

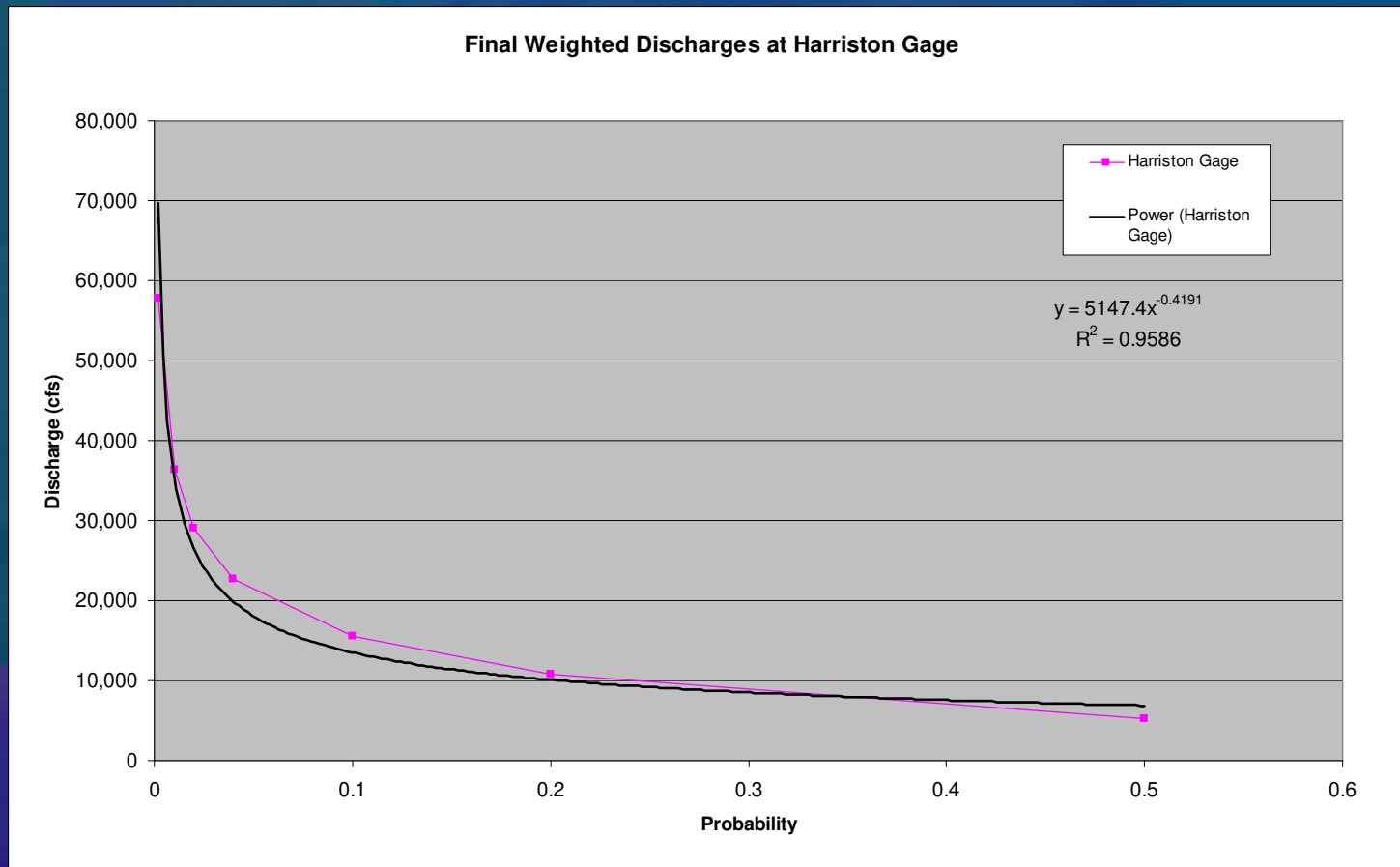
South River Hydrologic/ Hydraulic Analyses Project Update – April 2007

- Gage data analysis
- Hydraulic analysis

Overview of Hydrologic Analyses

- Discharges were determined for the following recurrence intervals: 1, 2, 5, 10, 25, 50, 100, and 500
- National Flood Flow Frequency Methodology – weighted averages of:
 - ◆ Gage data
 - ◆ Rural regression equations
- Used results in hydraulic modeling and for gage analyses

Discharge Regression Equation Based on Hydrologic Analyses



USGS Gage Analysis – Source Data

- Harriston Data:
 - ◆ Annual Peak Flows For Entire Period of Record
 - ◆ 01/17/1926 – present
 - ◆ 30-minute Incremental Flow
 - ◆ 01/01/1991 – 09/30/2003
 - ◆ 15-minute Incremental Flow
 - ◆ 10/01/2003 – 11/14/2006
 - ◆ Daily Mean Discharges (does not include peak discharges)
 - ◆ 01/17/1926 - present
- Similar data sets are available for gages at Waynesboro (54 yrs of record) and Doods (17 years of record)

Evaluating Historic Flood Events – (Frequency and Maximum Discharge)

- Historic data available for each gage (prior to 1991)
 - ◆ Daily mean discharges
 - ◆ Annual peak discharge (one event per year)
- Without instantaneous data, peak discharges can not be accurately determined
- On average, the daily mean discharge was 30 percent less than the peak flow

Evaluating Historic Flood Events – (Frequency and Maximum Discharge)

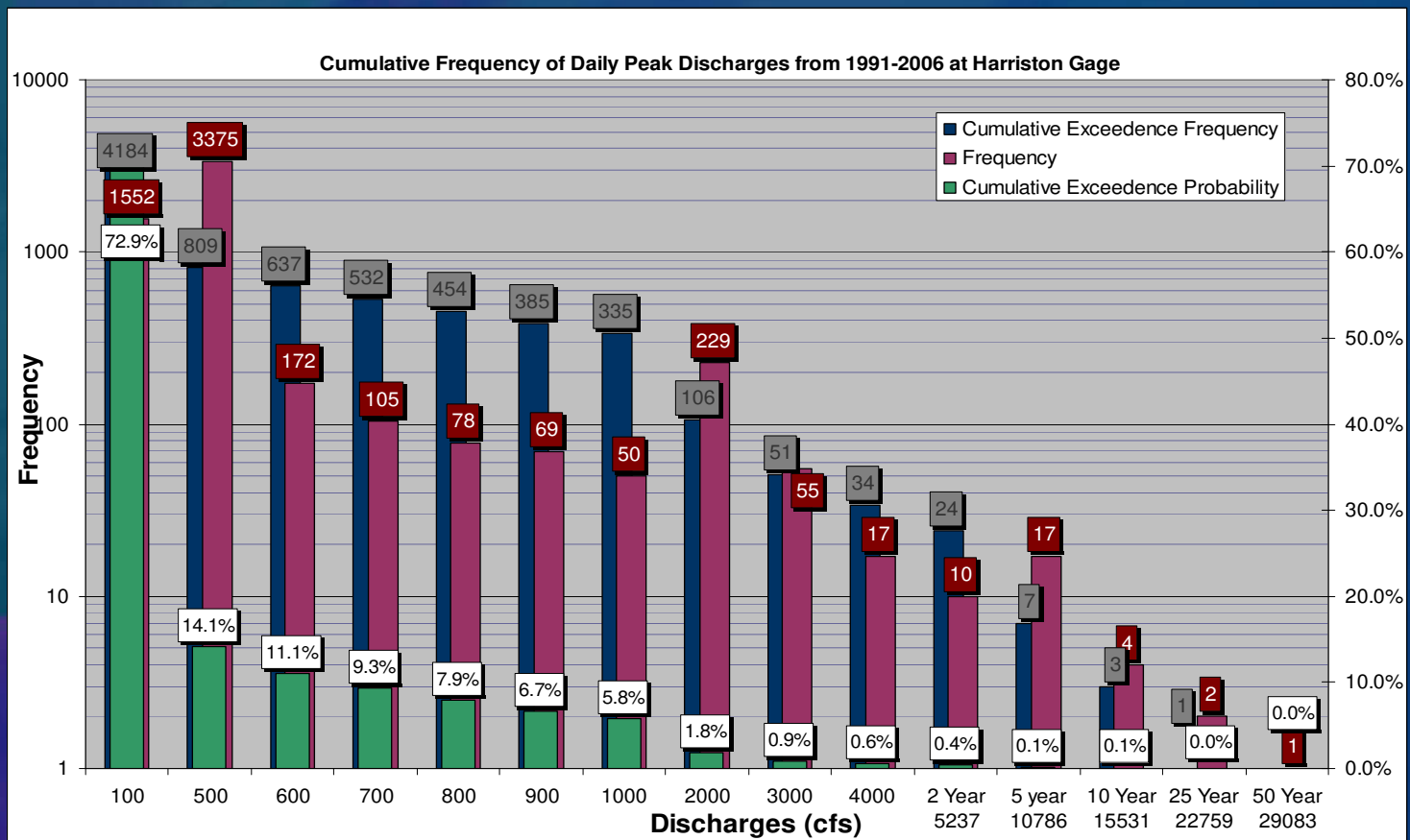
■ Example (9/6/96)

- ◆ Annual peak flow: 28,900 cfs
- ◆ Daily mean discharge: 10,800 cfs
- ◆ Daily mean discharge is 63 percent lower

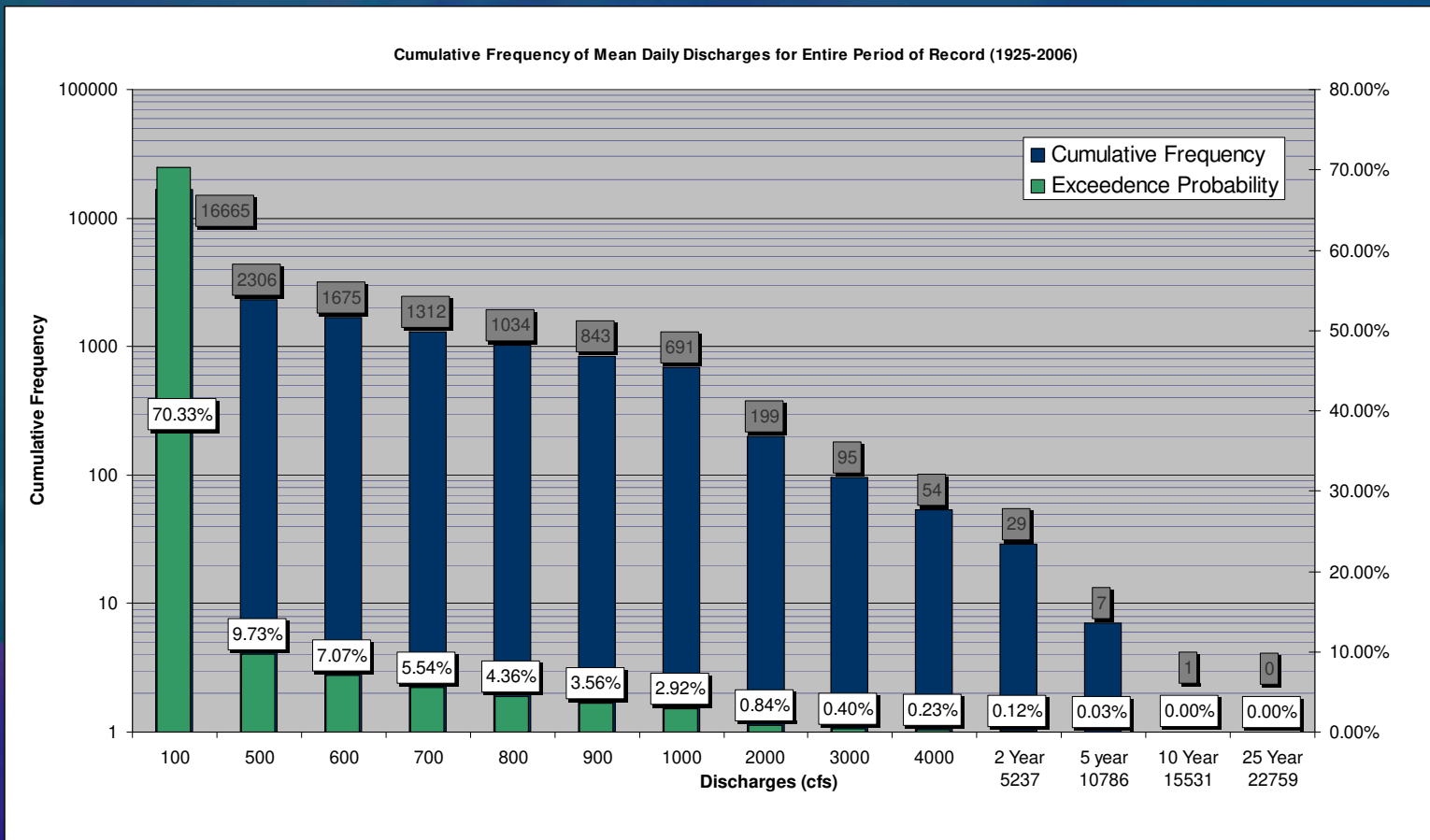
■ Example (3/19/83)

- ◆ Annual peak flow: 10,300 cfs
- ◆ Daily mean discharge: 6,680 cfs
- ◆ Daily mean discharge is 35 percent lower

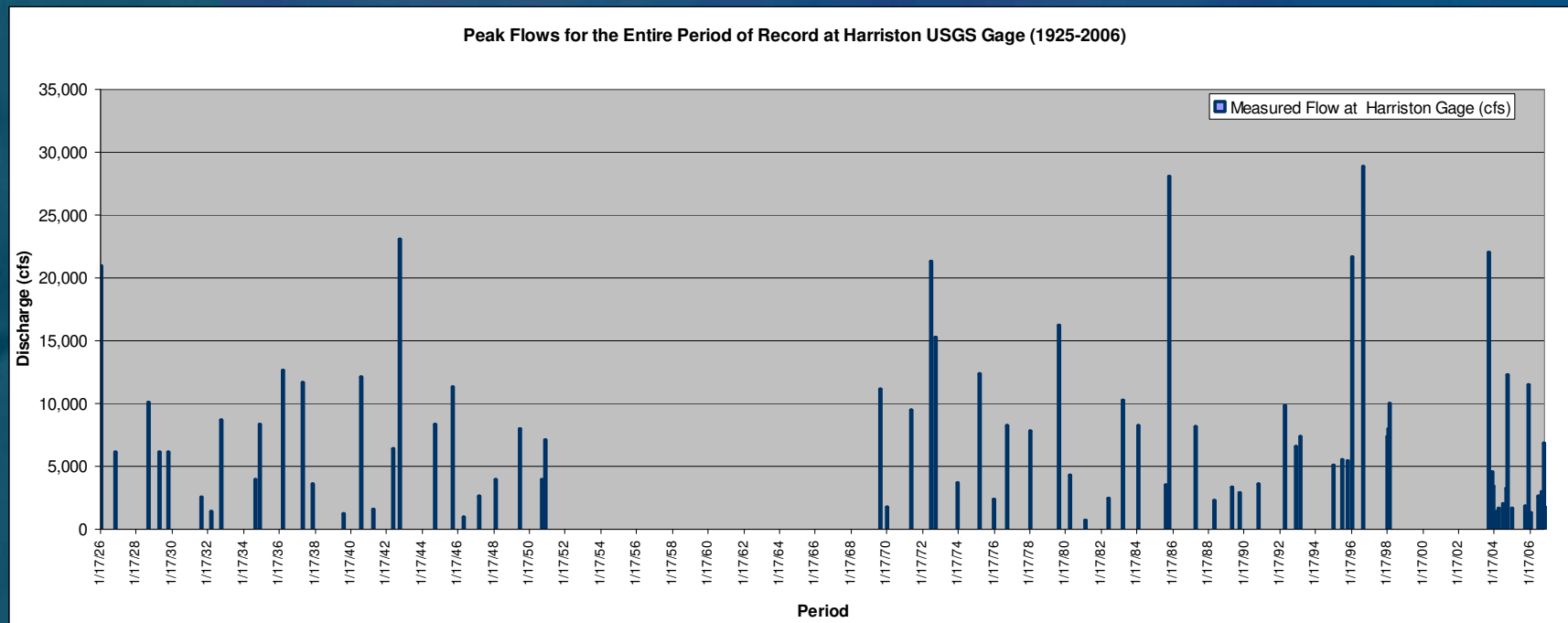
Cumulative Frequency of Peak Flows – 1991-2006 – Harriston Gage



Cumulative Frequency of Mean Daily Discharges – Harriston Gage



Peak Flows for Entire Period of Record – Harriston Gage



Summary of Discharges At Harriston:

2-year: 5,237 cfs

5-year: 10,786 cfs

10-year: 15,531 cfs

25-year: 22,759 cfs

100-year: 36,386 cfs

Hydraulic Analyses

- Utilized U.S. Army Corps of Engineers HEC-RAS Program as developed with GIS-based Watershed Information System (WISE) platform

HEC-RAS Model – Key Input Data

- Cross section data (Lidar, field survey, USGS)
- Manning's N values (roughness coefficients)
- Bridge data (field survey)
- Discharges

HEC-RAS Model – Calibration Efforts

- Calibrated model to USGS gage data at three gaging stations. Highwater mark surveys have not been conducted to date.
- Primary calibration efforts consisted of changing Manning's n values (roughness coefficients)
- Difference between the HEC-RAS model and the USGS gage data varies from -1.8 to 1.8 feet
- Further calibration is not recommended prior to conducting additional cross section field surveys in the vicinity of the gages

Hydraulic Model Results – Data Uses

- Utilize output parameters, such as velocity and shear stress, to aid in erosion rate estimates
- Estimate discharge that causes out of bank inundation for specific areas
- Develop rating curve data for use in loading analyses for storm sampling events
- Analyze inundation areas for a variety of storms

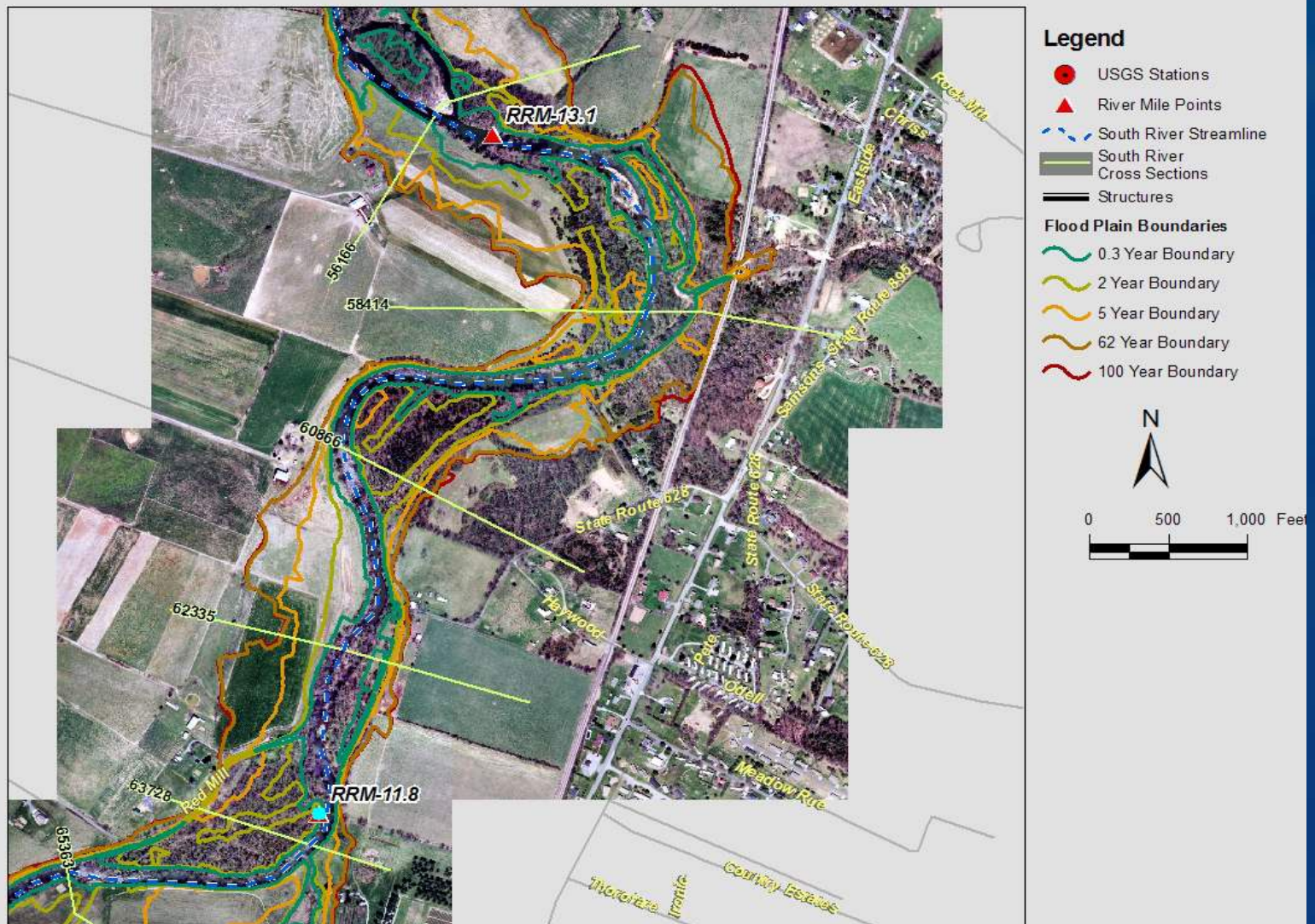
Inundation Areas

- Floodplain boundaries were plotted for the following storm events
 - ◆ September 2006 event (0.3-year recurrence interval)
 - ◆ 2-year
 - ◆ 5-year
 - ◆ Highest storm on record (62-year recurrence interval)
 - ◆ 100-year storm event

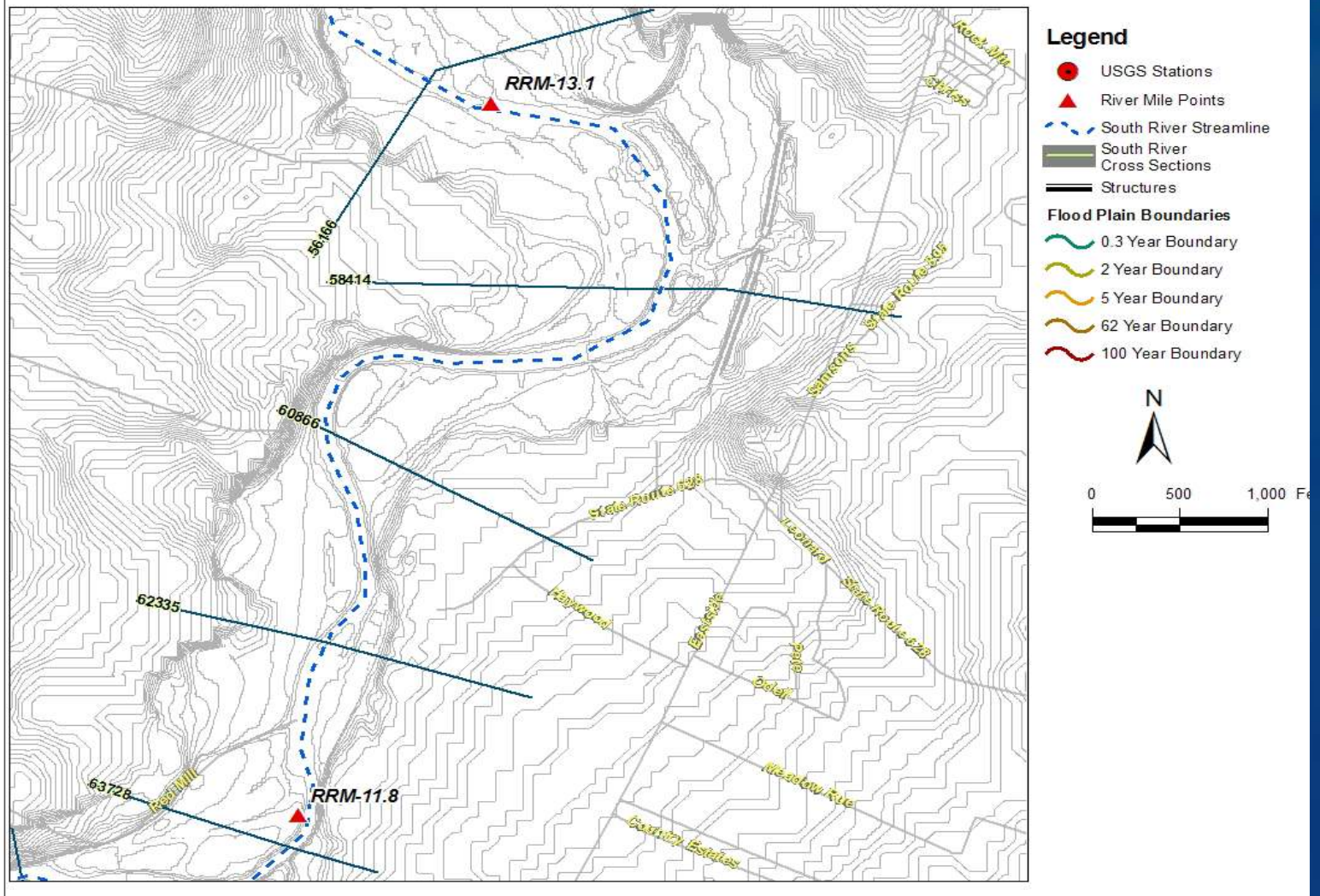
Inundation Areas – Selection of Storm Events to Plot

- Frequency of exceedence for instantaneous data (1991-2006)
 - ◆ 10-year: 3 events
 - ◆ 5-year: 7 events
 - ◆ 2-year: 24 events
- Frequency of exceedence for daily mean discharges:
 - ◆ 10-year: 1 event
 - ◆ 5-year: 7 events
 - ◆ 2-year: 29 events

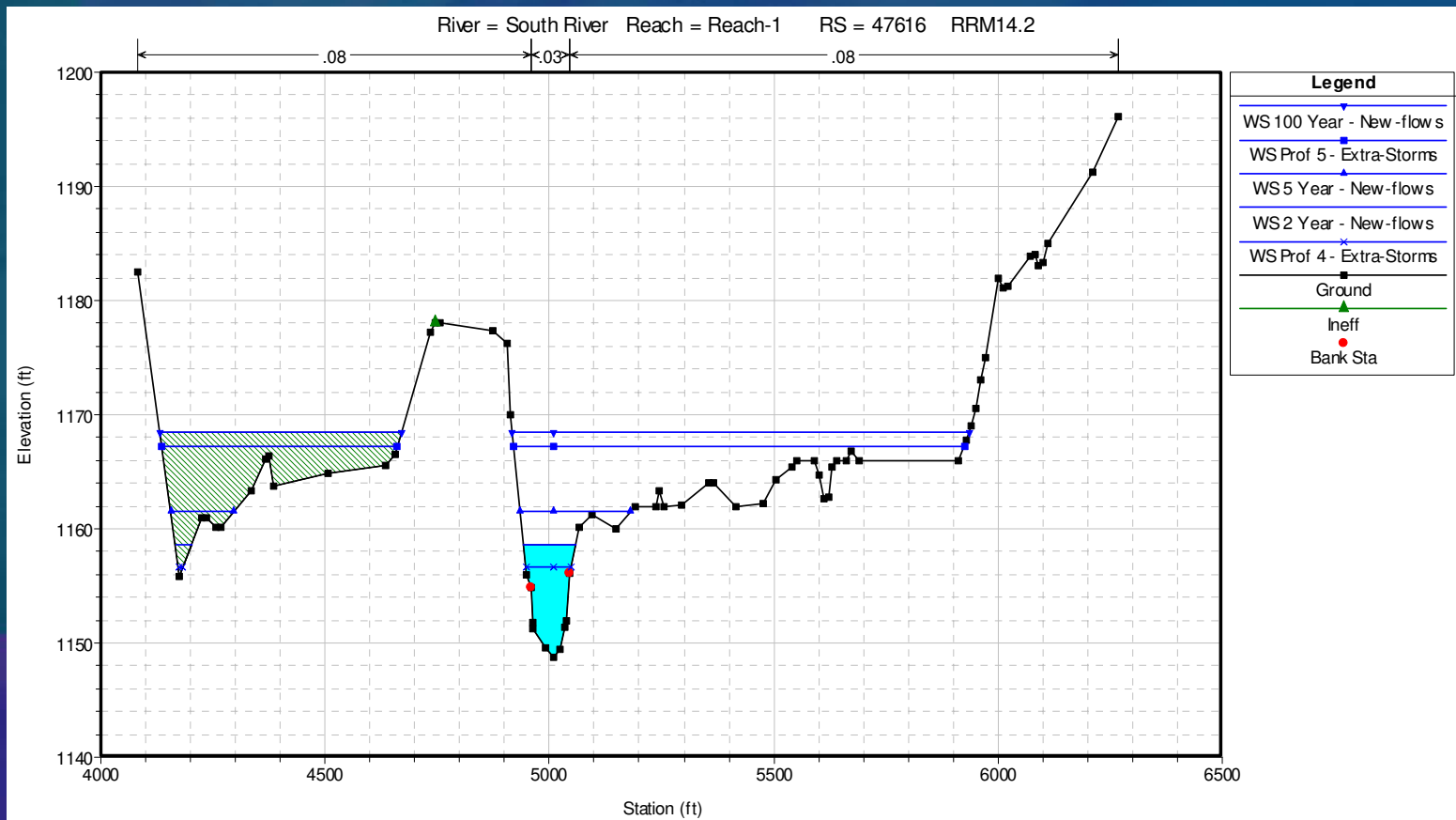
Inundation Areas -RM 11.8-13.1



Inundation Areas – RM 11.8 to 13.1

**URS**

Example – 2-Year Storm Event



Example – October 7, 2006 Storm Event

- Flow at Harriston – 6,840 cfs; close to the 2-year event
- Cross section data for 2-year storm
 - ◆ Depth of water – 9.76 ft
 - ◆ Channel banks not overtopped
 - ◆ Velocity – 6.58 ft/sec
 - ◆ Shear stress – 0.51 lbs/ sq ft

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