

**AMENDMENT NO. 1 EXHIBIT A
PLAN OF STUDY
WATER SUPPLY STUDY
SWATARA CREEK WATERSHED, PENNSYLVANIA**

1. **PROJECT TITLE** – Water Supply Study for the Swatara Creek Watershed, Pennsylvania.

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4. **COMMUNICATION STRATEGY** - An executive steering committee consisting of appropriate representatives of the Corps of Engineers (COE), Pennsylvania Department of the Environmental Protection (PADEP), Susquehanna River Basin Commission (SRBC) and the Capital Region Water Board (CRWB) will be established. This committee will convene as shown on the study schedule at key decision points in order to reach agreement before next steps in the planning process are taken. The further intent of these meetings is to track study progress, review and update public communication plans and consistently review deliverables to ensure expectations are met and clearly understood by all parties.

5. **PARNERSHIP ROLES AND RESPONSIBILITIES** – This study is being conducted under the Planning Assistance to States, Section 22 of the Water Resources Development Act (WRDA) of 1974. The program is cost-shared 50% Federal and 50% non-Federal. The COE has executed an agreement with the SRBC to conduct the study. The study will be conducted in partnership with PADEP and the CRWB. Further, the SRBC will track study progress, monitor all non-federal sponsor issues and coordinate as necessary with applicable agencies to resolve open action items.

6. PROJECT BACKGROUND AND REQUIREMENTS

Background

Many watershed residents and local government organizations hold concerns regarding conflicting water uses within the Swatara Creek watershed. A water supply study needs to be completed for the Swatara Creek watershed to identify problems, if they exist, and potential solutions. The study is necessary to document the water supply needs of the watershed.

A plan of study was developed and initiated in July 2000 having seven tasks: Data Inventory, Institutional Landscape, Public Participation, Analyze Gathered Information, Plan Formulation, Evaluate Alternatives and Capitol Region Water Board (CRWB) Participation. The data inventory and public participation was initiated with the initial public meeting completed and existing data and reports collected.

Upon reviewing this scope of work, it became apparent that the scope needed to be refined to add more detail to the remaining tasks in order to clearly define expectations of this study. This revised scope of work has resulted from coordination with Pennsylvania Department of Environmental Protection, Susquehanna River Basin Commission, Capital Region Water Board and the Army Corps of Engineers. The scope now includes seven tasks: Data Inventory; Public Participation; Analyze Gathered Information; Plan Formulation; Evaluate Alternatives and Develop Management Plan; CRWB Participation; and Project Management and Coordination.

Study Issues to be Addressed

The water management issues and associated concerns to be addressed in the study include the following:

- Water demand estimates based on the most recent population and industrial use projections by the county planning agencies with emphasis on recent data or updates of older data. Private well data, if available, will also be included in the demand analyses
- Groundwater (including potential for storage in quarries and mines)
- Supply analyses; existing and potential.

Study Area

The study area will be the Swatara Creek Watershed. All water transfers in and out of the basin would be accounted for in the study.

Scope of Study

This study will be performed primarily using existing data. There will be no original designs or detailed cost estimates prepared. The project will be conducted in six distinct tasks: 1) Data Inventory and Pre-Workshop Planning, 2) Public Participation, 3) Analyze Information, 4) Plan Formulation, 5) Evaluate Alternatives, and 6) CRWB Participation. The study calls for public participation on the problems and issues to be addressed to help shape the full scope of the water supply plan.

Purpose of Study

The purpose of this water supply study will be to identify all feasible, reasonable and environmentally sensitive alternatives for surface and groundwater management in the Swatara Creek Watershed, which will protect and enhance water-use requirements through the year 2030, if feasible, based on available data. The study will provide a water supply plan specific to meeting water supply needs of the large water suppliers. This study will be conducted in

consultation with all relevant and interested parties. The Plan of Study includes study tasks that amplify this goal.

The study will focus on gathering pertinent available information (water supply studies, etc.), conducting stakeholder meetings, and developing a range of alternatives, along with advantages and disadvantages of each, to address the various water resource needs in the Swatara Creek watershed. The purpose of the workshops will be to understand water resource issues/concerns, gather information/data, and identify future water management needs. Participants will include a wide-variety of individuals, including Federal, state, county water resource agencies and organizations, local and municipal officials, citizens and/or elected officials.

7. SCOPE AND ACTIVITIES

Task 1: Data Inventory

This task will involve collecting all relevant plans, studies, and data, to support the problems to be addressed and values to be protected for this study.

- Establish and develop methodology for gathering information.
- Gather available water plans and identify water-related problems and needs through 2030 (interstate, Federal, state, regional, county, local)
- Gather pertinent information from water users and regional and state agencies (e.g., DEP, SRBC)
- Assess the quality of the provided information
- Identify the data and planning gaps

Examples of data and reports to be collected include:

- Pennsylvania Drinking Water Information System (PADWIS)
- PaDEP's Division of Water Use Planning
 - Annual Water Supply Reports
 - Consumer Confidence Reports
 - Environmental Futures Studies
- SRBC Reports (groundwater studies, TMDL data, and source water assessments)
- Pennsylvania Fish Commission Data
- Pennsylvania Department and Conservation and Natural Resource Swatara Reservoir Study
- Pennsylvania Geological Survey drilling data and water resource reports
- Section 305B and 303D Reports
- USGS Annual Water Resources Summaries
- Source Water Assessments
- Gannett Fleming Lebanon City Water Authority Supply Study
- Swatara Creek Watershed Association, River Conservation Plan
- County Water Supply and Regionalization Studies
- State, County and local Land Use Plans, or plans which affect Land Use
- Other available studies and data.

Task 1 Products: COE -

- A summary matrix listing existing information, reports, and data.
- Listing of data gaps and methods proposed to supplement data gaps or use existing data only. If gaps are significant, then a plan to obtain data along with a time and cost estimate for amending the existing Plan of Study will be prepared.

Task 2: Public Participation

The public participation component has been identified as a critical element of the overall project. To ensure there is adequate opportunity for public participation by all interested stakeholders, SRBC will organize, arrange and conduct public outreach workshops and working sessions. These workshops and sessions may be held in the manner described below but may be modified in order to address the needs of the stakeholders.

- Introductory Workshop: full-day introductory workshop with 3 technical breakout sessions (This introductory workshop was held in Jan 01.)
- In Progress Public Participation Meeting: a half-day meeting to follow Task 3 and Task 4.
- Wrap Up Workshop: 1 full-day concluding workshop.

Activities will include:

- Organize and coordinate a workshop planning committee.
- Compile and develop a master database and an e-mail distribution list of appropriate participants.
- Identify a facility and make all necessary arrangements for AV equipment and other materials.
- Draft and mail invitations (and any attachments) and track RSVPs.
- Publicize the workshop by press releases, e-mails, web sites, newsletters, etc.
- Develop an agenda and identify and assign speakers, facilitators, etc.
- Host Workshop.
- Conduct any necessary follow up activities and provide a summary to the project sponsor and all participants

Subtask A: Introductory Workshop

Completed in January 2002.

Subtask B: In Progress Public Participation Meeting

After data inventory, analysis of gathered information (problem identification), and initial plan formulation is complete, there will be a public meeting to present the findings and elicit comments. This meeting will present the analysis of the water authorities, the water balance calculations, a list of preliminary alternatives and ideas on criteria for evaluating the alternatives.

SRBC will develop a strawman/framework for the public meeting format and agenda. This framework will be coordinated with the COE.

Subtask C: Wrap up Workshop.

After the formulation and evaluation have been completed and a draft report submitted to key stakeholders a final wrap up workshop will be held. This public meeting will present the evaluated array of alternatives that merit further consideration and elicit comments.

Task 2 Product: SRBC - Documentation from the Introductory Workshop, In Progress Meeting and the Wrap up Meeting, Master Database and E-Mail Distribution Lists, and Follow up Summaries for Workshops and Working Sessions.

Task 3: Analyze Gathered Information

Assess Current and Future Water Quantity/Supply Conditions and Potential Sources of Water Within the Swatara Creek Watershed.

Subtask A: Assessment of large water suppliers.

Identify potential sources of water by assessing water supply and demand for the three large water authorities that withdraw water from the Swatara Creek. Include an assessment of current and future supply and demand projected for United Water, Pennsylvania American, City of Lebanon Water Authority and Middletown Borough Authority. Middletown Borough Authority only uses water from Swatara Creek for emergencies. This task will rely on available information from the water suppliers concerning their sources of supply and their demand, as well as projections of demand based upon county planning department projections and historic unit consumption values.

Subtask B: General Water Balance Calculations

An overall water supply balance for the watershed will be developed using an empirical spreadsheet technique. The available surface water, groundwater, evapotranspiration, surface and groundwater withdrawals and consumptive use (domestic and municipal use, agriculture, energy, and industry) and return flows will be estimated for average and drought conditions for the Swatara Creek watershed, using a location nearest the outlet into the Susquehanna River and one other location within the watershed as the points of reference for flow data.

The groundwater net storage / depletion values (Section c. below) will be the basis for groundwater supply estimates. Stream flow data from USGS and State sources will be used to estimate surface water supply. The PADEP and USGS withdrawal data and SRBC data will be used to estimate demand for all regulated water users and for irrigation usage. Other water user demand will be estimated using socioeconomic data and assumptions regarding per capita usage.

For the average stream flow condition, analysis will consider the balance on both a yearly basis and for the limiting low flow month. Drought conditions will use the 10-year low flow condition on both a yearly basis and for the low flow month. A minimum flow to be maintained during drought conditions will be the 7-day 10-year low flow.

A further analysis will be conducted of storage capacity versus quantity of water required from storage to meet seasonal variations. The total water supply shortfall for all months during the year in which demand exceeds supply will be compared to water storage capacity to determine whether the stored water plus other sources of water supply are adequate to meet demand. When storage is not adequate, the required additional storage will be calculated.

Subtask C: Groundwater Resource Assessment

The groundwater analysis will sub-divide the Swatara Creek watershed into groundwater “sub sheds” and calculate the groundwater recharge value and consumptive use value for each sub shed. Recharge and consumptive use values will yield either net groundwater storage or net depletion under average and drought conditions for each sub shed. The net storage/depletion constitutes the primary output for the assessment. Sub sheds will be summed for the watershed.

- Sub Basin / Sub Shed Development---Initially topographic data will be used to prepare a base map depicting groundwater sub basins (based on stream drainage patterns). Next, geologic formation and hydrogeologic properties will be used to further subdivide the sub basins into smaller “sub sheds” consisting of areas with common physical parameter or attributes (primary data inputs).
- Spreadsheet Model Development--- A coarse groundwater model using a spreadsheet-type format will be developed for this study. Based on the outcome of the previous two steps, a spatial grid will be superimposed over the base map and a spreadsheet format will be set up for each sub shed. Hydrogeologic, land use, and precipitation data will be input for each sub shed. Hydrogeologic data will be used to define the characteristics that control ground water recharge and consumptive use. Land Use (based on available records and photographic interpretation) will be used to augment consumptive ground water use estimates where specific data is not available.
- Groundwater resource assessment---The resultant net groundwater storage or depletion will be calculated for current (baseline conditions) during average and drought adjusted recharge and summed for the watershed.

Task 3 Products: COE - Tables, charts or other appropriate formats for displaying findings will be produced and utilized at executive committee meetings. Information will feed into the draft report.

Task 4: Plan Formulation

Subtask A: Develop Alternatives.

Consider as a minimum the following alternatives:

- water surplus from other locations within the watershed
- existing and new groundwater sources (quarries and water importation)
- optimization of operation of existing surface water sources (reservoirs and streams)
- new reservoirs
- groundwater recharge enhancement
- water conservation
- water reuse
- reduction in system losses (leakage, exfiltration, etc)

Alternatives will provide solutions at a conceptual and generic level, and will not entail detailed feasibility analysis and site adaptation. Specific project locations will not be identified. More detailed site-specific analysis and project development would need to be accomplished under a future effort.

Subtask B: Develop Evaluation Criteria

The study will identify key criteria, in addition to cost, that will be used to compare the various alternatives. These criteria will focus on technical applicability and effectiveness of alternatives in providing for current and projected needs and their monetary costs, but will also include environmental, social considerations, and implementation concerns.

Task 4 Products: COE - A written description of the alternatives being considered and a list of evaluation criteria. Each evaluation criterion will be clearly defined.

Task 5: Evaluate Alternatives and Develop Management Plan

The costs and benefits of each alternative (or combination of alternatives) will be provided, using generic unit factors, where available. Alternatives will be qualitatively, and where possible, quantitatively compared and evaluated against the appropriate criteria to determine the most applicable one(s) for implementation. The process used in determining the most applicable measures for implementation will be documented.

The study will provide a water supply plan specific to meeting water supply needs of the large water suppliers. This plan will present an array of alternatives or combinations of alternatives that merit further consideration. This alternative summary will include a matrix detailing which alternatives can be implemented by Federal, state, local or private entities. If additional storage

is needed, the recommendation would likely need to be generic rather than site-specific. A siting study might emerge as a recommendation.

Task 5 Products: COE - A completed matrix and appropriate supporting documentation (developed in Task 4) providing an integrated list and description of alternatives addressing basin water supply problems and an evaluation of alternatives.

Task 6: CRWB Participation

The CRWB is a significant project stakeholder. As such, will also serve on the Executive Steering Committee.

Task 6: Product: CRWB - None.

Task 7: Project Management and Coordination

The Executive Steering Committee will convene as indicated on the study schedule. There will be a minimum of 5 meetings of this committee. The purpose of each meeting is described below:

Checkpoint Mtg. # 1 – Purpose is to review the revised POS, schedule and deliverables as well as to review the upcoming Public Meeting agenda and format.

Checkpoint Mtg #2 – Purpose is to review the data inventory findings and reach agreement on methodology to supplement any identified data gaps.

Checkpoint Mtg # 3 – Purpose of meeting is to review analysis of data or problem identification study phase. Assessment of large water suppliers, general water balance calculations, and groundwater assessment will be completed prior to this meeting.

Checkpoint Mtg # 4 – Purpose of this meeting is to review findings of alternative evaluation, including evaluation criteria, prior to the development of a watershed management plan.

Checkpoint Mtg. # 5– The final checkpoint meeting is scheduled after the review of the draft report by SRBC, PADEP, and CRWB. The purpose of the meeting is to consolidate and agree on course of action for addressing all comments on draft report.

8. SCHEDULE

The study was initiated in February 2001. In October 2001, the study was stopped and rescoped. The study resumed again in June 2002. It is currently scheduled to be completed in June 2003. A detailed schedule is attached to this Plan of Study.

9. COSTS

It is estimated that this work effort will cost \$200,000.

10. ASSUMPTIONS

Existing data will be sufficient to meet all the requirements of the analysis presented in this scope. No collection or modification of data will take place. The focus of this effort will be to answer questions about the supply and demand for water in the Swatara Creek watershed.