Kickoff Meeting Agenda

1. Introductions
2. Project Overview
3. Stakeholder Meetings
4. Approach to Developing Unimpaired Flows
5. Simplified Water Allocation Model (SWAM)
6. Other – Questions, Comments, Closing Remarks
Project Scope Overview

Major Steps for Each of Eight Models

**Data Collection**
- Streamflow, M&I and ag withdrawals, discharges, census data, precipitation, reservoir operations, interconnections, facility operation dates, etc.

**Data Analysis**
- Gap filling and record extension

**UID Development**
- Daily mean UIFs

**Task 1**

**Basin Schematic**
- Model framework development

**Task 2**

**Model Calibration**
- Reproduce actual conditions

**Baseline Model Runs**
- Simulate current conditions
Intended Model Uses

• Evaluate surface-water availability in support of the new Surface Water Withdrawal, Permitting, Use, and Reporting Act

• Predict future surface-water availability using projected demands

• Develop regional water-supply plans

• Test the effectiveness of new water-management strategies or new operating rules

• Evaluate the impacts of future withdrawals on instream flow needs and minimum instream flows as defined by regulation

• Others?
## Data Needs / Data Collection

<table>
<thead>
<tr>
<th>Data Need</th>
<th>Primary Source</th>
<th>Frequency</th>
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</thead>
<tbody>
<tr>
<td><strong>Flow and Meteorological</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Streamflow</td>
<td>USGS</td>
<td>Daily</td>
</tr>
<tr>
<td>Evaporation</td>
<td>SC Climatologist</td>
<td>Daily/Monthly</td>
</tr>
<tr>
<td>Precipitation</td>
<td>SC Climatologist</td>
<td>Daily/Monthly</td>
</tr>
<tr>
<td><strong>Withdrawals and Discharges</strong></td>
<td></td>
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<tr>
<td>M&amp;I Withdrawals</td>
<td>DHEC and Utilities</td>
<td>Monthly</td>
</tr>
<tr>
<td>NPDES Discharges</td>
<td>DHEC and Utilities</td>
<td>Monthly</td>
</tr>
<tr>
<td>Ag Withdrawals</td>
<td>DHEC</td>
<td>Monthly</td>
</tr>
<tr>
<td>Hydropower/Cooling</td>
<td>DHEC and Elect. Util.</td>
<td>Daily/Monthly</td>
</tr>
<tr>
<td>Groundwater Withdrawals</td>
<td>DHEC</td>
<td>Monthly</td>
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<tr>
<td><strong>Reservoirs</strong></td>
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<tr>
<td>Operating rules (current/historical)</td>
<td>Electric Utilities</td>
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<tr>
<td>Historic Elevations</td>
<td>Electric Utilities/USGS</td>
<td>Daily/Monthly</td>
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<tr>
<td>Stage/Storage/Elevation</td>
<td>Electric Utilities</td>
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<tr>
<td><strong>Other</strong></td>
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<td></td>
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<tr>
<td>Instream Flow Requirements</td>
<td>DHEC</td>
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<tr>
<td>Drought Management Plans</td>
<td>DHEC and Utilities</td>
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<tr>
<td>Previously Developed UIF Datasets</td>
<td>NC DWR, GA EPD</td>
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<tr>
<td>Basin Characteristics</td>
<td>GIS</td>
<td>-</td>
</tr>
<tr>
<td>Census Data</td>
<td>US Census</td>
<td>-</td>
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</table>
Schedule

Preliminary and Recurring Tasks
- Kickoff Meeting
- Modeling Plan Development
- Installation & Testing on DNR & DHEC Servers
- Progress Reports

Pilot Basin Model

Task 1 Development of Inflow Datasets
1.1 First Stakeholder Working Session
1.2 Data Collection
1.3 Data Analysis, Extension and Gap-Filling
1.4 Unimpaired Flow Development

Task 2 Surface Water Model Development
2.1 Model Framework
2.2 Second Stakeholder Working Session
2.3 Calibration & Verification
2.4 Baseline Model Runs

Task 3 Model Training

Remaining Seven Basin Models

Task 1 Development of Inflow Datasets
1.1 First Stakeholder Working Session
1.2 Data Collection
1.3 Data Analysis, Extension and Gap-Filling
1.4 Unimpaired Flow Development

Task 2 Surface Water Model Development
2.1 Model Framework
2.2 Second Stakeholder Working Session
2.3 Calibration & Verification
2.4 Baseline Model Runs

Task 3 Model Training
Near Term Schedule and Deliverables  
*Saluda Basin*

<table>
<thead>
<tr>
<th>Deliverable</th>
<th>Due Date</th>
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<tbody>
<tr>
<td>Modeling Plan</td>
<td>Oct 15</td>
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<tr>
<td>Quarterly Reports</td>
<td>Nov 15/Feb 15/May 15</td>
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<tr>
<td>UIF Methodology</td>
<td>Dec 1</td>
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<tr>
<td>Saluda Model Framework</td>
<td>Jan 15</td>
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<tr>
<td>UIF Dataset</td>
<td>Mar 1</td>
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<tr>
<td>Draft Baseline Model Runs</td>
<td>May 1</td>
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<tr>
<td>Final Calibrated Model</td>
<td>Jun 1</td>
</tr>
<tr>
<td>Training/Users Manual</td>
<td>Jul 30</td>
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</tbody>
</table>
Project Quality Management Process

• Clarify key project stakeholders roles and responsibilities
• Develop a clear understanding of the purpose, objectives and expectations of the project
• Develop consensus on the most important factors necessary to ensure a successful project
• Develop plan of action that will help the project team meet the project objectives
Project Critical Success Factors

• Modeling Plan/Pilot Model
  – *We must use the pilot model and modeling plan to develop a sound, clear, and transferable approach and template, and achieve consensus.*

• Communication
  – *We must develop and follow an established internal communication approach with a dedicated team having the proper skills to ensure consistency in execution and continually address critical success factors.*
Project Critical Success Factors

• **Data Collection**
  
  - *We must develop an efficient data collection approach that is appropriate to the model scale, clearly defines the period of record, identifies critical data, and documents the sources of data collected.***

• **Unimpaired Flows**
  
  - *We must achieve agreement on a consistent methodology to develop unimpaired flows, and the results.*
Project Critical Success Factors

• Quality
  – *We must follow CDM Smith’s Quality Management Procedures (QMP), which include careful review and quality control of the products to ensure the highest quality before releasing to the client and public.*

• Modeling
  – *We must clearly define and achieve model requirements to meet the overriding objectives and stated future uses of the models, with a focus on model robustness, usability, transferability, defensibility, and flexibility.*
Project Critical Success Factors

• Stakeholders

  - We must understand our role and work with DNR, DHEC, and the facilitator, to build understanding and agreement on the technical approach.
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6. Other – Questions, Comments, Closing Remarks
Stakeholder Meetings

- Proposed Approach
  - Up to two meetings per basin
    - 1st Meeting to introduce model framework, present approach and assumptions, and explain data needs
    - Potential 2nd meeting to refine or confirm assumptions and clarify data received

- Role of Facilitator
Kickoff Meeting Agenda

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Draft Process Diagram for Unimpaired Flows for South Carolina

DATA COLLECTION
- Complete vs. Incomplete records and possible reference gages
- All USGS daily flow records
- Basin characteristics for each USGS gage: slope, area, land use
- Date reservoirs put into service
- Reservoir records (daily or monthly): Elevation, W/Ds, releases, evap, precip
- Storage-Area-Elevation relationships
- Operating rules, where available
- Surface water and groundwater use inventory (with starting service dates)
- Monthly water withdrawals
- Monthly discharges of cooling water, treated wastewater, process water, etc.

UNREGULATED FLOWS
- USGS flows adjusted for reservoir operations: “Unregulated Flows”
- Hydrologic routing with time lags if needed

GAP FILLING
- Gap filling of unregulated flows:
  - MOVE2
  - Regression on watershed features
  - Area Ratios
- Gains/Losses due to storage impacts

UIF Components
- Incremental unregulated flows by reach
- UIFs & current condition flows from NC or GA
- Reservoir evaporation and precipitation
- Net gain or loss per reach

UIFs
- Use Hindcasting using trends and data to project estimated withdrawals and discharges back in time where records may not be available.

Some tasks may be iterative or re-sequenced

Check homogeneity/statinerity

Data and Trend Analysis

Unimpaired Flows
Saluda Basin
Kickoff Meeting Agenda

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5. **Simplified Water Allocation Model (SWAM)**
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Web Accessibility Options

- **Citrix Deployment** provides SWAM access behind firewall that simulates a desktop environment
  - Simple, secure, suitable for number of concurrent users
- **Web SWAM** resides on web as a distributed application
  - Large number of concurrent users; requires significant modification
- **Hybrid SWAM** is a combination of first two options
  - Large number of concurrent users; requires significant modification
- **Desktop SWAM** eliminates web accessibility issues
  - User simply registers then downloads desired basin model
  - Model is updated and run locally
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