Helmand Valley Water Management Plan

Presented By: Jason Needham, P.E. (HEC)

Project Team: HEC, AED, USAID

USACE, Hydrologic Engineering Center

Problem Statement

- Over 25 years of turmoil has lead to deficient water management in Afghanistan
  - Construction
  - Maintenance
  - Operations
  - Technical
    - Capacity
    - Equipment

Project Overview

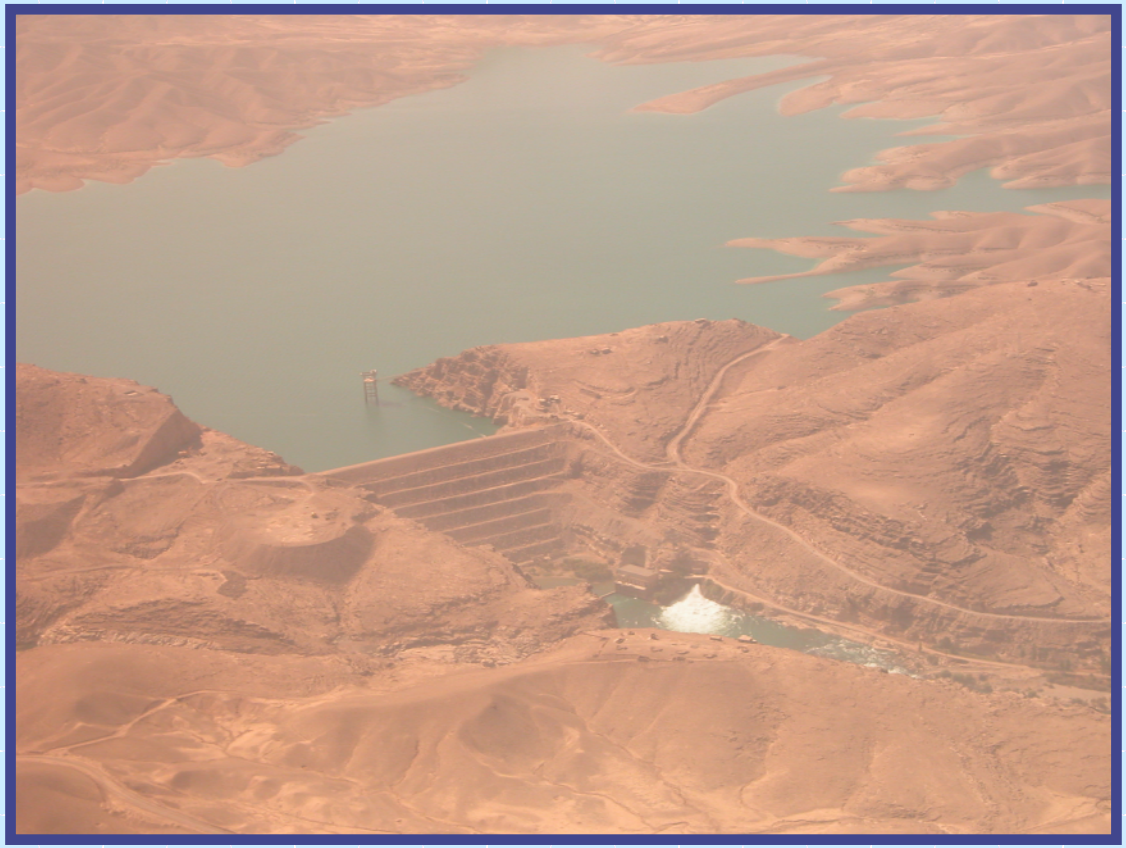
- Purpose
  - Develop water management plans for Helmand Valley
  - Restore water management institutional capacity in Afghanistan
- Two phase process
- Funded and managed by US Agency for International Development (USAID)
  - Contracted with USACE Afghanistan Engineering District (AED) and USACE Hydrologic Engineering Center (HEC)

The Helmand Valley

- Drainage area
  - 160,000 km^2
  - 31% of country
- Helmand River
  - AY~14 Billion m^3
- Kajakai Reservoir

Kajakai Reservoir

- Max Capacity - 3.2 Billion m^3
- Water supply
  - Irrigation
  - Wetlands
  - Iran
- Hydropower
  - Existing - 33 MW
  - Design - 150 MW



Phase I

- Goals
  - Provide updated information on the capacity of the Helmand system to support water resource demands.
  - Evaluate immediate improvements to the system and provide information for long-term planning of water resources.
  - Begin capacity building process.

Phase I – Tasks

- Hydrologic Data
  - Data gathering and validation
    - 42 stream gages
    - 1950s through late 1970s
  - USGS – 1991 event
- Institutional capacity building
  - Ministry of Water and Energy Engineers (6)
  - Two week water management training in US
    - Site visits
      - Joint Operation Center (DWR, USGS, NWS, USACE)
      - Gage sites
      - Irrigation districts
      - Large reservoirs and hydropower facilities
      - Small reservoir and water diversion structures
      - Irrigation management information system
    - Introduction to water management software

Phase I – Water Management Tour

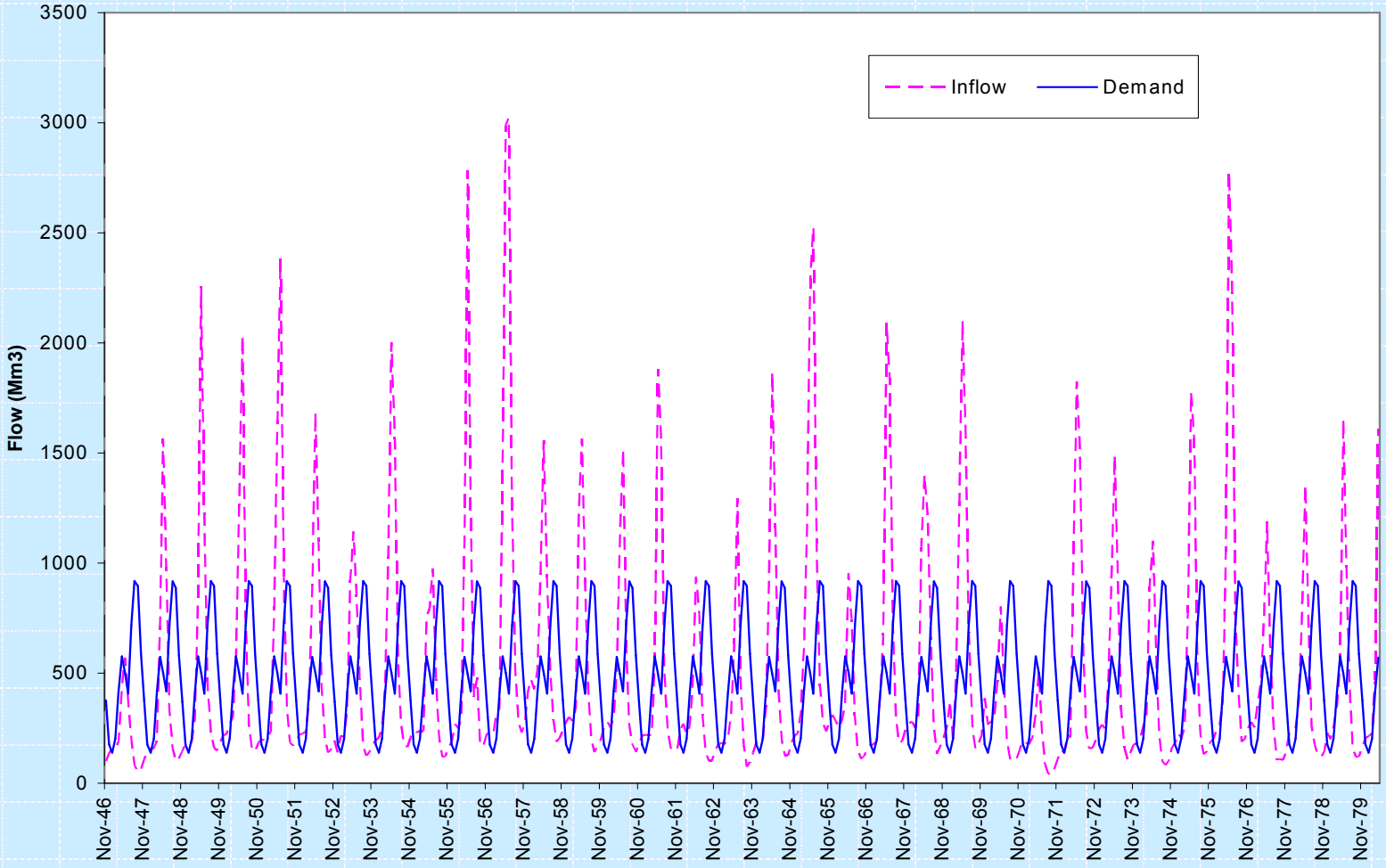
Phase I – Water Management Tour

Phase I – Tasks (Continued)

- Preliminary Water Budget Analysis
  - Update information on capacity of Kajakai Reservoir for irrigation supply and power generation
    - Simulation Model
      - Existing configuration
      - Existing power/gated spillway
      - Expanded power/gated spillway
      - Raised dam/expanded power/gated spillway
    - Use historic inflow record
    - Demands
      - Various levels of irrigation demand
      - Iran treaty requirements

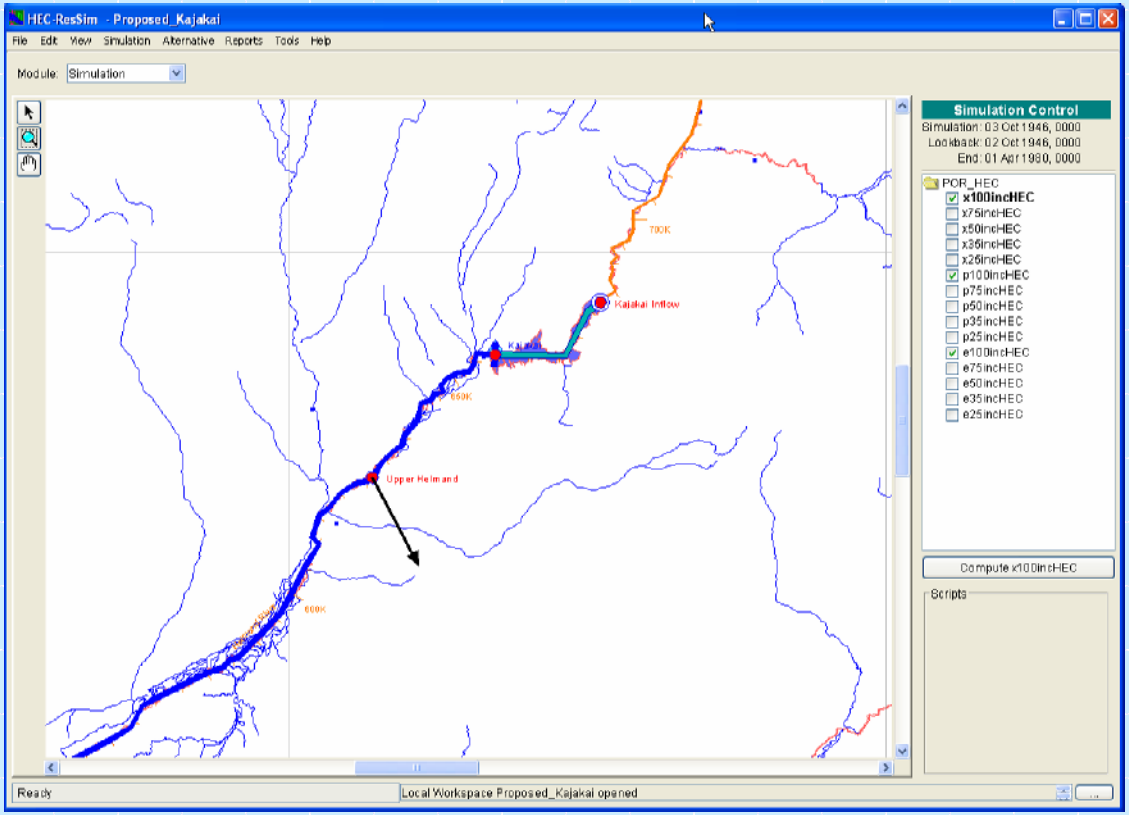
Phase I – Tasks

- Inflows vs. demand

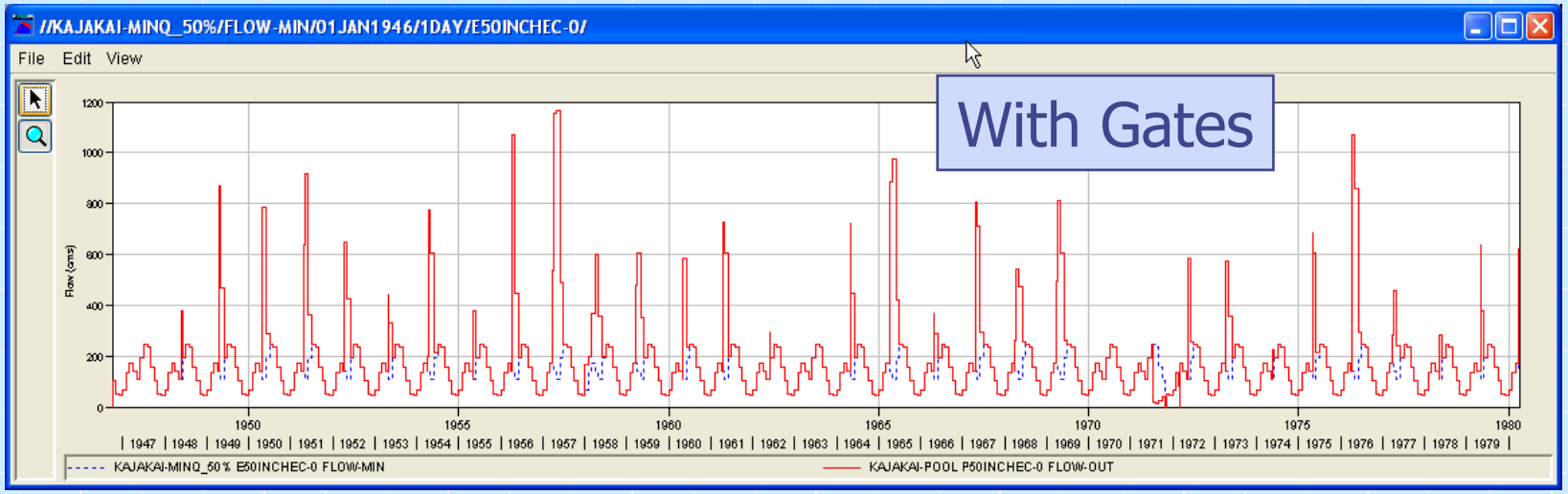


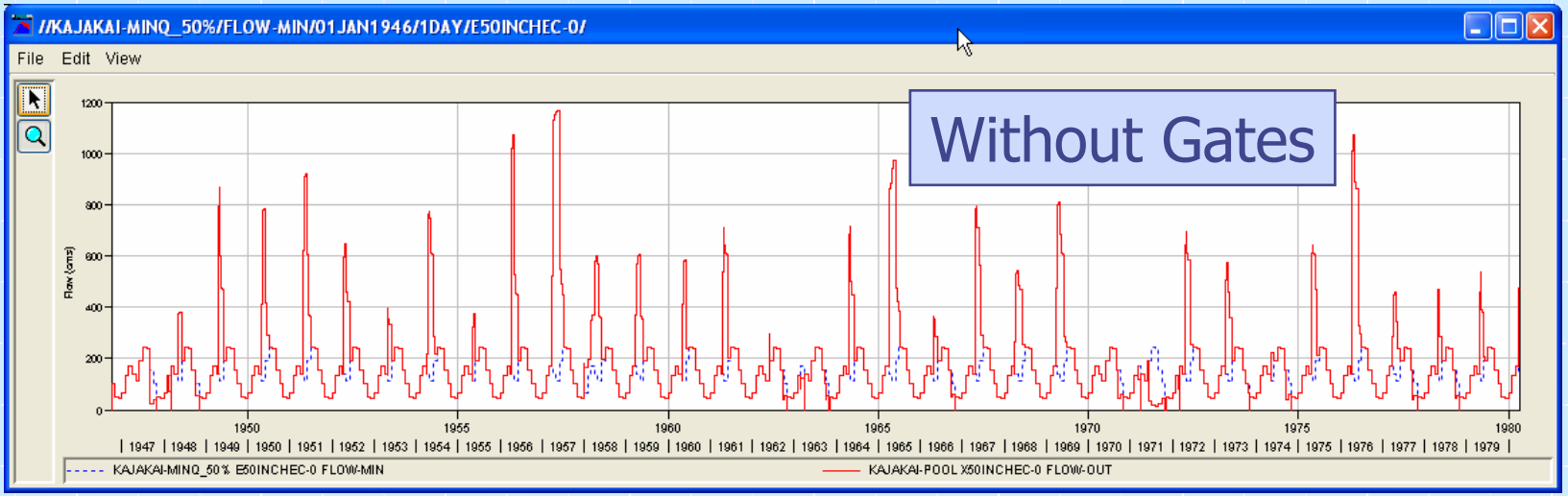
Simulation Model – HEC-ResSim

- Rule-based
- Multi-purpose system simulation
- Network structure – object structured.

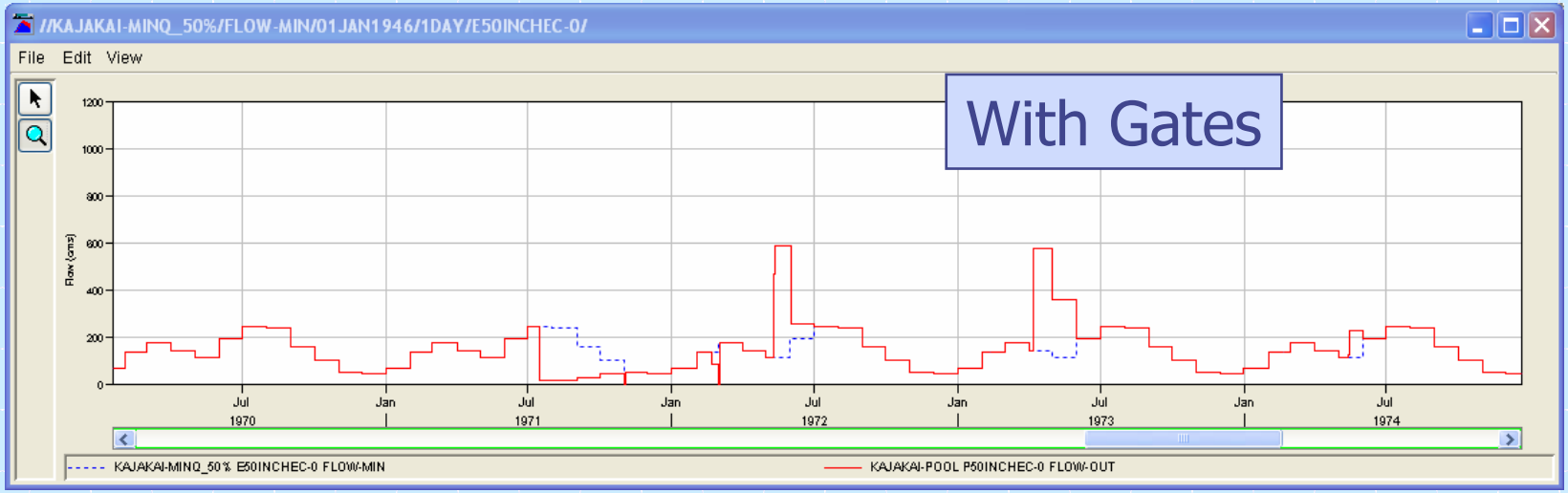


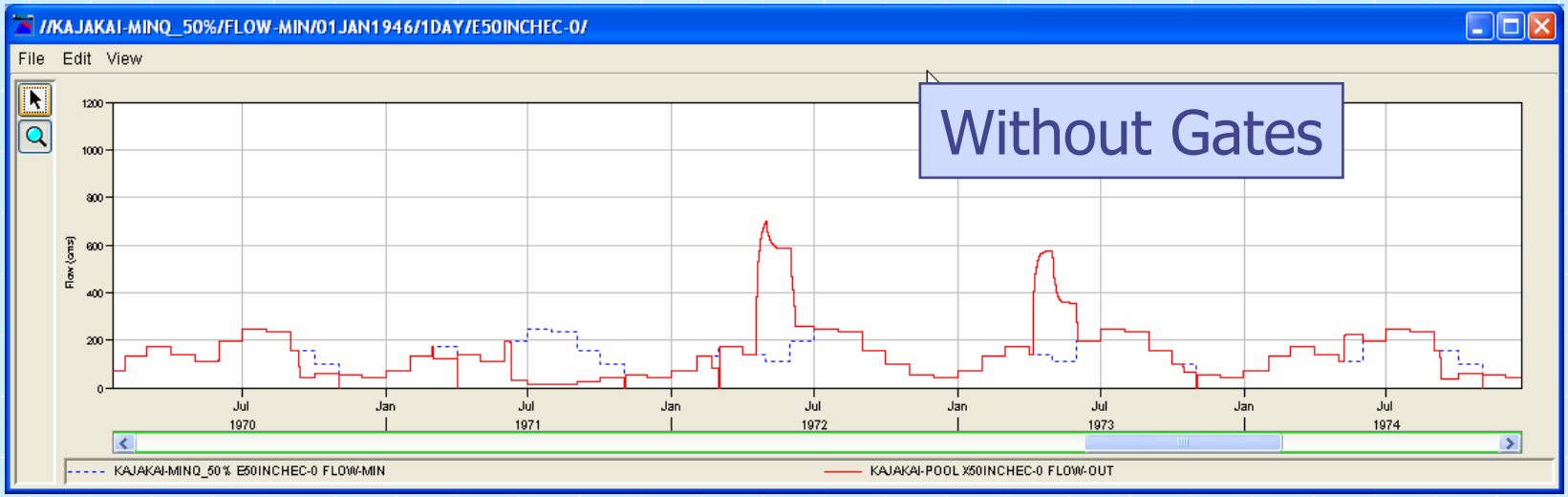
Water Supply Comparison – 50% Demand



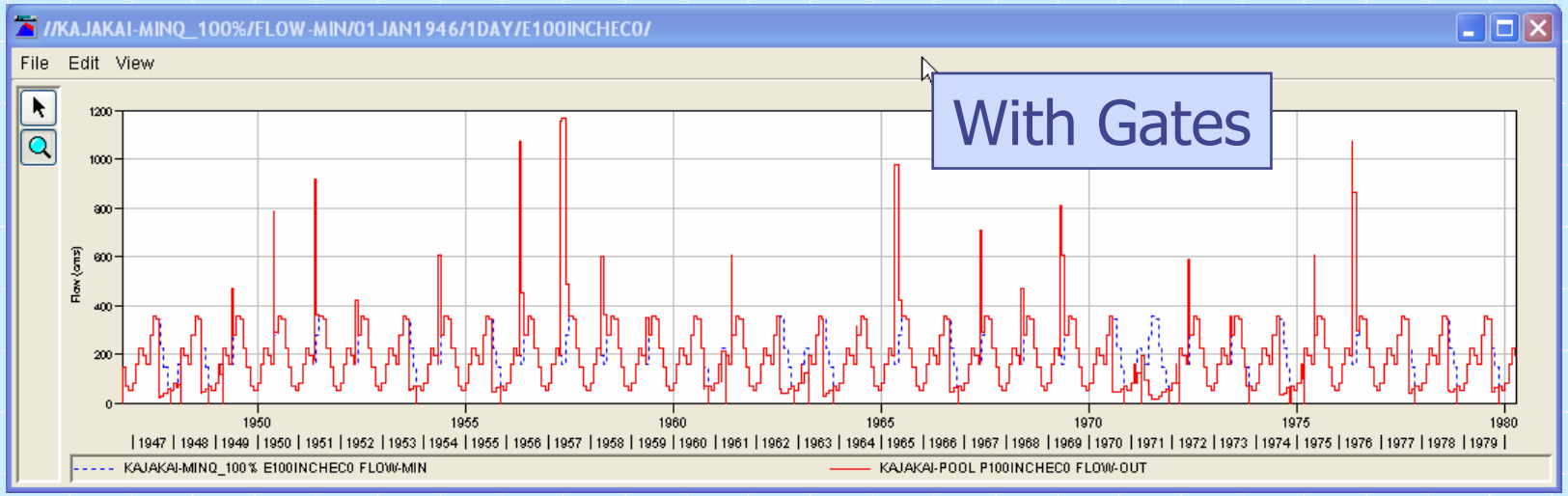


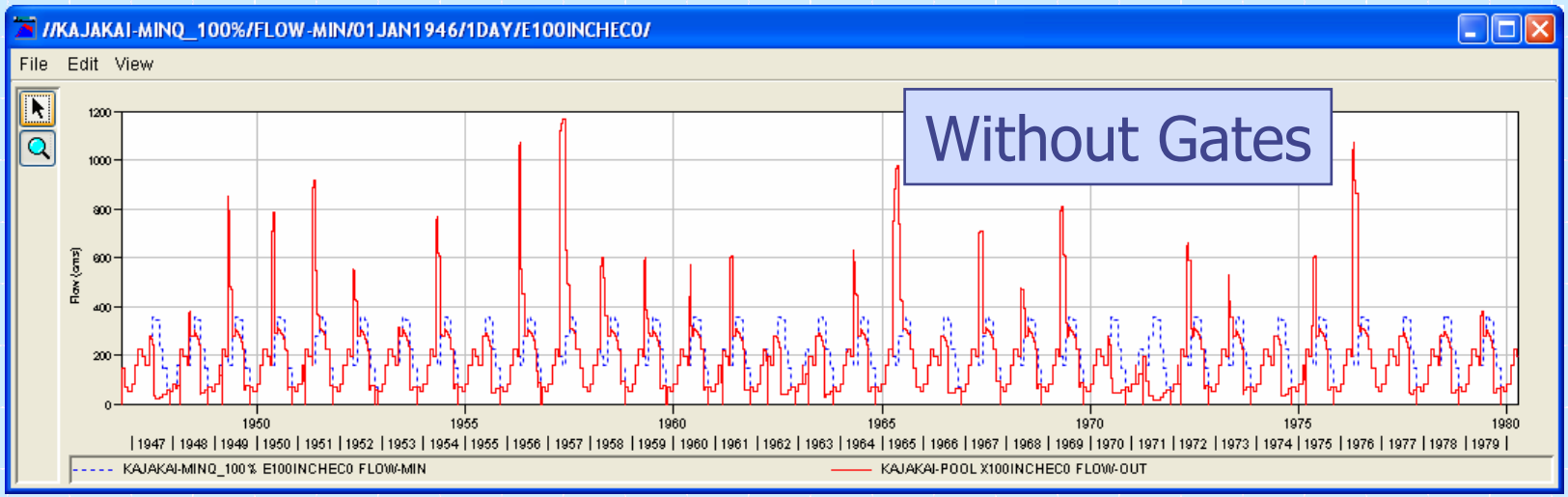
Water Supply Comparison – 50% Demand



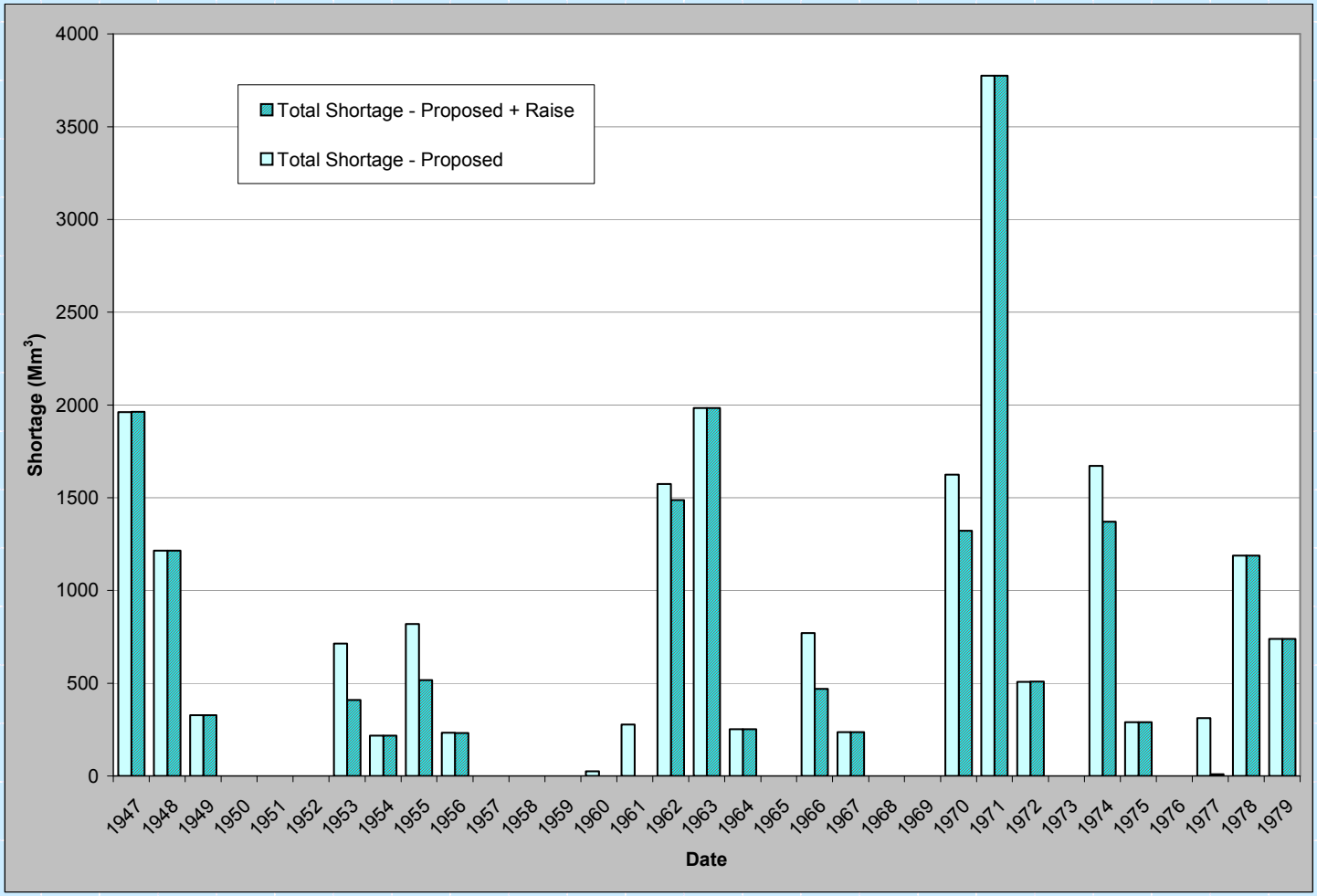


Water Supply Comparison – 100% Demand





Water Supply Comparison – Raised Dam



Phase I – Tasks (Continued)

- Preliminary Water Budget Analysis (cont.)
  - Preliminary rule curves
  - Time to fill estimate
  - Report
- Define Phase II

Phase II

- Comprehensive simulation model
  - Tributaries
  - Demands
  - Hydropower vs. irrigation trade-off
- Reservoir regulation manuals
- Training

Contact

- Jason Needham
- US Army Corps of Engineers
- Hydrologic Engineering Center
- Davis, CA 95616
- (530) 756-1104
- Jason.t.needham@usace.army.mil