

Duck Creek ALERT

Flood Warning System

(Automated Local Evaluation in Real Time)

City of Davenport, Iowa

Eric R. Schallert, P.E.

System Operations and Maintenance

STREAM CHARACTERISTICS

- Duck Creek flows from west to east directly into the Mississippi River
- 3 major tributaries flow from north to south in Davenport (Silver, Goose, and Pheasant Creeks)
 - Drainage Area 47 Square Miles
 - Crossed by 12 vehicle bridges

Warning System History

- Two catastrophic 500+ year floods two weeks apart
 - June 16th and June 29th, 1990
 -
- First flood 9-11" training thunderstorms over 6 hours directly over Duck Creek main stem
- Second flood, 8"+ rain over Silver Creek Basin

Warning System History

- Multiple basement walls caved in
- New cars swept into creek and not found for weeks
- Water over first floor countertops in downstream city
 - No loss of life , tremendous property damages
 - North-south transportation network crippled
- (the center 8 of 12 bridges out of service during flooding)







Warning System History

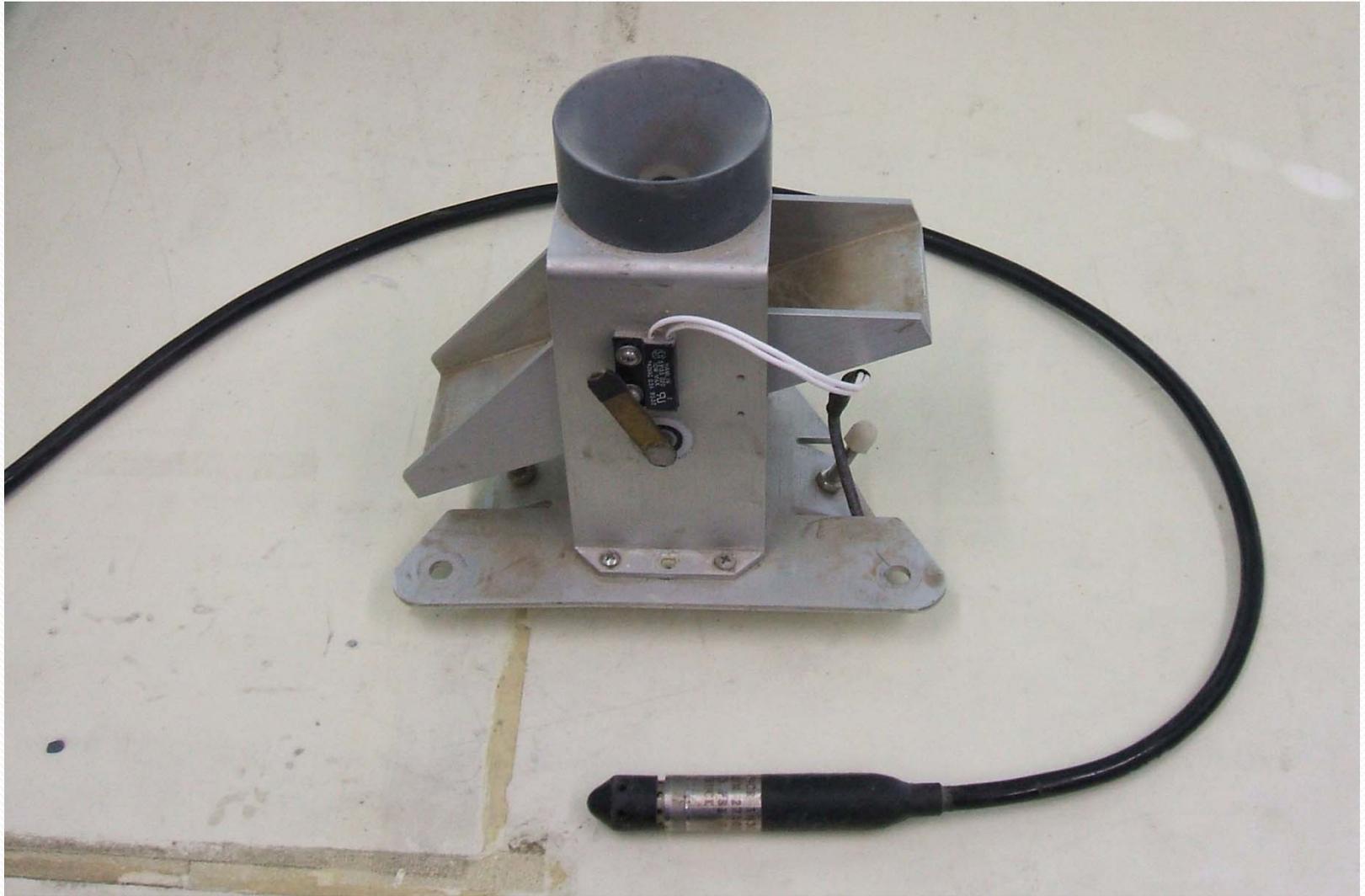
- Davenport City Council decided a warning system was needed
 - Money was budgeted (approx \$100k)
 - A Request for Proposals was sent out
 - Proposals were received and evaluated
- The system was finally operational in 1996

WARNING SYSTEM FIELD EQUIPMENT

- 8 Gauging Stations
 - 6 combined rain/stream, 2 rain only
 - 2 cooperated USGS stilling wells, 6 City standpipes
- Rainfall measured by 1 mm and .01 inch tipping buckets
- Stage measured by Bubblers, PT's, and Ultrasonically











WARNING SYSTEM FIELD EQUIPMENT

- Aluminum Standpipes for standalone sites
- Doors on Standpipes for easy equipment access
 - Battery operated or backed-up gauging sites
- Solar Panels on some sites for keeping batteries charged
 - Trickle chargers for AC powered sites





New 3/19/08
DC e Brady 5/5/08

Werker®

WKA12-12F2
12V 12Ah AGM Sealed Non-Spillable Battery
Bateria de Plomo-Ácido Sellados
Batterie Acide de Plomb

CAUTION:
• AVOID SHORT CIRCUIT
• DO NOT CHARGE IN A SEALED CONTAINER
• KEEP AWAY FROM SPARKS AND FLAME

PRECAUCIÓN:
• EVITE EL CORTOCIRCUITO
• NO CARGUE EN QUE MANTIENE DE UN ENVASE SELLADO
• LEJOS DE CHISPAS Y DE LA LLAMA

ATTENTION:
• ÉVITEZ LE COURT CIRCUIT
• NE CHARGEZ PAS SUBSTANCES DANS QUE RÉCIPENT SCELLÉ
• LOIN DES ÉTINCELLES ET DE LA FLAMME

Must be recycled. Call 1-888-9 ASCENT for proper disposal.
Debe ser reciclado. Llame 1-888-9 ASCENT para la disposición apropiada.
Doit être réutilisé. Appelez 1-888-9 ASCENT pour la disposition appropriée.

PS PS PS   **MH20720**
MADE IN CHINA
HECHO EN CHINA
FABRIQUÉ EN CHINE



WARNING SYSTEM COMMUNICATIONS

- Standalone and piggyback transmitters

 - Power Amplifiers where needed

Combination of omni- and uni-directional antennas

- Communications by Line-of-sight FM radio to City and NWS, GOES antennas for USGS

 - (Geostationary Operational Environmental Satellite)

 - User-friendly software on desktop computer

 - NWS can incorporate data into their systems

- NWS data can also be incorporated into warning system







THINGS TO THINK ABOUT FOR THE CONTRACT

- Specify solar panels for all sites from the beginning to increase battery maintenance interval
- Specify that the vendor supplies a toolkit with the installation
 - Specify that the vendor supplies a good folding ladder
- Specify that your software vendor set up pager or cell phone text messaging with the contract
 - Specify turnkey system installation, including FCC license
(There will be plenty of maintenance to keep you busy later)

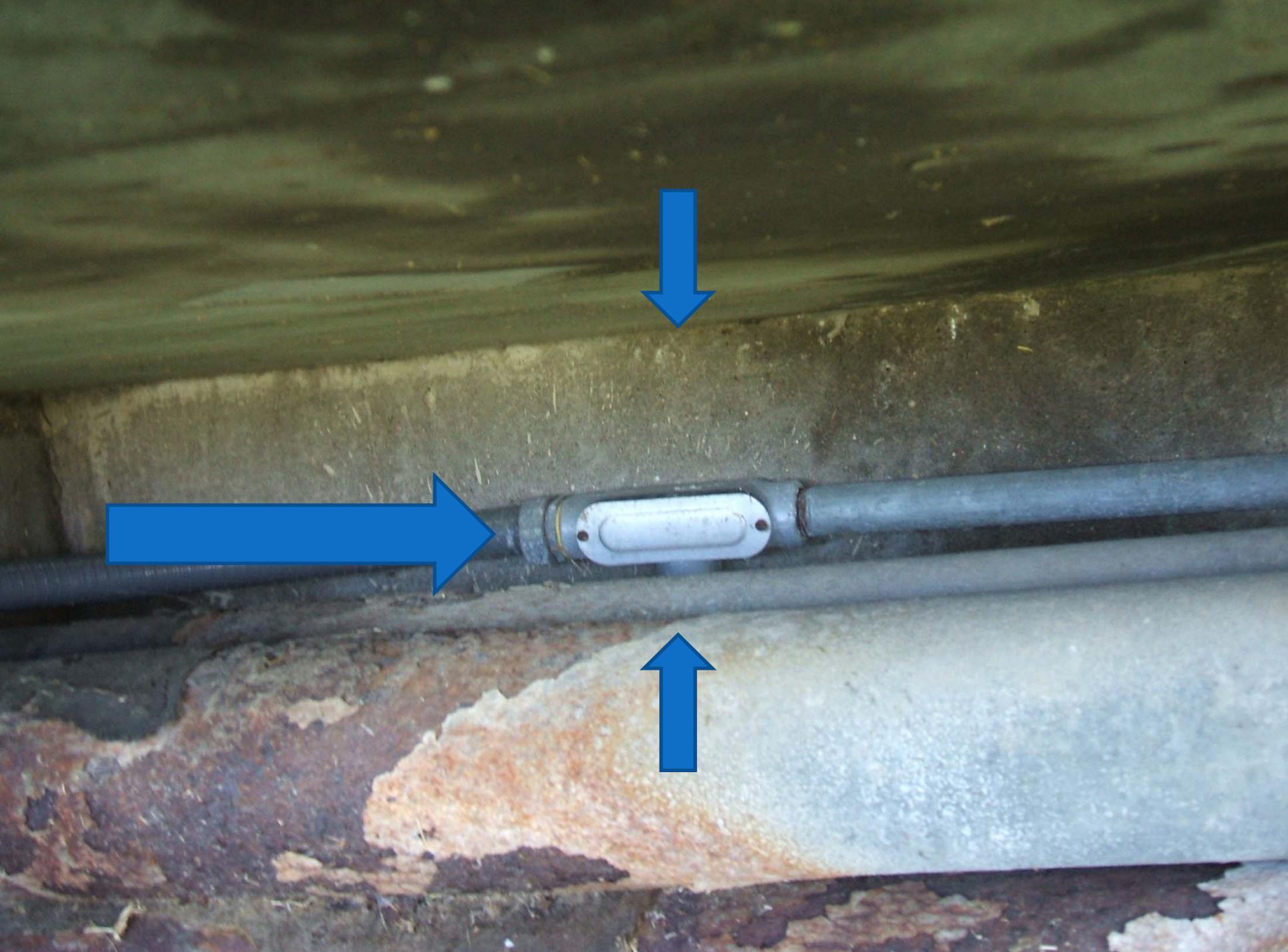


THINGS TO THINK ABOUT REGARDING EQUIPMENT

- When testing radio signals, remember the words “line of sight”
- Think about access, maintenance, and snow drifts when installing gauging sites and conduits
- Consider using equal length PT’s for interchangeability
 - Run the shortest cable runs possible, and to the upstream side of structures
- Think about protection from traffic when siting gauges











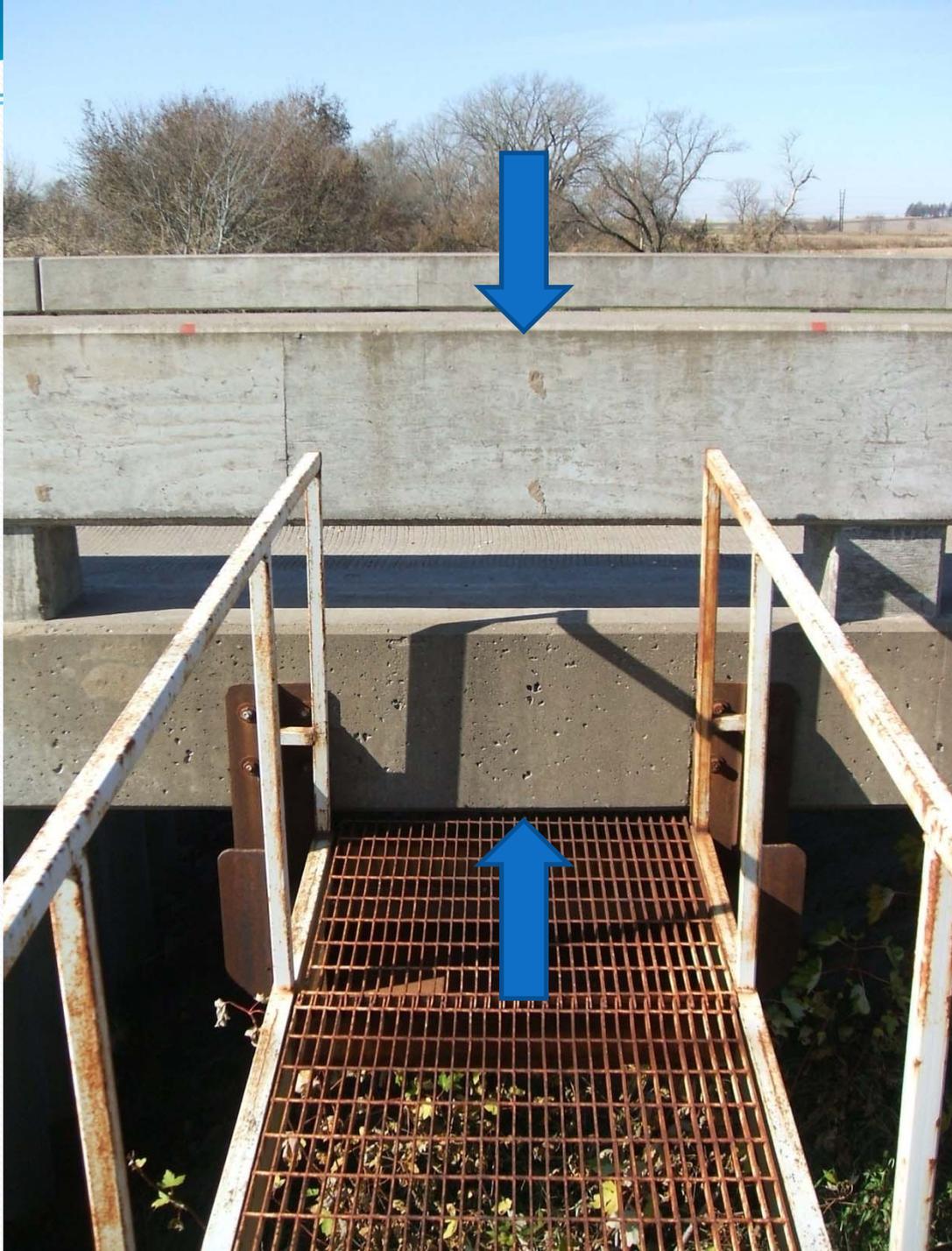








Fairmount St



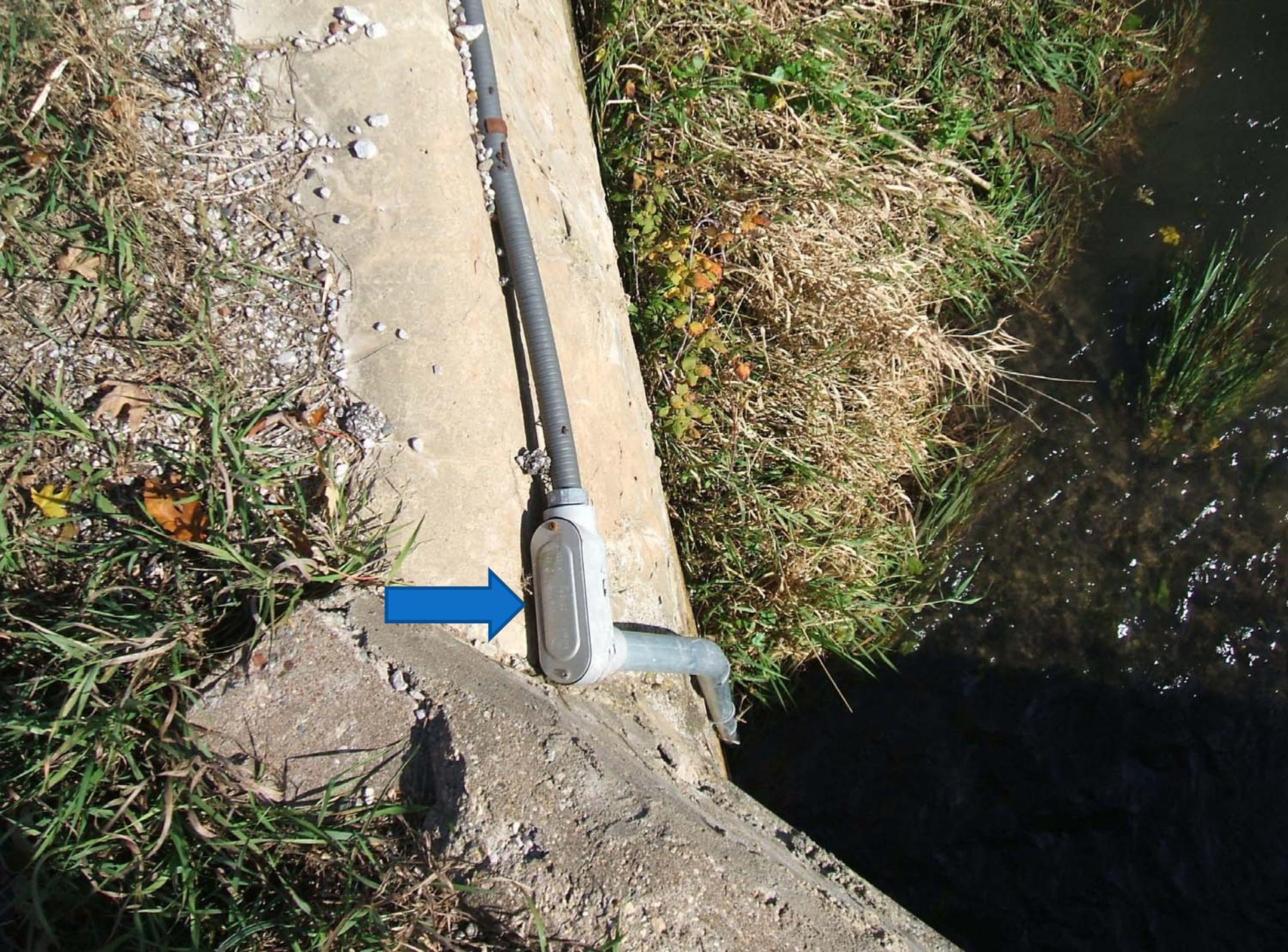








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THINGS TO THINK ABOUT REGARDING EQUIPMENT

- Lapel mics can flood the receiver and block data
- New batteries die young, and old ones seem to last forever
- Pressure transducers do freeze and break if you leave them in too long to catch that last rain event in the fall (\$1,000 each)
- Tipping buckets don't like bean or gravel dust, leftovers from hawk lunches, or losing bearings and tipping to one side
 - Spiders like to live around standpipe doors
- Keep good records of settings that work and repairs done





THINGS TO THINK ABOUT REGARDING PEOPLE

- Get to be friends with someone with access to a boom truck
- Get to be friends with someone who can field solder and fix cable ends (traffic signal shop or automotive shop guys)
 - If possible, have a helper come with you when doing maintenance to back you up and learn the process

THINGS TO THINK ABOUT REGARDING PEOPLE

- Don't be the only one in your office who understands how to “read” the computer interface system
- Don't be the only one in your office who understands basic system maintenance procedures
- Invite and encourage local emergency responders to prepare a plan to use your data to warn/protect the public



City of
Davenport

78175

T712

TUR-A-LIFT

343

THINGS TO THINK ABOUT BEING PREPARED

- Budget money yearly for battery and component replacements
 - Always carry your warning site keys
 - Always have 2 spares for everything
- Take one set of spare parts with you to the field
 - Always take your complete tool kit with you
- Take a container of water or know a close source to your site and pre-plan a way to retrieve it (for cleaning, testing, calibration)

THINGS TO THINK ABOUT BEING PREPARED

- Schedule a few days in early spring and late fall for maintenance
- Record storms will come when you are unprepared, so keep your system as operational as possible at all times
- People may break, vandalize, and/or steal equipment, so check for data anomalies daily
- People will use phone connections to call 900 numbers

Fairmount





City of
Davenport



THINGS TO THINK ABOUT SAFETY

- Get a bright, reflective vest and wear it while working on dry days
- Get a bright, reflective full body rain suit and rubber boots for wet days
 - Watch out for nearby electrical lines when working with antennas
 - When possible, do top end service from a bucket truck
- Wet stream banks are slippery , sticky, and sometimes bury your boots (I wish I had a picture)





System Output

- Long-term rainfall graph and table
 - Short term rain graph and table
- Long-term stream hydrograph and table
 - Prediction software output
(Rain and stream graphs combined)

Tabular Graph Options

in for the most recent 99 days in 1 day periods

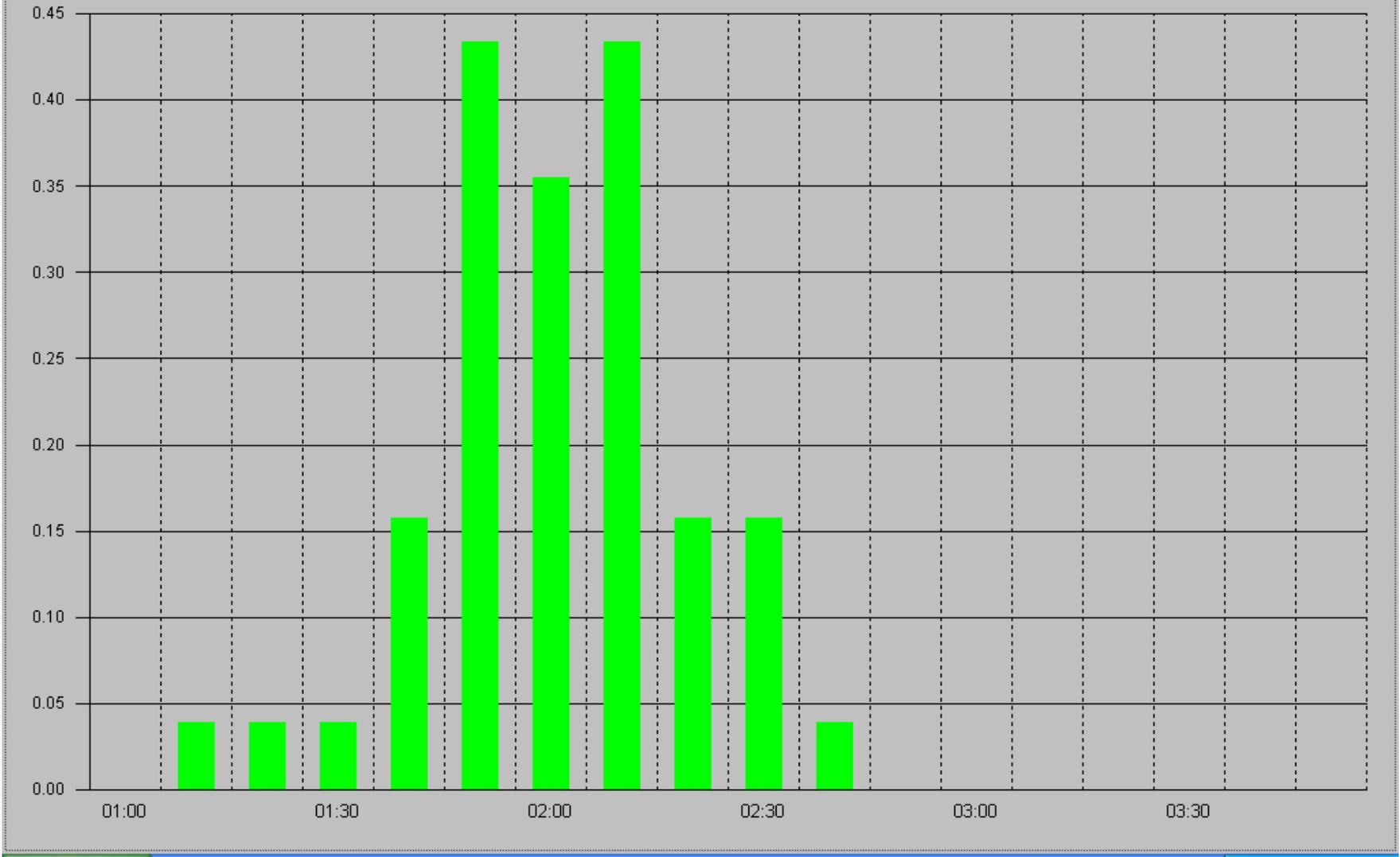


500 Fairmount Rain 8/17/2009 01:00 to 8/17/2009 04:00



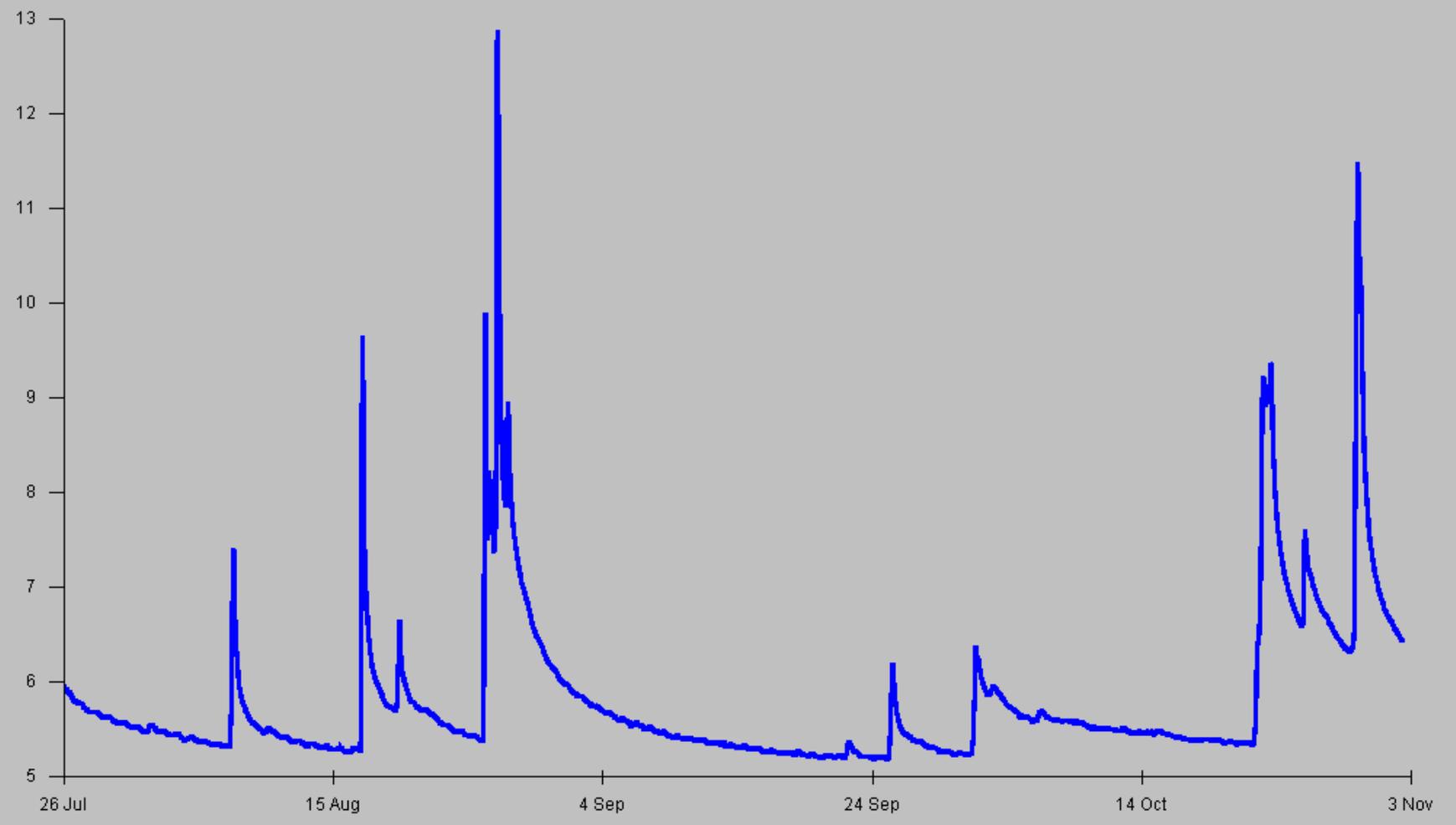
Tabular Graph Options

in for 2 hours starting 8/17/2009 01:00 in 10 minute periods

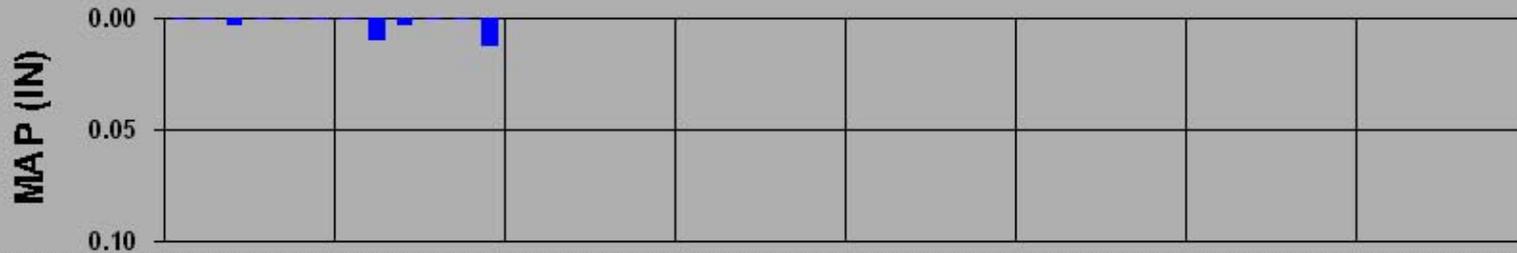


Tabular Graph Options

feet for the most recent 99 days



Precipitation - Golf



Runoff - 10 Min / 6 Hr Forecast

— Observed - Golf — Forecasted - Golf — CURRENT



Forecast Start - Oct 30 2009 1:30



QUESTIONS
COMMENTS
CONCERNS
OBSERVATIONS

CONTACT INFORMATION

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