

Knight Piésold Minder™

A New, Dynamic Internet-based
Reservoir Water Management
Tool

by

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Knight Piésold Minder™

- A dynamic, state of the art, reservoir operational, reservoir state, and output forecasting tool
- Internet based with an intuitive, user- friendly interface
- Produces easy to understand, graphical output

Reservoir Operational Model

- A model analyzing the flow and storage of water in a system
 - Uses climatological and reservoir operational variables
- Analyzes inflows and outflows, including:
 - Precipitation, evaporation, and seepage
 - Water allocation discharges for various uses

Purpose of Reservoir Operation

- Permit/water right compliance
- Estimate reservoir storage and water requirements for downstream uses and electrical energy production
 - Assists with system optimization
- Estimate flows to and from pumped storage facilities
 - Assists with sizing of turbines/penstocks/facilities
- Forecast flow and energy fluctuations
 - Assists with forecast planning

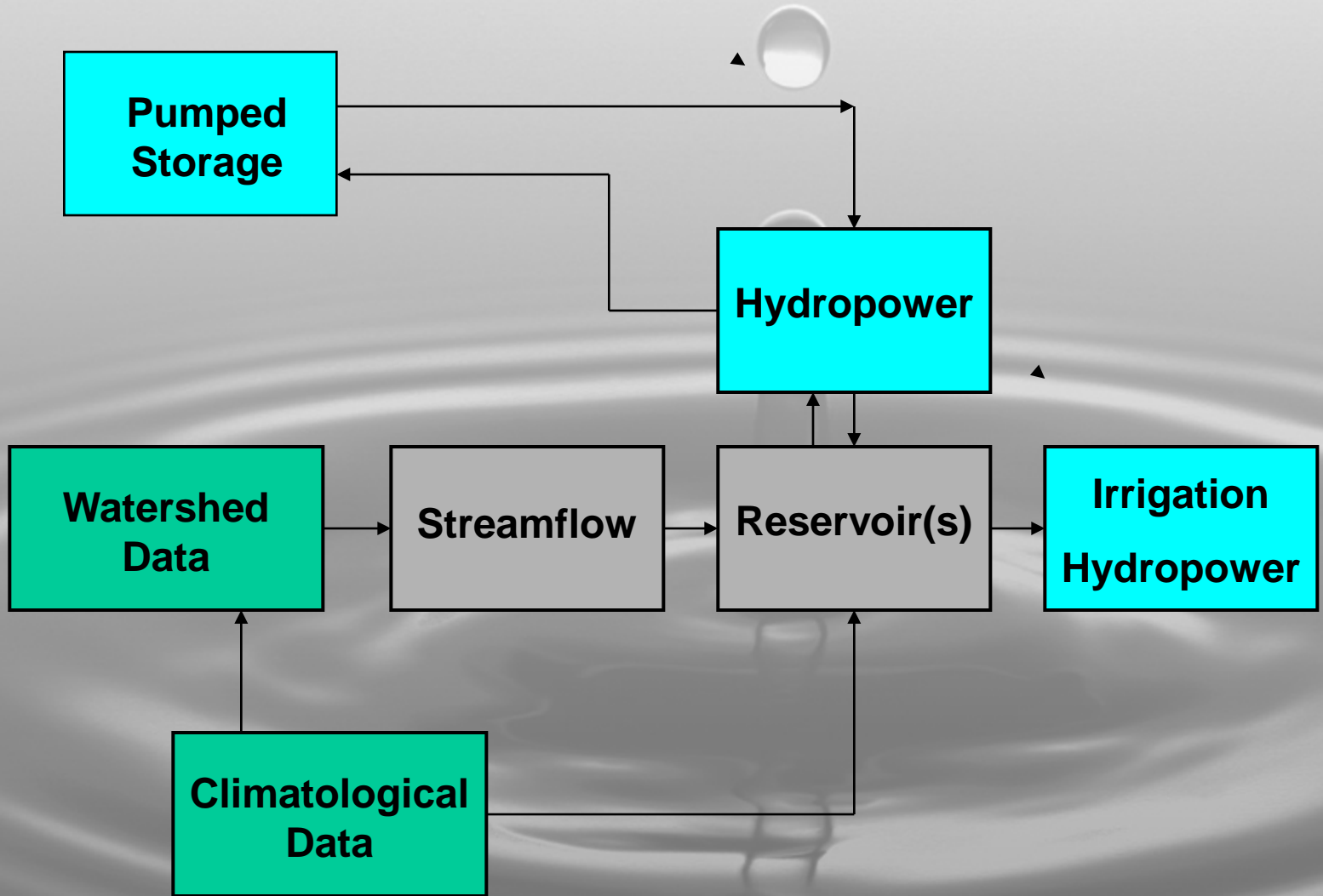
Advantages of Knight Piésold Minder™

- Based on proven methods
 - Developing reliable reservoir operational models is a core part of our expertise
 - Knight Piésold has extensive experience in climatological modeling
 - Knight Piésold has developed reliable electricity production and cost modules
- Internet hosted model
 - Access from any computer connected to the Internet
 - Only requires an Internet browser to run
 - People in different locations can simultaneously run model and view output
- Efficient code
 - Simulation results are available within seconds
 - Multiple scenarios can be quickly modeled

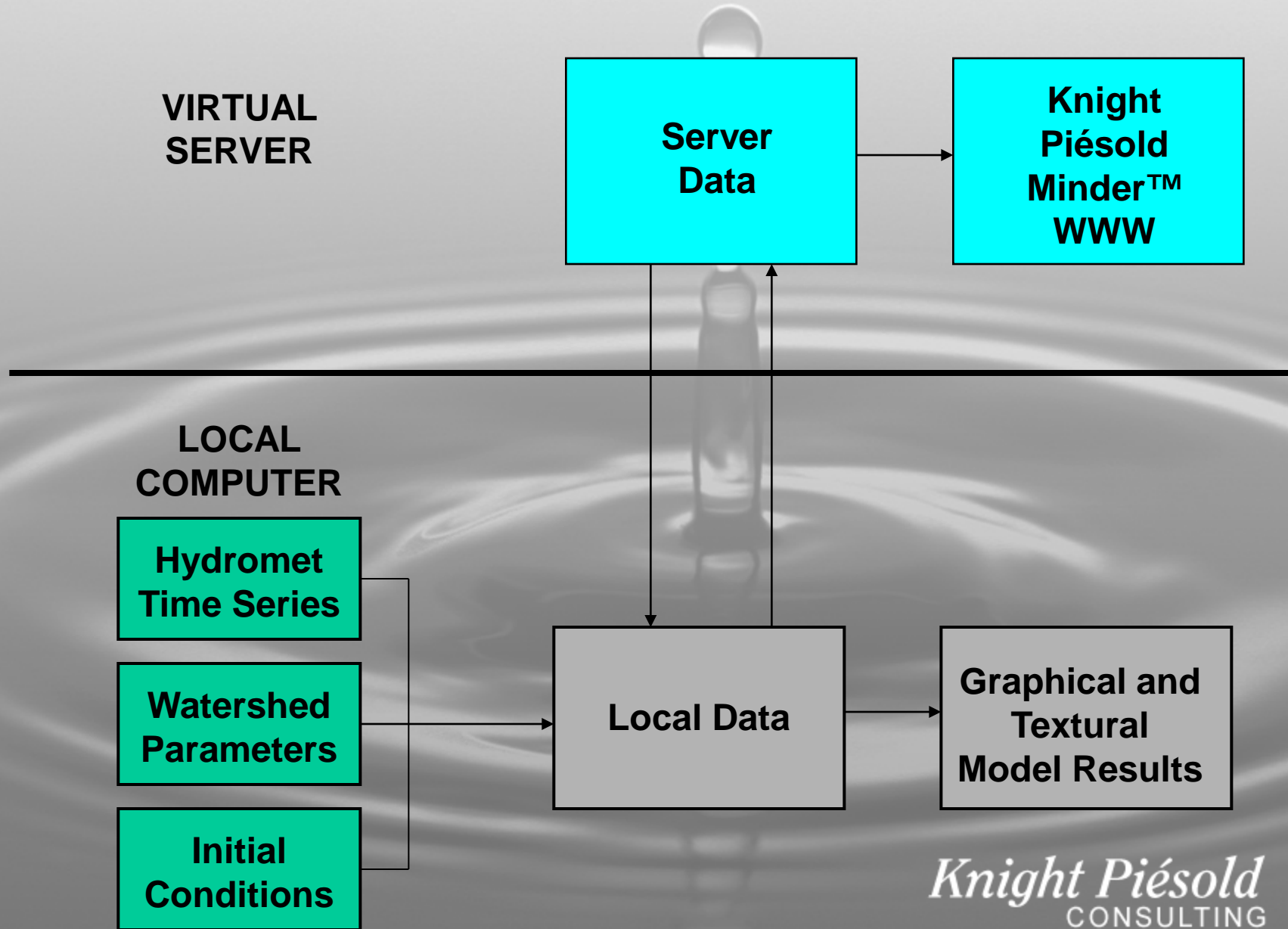
Advantages of Knight Piésold Minder™ (cont.)

- Owner of the model can independently model scenarios
 - Saves on consulting costs
 - Owner can identify potential issues before they become a problem
 - Risk to the facility can be reduced
- The methods used by Knight Piésold have proven themselves to be reliable
- Other commercially available software investigated by us could not independently model the more sophisticated algorithms required to develop a reliable model
 - Knight Piésold Minder™ models these algorithms, thereby:
 - Providing more reliable results
 - Providing better model flexibility
 - Providing better performance
 - Reducing the risk of errors

GENERAL INFORMATION



GENERAL INFORMATION



Climatological Features

- Customized for each site
- Provides all necessary climatological data for long-term and short-term models
 - Normal conditions
 - Extreme conditions

Short term

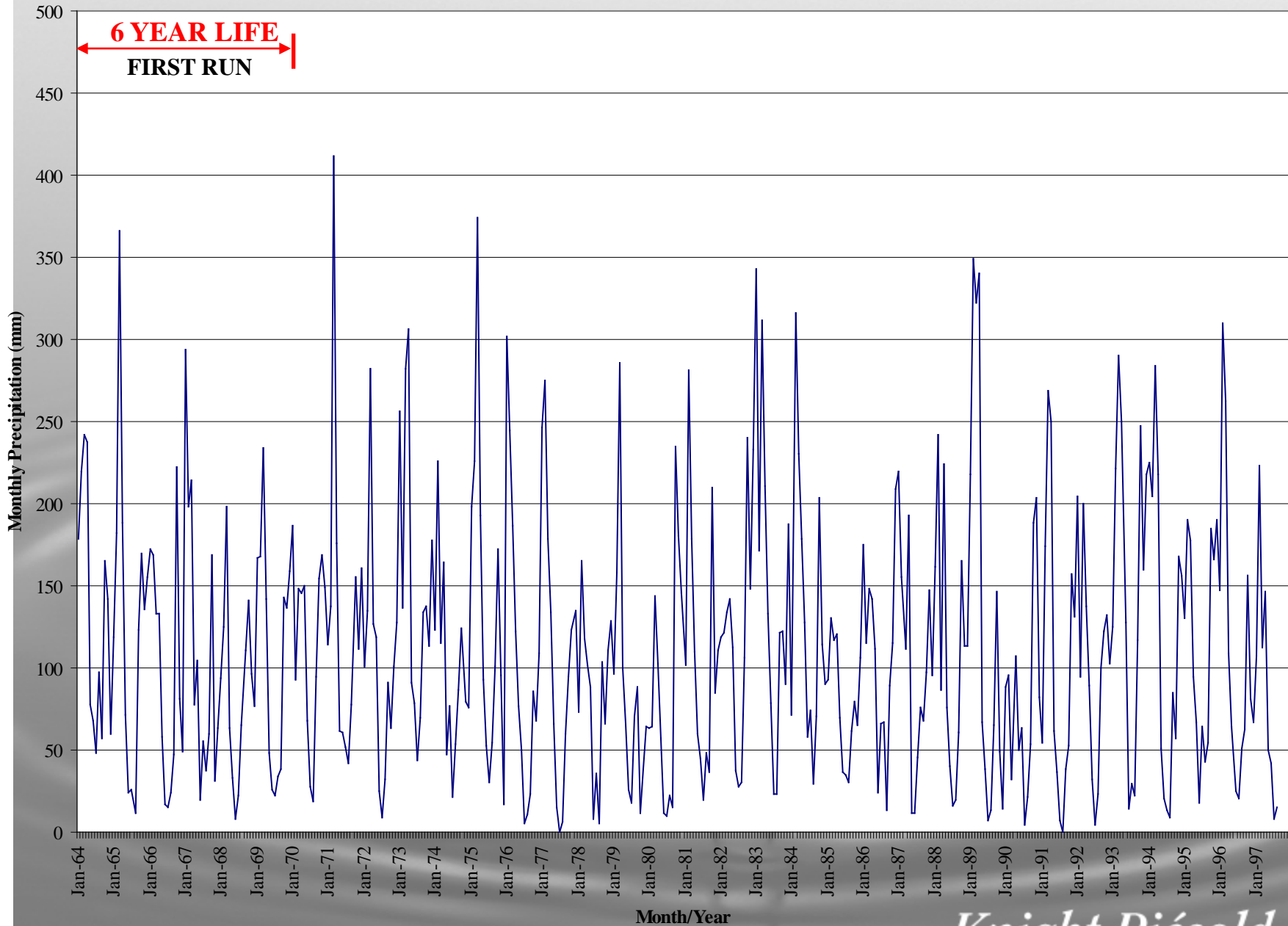
Long term

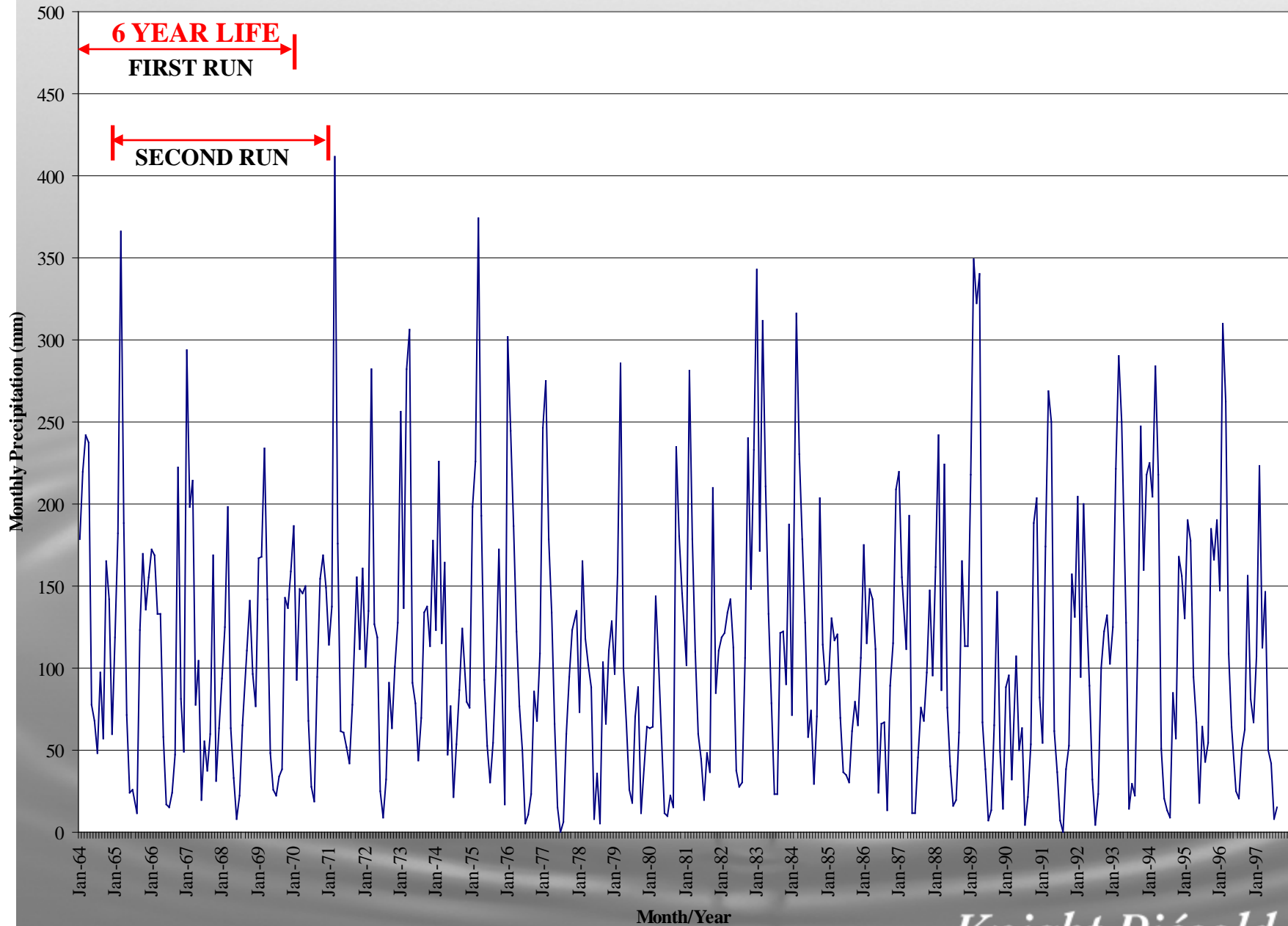
Input

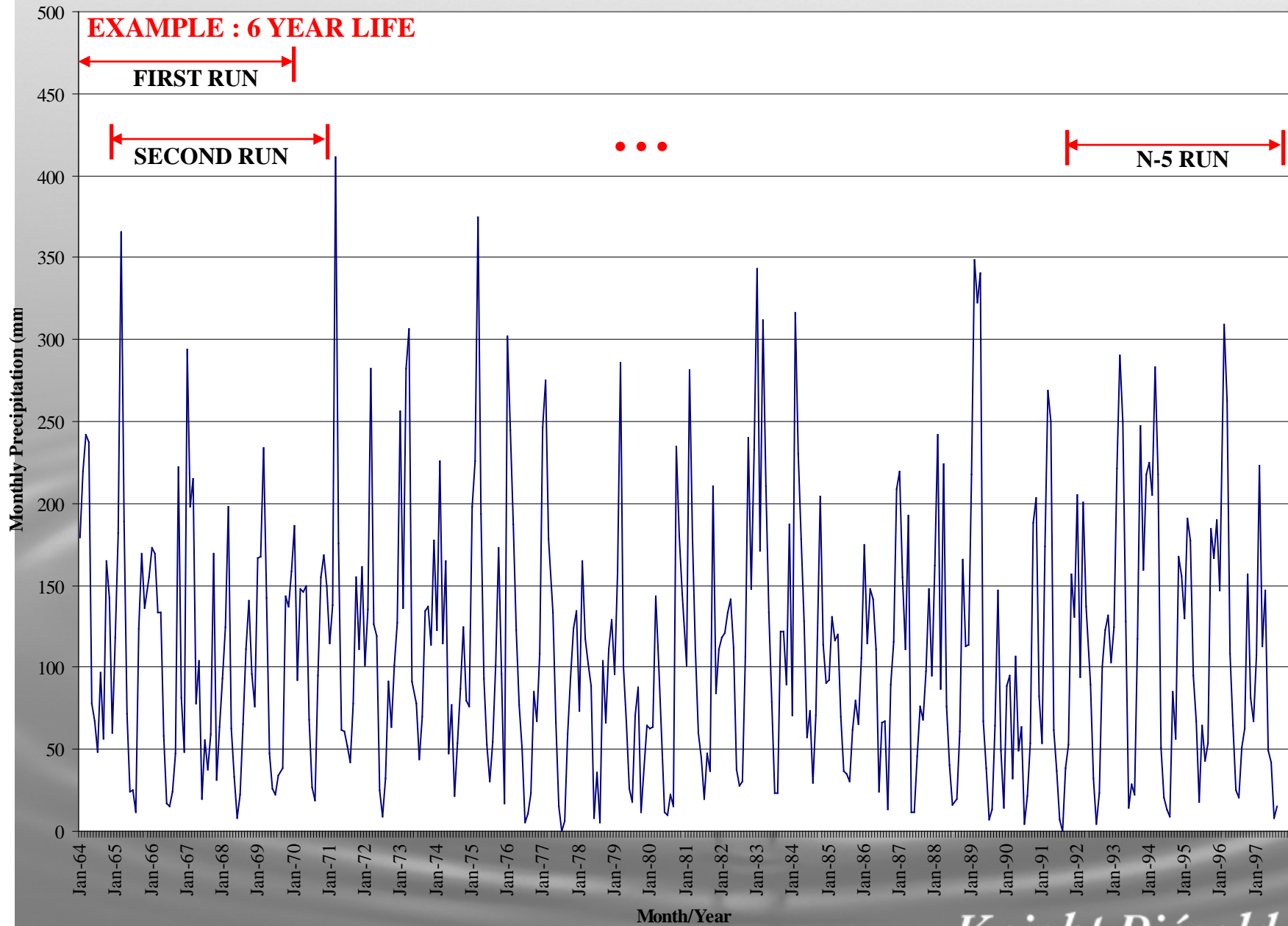
- Climatological Data
 - Historical Precipitation
 - Air Temperature
- Area-Elevation-Capacity Curves
- Facility Characteristics
- Operating Rules
- Calculated Variables
 - Evaporation (PET, AET)
 - Surface Runoff
 - Flow-Duration Curves
 - Power Potential

Input (continued)

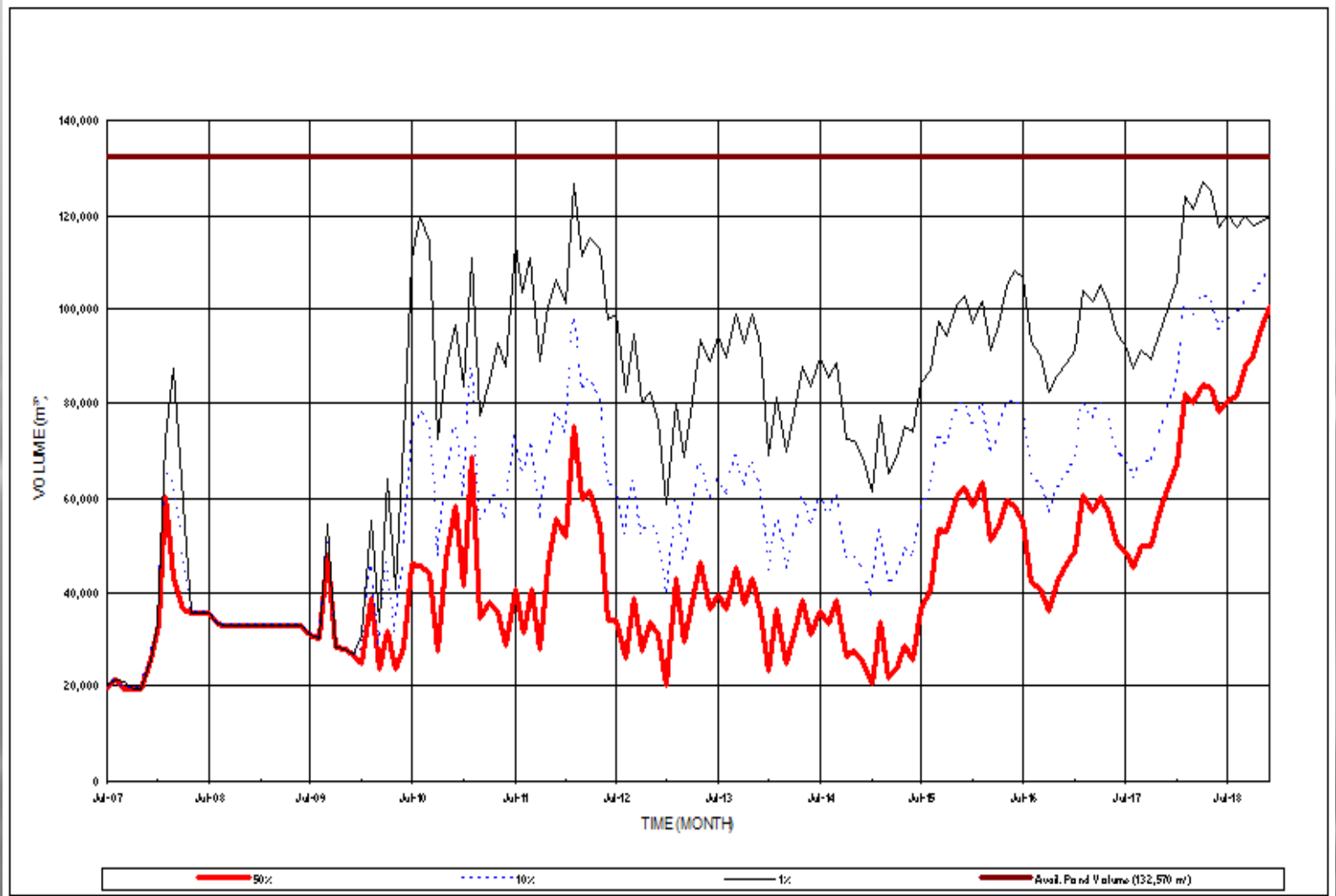
- Measured Variables
 - Maximum Heads
 - Lengths of Facilities (e.g., Penstocks)
- Other Operational Data



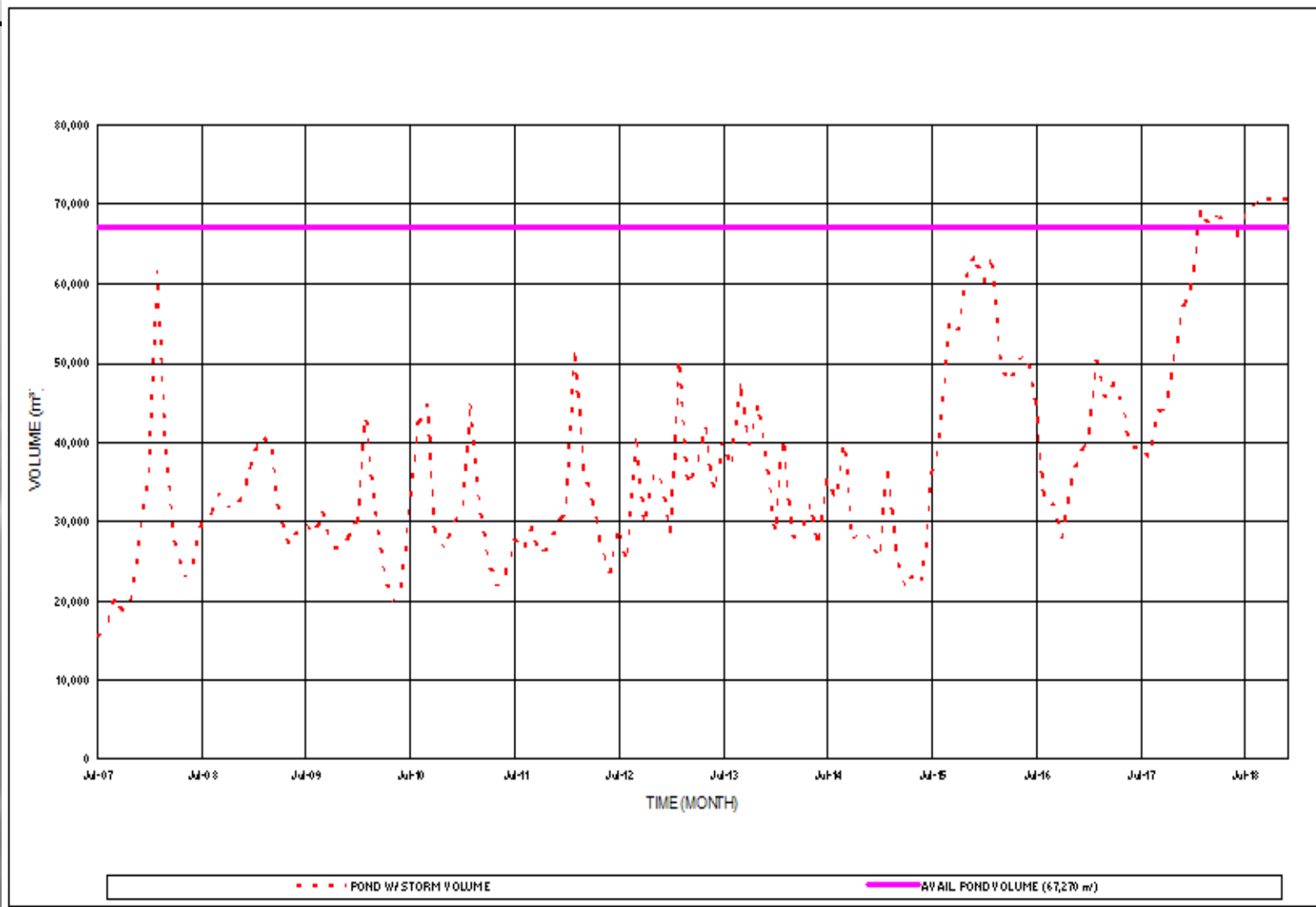




Probabilistic Reservoir Volume



Reservoir Volume with Storm Event



Summary

- Knight Piésold Minder™:
 - Is a dynamic state of the art, reservoir operational, reservoir state, and output forecasting tool
 - Has been developed by experienced professionals using sophisticated and proven methods
 - Is Internet based, allowing:
 - Access from any computer connected to the Internet
 - The model to be run on more than one computer at a time
 - Multiple users to simultaneously view simulation results
 - Uses efficient code, making it quick and easy to set up and run a simulation

Summary (cont.)

- Allows the Owner to evaluate his own facility, thereby:
 - Saving consulting costs
 - Allowing potential issues to be identified before they become a problem
 - Reducing operating risk
- Is more than a reservoir operational program. The following are incorporated:
 - Electrical energy production
 - Financial module

Summary (cont.)

- Is capable of running sophisticated algorithms, thereby:
 - Providing more reliable results than other commercially available software
 - Providing better performance
 - Providing better model flexibility
 - Reducing the risk of errors

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