STRAWMAN OUTLINE
March 21, 2008

ISWS/ISGS REPORT ON THE OPPORTUNITIES AND CHALLENGES OF MEETING WATER DEMAND IN NORTH-EAST ILLINOIS

REPORT TO BE DELIVERED TO THE RWSPG BY SEPTEMBER 30, 2008

2.3.i. General characteristics
- **a. Areal extent**
- **b. Thickness**
- **c. Regional variability**

2.3.ii. Stratigraphy
- **a. Wisconsin and Hudson Episodes**
  - **- Cahokia Formation**
  - **- Wedron Group**
  - **- Mason Group**
- **b. Illinoian Episode**
  - **- Glasford Formation undifferentiated**

2.3.iii. Hydrogeology
- **a. Mason Group**
  - **- Henry Formation**
- **b. Glasford Formation undifferentiated**
  - **- Sand and gravel deposits within and below Glasford tills**
  - **- Hydrogeologic relationship with fractured bedrock**

2.4. Summary

3. Water cycle

3.1. Natural water cycle (components; interactions; and variability)
- **3.1.i. Introduction**
- **3.1.ii. Climate (included climate change and variability)**
- **3.1.iii. Surface water**
- **3.1.iv. Groundwater**
- **3.1.v. Water quality (includes changes as water moves from the surface to the aquifers)**

3.2. Human-induced changes to the water cycle
- **3.2.i. Introduction**
- **3.2.ii. Lake Michigan diversion**
  - **a) Accounting system, allocations and use**
  - **b) Lake level**
  - **c) Water quality (relevant to water supply and discharge)**
- **3.2.iii. Land-use**
  - **a. Rural**
    - **- vegetation**
    - **- drainage**
  - **b. Urban**
    - **- urbanization**
    - **- streamflows and recharge**
  - **c. Urban and rural**
    - **- streamflows and recharge**
- **3.2.iv. Reservoirs, side channels and dams (includes loss of capacity with sedimentation)**
- **3.2.v. Groundwater and other surface water withdrawals and use**
  - **a. Source by aquifer and stream**
  - **b. Quantity by sector**

- Average day
- Peak day
- Peak season
- Per capita

3.2.vi. Impacts of withdrawals (on aquifers, heads, recharge, existing wells, regional groundwater flow, streamflow, water quality etc)

3.2.vii. Waste water discharges

- **Quantity (including impacts on streamflow)**
- **Quality (including thermal) and impacts (source of nutrients, eutrophication, taste/odor problems source of metals, organics, PPCPs, etc)**

3.2.viii. Streamflows

- **Average**
- **Low flows**
- **Peak flows**

3.2.ix. Water quality (includes USEPA drinking water standards; ecological standards/considerations; contaminants typical in rural (agricultural) areas (pesticides, nitrate, potassium, etc.); contaminants typical in urban areas (chloride, metals, organics, etc.)

3.3. Summary

4. Scenarios to 2050

4.1 The nature of scenarios and the importance of planning
4.2. Climate variability and change
4.3. Growth, land-use and other changes
4.4. Water withdrawal (3 scenarios & climate sensitivity from consultant's report)
4.4.i. Average day (by sector and source)
4.4.ii. Peak day
4.4.iii. Peak season
4.4.iv. Per capita
4.5. Summary

5. Methods, data and analytical tools for evaluating the impacts of future scenarios

5.1. Introduction
5.2. Data
5.3. Great Lakes hydrology model
5.4. Surface water accounting model
5.5. Watershed model
5.6. Geological and groundwater flow models
5.7. Summary

6. Evaluations of the impacts of withdrawing and allocating water to meet water demand and drought and climate change scenarios to 2050

6.1. Introduction
6.2. Lake Michigan diversion (water level and diversion allocations)

6.3. Other surface waters (impacts on streamflow, sedimentation, reservoir levels, water quality, intakes etc)
6.4. Aquifers (drawdown, recharge, existing wells, groundwater flow, streamflow, water quality (may release As, brine, Ra, Ba or other contaminants; higher TDS, road salt etc.))
6.5. Summary

7. Conclusions

7.1. Planning for an uncertain future (water availability and demand)
7.2. The importance of incorporating water supply in regional planning and determining acceptable impacts and costs of water withdrawals
7.3. Opportunities and challenges for management consideration
7.3.i. Sustainability (reasonable use, conservation, reuse etc.)
7.3.ii Drought and climate change
7.3.iii. Surface waters (including storm-water and TARP; re-use of treated wastewater; effects of re-use on water quality, salt build-up etc.)
7.4.iv. Groundwater (including recharge and desalination)
7.4. The need for continued water supply planning and integration in regional planning
7.5. Improvements in data collection and analysis

References
Glossary
Appendices

The water resources of NE Illinois are complex, interrelated and variable over space and time. The future is uncertain for water availability and water demand, but it is certain that the demand for water will increase. Water supply planning in the context of regional development is necessary to assure adequate water supplies, prevent conflicts and unacceptable consequences, and minimize costs.

The report provides data and information on the regional scale for use by the Regional Water Supply Planning Group in the development of an initial regional water supply plan. Describing the diversity of regional water resources will be a major focus of the report.

This is a pilot project conducted within a three-year time span with available resources. The geology and hydrology will be described at a level of detail sufficient for the initial regional planning initiative. The descriptions will not be of sufficient detail to provide adequate analyses for local analysis or the selection and installation of individual facilities.

Data availability and analysis across the region are uneven. The significance of data gaps, strengths and limitations of analytical tools, and confidence levels on

the data and model output will be described. Recommendations for improving the data bases and analytical tools will be made. It is hoped that a permanent process will be implemented for regional water supply planning and periodic updates of the regional plan will be made.

Water quantity is the focus of these studies. Water quality will be included in the report as it is relevant to water supply. Return flows and discharges of treated water will be included in the analyses.

Economics, water rates, law, infrastructure, utility operations, water treatment, detailed water use and management are not included in the study in a substantial manner.

The climate and drought scenarios are described in a separate ISWS document entitled "Climate Change and Drought Scenarios for Water Supply Planning".

The streamflow accounting model will be available only for the Fox River and the watershed model for the Fox River watershed. They will include discharges of treated water.

The groundwater flow model is a 22-layer model vertically extending from land surface to the pre-Cambrian bedrock and horizontally extending northward into central Wisconsin, eastward into Michigan and Indiana, westward to the Mississippi River, and southward into central Illinois. The model uses our knowledge of geology and layer hydrogeologic/hydraulic properties to simulate groundwater flow in each model layer. Five layers are used to simulate groundwater flow within the Quaternary deposits (the unconsolidated deposits above the bedrock). The greatest geologic detail (e.g., layer thickness, hydraulic interconnectedness, and hydraulic properties) within these five layers is contained within the Illinois portion of the Fox River Basin (FRB). Outside of a polygon surrounding the FRB of Illinois, the Quaternary thickness is divided into five equal thicknesses. Seventeen layers are used to describe the bedrock geology (including shallow and deep bedrock aquifers). The flow model simulates heads (groundwater elevations) and is calibrated to head and streamflow values observed in the field. Within the FRB of Illinois, the model will permit estimation of changes in streamflow resulting from groundwater withdrawals. Recharge can be varied to simulate climate change and drought, as reflected in groundwater fluxes to streams within the FRB. The models will be run to simulate the impacts of a) continuing withdrawals at the current pumping rates and locations, b) the 3 water demand scenarios to 2050 produced by the consultant with increased pumping at existing locations, and c) climate change and drought scenarios.

Scenarios of Lake Michigan water levels and runoff and water withdrawal in the Lake Michigan Service Area will be constructed to 2050 so that the Lake Michigan diversion can be incorporated into the regional analysis and planning.