



S-12-D Data Collection and Computation Overview

U.S. Department of the Interior
U.S. Geological Survey

Everglades TOC
Mark Dickman
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Discussion topics:

- USGS data production overview
- Data sets necessary to compute discharge record at S-12-D
- Data sources
 - Continuous data
 - Sensor inspections and discharge measurements
 - Gate opening record
- Data management

Discussion topics (cont'd):

- **Computation process**
 - Data entry
 - Continuous discharge computations
- **S-12 discharge production overview**
- **Challenges to rapid approval**
- **Recent/future enhancements**
- **Future issues to be ironed out**

USGS data production overview

- Data entry – data considered “Provisional”
- Computation – all data processing and documentation; data still “Provisional”
- Check – verify computation processing; data still “Provisional”
- Review → data “Approved” or finalized

Data sets necessary to compute discharge record at S-12-D

- Upstream water level record – USGS
- Downstream water level record – USGS
- Gate opening record – USACE
- Discharge measurements – USGS
- Inspections of upstream and downstream stage sensors – USGS
- Read gate opening indicators – USGS

Data sources: Continuous data

- Water level sensors: shaft encoder/float/float tape systems on upstream and downstream side of structure
- DCP logs and transmits water level data
- Gate opening record
 - On-site operations
 - Logged by dam tender
 - Entered into USACE database

Data sources: Sensor inspections and discharge measurements

- Inspect upstream and downstream water level sensors
 - If necessary, calibrate sensors
 - Download data file, EDL, from DCP
- Read gate opening indicator
- Measure discharge
 - ADCP
 - Measuring section located about 50 ft upstream of structure

Upstream water level sensor

DCP

Gate opening data

Downstream water level sensor

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Google earth

Imagery Date: 3/26/2011

25°45'43.35" N 80°40'54.25" W elev 5 ft

Eye alt 410 ft

Upstream water level dock and equipment shelter



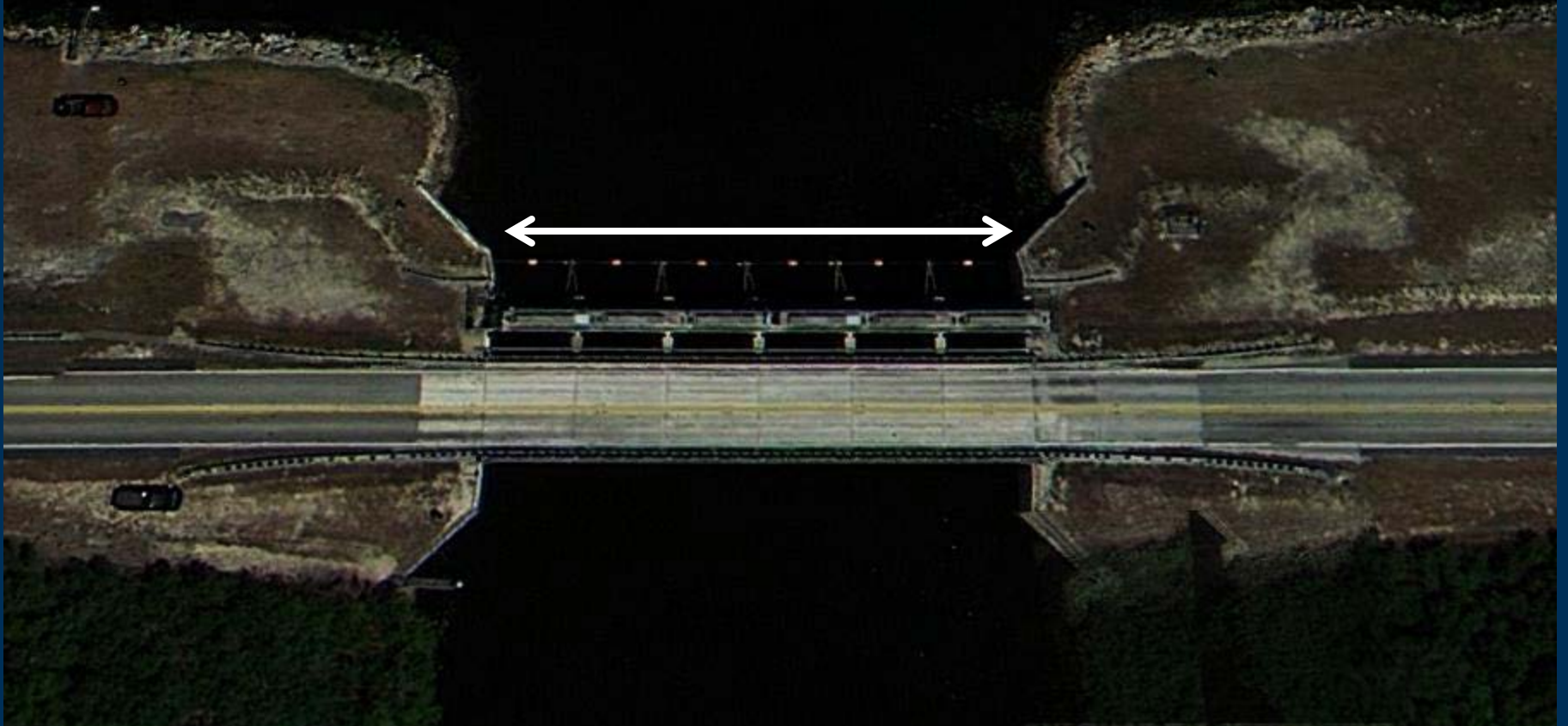
Downstream water level dock and equipment shelter



DCP shelter



Measuring Section



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Imagery Date: 3/26/2011

25°45'43.35" N 80°40'54.25" W elev 5 ft

Eye alt 410 ft



Data sources: Gate opening record

- **Dam tender logs**
 - Gates operated manually
 - Dam tender records new gate openings
 - Gate openings entered into USACE database
- **Gate record requested by USGS**
 - USACE generates data files and stores in an FTP site
 - USGS retrieves data files

Data management

- **Upstream and downstream water level data**
 - GOES data transmitted hourly – automatic entry
 - Downloaded log, or EDL, files – manual entry
- **Inspections entered by field staff**
 - Water level sensors
 - Gate reading
- **Measurement data files entered by field staff**
- **Gate record from USACE**
 - Upon request

Computation process

- **Data Entry:**
 - Flow measurements computed and entered into NWIS and archive
 - Site inspections of water level sensors and gate readings entered into NWIS and archive
 - Upstream and downstream water level record
 - EDL entered into NWIS and archive
 - Any GOES data gaps filled in
 - Corrections applied to water level data if necessary
 - Gate data
 - Retrieve and enter into NWIS and archive

Computation process (cont'd)

- **Continuous discharge computations**
 - **Stage-discharge computation – gates clear**
 - **Input is downstream water level data**
 - **NWIS runs stage-discharge computations automatically, no matter the gate condition**
 - **Shift from rating determined and usually applied from last measurement or gate opening**
 - **Record recomputed for the analyzed period**
 - **Run review scripts to evaluate computation technique**
 - **Continuous (UV) and daily value (DV) record automatically stored in the stage-discharge Data Descriptor (DD)**
 - **During submerged orifice periods, large shift applied to compute zero flow using stage-discharge method**

Computation process (cont'd)

- **Continuous discharge computations (cont'd):**
 - **Submerged orifice computation – gates in water**
 - **Gate record evaluation**
 - Evaluate with inspections and water level data
 - Fix errors in record (all 6 gates) and compute gate record
 - **Damflo program is external to NWIS**
 - **Manual retrieval of final upstream and downstream water levels and gate opening data files from NWIS**
 - **Manually run Damflo program to produce unit value (UV) and daily value (DV) discharge**
 - **Evaluate results**
 - **Script run to enter Damflo UVs and DVs into the gate flow Data Descriptor (DD) in NWIS**

Computation process (cont'd)

- **Final daily value discharge record**
 - **Script combines stage-discharge and submerged orifice DV discharges**
 - **Review results**
 - **Manually store combined DVs to the final discharge Data Descriptor (DD)**
- **Station documentation updated**

Computation process (cont'd)

Notes about missing input data

- For periods when the gates are clear of the water:
 - Missing downstream water levels? Use upstream water levels with correction
 - Missing both upstream and downstream water levels? Use S-333 water levels with correction
- For submerged orifice conditions:
 - Upstream water levels missing? Use S-333 water levels with correction
 - Otherwise, estimation based on remaining data, comparisons of data before and after loss, and/or use record at other S-12s

S-12 discharge production overview

- *Data Entry – data considered “Provisional”*
 - *for S-12s, discharge data not available*
- *Computation – all data processing and documentation; data still “Provisional”*
 - *provisional discharge data now available*

----- QA process -----

- **Check – steps similar to computation; data still “Provisional”**
- **Review → data “Approved” or finalized**

Challenges to rapid approval

- High frequency of measurements
- Gate data and operations
 - Opening record provided upon request
 - Clean up errors in the gate data
 - Frequent gate changes
 - Frequent switching between computation methods?
 - Combine results in the “final” DD
- Many manual steps in computations
- October filled with routine field work
 - Few records computed, if any

Recent/future enhancements

A photograph of a water control structure, possibly a dam or spillway, with several workers in orange safety gear and white hard hats on top. A silver pickup truck is parked in the foreground, partially obscured by a chain-link fence. The structure has a sign that says 'S-12-D'. The sky is overcast.

- Updates to controls and instrumentation at the structure
- Gates:
 - Controls added for remote operation
 - Sensors added to measure opening
 - Installed on all gates!
 - Wired to DCP → transmission directly to NWIS!
- S-12-D instrumentation mostly complete, but undergoing testing

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Future issues to be ironed out:

- Reliability of gate sensors unknown
- Calibration of gate sensors?
- Replacement of faulty gate sensors?
- Automate orifice flow computations?
 - Manual combination of data likely to continue

Questions?