

SCOPE OF WORK

IDENTIFICATION AND SCREENING LEVEL EVALUATION OF MEASURES TO IMPROVE DISSOLVED OXYGEN IN THE SAVANNAH RIVER ESTUARY

SAVANNAH HARBOR EXPANSION PROJECT & SAVANNAH HARBOR ECOSYSTEM RESTORATION STUDY CHATHAM COUNTY, GEORGIA

1.0 INTRODUCTION.

As components of both the Savannah Harbor Expansion Project and the Savannah Harbor Ecosystem Restoration Study, Savannah District needs to identify and conduct a screening level evaluation of potential measures that could improve dissolved oxygen in the Savannah River Estuary.

The Savannah Harbor Expansion Project is evaluating deepening the navigation channel in Savannah Harbor. Such deepening could reduce dissolved oxygen levels in some locations within the river during some periods of the year. The project desires to consider methods to reduce or eliminate that potential adverse effect. The project is also identifying cumulative impacts to the harbor's ecosystem that have resulted from previous developments.

The Savannah Harbor Ecosystem Restoration Study is examining ways to improve dissolved oxygen levels in the harbor. That study is focused on methods of improving existing levels of dissolved oxygen in the harbor during the critical summer months.

2.0 BACKGROUND.

Portion of Savannah Harbor has not met Georgia's water quality standards for dissolved oxygen in some locations during the summer months. The harbor is on Georgia's Section 303(d) list for waters that do not comply with water quality standards for dissolved oxygen. EPA Region 4 released a Draft TMDL for Dissolved Oxygen for the harbor in August 2004. That document identified a portion of the harbor which experiences low levels of dissolved oxygen during the summer months. The Draft TMDL calls for elimination of all point source waste loads exerted on the harbor, plus the addition of 90,000 lbs/day of oxygen to the harbor system during critical conditions. EPA's document indicates that the waste load from discharges within the harbor places a 99,000 lbs/day oxygen demand on the system, while the load from upriver discharges exerts an additional 100,000 lbs/day oxygen demand in the harbor. These combined loads equate to roughly a 0.4 mg/l of the oxygen deficit in the critical harbor segment. Roughly half of

that load originates from discharges within the harbor, while the other half result from upriver discharges. EPA proposed an alternate TMDL consisting of a revised water quality standard and a 30 percent reduction in the total point source waste load to the harbor (a reduction of about 57,000 pounds/day TBODu to produce a remaining load of 132,000 pounds/day TBODu).

It is unlikely that the present Georgia water quality standard for dissolved oxygen will remain in place in its present form. EPA has stated that it is not effective and has proposed an alternate standard in the August 2004 Draft TMDL. The public comment period has not yet closed on EPA's proposal, so we cannot know if their proposal will be adopted as proposed. The effect of the deep-draft navigation channel on the system's ability to recover from the waste loadings is unknown at this time, but this factor is being investigated.

The Savannah Harbor Expansion Project has not determined the precise extent of its potential impact on dissolved oxygen levels. However, we believe it could reduce already low D.O. levels at the bottom by as much as 0.5 mg/L. The Expansion Project has identified several measures that could be used to improve dissolved oxygen within the harbor. Those measures are as follows:

- Add air or oxygen to low dissolved oxygen waters
 - Add air or oxygen upstream of the deep-draft harbor (Augusta to Savannah)
 - Floating aerators, air injection system, D.O. injection system
 - Add air or oxygen within the deep-draft harbor
 - Floating aerators, air injection system
 - D.O. injection system on bottom of river
 - D.O. injection system on Hutchinson Island
- Mix low dissolved oxygen waters on the bottom with higher D.O. surface waters
 - Inflatable weir
 - Pumps
- Increase releases from upstream reservoirs
- Reduce the BOD loads from industrial and municipal discharges in the harbor
- Reduce the BOD loads from industrial and municipal discharges further upriver

Other measures may also exist that are feasible and implementable. This initial study focuses on the potential improvements that are associated with BOD load reduction and addition of air or oxygen. The potential feasibility of other measures will be examined qualitatively. As part of its assessment of cumulative impacts, the Expansion Project is also identifying effects that past development of the harbor have produced on water quality.

3.0 OBJECTIVE. The objective of this study is to identify and conduct a screening level evaluation of potential measures that could improve dissolved oxygen in the Savannah River Estuary. This analysis will include an assessment of the engineering feasibility and cost effectiveness of potential improvement measures, as well as identification of implementation problems. This effort will be directed toward both the portion of the harbor and time of year that were identified in EPA's Draft TMDL for Dissolved Oxygen as having recurring low levels of D.O. The analysis will allow both Corps projects to consider alternate methods of improving

dissolved oxygen from its present levels, as well as developing several increments of D.O. improvement.

4.0 METHODOLOGY. This study will be conducted in two phases, with multiple steps in each phase. Models currently exist for both the riverine portion of the Savannah River from Thurmond Dam to downstream of Clyo, Georgia (River Model) and for the Savannah Harbor from Clyo to the Atlantic Ocean (Harbor Models). These models need not be used in this screening level evaluation.

Phase I will be an assessment of potential D.O. improvement measures that could be used either singly or as a package to meet the Georgia water quality standard for dissolved oxygen. Since EPA has disapproved the present Georgia standard for D.O., this phase will include four steps. The first step will consider measures that would allow the harbor to comply with the present Georgia D.O. standard under existing waste loads. This would address the approximate 200,000 lbs/day excess oxygen demand presently in the harbor. The second step will consider measures that would allow the harbor to comply with the present Georgia D.O. standard under full permitted waste loads. This would address the discharged loads of approximate 367,000 lbs/day TBODu that are permitted in the harbor plus 75 percent of the 358,000 lbs/day TBODu that are permitted in the upriver areas. The third step will consider measures that would improve D.O. levels in the harbor to the extent that it meets the D.O. standard that EPA proposed for Georgia in its August 2004 Draft TMDL. This step would consider the effects of the existing waste loads. This step would develop plans that have the same effect as the 30 percent reduction in BOD loading proposed by EPA in its Alternate TMDL. The fourth step will also consider measures that would allow the harbor to comply with the D.O. standard that EPA proposed for Georgia in its August 2004 Draft TMDL. This step would consider the effects of full permitted waste loads -- 367,000 lbs/day TBODu permitted in the harbor area plus 75 percent of the 358,000 lbs/day TBODu that is permitted upriver. These steps can be summarized as follows:

Step	D.O. Standard	Point Source Loading
1	Present GA D.O. Standard	Present loading
2	Present GA D.O. Standard	Full permitted loads
3	EPA proposed standard	Present loading
4	EPA proposed standard	Full permitted loads

Phase II would consist of assessing potential measures that could be used either singly or as a package to further improve dissolved oxygen levels in the harbor. The improvements evaluated in this second phase could be larger scale designs of those identified in the first phase effort or could be a separate set of design solutions. This phase would also consist of four incremental steps, each improving bottom D.O. levels by 0.2 mg/L. Thus, this phase will develop four incremental designs for improving dissolved oxygen, the first capable of improving bottom D.O. levels by 0.2 mg/L, the second would improve D.O. levels by 0.4 mg/L, and the third would improve D.O. levels by 0.6 mg/L., and the fourth would improve D.O. levels by 0.8 mg/L. The

work on this phase would assume the harbor already meets the D.O. standard the EPA proposed in August 2004.

5.0 WORK TO BE PERFORMED BY THE CONTRACTOR.

The scope of this study is to assess the feasibility and cost effectiveness of potential measures to improve dissolved oxygen (focusing on BOD load reduction and addition of air or oxygen) in the harbor during the summer months. Major steps within this study are:

- 1) Review the Draft TMDL for Dissolved Oxygen for the harbor that was proposed by EPA Region 4 in August 2004.
- 2) From EPA's Draft TMDL and the inputs to the computer models upon which it is based, conduct a screening level assessment of the potential contribution to the D.O. deficit from individual point source discharges along the river. This will include each of the discharges included in the TMDL models, whether they are located in Savannah, Augusta, or in between. Table 1 in EPA's Draft TMDL shows the permit loads calculated for dischargers in Savannah, while similar information for the upstream dischargers can be found in Appendix D of that report.
- 3) Develop a comprehensive list of potentially feasible measures to improve D.O. levels in Savannah Harbor during the summer months. This should include measures to address point source loads (upriver and in the harbor), non-point source loads, and storm water loads.
- 4) Identify and assess the largest contributors of BOD loads to the Savannah River. Develop a table ranking the BOD loads contributed by each source to identify the sources contributing the largest BOD loads. For the five largest point source contributors of BOD to the system, summarize their existing treatment systems. For each of those five sources, list the next two steps that would most traditionally be employed for additional BOD reductions and the estimated extent of reduction to be expected from each of those steps.
- 5) Assess the feasibility of each of the potentially feasible D.O. improvement measures identified above in step 3 in light of the conditions occurring in the Savannah River system. Briefly describe the conditions under which each measure would typically be most effective and the conditions that reduce its effectiveness.
- 6) For each step in Phase I, develop one suitable method for making the desired D.O. improvement. This will include a conceptual-level design for each alternative method. Coordination with either the point source dischargers or GA DNR-EPD may be necessary to obtain additional information on the physical and biological characteristics of each discharge. That information could be needed to assess the technical feasibility of potential improvement methods. This conceptual design will include description of the process to be employed and the size/scale of the major features. As part of the conceptual designs, identify problems or considerations that may limit the effectiveness of the measure or render it un-implementable. For Phase II, develop conceptual-level designs for making four incremental steps of improvement in D.O. in the harbor. Develop a conceptual design – as described above -- for each of those four levels of D.O.

improvement. The conceptual designs are expected to be screening level design layouts and include major features and/or BOD load reductions. Modeling to assess the impact of the conceptual designs to D.O. in the harbor will not be performed in this study. As part of each conceptual design, include the reasoning for why the design identified would be the most cost effective approach.

- 7) Evaluate the cost-effectiveness of the four conceptual designs for improving D.O. levels that were developed in Phase I and the four designs developed in Phase II. This will include implementation (access, land, equipment, construction, etc.) and operation costs. Cost estimates provided will be feasibility level cost evaluations and will be used to assess the cost-effectiveness of each conceptual design.
- 8) Identify the most cost effective D.O. improvement measure for each of the four steps in Phase I.
- 9) For the most cost-effective D.O. improvement designs developed through Phase I and the designs developed through Phase II, provide the following information to aid in the description of those designs: (A) general location map, and (B) site map showing its relation to nearby properties. Site maps will utilize readily available GIS/CADD tax parcel files. If files are unavailable, a figure showing predominant land use in the area may be substituted.
- 10) Prepare a report describing the procedures used, the measures that were considered, the conceptual designs that were developed, and the conclusions reached in the study.

6.0 MATERIALS TO BE FURNISHED BY SAVANNAH DISTRICT. Savannah District will provide no materials for this Delivery Order. However, the Savannah District may be able to research tax records in Savannah and surrounding areas.

7.0 DELIVERABLES. All deliverables should be provided to the U.S. Army Corps of Engineers, Attn: CESAS-PD-E (Mr. William Bailey), P O Box 889, Savannah, GA 31402.

7.1 MONTHLY PROGRESS REPORTS (Deliverable 1). Submit one (1) copy by the 10th of each month documenting the previous month's efforts.

7.2 DRAFT SUMMARY REPORT (Deliverable 2). Submit ten (10) bound copies of a report describing the procedures used in this work, as well as the findings and conclusions. Submit ten (10) CDs containing the report developed through this work.

7.3 FINAL SUMMARY REPORT (Deliverable 3). Submit twenty (20) bound copies of a report describing the procedures used in this work, as well as the findings and conclusions. Submit twenty (20) CDs containing the report developed through this work. Submit one (1) CD containing the report in both Microsoft WORD and ADOBE Acrobat formats.

8.0 SCHEDULE. The Contractor shall adhere to the following project schedule.

Milestone

Due Date

Initiate work	1 week after issuance of the Delivery Order
Monthly Progress Reports	10 th of each month until completion of the D. Order
Draft Summary Report	12 weeks from issuance of the Delivery Order
Final Summary Report	3 weeks from receipt of comments on Draft Report

The Government expects to provide comments on the Draft Summary Report after a 30-day review period.

9.0 POINT OF CONTACT. Mr. William Bailey (CESAS-PD-E) will be the US Army Corps of Engineers' point of contact for this work. He can be reached at 912-652-5781 (FAX 912-652-5787) or at the following address:

Mr. William Bailey
ATTN: PD-E
US Army Corps of Engineers
Savannah District
P.O. Box 889
Savannah, GA 31406-0889

All billing invoices should be sent to Mr. William Bailey.

10.0 REFERENCES.

EPA, Region 4, August 2004. Draft Total Maximum Daily Load (TMDL) for Dissolved Oxygen in Savannah Harbor, Savannah River Basin, Chatham and Effingham Counties, Georgia. Report prepared by EPA Region 4, Atlanta, Georgia.