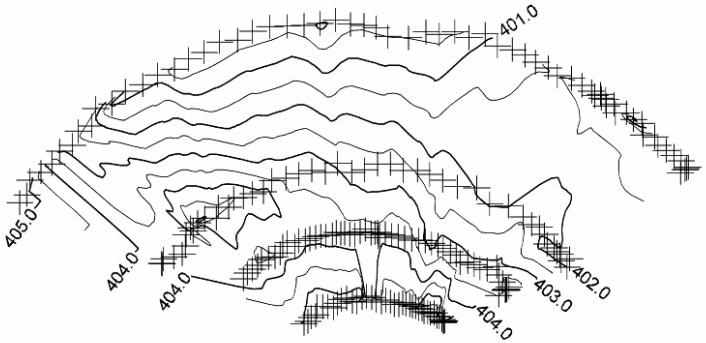
Legend

++++ Arc Data

oooooooo Cross Section Data



Contour Data Pier #3
Upstream



Contour Data Pier #4
Upstream

Questions