ATTACHMENT 6C

RESPONSES TO 2000 DRAFT REPORT
EPA

YAZOO BACKWATER AREA REFORMULATION
APPENDIX 5
COORDINATION

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INTRODUCTION

The following comments were given by the Environmental Protection Agency (EPA) after the Yazoo Backwater Reformulation Draft Report release. This attachment contains the U.S. Army Corps of Engineers, Vicksburg District, official response to the issues raised.

Environmental Protection Agency, Region 4, Atlanta Regional Office

Letter, John Hankinson, Jr., 3 November 2000. (Exhibit 4C-1).

1. General Comments.

a. Comment. Our staff met on February 11, 2000 to discuss the results of this technical report and to provide the Corps with an opportunity to ask questions of the principal authors of the Shabman alternative. Despite these efforts at inter-agency coordination with the Corps, this non-structural alternative was not considered in detail in the DRR/DEIS as a practicable.

Response. The Draft Report analyzed the Shabman Report and determined it failed to meet the study objectives. The Shabman Report was economically unjustified without counting benefits from carbon sequestration and nutrient load reduction. Neither of these categories were recognized in Principles and Guidelines. The Final Report and Final Supplemental Environmental Impact Statement (FSEIS) include a variation of the Shabman Plan (Plan 2C) in the final array of alternatives.

b. Comment. The EPA recommends that the enclosed conceptual plan for alternative investments in the Lower Yazoo River Basin, called the "Lower Yazoo River Basin Economic and Environmental Restoration Initiative", as the appropriate alternative for the Yazoo Area.

Response. The Economic and Environmental Restoration Initiative (EERI) involved a series of land use and economic policies designed to change the region so that, in essence, flood control would not be needed. In 2000 and since, there has been no indication that regional, state, or Federal entities intend to undertake efforts or legislation to accomplish this alternative approach. No comments from any governmental entity, other than EPA, have indicated support for plans to implement this alternative. For these reasons, the Vicksburg District concluded that the alternative was not reasonable and did not warrant further review in the FSEIS.

c. Comment. EPA's alternative investment proposal achieves the project purpose of flood damage reduction and provides superior economic and public health benefits to the local citizens.

Response. The EPA's plan as presented would provide for some flood damage reduction by a change in land use. However, there is no supporting documentation that justifies the claim of superior economic or public health benefits to the areas' residents.

d. Comment. The DRR/DEIS does not adequately assess projects impacts as required under Section 404 of the CWA or examine alternatives, such as the Shabman Plan.

Response. While the Vicksburg District believes that the DRR/DEIS adequately addressed project impacts, the Final Report presents a number of alternatives including a variation of the Shabman Plan (plan 2C), which were evaluated in detail during the planning process. The results of this analysis are presented in the Final Report and FSEIS. All topics required by EPA's Section 404(b)(1) guidelines have been discussed in the Final Report and FSEIS.

e. Comment. The Corps has greatly underestimated and discounted the extent of adverse wetland impacts.

Response. The wetland analysis in the Final Report and FSEIS has been completely revised utilizing the HGM approach as suggested by EPA. Independent estimates made by the Vicksburg District and EPA for the final report both place the total wetland resources in the project area at approximately 200,000 acres (Vicksburg District, 189,000 and EPA, 212,000). The Vicksburg District estimate only includes wetlands sustained by backwater flooding, while the EPA estimate includes wetlands sustained by either precipitation or flooding. This total extent of wetlands will not be impacted by the project. Using conservative estimates, assuming that the wetlands are only sustained by backwater flooding (rather than other sources of hydrology) indicates that 26,300 acres of wetlands could be impacted and may lose wetland characteristics, while 40,700 acres of wetlands could be impacted by changed hydrology, but retain wetland characteristics. The baseline wetland functional capacity is 885,300 functional capacity units (FCU), and the net functional loss is 14,200 FCUs. This loss represents 1.6 percent of the baseline functional capacity. The functions performed by these impacted wetlands will be offset by 3,858 acres of reforestation, part of the total 55,600 acres of reforestation of cropland within the 1- and 2-year flood plain.

f. Comment. We believe that the proposed mitigation for wetland impacts is inadequate, and there is legitimate concern that mitigation may not be carried out. Both the failure to identify specific mitigation lands in the project area and the current backlog of unmet mitigation for other Corps projects in the Lower Mississippi River Basin (totaling in the thousands of acres) cast doubt on the entire mitigation process. Based on our review, the information in the DRR/DSEIS with regards to mitigation is insufficient to demonstrate Section 404 compliance

and does not meet the informational requirements of Section 404(b)(1). Notwithstanding the insufficient amount of information presented, the limited available data has lead us to the conclusion that the proposed alternative, even if fully discussed, would not satisfy the substantive requirements of Section 404(b)(1).

Response. The amount of reforestation required to offset wetland impacts has been recalculated in the Final Report and FSEIS. There are no unmet mitigation requirements within the Vicksburg District, as detailed in Appendix 1 (Mitigation Appendix). The EPA has concurred with the same mitigation methodology used by the Vicksburg District on Upper Yazoo Projects, Steele Bayou, and Mississippi River levees. The EPA has previously concurred that mitigation should be accomplished concurrent with construction and has not required the specific location of mitigation for any of these projects. Compensating mitigation is included as the minimum threshold under the nonstructural feature and will be acquired prior to pump station operation. Section 404(b)(1) in the Final Report discusses placement of fill material and disposal of dredge material at the pump station site. Mitigation proposed in Appendix 1 fully offsets impacts from these activities at the pump station site.

g. Comment. Aquatic impacts would be largely avoidable with the implementation of the non-structural approach as recommended by the EPA.

Response. The Vicksburg District's recommended alternative also avoids and minimizes aquatic impacts while providing substantially more flood reduction benefits. Aquatic spawning benefits will increase by an estimated 30.3 percent, and aquatic rearing benefits will increase 8.0 percent over existing conditions. The Shabman Plan did not meet the study's purpose and needs and was not economically justified. The EERI plan is addressed in response 1b. Therefore, the Vicksburg District reasonably sought to avoid impacts with a balance of structural and nonstructural approaches.

h. Comment. We have serious technical concerns about the methods used in the DRR/DSEIS to estimate the benefits and costs of the recommended alternative. Specifically, by an independent evaluation of the Corps' economics analysis it was found that the Corps' values on agricultural benefits have been overestimated by $144 million.

Response. The benefits and costs identified as accruing to the recommended plan were developed in accordance with guidance identified in Engineer Regulation (ER) 1105-2-100. The Economic Appendix was revised in the Final Report and SEIS and has been independently technically reviewed. The EPA reviewed the Draft Report and made comments regarding the methodology used to determine agricultural benefits. The economic analysis was revised and expanded to incorporate those comments consistent with USACE guidance.

2. Attachment: EPA, 2 November 2000, Yazoo Backwater Area -- Technical Review of the Draft Reformulation Report, Cumulative Impacts in the Yazoo Basin, Environmental Impacts of the Pump are Underestimated.

a. Hydrology Analysis.

(1) Comment. The Corps hydrological/hydraulics analyses have been developed at a coarse landscape level, and are based on the use of satellite imagery and recorded stage data. The use of this coarse level procedure for assigning environmental impacts is an approach best used for conceptual planning, but not for design application. This procedure has resulted in an underestimation of impacts.

Response. The Vicksburg District's hydrologic/hydraulic analyses adequately address the environmental and hydrologic impacts to the Yazoo Backwater Study Area and do not underestimate impacts. The analysis provides all the hydraulic and hydrologic data required by USACE regulations. Data that were used were acquired and analyzed using state-of-the-art procedures. Since release of the Draft Report, our agencies have been involved in revising the wetland analysis utilizing satellite imagery, recorded stage data, and landscape analysis to determine wetland impacts. Previous Vicksburg District planning studies within the Yazoo Basin have utilized landscape level methods, which were reviewed and accepted by EPA and the U.S. Fish and Wildlife Service (FWS), along with other agencies. A landscape scale analysis is the only feasible method that can be applied to a project at this scale.

(2) Comment. The keystone of the Corps hydrology analyses is the elevation area curves depicted on Plates 4-7 to 4-10. The text (page 6-30) implies that data points from ten satellite images were used to generate these Plates. The Corps has not, however, documented any of the data points on these elevation-area curves. Additionally, the method used for "fitting" the data points to the curves was not given (page 6-31 only states that "a best fit curve routine was used"). While we assume that a composite elevation-area curve for the four reaches was developed and used in the analyses, this was not stated in the Draft EIS. This information is needed in order for the technical reviewer to verify the shape of the curve as currently assigned. Since all other analyses depend on the data generated from these curves, its documentation is important. These ten data points and the curves generated by these data points are the basis for the hydrological analyses, including the stage-frequency and stage area data (Table 6-9), stage-frequency curves (Plate 4-22- 4-23), elevation-area curves (Plates 4-7-4-10, elevation storage curves (Plate 4-11), and elevation-duration curves (Plates 4-24 - 4-25), as well as the hydrology analysis done for the economics evaluation. Minor differences in the shape of the curve, particularly given the total number of points (10) and the cluster of data points (nine are at 91.9 feet or below, one is at 100.3 feet), could result in significant differences in the reported number of flooded acres.

Response. The stage-area curve data point elevations developed from the satellite flood scenes are shown in Table 6-5 in the revised Appendix 6. This table clearly identifies the elevation data points used in developing the stage-area curves and essentially covers the entire range of elevations found in the Yazoo Backwater Area. The Final Report includes a more detailed description of the development of the stage-area curves. Since the release of the Draft Report, the Vicksburg District briefed EPA on the development of stage-area curves and the use of satellite imagery as a part of the Wetland Appendix coordination.

(3) Comment. It is stated that the "satellite scenes were classified with an unsupervised classifier," (page 6-30). This apparently means that there was no validation of the GIS technique used by either photo-interpretation or ground-truthing.

Response. The statement refers to using computer software that performs an unsupervised classification, which means the sorting was performed without "a priori" information. This technique utilizes statistical analysis of the data to group the data into classes. It does not imply that verification using photography or other means is not performed. Verification was performed for the land use and the flood delineations.

(4) Comment. There is a gap in data points from the satellite imagery between 91.9 feet (nine points at 91.9 feet and below) and 100.3 feet (one point at 100.3 feet). This gap results in lower confidence in assessing the less frequent flood stage events.

Response. It is more difficult to obtain satellite imagery of less frequent flood events. They occur less frequently, and the weather is often cloudy. An Arc View model, Flood Event Simulation Model (FESM), was developed by the Vicksburg District to simulate pre- and postproject frequency flood events. The combination of observed and modeled flood scenes provides very good estimates of the aerial extent of floods. Since the release of the Draft Report, the Vicksburg District briefed EPA on the development of stage-area curves and the use of satellite imagery as a part of the Wetland Appendix coordination.

(5) Comment. Ten satellite images were used, five of which were outside of the growing season when many of the wetland impacts and claimed cropland flood reduction are considered to be most critical to project assessment.

Response. The ten satellite scenes were used to develop stage-area relationships (curves). The extent of flooding is not dependent on either the season of the year or the presence or absence of leaves on trees. The extent of flooding is dependent on the elevation of floodwater surface and the duration of the flood. The presence of leaves on trees obscures flood extent in forested areas; therefore, the Vicksburg District uses satellite scenes obtained during leaf-off conditions whenever possible.

(6) Comment. Accurate flood profiles can only be established by basin-wide channel cross-section data. The Corps has only two cross-sections in the connecting channel between Steele Bayou and Little Sunflower, and no basin-wide cross-section data.

Response. Sixty-four cross-sections were used to develop the HEC-RAS hydraulic model utilized to predict pre- and postproject conditions at the six gage stations located throughout the Yazoo Backwater Study Area. This hydraulic model was provided to EPA at their request. These stage data, in conjunction with the satellite imagery, are sufficient to describe the flooding in the study area.

(7) Comment. The land use classification data used are out-dated (over ten years old).

Response. The Final Report, FSEIS, and appendixes utilize 2005 land use data.

(8) Comment. Spatially explicit data were apparently not used in the environmental assessments. Therefore, specific geographic locations of impacts cannot be determined.

Response. The Final Report and FSEIS utilized spatially developed data to determine wetland impacts. The impacted areas for each alternative in the final array are displayed in the revised Appendix 10 (Wetland Appendix). The remaining environmental analyses utilized daily stages; therefore, only general locations can be provided. This is sufficient for landscape-level analyses.

(9) Comment. There is insufficient detail about how the pump will be operated.

Response. A more detailed description of the pump operation has been included in the final Appendix 6 (Engineering Appendix).

(10) Comment. The only hydrograph presented is for the l00-year flood (Plate 4-21). However, the pumping project will have more impacts on the more frequent flood events (such as the 2-year flood). Therefore, including the hydrographs for the more frequent events would allow for more confidence in results interpretation.

Response. The Engineering Appendix in the Final Report and SEIS was revised. The final Engineering Appendix contains several additional hydrographs which represent a wide range of conditions.

(11) Comment. The Corps' analysis apparently assumes a static channel system throughout the project area with no changes due to channel filling by sedimentation. This would affect the analysis of storage curves and rate of delivery of water.

A more accurate level of analysis would have included channel cross-section data throughout the 100-year floodplain. This protocol would provide for a better assessment of channel hydraulics and the impacts of flood routing. This information would be important for a determination of flooding duration (days of inundation), spatial extent of flooding, and flood routing to determine the influence of channel and floodplain hydraulics on rates of dewatering. These are techniques commonly used in analyses for large- and small-scale water management projects. In addition, a spatial representation of pre- and post-project conditions should have been evaluated to provide a more realistic extent of impacts across elevation gradients. This type of work has been performed by the U.S. Geological Survey in a study developed for prioritizing wetland restoration in the Lower Yazoo.

Response. While channel modifications and sedimentation have occurred in the Big Sunflower River and Steele Bayou, this will only have a minor effect of flood storage. Out-of-channel storage provides most of the flood storage in the project area. If the lowest 8 feet of storage were lost to sedimentation, this would only represent a loss of 2.3, 1.2, and 0.3 percent for the 1, 2, and 100-year flood events, respectively.

(12) Comment. Although the Corps did conduct modeled spatially explicit hydrology (page 6-44), the results were apparently primarily used for illustrative purposes. The procedures used and application of the modeled hydrology were not documented, nor were the resulting estimations of flooded acres (pre- and post-project) provided. It was stated, however, that the Corps modeled hydrology was used in identifying the location of the proposed reforestation component (page 6-44)--a major element of the DEIS. For this reason, it would be very important to include a description of the model; a clear documentation of how the procedures were or were not combined; and the resulting flooded acres during specific flood frequency events, comparing the modeled hydrology and the satellite/gage based methods. EPA has determined that there are very significant differences in the Corps' modeled hydrology acreage figures, as compared to the Corps' satellite image/stage area method acreage figures. For example, there is a difference of over 100,000 flooded acres when comparing the total acres flooded in the 2-year flood event with the two methods.

Response. Appendix 6 (Engineering Appendix) in the Final Report and FSEIS has been revised to include more information on the spatially explicit hydrologic model. Since the release of the Draft Report, the Vicksburg District has briefed EPA on all aspects of the hydrologic analysis used in the study. In addition, the models have been furnished to EPA at their request.

(13) Comment. The hydrological information based on satellite and stage data was apparently a major element in the determination of wetland extent and impact. Although this type of information can be useful for a landscape-level planning project, it cannot substitute for a detailed analysis in combination with field inspection necessary for regulatory decisions. Information that is standardly used by private and public entities in the context of the Section 404 regulatory program includes: field-level assessments of soil saturation and inundation; infrared imagery; site-specific soils information; appropriate scale digital elevation model data; up-to-date crop surveys; up-to-date National Wetlands Inventory (or other inventory) mapping; and information on other features, including streams, channels, and ponds. A sampling and survey process could have been implemented to "ground-truth" the database, particularly for wetlands and other critically impacted resources.

Response. The Vicksburg District utilized the methods as discussed by EPA in performing the revised wetland analysis. An extensive field verification of wetland extent was designed by EPA utilizing EMAP. The field verification was cooperatively performed by scientists from EPA, the Natural Resources Conservation Service (NRCS), FWS, and the Vicksburg District utilizing the 1987 Wetland Delineation Manual. A report describing this field verification is included as Supplement A to Appendix 10. The data as presented are appropriate for a planning study for an area this large. The data have not and will not be used to make site-specific wetland determinations. The 1987 Wetlands manual clearly allows offsite determinations of wetlands. An offsite determination is appropriate for the EIS of a project covering approximately 600,000 acres. Onsite determinations are more accurate and are used on site-specific locations, but it is not practicable to use onsite methods for this large of an area.

b. Pump Operation.

Comment. How the pumps are to be operated is the foundation of all analyses in the Draft EIS, and has significant implications for environmental impacts. Providing an indefinite operation schedule is therefore a great concern. To accurately assess the impacts from the pump, a definitive schedule of pump operation is necessary.

Response. See response 2a(9).

c. Wetlands Extent and Impacts Analysis.

(1) Comment. The functioning of the wetland communities in the project area will be impacted primarily because of the hydrologic changes caused by the proposed pumping. The most severe of the hydrologic impacts will result in an elimination of wetland hydrology. The proposed plan will result in extensive changes to the extent, duration and depth of flooding for both the lower frequency and higher frequency flood events.

Response. The Vicksburg District agrees that the project will affect the depth, duration, and extent of flooding in the study area. The revised Appendix 10 (Wetlands) fully addresses these changes in hydrology. The functions of the affected wetlands have been measured and quantified by hydrogeomorphic (HGM) methodology and are presented in the Final Report and FSEIS.

(2) Comment. Water quality parameters, including presence of toxicants, oxygen levels, and sedimentation, are also important determinants for the quality of spawning and nursery habitat for fishes. The anticipated degradation of water quality because of the hydrological impacts to wetlands resulting from the Corps' recommended plan is another expected impact to fish habitat.

Response. The potential changes in water quality resulting from the hydrologic alteration of wetlands are fully addressed in the revised Appendix 16 (Water Quality). The Vicksburg District quantified impacts to water quality using three HGM functions. The quantification of water quality impacts using HGM was reviewed by EPA and Mississippi Department of Environmental Quality (MDEQ). The net effect of the project will be an improvement to water quality.

d. Average Daily Flooded Acres Method:

(1) Comment. A method for determining the average daily flooded acres was used to account for the baseline and changed wetland hydrology because of the proposed pumping. "Average daily flooded acres were determined by summing the number of acres flooded each day over the period of record (1943-1997) in the 2-year frequency and dividing the total by the number of days." To determine the number of acres, presumably the satellite image/stage data method (elevation area curves, page 6-36) was used; however, this step in the procedure was not stated or explained.

Response. The average daily flooded acres method is not used in the final Wetland Appendix. The 5 percent duration flood method was used to determine the extent of wetlands in the revised Appendix 10 (Wetlands). This change in methods resulted in the extent of the base wetlands increasing from 48,500 to 189,600 acres.

(2) Comment. The average daily flooded acres method is an unorthodox procedure in wetlands' evaluation, and the concept behind its use has not been documented. The resulting data from this procedure underestimate the extent of wetlands. Flood records indicate that the majority of floods occur during the months of March through June (page 6-17), with all but one year of record reaching the maximum peak stages sustained for 5 percent of the growing season during these months. The average daily flooded acres method, however, averages acres flooded over the entire calendar year (for 55 years), including the summer, fall and early winter drier seasons. This results in "weighing down" the average value rather than had the method evaluated only the "flood" season, the season critical to determining jurisdictional wetlands.

Response. See response 2d (1).

e. Jurisdictional Wetlands Elevation Cut-Off:

(1) Comment. It is stated in the DEIS that the "maximum elevation at which backwater flooding influences the jurisdictional delineation of wetlands in the study area is 88.5 feet" (p. DSEIS-53). "Plate 4-39 shows the Jurisdictional Wetlands"(p. 6-48). The Corps estimates 23,200 acres of jurisdictional wetlands based on this elevation cut-off. The justification for the elevation cut-off was not documented, and no explanation was provided as to how the plate illustrating jurisdictional wetlands was developed. We learned by personal communication with the Project Manager (Sept. 27, 2000), that the 88.5-foot elevation was derived by the WETSORT computer program.

The WETSORT method underestimates the extent of wetland acres because it examines only the duration of inundation. This method is a landscape-level, remote assessment, and not a site-specific level assessment. It does not capture acres that remain ponded for periods of time after an inundation event; nor does it capture all acres that pond or are saturated within a foot of the surface because of rainfall or groundwater seepage. It also does not capture the interaction between backwater flooding, rainfall and groundwater as described in the 1987 Corps of Engineers Manual. This method does not account for saturation at all; it is based only on inundation. The Corps' 1987 Manual requires inclusion of wetland acreage that meets saturation criteria. The low permeability of soil types in the Yazoo Basin makes this a very important consideration. These soils can remain saturated after inundation and ponding for long periods of time.

Response. WETSORT is not a method to determine wetland extent. WETSORT is simply a computer program used to calculate the 5 percent duration elevation for each year and to determine the median elevation for the POR. Site-specific assessments are not practical on a study of this extent. The method utilized in this study is the appropriate method for this study because it is a landscape level estimate. Wetlands created by local hydrologic conditions will not be affected by this project. Only wetlands created by backwater flood conditions will be affected by the pump, thus the estimates based on water surface elevation are appropriate. The pump will not affect the amount or location of rainfall. Wetlands created by local conditions will remain wetlands. The pump will not affect the water surface elevation to such a degree that ground-water levels would be altered. In the lower Backwater Area, the Mississippi River water surface has a much greater influence on ground-water levels than the water surface of the Big Sunflower River. Thus, wetlands created by ground-water seepage (if any exists in the Backwater Area) will likely remain unaffected. The low transmissibility of the soils limits the horizontal and vertical movement of water. During a 15-day duration event, surface water can penetrate 12 inches vertically and somewhat less distance horizontally. This soil moisture may be

maintained for long periods during the winter months, but it will disappear rapidly due to transpiration once the trees leaf out. The impact of saturation on wetland extent is equally important to pre- and postproject conditions. Thus, the impacts of saturation are offset in the analysis.

The Jurisdictional Wetland elevation at each of the six gages in the project area was used to compute the areal extent of wetlands. The base extent increased to 189,600 acres. The areal extent of wetlands in the recommended plan (Plan 5) increased to 163,300 acres. Thus, the project would induce a loss of 26,300 acres of wetlands. These revised acreages are provided in the final Wetland Appendix. The baseline wetland functional capacity is 885,300 FCUs, and the net functional loss is 14,200 FCUs. This loss represents 1.6 percent of the baseline functional capacity. The 1987 Wetlands manual clearly allows offsite determinations of wetlands. An offsite determination is appropriate for the EIS of a project covering approximately 600,000 acres. Onsite determinations are more accurate and are used on site-specific locations, but it is not practicable to use onsite methods for this large of an area.

(2) Comment. On Page 85 in the Main Report, it is stated that the "pumping plant would affect 23,200 acres of jurisdictional wetlands between the pump operation elevation of 87 feet and 88.5 feet - the elevation at which lands in the project area are inundated or saturated for at least 5 percent of the growing season in most years." There is no explanation for how the acreage between these two elevations was quantified, or how this figure is related to the average daily flooded acres method, the functional assessment procedure, and the compensatory mitigation acreage amount. Also, there is an important, unexplained discrepancy in the reported total flooded acres in the 2-year floodplain, which is used as a basis for the wetland evaluation. Table SEIS-17 indicates 192,223 total flooded acres in the 2-year floodplain, as compared with the Stage Area data in Table 6-9, which indicates 317,535 total flooded acres in the 2-year floodplain. The Corps has greatly underestimated the extent of wetlands impact due to the recommended plan of a pumping plant operating to 87 feet. Three additional elevational areas of impact apparently not considered by the Corps include acreages that are: below 87 feet; within the 2-year floodplain to 91 feet; and topographic depression/hydric soil areas above the 2-year floodplain throughout the project area.

Importantly, the wetland areas below 87 feet, including the cleared lands targeted for the Corps' reforestation plan, will be hydrologically impacted by the pumping plant because the depth of inundation will be changed. The pumping will "cut off the top" of the hydrograph for flood events, and, therefore, lower the peak periods of inundation. On the ground, this translates into a lower depth of water during flood events, which can shorten the duration of inundation as well.

Also, because the Corps has indicated that the pumps will be operated below 87 feet (conditions not specified), additional hydrologic impacts to the wetlands below this elevation can be anticipated (discussed in previous section). Additionally, the Corps has included a base

conditions vs. recommended plan hydrograph for the 100-year flood (Plate 4-21) which shows that the rising limb of the hydrograph will be delayed with the recommended plan, meaning that the pump would result in a shorter time that the area is inundated. However, the gross scale of the curves does not allow the reader to fully interpret these predicted changes with pumping. Also, the hydrographs for the more frequent flood events were not provided.

The Corps has underestimated the impacts to wetlands within the 2-year floodplain (to 91 feet) by not including all these lands in their identification of 23,200 acres of jurisdictional wetlands. Although the Corps has stated that they "included all wetlands up to the 91 foot elevation," (page SEIS-53) in their evaluation, they state elsewhere (page 85, Vol. 1) that the pumping plant would affect 23,200 acres of jurisdictional wetlands between 87 feet and 88.5 feet. This is an important discrepancy.

Response. The wetland analysis in the Final Report and FSEIS has been totally revised, and the new methods are well described. The wetland extents have been extensively field verified by EPA, NRCS, FWS, and the Vicksburg District using the 1987 Wetland Delineation Manual.

(3) Comment. EPA has provided a separate estimate of wetland impacts within the 2-year flood plain, which was prepared using Corps imagery and land use classification data. The procedures used, limitations of the landscape-level, GIS based procedures, and a discussion of acreages and type of impacts are described in Attachment C. Our assessment of wetland extent and impacts greatly exceed the Corps' estimates. Specifically, EPA estimates that there may be as many as 96,518 acres of forested wetland impacts and 76,827 acres of cropped wetland impacts within the two-year floodplain.

Response. See response 2e(2). In addition, EPA has provided a new estimate of wetland extent based on the field verification study (EMAP), and the EPA’s estimate has been included in the revised Appendix 10.

(4) Comment. The Corps has also not accounted for wetland extent and impacts above the 2-year floodplain. In Attachment C (described above), EPA has also provided an analysis of wetlands above the 2-year floodplain, in which a GIS-based methodology was used to identify areas of topographic depressions with hydric soils. Based on this landscape-level analysis, there are extensive acreages of wetland areas above the 2-year floodplain that have not been considered in the Corps' wetland analysis. Specifically, EPA estimates that there may be as many as 96,180 acres of wetland impacts above the two-year floodplain.

Response. See response 2e(2).

f. Farmed Wetlands Inventory Mapping.

(1) Comment. In the Reformulation Report, the Corps includes a map of farmed wetlands (Plate 4-41). The report, however, fails to sufficiently describe the use and application of the data. We are assuming that Plate 4-41 is the Natural Resources Conservation Service (NRCS) GIS coverage of farmed wetlands, and that the Corps used this information to assess wetland extent and impacts on farmed wetlands.

Response. The delineation is based on the NRCS coverage. The HGM functional analysis of wetlands in the revised Appendix 10 addresses project impacts to all agricultural lands, including farmed wetlands. The project will affect 17,600 acres of cleared agricultural land. These cleared acres will experience a loss of 2,930 FCUs. The nonstructural project feature will reforest 55,600 acres of cleared agricultural lands, which will increase wetland functional value by 187,000 FCUs (based on 90 percent reforestation, see Appendix 1).

(2) Comment. An analysis done by U.S. Geological Survey (USGS) (contracted by EPA) has determined that within the Yazoo Backwater Project Area there are 57,940 acres of farmed wetlands (using the GIS coverage provided by NRCS). EPA considers this to be a very conservative estimate of farmed wetlands in the area- only capturing the wettest of the farmed wetlands. The methodology that NRCS used to develop this coverage is based on the use of stream gage data and satellite imagery from March 1989 (a 2-year flood stage according to NRCS; also additional satellite dates were used to locate permanent water and wooded areas).

This method underestimates farmed wetland extent for several reasons. It does not comprehensively assess ponding, and it does not account for wetland areas above the 2-year flood frequency area. Additionally, the particular date of imagery used showed the reading at Steele Bayou gage to be just below 90 feet, therefore below the two-year flood stage (according to the Corps of Engineers, the 2-year flood is 91 feet). The peak stage for the NRCS imagery used was 89.7 feet, and the flood remained at that peak stage for approximately 4 days. More appropriate imagery for assessing farmed wetlands within the 2-year flood would have been from a gage reading at 91 feet, where the flood peak lasted for 15 days or more (duration criteria under the Food and Security Act). Other methodologies would have to be employed to assess farmed wetlands resulting from ponded areas above the 2-year flood frequency stage (for example, see Attachment C).

Response. Six springtime flood scenes were utilized by NRCS in their study. All areas that were flooded in three of the six scenes were considered wetlands. Congress gave the responsibility of determining farmed wetlands to the NRCS. The Vicksburg District is using the most appropriate delineation. The revised Appendix 10 has evaluated impacts to all agricultural lands, including farmed wetlands.

(3) Comment. Additionally, NRCS indicated that in classifying farmed wetlands, classification (satellite image processing) of certain areas were "backed off" to better correlate with field investigations from "Procedure Used to Develop Mississippi Natural Resources Conservation Service Farmed Wetland Inventory Maps," provided by Dr. Paul Rodrigue, NRCS to EPA on Sept. 27, 2000. The methodology of the field investigations and criteria used were not, however, described in the NRCS document.

Response. Comment noted.

(4) Comment. We also have concerns with the Corps' Plate 4-39, Wetland Land Classification map. When comparing this Plate with the Farmed Wetland Plate (4-41), it is clear that not all farmed wetland acreage is included in the Wetland Land Classification map. There a significant discrepancy here.

Response. See response 2e(2). These plates have been updated with the most recent information available.

g. Functional Assessment Procedure.

Comment. The wetlands functional assessment procedure used in the Corps' analysis is a coarse, landscape-level procedure. This is not an appropriate method for assessing wetland impacts from a pumping plant at a site-specific scale. We have previously documented our concerns about this procedure and its application to large-scale flood control projects in a letter to the Corps Vicksburg District, dated October 12, 1999 (Attachment D). The key concerns stated in that letter were: no data are provided that would help support the assumptions made for the methodology; it is unlikely that the methodology used is sensitive to changes in hydrology, (given that the greatest impact of the proposed pumping plant is hydrologic change, this assessment methodology is inappropriate); and there is no documentation of assumptions involved in the choice of indicators, indices, and in the assignment of sub index values.

Given the overall failings of this functional assessment procedure in this application, the final results which were presumably used as a basis for determining compensatory mitigation (coined "minimum threshold for no-net-loss") are inaccurate.

Response. The revised Appendix 10 contains a revised functional analysis using state-of-the-art GIS and HGM methodology. The HGM method was developed by the U.S. Army Engineer Research and Development Center (ERDC) in cooperation with EPA, and the Yazoo Basin Regional Manual was finalized in 2002. Preparation of the revised Appendix 10 has been extensively coordinated with EPA and reviewed by cooperating agencies.

h. Impacts to Wetlands on Public Lands, WRP/CRP, and Mitigation Lands.

Comment. The proposed project appears to undermine the goals of ongoing federal investments and programs in the basin. In the past decade, the federal government has invested more than $30 million in the Yazoo Backwater area through landowner incentive programs, especially the Wetlands Reserve Program (WRP) and the Conservation Reserve Program (CRP). To date, there are approximately 22,500 acres of WRP and 9,000 acres of CRP in the project area. The Corps' recommended plan may jeopardize the success of areas that have been newly restored and managed for wetland functions under these programs. Additionally, the Corps' recommended plan will impact mitigation lands -- wetlands that have been restored for mitigation for other previously constructed flood control projects. The recommended plan will also impact tens of thousands of forested wetland acres on public recreational lands, including the national wildlife refuge, national forest, and state lands.

Response. All environmental impacts were assessed for both public and private property. Mitigation is being provided to offset adverse environmental impacts. Although the project will affect environmental value on these properties, the net effect of the project will be an increase of environmental value in the study area.

i. Agricultural Intensification.

Comment. EPA is concerned that the proposed project will encourage increased conversion of wetlands to agricultural uses. The Corps indicates that agricultural intensification will not occur as a result of this proposed project, stating for example that "current economic conditions are not conducive for any conversion of bottom-land hardwoods to agricultural lands; [and that] Section 404 also serves as a deterrent to land-clearing" (page 40, Vol. 1). Given that the proposed project is intended to improve conditions for agriculture, we are very concerned that it would encourage increased agriculture intensification. Also, it is important to note that if the pumping plant alters the hydrology to remove the jurisdictional status of existing forested wetlands, then landowners could convert that newly non-jurisdictional forest into agricultural lands.

Response. Swampbuster, still in effect, discourages the conversion of wetlands to agricultural use with a loss in U.S. Department of Agriculture (USDA) program benefits. In addition, landowners would still be subject to the Section 404 process. The NRCS has indicated that clearing of bottom-land hardwoods in the entire Mississippi Delta over the last 20 years has totaled only 1,105 acres. They also indicated that provisions of Swampbuster are triggered by the removal of woody vegetation and not changes in drainage. Agricultural intensification as defined in this analysis is the shifting of crop patterns that would produce higher net returns, not

additional conversion of forest land to cropland. There are no intensification benefits in the Final Report's economic analysis. The nonstructural reforestation feature of the Recommended Plan removes up to 55,600 acres from agricultural production.

j. Big Sunflower Dredging Project - Cumulative Impacts.

(1) Comment. The proposed pumping plant project overlaps in project and drainage area with the Big Sunflower Maintenance Project, a proposed 130 mile channel dredging and clearing project. The massive scale of these two proposed projects within the Yazoo River Basin raises significant concerns regarding cumulative impacts. The Corps has failed to adequately address the cumulative impacts of these projects within the Draft EIS. Also, because the Corps used the same methodologies for the Big Sunflower Maintenance Project EIS and the Yazoo Backwater Draft EIS, we can conclude that the wetland extent, impacts, and mitigation acreage are likely underestimated for the Big Sunflower project as well. This has significant implications for understanding the combined cumulative impacts of these two large flood control projects. Further, the overall limitations that we have described in this technical review regarding the hydrology/hydraulics methodology give cause for questioning the conclusions regarding the hydrologic connections between these two large-scale flood control projects. Additionally, the anticipated impacts of these pending projects should also be comprehensively addressed in regards to the cumulative impacts from the many previously constructed or currently under-construction projects throughout the Yazoo River Basin, including Steele Bayou; Yazoo Backwater levees, cut-offs, floodgates; Upper Steele Bayou; Upper Yazoo Projects; Mainline Mississippi Levee; and others. Additionally, previous 404-permitted activity in the basin should be considered in evaluating cumulative impacts.

Response. Cumulative impacts from the past, present, and future projects in the Yazoo Basin have been addressed in the FSEIS. A quantitative cumulative impact assessment between the Big Sunflower River Maintenance Project and the Yazoo Backwater Project has been added to the Terrestrial, Waterfowl, Wetland, Aquatic, and Water Quality Appendixes. The revised Appendix 10 (Wetland Appendix) used the HGM approach to assess the functional value of wetlands and has been reviewed by EPA. The approach measures both the quality and quantity of wetland functions.

k. Comment. In reference to the Big Sunflower Maintenance Project, the Corps has stated that with the modified conveyance capacity (i.e., 130 miles of dredging and clearing) that the rate of flow from the Steele Bayou and Sunflower River basins "may be changed slightly," however, the same volume of flow from storm events will arrive in the Backwater area (page 47, Vol. 1). The presumed objective of the dredging project is to move water downstream more quickly and reduce the height of the flood peak. Given what is known about the extensive environmental damage caused by channel dredging, we question that if the rate of flow is only "slightly changed" by this extensive dredging project, then the environmental impacts are probably greater than the flood control benefits.

Response. The primary purpose of the Big Sunflower Maintenance Project is to reduce headwater flooding above the Yazoo Backwater Study Area. A typical single event flood hydrograph generally has a duration of approximately 2 weeks for floodwater to flow from headwaters near Clarksdale, Mississippi, to the Steele Bayou structure. The Big Sunflower River Maintenance Project has no effect on the volume of water that reaches the Steele Bayou structure. The project increases channel conveyance and decreases the travel time of a flood event by approximately 12 hours. Upstream flood stages will be reduced. Environmental impacts from the Big Sunflower River Maintenance Project will be addressed in a separate SEIS.

l. Water Quality Impairment.

Comment. The Corps has summarized findings about the existing water quality conditions in the project area and concludes that there are extensive water quality impairments, (Appendix 16, Vol. 3). An extensive number of streams and rivers in the project area are listed for impairment under Section 303(d) of the Clean Water Act. The Corps does not, however, provide a comprehensive description of the anticipated water quality impacts from the pumping plant. The Corps makes the apparent assumption that the nonstructural component will have a positive influence on water quality; however, this is discussed broadly in the context of the full array of alternatives rather than the specific recommended plan.

Many water quality functions, including chemical transformations and physical settling processes are dependent upon duration of flooding. For example, in the Cache River in Arkansas, the maximum sedimentation rates in bottomland hardwoods were found in cypress sloughs that were flooded in excess of several weeks (Kleiss, 1996). Compounds such as phosphorus and pesticides are commonly sorbed onto the surface of suspended sediments in the water column. Therefore, the removal of suspended sediments in the water column both decreases the turbidity of the water and the load of contaminants and others materials associated with suspended sediments. Denitrification (the conversion of nitrate to atmospheric nitrogen) occurs in wetland soils, after all available oxygen has been utilized. The utilization of oxygen is dependent upon many factors including microbial community, carbon availability and temperature, but is primarily driven but the duration of floodwaters. Therefore, a pumping project that would serve to decrease the duration, depth and extent of flooding would also impact these known wetland functions.

Because the extent of wetland impact has not been adequately determined in the Draft EIS, the impacts to water quality cannot be accurately described in a manner that compares impacts caused by the loss of wetland function to the improvements gained by compensatory mitigation lands, and the proposed reforestation component. Also, because the amount of mitigation and nonstructural reforestation is indefinite in this plan, the resulting benefits to water quality cannot be concluded.

Based on EPA's estimates of wetland impact, it can be concluded that the proposed pumping activity will cause impairment and contribute to the degradation of already impaired waters; many waters in the project area are currently listed under Section 303(d). Decreased residence times for surface waters in the Basin would result, given the extensive hydrological impacts. As well, increases in nonpoint source pollutants, such as pesticides and sediments, can be expected from the increased intensity of agricultural use with the proposed recommended plan. These impacts would have significant implications for the development of total maximum daily loads (TMDLs). EPA and MS Department of Environmental Quality are currently developing TMDLs for the impaired waters in the state. With the recommended plan, the significant shifts in the hydrologic regime and resulting loss of wetland function, would increase the pollutant loadings to these waters, and therefore delay and counteract efforts to reduce the causes of impairment.

Response. The revised water quality analysis addresses impacts to impaired waters within the study area, including those with TMDLs. Potential water quality impacts for each of the alternative plans were identified and addressed either qualitatively or quantitatively. The water quality analysis used a combination of HGM methodology and nonpoint source runoff estimates to estimate percent change above base/existing conditions. This project has no adverse effect on impaired waters.

m. Ground-water/Surface Water Interactions.

Comment. The impacts of the pumping plant as related to groundwater-surface water quality and quantity have not been addressed in the Draft EIS. Previous studies have indicated that a decrease in stage in streams in the Yazoo Backwater project area due to backwater pumping during high water periods may influence the ground water levels in the Mississippi River alluvial aquifer. In a study published in 1984, the USGS in cooperation with the Corps of Engineers, Vicksburg District (Lamonds and Kernodle, 1984) studied the potential ground-water level changes in the Mississippi River alluvial aquifer in response to proposed navigation improvements on the Yazoo River. Although the main focus area of this study was to the east of the Backwater Study area, some of the observation wells measured during the study are located in the Backwater area. Generally, their conclusions stated that although the degree of hydraulic connection between the streams and the alluvial aquifer varies in the study area, water levels in the alluvial aquifer adjacent to streams fluctuate in response to changes in stream stage. Specifically, it was noted "during the wet season a ground-water mound developed beneath the Deer Creek meander belt." The higher water levels in the alluvial aquifer beneath the meander belt indicate a hydraulic connection between water in Deer Creek and the alluvial aquifer. Adjacent drainages such as Steele Bayou and the Sunflower River system may also be in hydraulic connection with the alluvial aquifer, and, therefore, changes in their stage would impact alluvial aquifer levels.

Some rivers in the Yazoo Basin have shown significant decreases in the 7-day low flow during the past decade. Low flows in the Big Sunflower River have been below the published 7Q10 for the stream every year since 1978. The levels of the alluvial aquifer have been affected by the hydrologic alterations to the basin, and by ground water withdrawal for irrigation. These low base flow conditions are resulting in problems for waste load allocations, water quality, habitat for aquatics, and irrigation supply demands. For example, regarding irrigation supplies, the expected increases in irrigation demands for cropped lands and catfish farms has lead to discussions of proposals for an engineering "fix" by piping water from the MS River to supplement flows in the tributary channels. Other engineering fixes proposed or already implemented include building in-channel weirs to help pond water for irrigation and aquatics habitat, and dredging in-channel holes to provide for aquatics habitat. In the EIS, the Corps' plan to maintain water elevations between 70 and 73 feet during low-water periods will improve ponding from the current practice (and perhaps lessen fish kills), however, it should be noted that this is a proposed change in operation of an existing structural feature-the Steele Bayou gates.

With the proposed Backwater Pumping Plant plan, the pumping of surface waters would exacerbate these existing low base flow conditions by having a direct impact to the alluvial aquifer. Impacts to the alluvial aquifer will change the dynamics of recharge and discharge, which can also result in indirect impacts to wetlands hydrology, including saturation, ponding and/or inundation, duration and extent. The resulting changes could reduce the hydroperiod of the wetland sufficiently to eliminate wetland hydrology, or to impact the hydrology enough that wetland form and function are changed.

Response. The final Water Quality Analysis (Appendix 16) discusses impacts to ground-water quantity and quality resulting from operation of the Yazoo Backwater pump station. Geological surveys show that Steele Bayou and the lower Big Sunflower River both pass through backwater swamp deposits of silt and clay, while Deer Creek is a perched basin with sandy soils. A connection between Deer Creek and the alluvial aquifer is not surprising but, considering the nature of the soils, that type of connection in either the lower Steele Bayou or the lower Big Sunflower is less likely. Ground-water infiltration through backswamp soil is relatively slow, such that changes in duration would have minor impacts on infiltration in these areas. In the lower project area, infiltration from the Mississippi and Yazoo Rivers has a greater influence on the alluvial aquifer than does infiltration from overbank flooding. The proposed changes in operation of the Steele Bayou structure during the summer months should improve infiltration during those periods.

n. Alternatives are not Adequately Addressed.

(1) Flawed Analysis of Economic Benefits.

Comment. In evaluating alternatives for addressing flooding issues in the Yazoo Backwater area, the Corps did not adequately or accurately assess the economic benefits and

costs of project alternatives. Flaws in the Corps economic benefit analysis have resulted in the Corps failing to fully evaluate other non-structural alternatives to construction of a pump.

Response. The economic analysis conducted by the Vicksburg District was revised for the Final Report. The revised economic analysis follows the guidance provided in ER 1105-2-100 and the Planning Guidance Notebook for Federal Projects. It incorporated many of the comments provided by EPA. The final array of alternatives includes: four nonstructural, one structural, four combined, and the no-action alternative. All alternatives were evaluated using the same level of detail following the guidance outlined in ER 1105-2-100. To the extent possible, all categories of benefits were analyzed using geo-spatial data, current farming production practices, 2005 crop budgets, 2005 crop prices, and 2005 land-use data. Construction costs are based on October 2006 price levels. The District evaluated a nonstructural alternative (Plan 2C) that provided some benefits to the entire 100-year flood plain unlike the plan proposed by Shabman, et al. Agricultural benefits are the largest sector of benefits in the backwater report. The benefits accruing to the people of the lower Delta from reduction of damages to their homes, businesses, schools, roads, and other similar structures are also significant. Reduction in damages to these improvements will increase the quality of life significantly for the residents of the lower Delta. Costs and benefits have been revised and are presented in the Final Report.

The Yazoo Backwater report has been independently technically reviewed by other elements of USACE as required by USACE guidance to ensure that all guidance and policy have been adequately addressed during this process. The Independent Technical Review comments are included in the Final Report.

(a) The Corps Overestimates Agriculture Benefits of the Project.

Comment. While there are strong implications in the DEIS that the proposed project is motivated by the need to protect homes and businesses in the project area, 67 percent of the total project benefits are for agricultural crop benefits, and an additional 16.5 percent of the total benefits are related to agricultural crop production and reforestation. Only 15.6 percent of the benefits are for protection of structures, roads and bridges, and related items. Given the high percentage of agricultural crop benefits, any flaws with the estimation of these benefits, therefore, have significant impacts on the overall assessment of project benefits.

The agricultural benefits estimated by the Corps are inaccurate because they are based on a projection approach that is technically flawed and does not rely on the best information. The Corps' projections of agriculture benefits are based on a method which uses crop sales to predict future net returns. Projections based on historical crop sales do not provide any information

about future changes in costs of production, which may diminish the future growth rate of net returns. A more appropriate approach for this evaluation would be to project future prices, yields and costs based on a model such as the one the Food and Policy Research Institute (FAPRI) produces which is based on assumptions about future economic and policy conditions.

Agricultural benefits by net return estimates cannot be reconciled with land market prices based on the most current, net returns data released by the Corps. These 1997 net returns estimates, which are more current than the 1994 net returns reported in the EIS, imply land prices that are many times greater than the actual market value of lower elevation, agricultural lands in the Yazoo Basin.

In summary, the Corps analysis projects $168.6 million of agricultural crop benefits in net present value, whereas Shabman's analysis finds the benefits to be only $25 million in net present value.

Response. The FAPRI projections which were used by Shabman and Zepp were developed to be used in evaluating alternative policy decisions. This is not the appropriate method of making projections of future prices. The method of projecting future conditions utilized by the Vicksburg District is based on historic data for value of agricultural products sold. Value of agricultural products sold over time reflect changes in crop yields and relative prices over time. The net returns expressed in the DSEIS were based on the prices developed by USDA for use by all Federal natural resource agencies. The net returns reported by the Vicksburg District are similar to net returns reported in a survey by Mississippi State University (MSU) for farmers in the south Delta for the years 1994, 1997, and 1998. Net returns reported for these years are $36.33, $85.00, and $54.00 for the years 1994, 1997, and 1998, respectively. These figures are net before payment for land. Due to the volatile nature of agriculture, land prices tend to lag behind changes in crop prices. Also, many other factors affect land values, such as agricultural programs administered by USDA and demand for land for hunting and recreational use. The benefits identified by the Shabman Report do not include any allowance for yield increases which may result from earlier planting of crops and increased net returns from shifting from soybeans to cotton or corn, even though the Shabman Report recognizes that this problem exists (page 50, 4E1a2). Based on research from MSU, earlier planting of the major crops in Mississippi can result in significantly higher yields and reduced production costs. A recent study conducted by MSU is included the Final Report (Attachment 7B) which documents these findings. Yield losses for soybeans planted after 15 June can be as high as 0.6 to 1.8 percent per day. Based on this research, it is reasonable to expect higher yields for all crops since those lands not reforested will experience reductions in early season flooding and reduced potential for flooding. In addition to the traditional economic analysis, several sensitivity analyses were conducted. One of these analyses evaluated the impact of a no-growth scenario for agricultural crop damages. The results of this analysis were that the project remained economically justified with a benefit-cost ratio of 1.2 to 1.0. Therefore, projections of agricultural growth have little bearing on project recommendation.

(b) Lack of Justification for Intensification Benefits.

Comment. The Corps estimates benefits using an "intensification" factor on non-wetland crops by assuming that flood-free net returns would be higher with the pump project than they would be without a pump, even when the pump is not operating. In essence, this theory is based on the notion that benefits will be accrued from the pump before the forgone flood damages are taken into account because landowners will employ better management practices. This rationale is not consistent with agricultural practices in the region.

Response. In the Final Report, there are no intensification benefits as defined by ER 1105-2-100. Intensification is defined as a change in cropping patterns. The revised economic analysis shows no change in cropping patterns under any of the with-project conditions. With implementation of the Recommended Plan, up to 55,600 acres of currently farmed lands will be taken out of row crop production and reforested. Based on farmer surveys and research conducted by MSU, it is anticipated that farmers will plant earlier and thus have the potential to achieve higher crop yields, reduce production costs, and increase net returns.

During the review processes, EPA suggested that a proxy area (similar agricultural area in soil type, cropping pattern, etc.) be identified for the Yazoo Backwater Area. The MSU was contracted to document the changes in production practices and crop yields and identify a proxy area. The MSU report indicated that Washington County, Mississippi, was a good proxy area for the Yazoo Backwater study. Washington County was identified as the proxy area because they possess similar soil types. Washington County does not suffer from the threat of frequent flooding as the Backwater Area does and thus, management practices utilized in this area were assumed to be adopted in the Backwater Area with implementation of the recommended alternative. Crop yields, crop production costs, and other inputs utilized to calculate net returns to crops are documented in the Final Report.

In the area in which the Tensas-Cocodrie pump was operated for the past several years, there has been a significant increase in crop yields. The yields in this area have grown in the same proportions as areas that are not subjected to frequent flooding. An evaluation of yields and cropping patterns of this area prior to the installation of the Tensas-Cocodrie pumping plant shows that yields in this area did not match those of other less flooded areas. This indicates that the pumps are operating as they should and area farmers are benefiting from higher yields. The Vicksburg District expects the same results in the Yazoo Backwater Area.

(c) Errors in the Calculation of Benefits for Reforested Land.

Comment. Benefits for reforested land below the 87' elevation inappropriately double count the reduced flood damages. The costs for reforestation include the cost of purchase for easements on the lands below 87'. The prices of easements for these lands already accounts for the reduced land value because of flooding. Therefore, lower project costs capture flood impacts on those properties.

However, the Corps also includes $2.96 million in "non-structural agricultural crop" benefits from flood damages eliminated on those lands below 87' (reduced insurable flood losses). As Dr. Shabman points out in his analysis, the *Principles and Guidelines* does not even allow reduced flood damages as a benefit from a change in agricultural flood plain land use.

By including reduced easement prices in the costs of the project, and reduced flood damages due to reforestation as a benefit, the Corps is double counting this activity. This overestimates the benefits of the proposed plan.

Response. The cost of the easements is only one part of the evaluation of these easements. The value of these easements is based on the current value of the land, which is derived in large part, by the value from agricultural production. In the case of the lower elevations of the south Delta, the land values are reduced due to the flooding and potential for flooding. If there were no benefits for the expenditure for these easements, then this would not be a good expenditure of public funds. The reduction in flood damages that would accrue from removing these lands from production are as valid as benefits from structural methods of flood reduction and would be a benefit to the national economy. These damages are based on the current productivity of the lands, as are the costs of removing these lands (easements).

Current guidance allows for the calculation of benefits from nonstructural projects. Guidance is quite specific in directions that these benefits be calculated in the same manner as benefits for structural projects (Section 219 of WRDA 99).

(d) Lack of Disclosure Regarding Economic Justification Issues for the Project.

1. Comment. The Corps has failed to fully disclose the updated data used in their economics evaluation of the proposed project, specifically a non-disclosure of the 1999 crop prices, production costs, number of acres affected by the project by reach and stratum, per acre flood damage estimates, cropping mix, days of planting delay associated with the different flooding regimes with and without project, and replanting costs for flooding.

The Corps has failed to clearly describe and document information about the number of days it will take water to drain from structures and agricultural lands with their recommended pumping operation. This information would be important for all landowners. There will be significant lag times in drainage of property, depending on the flood event, even with the pumps operating at maximum capacity. It is important for the Corps to describe this, because there is a common misconception among landowners that the pumps will provide nearly instantaneous drainage.

As one example, we have calculated from the Corps elevation storage curves (Plates 4-11), that it will take the pumps, working at maximum capacity, 7 days to lower the flood level by just one foot, from 95 feet (about five year frequency event) to 94 feet. This length of time for drainage will have significant implications for residential and commercial structures. In another example, we have calculated that it will take 22 days (pumps operating at maximum capacity) for

the 10-year flood to achieve the maximum stage reduction claimed by the Corps. At incrementally higher elevations, it will take increasingly longer periods of time for the pump to drain the water off of the land and structures.

Landowners in the project area have *already* been compensated for flowage easement payments on 19,400 acres of land as a result of previously constructed flood control projects. The Corps does not indicate the specific areas of overlap between these existing flowage easements and the reforestation easements targeted for this new project. Specifically, what reductions in cost to the federal government will there be for these reforestation easements that overlap with existing flowage easement lands?

Response. The crop prices used in the Draft Report were clearly described as 1999 current normalized prices. These prices are developed by USDA and are utilized by all Federal natural resources agencies. The Final Report was revised to include the latest available 2005 Current Normalized prices. These prices are available to the public. The revised economic analysis has expanded the documentation on the methodology utilized to calculate the agricultural flood damages and benefits. The Final Report fully discloses all data used in the economic evaluation.

The benefits from the pumps are based on reductions in stages produced by the pumps. The flood levels would be reduced from 95.0 to 94.0 feet, NGVD, more quickly with the pumps; however, another benefit is based on the fact that flooding would not rise above the 95-foot, NGVD, elevation, whereas without-project flooding would occur at higher elevations. The benefits from the pumps are based on reduction in stages produced by the pumps as well as reductions in the number of days a parcel is flooded. The existing flowage easements were acquired on lands below elevation 70.0 feet, NGVD. Prices paid to landowners for perpetual reforestation/conservation easements will reflect any previous easements.

There is not any overlap between these two areas. Landowners are aware that the pump will only reduce the flooding by a maximum of 4 to 5 feet and that it will not be instantaneous. All water will not be pumped because as stages fall on the Mississippi River, the Steele Bayou structure will be opened and pump operation will cease. The Engineering Appendix includes tables on ponding area reductions by frequency flood event, yearly period of record pumping data, and a discussion of pump operation.

2. Comment. In their Future Without-Project Conditions section (page 38, Vol. 1), the Corps has stated that land use will not change significantly. The U.S. Fish and Wildlife Service has provided an analysis that contradicts the Corps position, based on a comprehensive

assessment of recent land use changes and projections for future without-project conditions (in Fish and Wildlife Coordination Act Planning Aid Report, 1999.) EPA concurs with assumptions and conclusions made by the U.S. Fish and Wildlife Service that the trends of reforestation on marginally productive agricultural lands will continue in this project area.

Response. The Final Report utilized 2005 land use to access the existing and future land use of the study area. These data incorporated the latest enrollments of lands into the WRP and CRP programs. The stage-area curves for the study area were adjusted to remove these lands from the classification of "cleared cropland," and no flood reduction benefits were calculated or claimed on these lands. The cap for entering cropland into the WRP program has been reached in Sharkey and Issaquena Counties. A significant feature of the Recommended Plan is the reforestation of up to 55,600 acres of frequently flooded farmed lands. With the easements proposed in the recommended plan, these lands would be permanently removed from crop production. For additional information, see Attachment 4B, Response 1i.

3. Comment. In justifying the need for this project, the DEIS does not adequately address the issue that within the five Yazoo Delta counties (Sharkey, Issaquena, Washington, Yazoo, and Humphreys), including the entire project area, only about 200 structures are identified by FEMA as repetitively flooded structures in the National Flood Insurance Program (and most of these structures are outside of the project area in the "unprotected" lands outside of the main levees.)

Using gage data, EPA has calculated that since 1978 (post-levee construction), had the proposed pump been in place and operating under the proposed plan (assuming operation when the stage exceeds 87 feet), the pump would have only been operated about six out of every ten years over that time period. Also, according to the Corps, there will be some years when the pump would not be operated even when the stage exceeds 87 feet, in cases when the Mississippi River is lower than the interior ponded area. A more detailed discussion of this point is warranted in evaluating the economic justification and intent of this project.

Response. The Federal Emergency Management Agency (FEMA) report included only structures that are flooded on a very frequent basis. The analysis by the Vicksburg District evaluated all structures within the 100-year flood plain. Damages for the without- and with-project analyses are based on all of these structures. Additional discussion is included in the Final Report to discuss pump operation and how reduction in flooding provides benefits to the lower Mississippi Delta. A table showing the times and number of days pumped over the period-of-record is included in the Final Report and revised Appendix 6 (Engineering Appendix).

4. Comment. Wetlands impacts and mitigation acreage are incorrect; therefore, the costs associated with this mitigation are incorrect. Additionally, it is inappropriate to claim silvicultural economics benefits on compensatory mitigation land.

Response. The Wetland and Mitigation Appendixes in the Final Report and SEIS have been revised. Due to the large uncertainty associated with future hardwood timber value, timber benefits were assumed to be equal to the cost of reforestation. The timber benefits are associated with the nonstructural reforestation feature and are therefore an appropriate benefit category.

o. Alternatives Analysis Based on an Ecological and Economic Evaluation of the Lower Yazoo Basin - EPA, Virginia Tech University, and U.S. Geological Survey.

Comment. Federal and state programs and policies have been steadily advanced in the past two decades to encourage non-structural alternatives for floodplain management; remove marginally productive agricultural lands from production; protect and restore wetlands; increase incentives to reduce flood risks; and to improve floodplain management and flood loss reduction activities. Examples include: the Water Resources Development Act of 1990 that authorized the Secretary of the Army to include environmental protection as a primary mission of the Corps, setting out a specific goal of increasing the quantity and quality of the nation's wetlands. Programs such as the Wetlands Reserve Program, the Clean Water Act's Section 319 Nonpoint Source Program, and the Federal Emergency and Management Agency (FEMA) programs, including the Hazard Mitigation Grant and the Flood Mitigation Assistance Programs, are working to implement natural resource restoration, pollution abatement, and appropriate floodplain management.

It is within this context that EPA collaborated with scientists from Virginia Tech University and the U.S. Geological Survey to produce an economic and ecological evaluation of a non-structural reforestation alternative for the Lower Yazoo River Basin. This alternative plan is in keeping with the national and state policies and programs, as described, and is recommended with an understanding of the important human uses of this ecosystem, especially the multiple agricultural uses of this basin. A non-structural alternative for the Lower Yazoo Basin is a sound public policy recommendation that would provide for the expansion of landowner incentives encouraging reforestation on lands where row crop production is only marginally profitable. A non-structural approach would contribute significantly to the recent reforestation efforts in the basin, and assist in shifting the region toward a more sustainable economy and ecosystem.

The key elements of the alternative include:

Voluntary reforestation of 88,000 acres of land within the 2-year flood frequency area; Expanded farmer participation in a crop income insurance program to offset agricultural flood damage losses of landowners who choose not to reforest;

Relocation of structures subjected to frequent flood damages or construction of small-scale, localized flood control structures to address the flood risk for the limited number of structures in the backwater area.

Shabman and Zepp reported that the federal budget costs for the reforestation easements and an income assurance program would be $68 million, with the total number of 88,000 easement acres considered. The non-structural alternative was determined to be NED justified, with calculated net benefits of over $20 million. The key economic opportunities offered by the non-structural alternative include reforestation for commercial production of pulpwood and saw timber, reforestation for wildlife habitat and the associated recreational values, income assurance for agricultural production, and residential and commercial flood hazard management. Significant ecological benefits would also result in water quality enhancements including reductions in sediments, pesticide and nutrient loadings; reduction in atmospheric carbon; floodwater storage and retention; and the restoration of habitat for both aquatic and terrestrial species.

Response. The recommended alternative adheres to these policies. The plan would remove up to 55,600 acres of land permanently from crop production. These lands are located in the most frequently flooded areas of the lower Delta. The lands above the 1-year frequency flood elevation would be provided with flood damage reduction, which would allow these lands to be more productive. The project would also provide flood reduction benefits to residents of the area who have experienced significant flood damages. The Vicksburg District evaluated an alternative that provided localized flood protection to area residents, but due to the scattered nature and relatively low average value of these structures, these localized protection measures were not economically justified. As previously mentioned, the Vicksburg District proposes reforestation of up to 55,600 acres of cropland. The income assurance program proposed in the Shabman Plan would not provide National Economic Development (NED) benefits. This plan would work in a similar fashion to current subsidized agricultural crop insurance programs. These programs do not provide national benefits since they only shift some of the costs of flooding from farmers to other segments of the economy by providing subsidized premiums for crop insurance. This program does not provide cost efficiencies, production efficiencies, or any other benefits that would increase the level of productivity or reduce costs for area farmers. The same benefits listed to the Shabman Plan would accrue to the Vicksburg District plan; i.e., commercial production of timber, wildlife habitat, reduced flooding for area residents, carbon sequestration, and reductions in nutrient loadings, and these benefits would be accomplished by actual reductions in the level of flooding in the area not by relocating residents and moving them out of the lower delta. Dr. Shabman's plan was justified by using several benefits categories and methods such as carbon sequestration and nutrient reduction. The law and governing Corps policies do not authorize the Corps to use those benefits and methods. The Shabman Report failed to account for all of the costs necessary to achieve the benefits claimed. In addition, the final array of alternatives included an alternative similar to the Shabman Plan (Plan 2C), but reflects USACE planning policy and guidance.

p. EPA Economic and Environmental Restoration Initiative: Recommendations on Investment Alternatives for the Lower Yazoo River Basin.

Comment. In addition to the technical evaluation of a non-structural alternative, EPA has developed a conceptual plan for alternative investments in the Lower Yazoo River Basin. The Lower Yazoo River Basin Economic and Environmental Restoration Initiative, also called the "Alternative Investments Proposal" describes a new strategy for public investments in the Lower Yazoo Basin (Attachment G). This strategy was developed in response to some of the goals and recommendations established by an interagency task force and broad group of stakeholders in the report, *Delta Vision, Delta Voices: The Mississippi Delta Beyond 2000*. In addition, EPA has worked with local government officials, stakeholders and federal government representatives from this region to introduce the concepts presented here. We offer this strategy as an example of a more sustainable and more diversified approach to floodplain management in the Lower Yazoo River Basin, and will seek opportunities for making refinements to these proposals.

An important goal set forth by the proposal is to direct federal investments in the Lower Yazoo Basin toward a broad range of Delta and Mississippi residents. This proposal describes new approaches for environmental restoration, as well as for strengthening the economy through expanding markets. The strategy combines components for public health and safety, community economic development and floodplain reforestation. Implementing this strategy for the Lower Yazoo Basin could be a critical step toward ensuring the protection of public health, and providing opportunities for cleaner, safer, and more economically viable communities. The major components of the proposal are outlined in Attachment G, and include flood protection of structures; sewer and water infrastructure improvements; environmental health and children's health initiatives; reforestation, conservation easement and landowner assistance programs; establishing a Delta Interpretative Center and community assistance and ecotourism development offices; as well as other components. This strategy highlights proposals for an alternative vision for floodplain management in this region.

Response. See response 1b.

(1) Proposed Mitigation is Inadequate.

(a) Wetland Mitigation.

1. Comment. The Corps states in the Draft EIS that the "combination of structural/nonstructural flood control eliminates the need for traditional measures of mitigation that have been used in previous projects," (Page 1-29); and "implementation of the recommended plan would not require compensatory mitigation," (Page SEIS-40). We disagree with these

statements and contend that there should be a clear distinction between compensatory mitigation for wetlands impacts, as compared to a reforestation component as part of the structural flood control project. For this reason, we have included a separate discussion about the reforestation component in the next section.

The Corps includes a "minimum threshold" of 12,980 acres that would be required to achieve a no-net-loss of environmental resources on the recommended plan, (page SEIS-40). However, because the degree of impact has not been adequately determined in the DEIS this amount of compensatory mitigation is inaccurate. Determination of the actual acreage of impact is critical in order to assess appropriate levels of mitigation. The issue of extent of impact is discussed in the previous sections, and in subsequent attachments. It should be noted, however, that a minimum ratio of 2:1 (replacement acres: impacted acres) is typically used for restoration, and would be appropriate in this case, given the problems we have identified with the functional assessment procedure used by the Corps in this application.

Response. The Wetland and Mitigation Appendixes in the Final Report and FSEIS have been revised. Mitigation to offset adverse effects associated with the pump station construction and hydraulic changes with pump station operation is provided by the nonstructural feature (reforestation/conservation easements). This mitigation is in excess of a 1 to 1 ratio of wetland function replacement. This is consistent with Regulatory Guidance Letter No. 02-02. Sections 2a, 2c, and 2d address a watershed-based approach; mitigation to replace functional losses to aquatic resources (including wetlands); and functional assessment, replacement, and accounting. The revised Wetland Appendix is based on a GIS flood simulation model and HGM functional analysis. This HGM functional assessment was developed by ERDC in coordination with EPA.

2. Comment. There are additional significant concerns about other aspects of the mitigation proposal. These include issues related to location, acquisition and management of the mitigation lands; compensatory mitigation replacement ratios; monitoring for mitigation lands; and unfulfilled mitigation commitments from previous projects.

The *targeted* location of mitigation sites is identified as cropland below 87 feet (shown on an undocumented modeled hydrology map). However, the Corps has indicated that the District would "look elsewhere in the Mississippi Alluvial Valley," (page 1-48) should acquisition of targeted sites not become possible. Considered within the context of the Clean Water Act Section 404 regulatory program, the issue of mitigation site identification is essential. The large-scale nature of the mitigation proposal in this project makes it less likely to be successfully implemented, and, therefore, the specific location of mitigation sites is critical.

Response. The acres required for mitigation (15,029) are included in the 55,600 acres targeted for reforestation which are open lands primarily within the 1-year frequency flood plain in the study area. Indications from local landowners are favorable for participation in the

reforestation easements as proposed. In the event that the Vicksburg District is unable to secure enough perpetual conservation easements to achieve a no net loss of environmental resource value prior to initial pump operation, then the difference between the minimum threshold and the amount of perpetual easements already acquired from willing sellers will be purchased in fee title from willing sellers. The Vicksburg District will first seek suitable lands in the Yazoo Backwater Area, then the Yazoo-Mississippi Delta; however, if sufficient lands are unavailable, then the Vicksburg District will look to other areas in the Mississippi Alluvial Valley. The EPA has agreed with this approach on other Yazoo Basin projects. There are no unmet mitigation requirements. As stated in the report, acquisition will be by the Vicksburg District. Management will be by the individual landowners, while monitoring will be done by the Vicksburg District to ensure a satisfactory survival of trees and then to ensure that landowners abide by the terms of the easement.

3. Comment. There is another important concern regarding the targeted location (cleared lands below 87 feet) of the mitigation sites and the reforestation plan. As we indicated in the Wetlands Extent and Impacts Analysis section, pumping will lower the peak periods of inundation, and lower the depth of water on wetlands below 87 feet during flood events. Therefore the proposed pumping plant will result in hydrologic impacts to the Corps' targeted mitigation and reforestation lands. If the recommended plan impacts the wetland hydrology on the mitigation lands, then the restoration will likely not succeed. Mitigation cannot be successful unless all elements of restoration are addressed, including hydrology, vegetation, and monitoring.

Response. While operation of the pump station will change the depth and duration of flooding on lands below 87.0 feet, NGVD, this reduction in the water surface elevation will not affect the wetland status (i.e., will still maintain a minimum of 5 percent duration flooding) of these lands. The success of wetland mitigation is dependent on their maintaining a minimum 5 percent duration flooding, but not on the depth of flooding. See also response to P(a)6 below.

4. Comment. The hydrological changes to the targeted mitigation lands also has significant implications for aquatic resources. So for example, although the value of fisheries habitat is enhanced by reforestation, the hydrologic alterations of the pumping plant (such as reducing the flood frequency on the current 2-year floodplain to instead a 10-year flood frequency) will result in impacting critically important floodplain habitat functions.

Response. The hydrologic analysis performed as part of the revised Aquatic Appendix fully addresses changes in flood frequency and duration to aquatic habitat. The revised Mitigation Appendix includes a plate displaying the location of 23,300 acres of crop and noncrop lands that meet the aquatic-spawning habitat requirements (i.e., 8-day duration and minimum 1-foot depth). These lands are part of the 55,600 acres of the nonstructural flood damage reduction feature.

5. Comment. Additionally, because the Corps has incorporated the compensatory mitigation acreage into their reforestation component, their plans are to compensate impacts with conservation easements. The use of conservation easements is not an appropriate form of mitigation for wetland impacts in this case. Management of easements would be significantly more complex on private land versus fee title land in public ownership, and the management rights of these easements is not specified. Also, the Corps is not only allowing for silviculture on compensatory mitigation lands, but claiming the economic benefits for that activity as well. It is inappropriate to claim economic benefits for timber income on lands that are to be set aside for the purpose of compensating for wetland losses.

Response. The Wetland and Mitigation Appendixes in the Final Report and SEIS have been revised. The timber benefits are associated with the nonstructural reforestation feature and are therefore an appropriate benefit category. Conservation easements are less costly to acquire and manage.

Current guidelines for Federal projects call for these projects to contribute to National Economic Development consistent with protecting the Nation's environment. Protecting the Nation's environment is achieved when damage to the environment is eliminated or avoided. The environmental benefits that are expected to accrue from the reforestation feature of the proposed project are based on the projected use of these lands. These uses include harvesting of timber as would normally be expected with typical silvicultural practices. However, it is highly unlikely that timber harvest for economic purposes would occur during the 50-year project life. Terms of the reforestation/conservation easement require that the landowner will have a forest management plan approved by the Vicksburg District. Providing mitigation through easements on privately held lands is acceptable. The Vicksburg District will monitor the land use of these tracts. Should this monitoring indicate a violation in the terms of the easement, the Vicksburg District can take the necessary action to regain voluntary compliance with the terms of the agreement or use legal actions, if necessary.

6. Comment. The Corps states that "mitigation monitoring will not be a part of the recommended plan" (page 1-50). However, this is contradicted in the Wetlands Appendix, which documents the importance of long-term monitoring. In order to demonstrate compliance with Section 404 (b)(1) Guidelines, and CEQ guidance on mitigation in NEPA documents, the Corps must provide adequate documentation for success criteria and monitoring plans, and site restoration and management plans.

Response. Mitigation monitoring has been included in the Final Report and FSEIS. The Vicksburg District will monitor the land use of these tracts. Should this monitoring indicate a violation in the terms of the easement, the Vicksburg District can take the necessary action to regain voluntary compliance with the terms of the agreement or use legal actions, if necessary.

As a project feature, the Vicksburg District will acquire perpetual reforestation/conservation easements from willing sellers on up to 55,600 acres. These lands will be either be reforested or other conservation measures will be implemented. Once an easement is secured, a reforestation plan will be developed that will evaluate the species of trees most suitable for this tract. The evaluation will include a review of the flooding regime for the area, soil types, tree species common to the area, planting dates, and other factors which may affect the mortality of the trees.

Since 2000, ERDC has been monitoring wetland functional values in the Yazoo Basin for the Vicksburg District on similar reforested mitigation properties. Annual monitoring reports are included as attachments to the Mitigation Appendix. Long-term land use monitoring will be conducted utilizing remote sensing techniques. On-the-ground inspections will be conducted to verify the remote-sensing results.

7. Comment. Additionally, EPA has concerns regarding the issue of mitigation owed for the Yazoo Backwater levee system. The Corps indicated that 3,617 acres is the balance owed for the Yazoo Backwater levee (page 91 and 1-25, Vol. 1). It is stated that the original amount of mitigation acreage for the Yazoo area levees had been 33,000 acres of woodland acquisition (page 12, Vol. 1), and later only 8,807 acres of agricultural land acquisition was accomplished (Lake George project, page 1-23, Vol. 1). These discrepancies in light of the now promised additional 3,617 acres are not explained. The DEIS documents this and other examples of significant shifts in mitigation plans that have occurred in the past. This fact, in combination with the extensive amount of mitigation owed from Corps Vicksburg District projects (12,600 acres) further reduces our confidence that successful mitigation for any new projects will be fully achieved.

Response. Page 12, paragraph 28, in the Draft Report explained the reevaluation of mitigation requirements for all the Yazoo and Satartia area levees. The original mitigation acreage for the Yazoo Area and Satartia Area levees was 33,500 acres. A mitigation plan for the Backwater levee was completed in 1989, and the 8,800-acre Lake George property was purchased in 1990. As part of this reformulation study, the Vicksburg District agreed to reanalyze compensatory mitigation requirements associated with the Yazoo Area and Satartia Area Backwater Levee Projects. Based on this analysis, an additional 3,848 acres will be required for compensatory mitigation. The final Mitigation Appendix discusses the remaining acreage requirements. This and the status of mitigation owed for all projects in the Vicksburg District are presented in Appendix 1. The Vicksburg District is concurrent with mitigation requirements.

8. Comment. The Corps has stated that the reforestation component (which includes their compensatory mitigation) will be done concurrently with the construction of the project (p. 1-47, or the Mitigation Appendix in Vol. 1). The DEIS also states that the Corps will have a cut-off date for acquiring easements, after which they will only commit to meeting the

"minimum threshold" of 12,980 acres. Given our concerns regarding the Corps' mitigation backlog, we would recommend that a significant portion of the total mitigation/reforestation be completed before construction of the proposed pump would begin.

Response. The Final Report and SEIS have been revised to extend the cutoff date for acquiring easements to 10 years after completion of construction. The Vicksburg District will acquire 15,029 acres to achieve a no net loss of environmental impacts prior to pump operation. The Vicksburg District has no mitigation backlog and is committed to securing easements on up to 55,600 acres. In the event that the Vicksburg District is unsuccessful in securing easements to achieve a no net loss, compensatory mitigation using fee-title acquisition will be utilized.

(b) Reforestation Component.

1. Comment. It is stated in the Draft EIS that the recommended plan will "commit to the purchase of conservation easements from willing sellers on 62,500 acres of agricultural lands below elevation 87.0 feet." This component has been described as a "compromise plan," because it includes a nonstructural element along with the traditional flood control structure. This point-of-view, however, discounts the multitude of large-scale flood control works that have been or are being constructed in the Yazoo Basin, which have resulted in the existing impaired condition of water quality, floodplain function and habitat loss.

Response. All analyses are based on existing conditions. A cumulative effects assessment on all past, present, and future projects is included in the Final Report and FSEIS. Over the last 20 years, the Vicksburg District has included mitigation to fully offset adverse impacts from Yazoo Basin projects.

2. Comment. The recommended plan's reforestation component may not be fully implemented, and those portions that are implemented may not succeed, and, therefore, overall has a great potential for failure. In actuality, there is only a final commitment of 17,078 acres, coined the "minimum threshold" or compensatory mitigation acreage (page SEIS-88), should not enough willing sellers come forward to sell the 62,500 acres of conservation easement. The reforestation component is dependent on the Corps acquiring easements from willing sellers on 100 percent of the stated acreage of available cropland below 87 feet. A 100 percent level of participation seems highly unlikely. Also, the derivation of this acreage figure, 62,500, is apparently based on the Corps' modeled hydrology. No documentation on this model has been provided; and major discrepancies in flooded acreage values from this model as compared with the satellite/gage method have been identified.

Response. The 55,600 acres targeted for reforestation/conservation measures represents the open lands at or below the 1-year frequency flood level that corresponds to elevation 87.0 feet, NGVD, at the Steele Bayou structure. The 15,029 acres are the minimum required

acreage necessary to offset the impacts of the project and achieve no net loss of habitat. This results in a no net loss of aquatic spawning resource, a 2.1 percent increase in terrestrial resource value, a 1.4 percent increase in waterfowl foraging value, and a 2.4 percent increase in wetland resource value. In the event that the Vicksburg District is unsuccessful in securing easements to achieve a no-net-loss, compensatory mitigation using fee-title acquisition will be utilized. The Vicksburg District will first seek suitable lands in the Yazoo Backwater Area, then the Yazoo-Mississippi Delta; however, if sufficient lands are unavailable, then the Vicksburg District will look to other areas in the Mississippi Alluvial Valley. Additional documentation on hydrologic models is provided in Appendix 6. The difference between the extent of the 10 March 1989 flood scene and the stage-area curve is due to the fact that the flood scene stages are 4 to 6 feet less than a 2-year frequency flood in the upper part of the study area.

3. Comment. The lands below 87 feet that are targeted for this reforestation component will be also be hydrologically impacted by the proposed pumping plant (see Wetlands Extent and Impacts Analysis section above). Also, the management allowances on these reforestation acreages are open-ended, with little detail about their management rights provided.

Response. While operation of the pump station will change the depth and duration of flooding on lands below 87.0 feet, NGVD, this reduction in the water surface elevation will not affect the wetland status (i.e., will still maintain a minimum of 5 percent duration flooding) of these lands. The success of wetland mitigation is dependent on their maintaining a minimum 5 percent duration flooding, but not on the depth of flooding. The Final Report and FSEIS state that once reforestation is complete, the conservation management of the property resides with the property owner. Conservation easements will prohibit landowners from converting these lands back to other use.

4. Comment. It is also stated that "the Corps is committed to the fee title acquisition and reforestation of lands . . . should this minimum number of acres [17,078 acres] not be achieved." The basis of this "fall back" plan is illogical, because if there are not enough willing sellers of conservation easements, there will likely be even less number of willing sellers for fee-title acquisition. This assumption is based on years of working with community members and county officials who have expressed concerns about selling additional acreages for fee title ownership to the federal government. There has been a push toward use of conservation easements for compensatory mitigation, rather than fee-title acquisition, for that reason. Because landowner assistance programs, such as the Wetlands Reserve Program, sell conservation easements to landowners, the acquisition of fee-title lands has become difficult for the Corps in this basin (personal communication with MS Valley Division representatives, Sept. 8, 2000).

Response. The landowner acceptance of this conservation easement will in fact vary from year-to-year due to a number of factors. The passage of a favorable Farm Bill, revenue generated from the land, change in ownership, weather, floods, etc., are all valid reasons that landowners weigh in their decisions concerning the future of the property. It is for these reasons that "willing seller" acquisition varies yearly. However, based on current conditions and landowner inquiries in our program, we expect a substantial participation in the conservation

easements associated with this project. If fee title acquisition is required to achieve a no net loss, the Vicksburg District will first seek suitable lands in the Yazoo Backwater Area, then the Yazoo-Mississippi Delta; however, if sufficient lands are unavailable, then the Vicksburg District will look to other areas in the Mississippi Alluvial Valley.

(2) Failure to Demonstrate Compliance with Clean Water Act Section 404.

Comment. Civil Works projects must comply with all applicable laws and regulations, including Section 404 of the Clean Water Act. Based on the information provided in the DEIS, the proposed project does not comply with Section 404. Specifically, EPA is concerned with the inadequate analysis of alternatives, serious shortcomings in the proposed compensatory mitigation, and the potential for the project to cause or contribute to significant degradation to waters of the United States. Moreover, these concerns are heightened by weaknesses in the information and analysis of wetlands impacts provided in the DEIS.

The Section 404(b)(1) Guidelines (Guidelines) are the substantive criteria used to determine compliance with Section 404. Pursuant to the Guidelines, a permit cannot be issued if there is a less environmentally damaging practicable alternative. While the Corps is not responsible for issuing itself a permit in this case, it is critical that this central component of the Section 404 program be complied with in full. Accordingly, the Corps must perform a thorough analysis of less damaging alternatives. As discussed above, EPA has serious concerns with the alternatives analysis provided in the DEIS. We are particularly concerned with the inadequacies in the analysis of the preferred alternative (particularly the inaccuracies in the economic evaluation), as well as the failure to adequately assess a non-structural alternative similar to that discussed in the Shabman/Zepp report. Moreover, given the shortcomings in the DEIS' evaluation of potential wetlands impacts under the proposed pump project, it is extremely difficult to adequately compare the environmental consequences of different alternatives.

Once environmental impacts have been avoided and minimized to the maximum extent practicable, compensatory mitigation is required to offset any remaining impacts. On this subject, the DEIS is confusing. While on the one hand, the document indicates that "no compensatory mitigation is required with the recommended plan," the DEIS describes reforestation efforts which are intended to offset impacts to wetlands from the proposed project. For the purposes of compliance with Section 404, EPA can only assume that such reforestation efforts are intended to serve as compensatory mitigation. As discussed earlier, EPA has significant concerns with the mitigation proposal. These include: concerns with the amount of

proposed mitigation; a failure to adequately identify mitigation lands; inadequate assurances that the proposed mitigation will be implemented in the Yazoo Basin; and concerns that the mitigation might not succeed. Here again, the underlying inadequacies with respect to information on potential wetlands impacts preclude the development of an effective and complete mitigation plan.

The Guidelines also require that no project can be permitted if it will cause or contribute to significant degradation of aquatic resources, after considering mitigation efforts. Given the aforementioned concerns with the magnitude of the potential impacts to wetlands, the associated adverse impacts to water quality, and the shortcomings of the proposed mitigation plan, EPA believes that the proposed project will cause or contribute to significant degradation of waters of the United States.

Throughout our review of the DEIS, EPA has noted serious deficiencies with respect to the information and analysis used to describe and justify the proposed project. These shortcomings are particularly troubling in light of Section 404 policy, which requires that such analysis be commensurate with the magnitude of the potential environmental impacts. Specifically, the Guidelines state that the level of documentation should reflect the significance and complexity of the discharge activity. Given that the proposed project could potentially result in adverse impacts to over 200,000 acres of wetlands, the level of information provided in the DEIS regarding key issues such as the extent of wetlands in the study area, less damaging alternatives, and compensatory mitigation clearly fail to meet the intent of this important aspect of Section 404 policy.

Response. Section 404(b)(1) guidelines were applied to the construction and maintenance activities at the pump station site. Impacts to the waters of the United States due to dredge and fill activities at the pump station site are addressed in revised Appendix 2. Impacts to water quality were temporary, localized increases in suspended sediment. Water quality impacts are discussed in detail in the revised Appendix 16. Mitigation to offset adverse effects associated with the pump station construction is provided by the nonstructural feature (reforestation/ conservation easements). This is discussed in the revised Appendix 1.

The Section 404(b)(1) guidelines require avoidance, minimization, and compensation. The recommended alternative avoids and minimizes adverse environmental effects. As for the statement that “a permit cannot be issued if there is a less environmentally damaging practicable alternative,” the key word here is practicable. There is a difference of opinion over the term "practicable." The EPA’s preferred alternative is not practicable in that it will not achieve the project purpose of reducing flooding, is not economically justified based on the Vicksburg District’s analysis (Alternative 2C), and is not supported by local sponsor. It is unclear how EPA arrived at the determination that the proposed project would potentially result in adverse impacts to over 200,000 aces of wetlands. The wetland analysis has been revised for the Final Report.

All alternatives evaluated in the final array were analyzed using the same level of detail. Three additional nonstructural alternatives were evaluated in the Final Report, including one that is similar to EPA's Shabman Plan. The EPA reviewed the Draft Report and made comments regarding the methodology used to determine agricultural benefits. The economic analysis in the Final Report was revised and expanded to incorporate those comments consistent with USACE guidance.

The wetland analysis in the Final Report and FSEIS was revised utilizing the HGM approach as suggested by EPA. This revised analysis utilizes new methods to determine the impacts to wetlands and wetland functional values. The EPA has thoroughly reviewed and concurred in this approach to the assessment of wetland functional values. While the Vicksburg District and EPA disagree in the amount of wetlands in the Yazoo Backwater Study Area, the amount of mitigation more than offsets any impacts to wetland acres, regardless of which wetland estimate is used. A thorough discussion of the wetland analysis is found in the Final Report and Appendix 10 (Wetland Appendix).

In addition, the Terrestrial, Aquatic, Waterfowl, and Mitigation Appendixes have been revised in the Final Report. Findings from these analyses were utilized in the mitigation analysis.

q. Other Issues.

(1) Authorization Issues.

Comment. In the original authorization language for the Yazoo flood control projects (Flood Control Act of 1941), the lands below 90 feet were designated to serve as a sump area for floodwater storage. Specifically, it was stated that projects will "prevent the sump level from exceeding 90 feet, mean Gulf level, at average intervals of less than 5 years" and lands below the 90 foot elevation are to be "dedicated to sump storage." The question of whether the proposed Yazoo Backwater Pump exceeds the original authorization was raised by Earthjustice Legal Defense Fund in a letter to Secretary of Army Louis Caldera (copied to EPA John Hankinson, March 20, 2000). The Corps has not sufficiently addressed this issue in the Draft EIS. This is of significant importance, especially in light of a review of the hydrology and economics which shows that the originally proposed "sump area" would benefit from flood reduction the most from the proposed pumping plant, as compared to the higher elevation areas.

Based on the Corps' elevation storage curves (Plate 4-11), the lands at and below 90-91 feet will be dewatered the most rapidly, given the steepness of the curve up to this elevation. Therefore, in terms of the effectiveness of the pumping to reduce the flood stage,

these lower, more frequently flooded lands will be dewatered the most effectively, as compared to lands above those elevations. Given that a large percent of the total wetland acres are also below 91 feet, the greater effectiveness of the pumping on these more frequently flooded lands is a significant environmental concern. Additionally, the large majority of the economic benefits that the Corps claims for this project are for the lands below 91 feet.

Response. The first 12 pages of the report clearly set out the authority for the project. The 1941 Flood Control Act, Public Law 228-77th Congress, approved Plan C for the control of flooding in the lower Mississippi Delta. That plan, found in House Document 359, provided for the construction of three pumping plants with a combined capacity of 14,000 cfs. The pumps would be operated in a such a way that the impounded drainage would not rise above the 90-foot, mean Gulf, level contour, more frequently than once in 5 years on the average. The Act contained a grant of discretion to the Chief of Engineers to make certain modifications to the project plan.

The Committee on Public Works of the U.S. Senate on 12 June 1954 adopted a resolution calling on the Chief of Engineers to "examine and review the project for flood control of the Mississippi River in its alluvial valley . . . as authorized by the Flood Control Act approved May 15, 1928, as amended by subsequent Acts of Congress, as one comprehensive whole and in its entirety, and to submit at the earliest practicable date recommendations for any modifications that are advisable with respect to the project or any feature of the project." (See Page 1 of Comprehensive Review of the Project for Flood Control of the Mississippi River in its Alluvial Valley and for Improvement Between the Head of Passes and Cape Girardeau, Missouri, December 18, 1959.) In response, and in accordance with instructions from the Chief of Engineers, the Vicksburg District created a document that became Annex L to the Comprehensive Review. That Annex addressed the YBWP, Mississippi. The Annex puts forward a plan to connect the Sunflower and Steele Bayou sumps by a channel. The Vicksburg plan assumed a minimum sump elevation of 82.5 feet to provide recreational benefits.

The Comprehensive Review of the Mississippi River and Tributaries Project Report (published as HD 308, 88th Congress, 2d Session) adopted most of the recommendations of the Vicksburg District, concurring that the project would best function if the Steele Bayou and Sunflower River sumps were connected by a channel. This channel was completed in 1978. In addition, the report concluded that pumps were not then economically justified although at some future time, protection of some areas in the Yazoo Backwater by pumping might be warranted. The Chief of Engineers' letter forwarding the report to Congress noted that he considered the current project authorities to be broad enough to permit the proposed and possible future modifications to the project within the Chief of Engineers' discretion. The Flood Control Act of 1965 approved these modifications to the project.

The anticipated subsequent analysis was done and recorded in the Yazoo Basin, Yazoo Backwater Area, The Yazoo Pump Project report of July and November 1982. That report recommended construction of a single 17,500-cfs pumping plant at Steele Bayou to be operated at 80.0 and 85.0 feet, NGVD, at various times of the year. The recommended plan complies with these authorizations.

(2) Consensus Committee.

Comment. In several locations within the Draft EIS, statements are given regarding the Consensus Committee, sponsored by the Mississippi Levee Board and composed of project area residents, local and state elected officials, and state and Federal agencies (including EPA). We would like to clarify that while we participated in these meetings, we consistently stated our concerns with the process and decisions, which were made by this Committee. In particular, EPA objected to the effort to select a project plan without the benefit of review of sufficient documentation on hydrology and environmental assessments.

Response. Comment noted.

(3) Documentation Issues.

Comment. The DEIS report is written in a manner which does not clearly present some very key elements related to hydrology, environmental assessments and economics. There are failures in demonstrating how calculations were done, in clearly showing how one analysis is used in subsequent analyses, and how assumptions were carried through to arrive at the results or interpretations. We have specified instances of this in our review. Also, discrepancies in information and errors noted are described in more detail throughout this review.

Response. Subsequent to the Draft Report, the Vicksburg District met with EPA and provided a detailed hydrologic and hydraulic analysis schematic, which describes the dissemination of hydrologic data to the different environmental and economic analyses. Additional detail on calculations is provided in the Final Report, associated appendixes, and the FSEIS. All revised environmental appendixes have been coordinated with, and reviewed by, EPA and other cooperating agencies. If more information on calculations is required, it is available upon request.

(4) Noted Discrepancies.

(a) Comment. Table 1-1 - acreages of public lands are grouped under the Adjusted acres column, which is supposed to exclude acreages of public lands.

Response. Table 1-1 has been revised to include study area totals.

(b) Comment. Jurisdictional Wetlands Plate 4-39 does not include the same coverage of farmed wetlands as shown on the farmed wetland plate (Plate 4-41).

Response. The revised wetland analysis includes impact to all agricultural lands.

(c) Comment. Acreages for flooded areas differ in total when comparing Table SEIS-17 and the Stage Area Data, Table 6-9. Why is there a discrepancy of about 30,000 acres for total flooded acres?

Response. The tables were correct as shown. Table SEIS-17 was not derived from the stage-area curves. Table SEIS-17 only included wetlands and the stage-area curves includes all land use acreage.

(d) Comment. Plate 4-34 and 4-38 - why does recommended plan show less developed land than does the base conditions plan?

Response. In the DSEIS, Plate 4-34 showed base conditions (without-project) for the 100-year frequency event, and Plate 4-38 showed the recommended alternative (with-project) for the 100-year frequency event. There are less acres in the 100-year frequency with the project because the pump station reduces the extent of the 100-year flood.

(e) Comment. Page 79, Vol. 1, the Functional Capacity Units (FCUs) for wetlands for Plan 5, structural component is a negative 19,042, and for the nonstructural component a positive 51,520. The difference is 32,478, which does not agree with the listed NEQ benefit on Table 12 of 28,225. Why is there this discrepancy?

Response. The Final Report and FSEIS contain a revised wetland analysis and the numbers have been changed accordingly.

(f) Comment. The elevation-area curves (Plates 4-7 to 4-10) extend beyond the highest data point; this extrapolation should either stop at the uppermost data point, or be indicated with a dotted line.

Response. The maximum elevation of the stage-area curves at elevation 107.0 feet, NGVD, coincides with the overtopping elevation of the Yazoo Backwater Levees.

(5) Absences of Documentation.

(a) Comment. No description of how the Jurisdictional Wetlands plate 4-39 was derived.

Response. The map was based on the 5 percent duration flood at Steele Bayou structure. Appendix 10 has been revised in the Final Report and SEIS and describes, in detail, how wetland acres were determined.

(b) Comment. Page 7-151 states that a new structures inventory was done, but the data (except some isolated examples) are not presented. It states that the new inventory shows 1,642 structures estimated to be damaged with the "existing hydraulic conditions." Does that mean the 100-year flood, or is that the number of structures in the entire project area?

Response. These structures are located within the 100-year flood plain.

(c) Comment. In discussion of costs - mention pg. 6-79 in 35 years another estimated $21,083,000 would have to be spent on engines and pumps for "major replacement costs." Why was the life of the project set at 50 years if this major replacement cost is at 35 years?

Response. The period of analysis for this project is 50 years. This is the time horizon for project benefits, and project operation, maintenance and replacement costs. This is the period of time during which the proposed project is expected to be able to provide beneficial effects. The expected replacement, while extensive, is less than 20 percent of the total costs of the pumping plant. Other major features of the proposed pumps are expected to remain useful the entire 50-year period with only normal maintenance. The major replacement cost has been included in the economic analysis of the project.

(d) Comment. Page 85, Vol. 1 states that the pumping plant would affect 23,200 acres of jurisdictional wetlands between 87 feet and 88.5 feet. The acreage of the land classes of forested and cropped for that 23,200 acres is not documented.

Response. The final Wetland Appendix contains revised estimates of impacted acres.

(6) Unclear Information.

(a) Comment. Page 1-2 - what is meant by the reference to a nonhydric wetland, Table 1-1?

Response. Table 1-1 no longer contains nonhydric wetlands in the final Appendix 1. The Wetlands GIS layer is a composite of other layers. One layer was based on a GIS coverage of soils, which were classed as hydric or nonhydric. The nonhydric class referred to cleared lands that were not wetlands. The land use and wetlands tables must both account for all acres; thus, the wetlands GIS layer had a class for nonwetlands. In this case, the nonhydric soil class was retained from the original soils data base.

(b) Comment. There are apparent discrepancies in flooded acreages between 1-year base conditions map (Plate 4-26), as compared to the 2-year nominal floodplain image. Also, there is an apparent discrepancy in flooded acreages between the 2-year base conditions map (Plates 4-27), as compared to the 2-year nominal floodplain image.

Response. The 1-year base conditions and the 2-year flood frequency do show a difference. The base condition and with-project plans as shown on DSEIS Plates 4-26 and 4-27 are the result of our hydrologic analysis. In the Final Report, these plates (Plates 6-37 and 6-38) are provided in the revised Appendix 6 (Engineering).

(c) Comment. Opening paragraphs in the main report of the DEIS state annual acres flooded is 499,000 acres. This figure accounts for flooding that occurs on one spot of land multiple times over the year. It leads readers to believe that ~ 500,000 of the 630,000 acres in the 100-year floodplain are flooded each year.

Response. In the Final Report, approximately 541,000 acres are inundated on an average annual basis. Cleared lands account for 27 percent of this average annual value. This value reflects the annualization of all frequency events and is not intended to mislead.

3. Attachment: Response to USGS "GIS-based Estimates of Wetland Extent and Wetlands Impacts from the Proposed Pumping Plant in the Lower Yazoo Backwater Area, Tab C."

The 1987 Wetlands manual clearly allows offsite determinations of wetlands. An offsite determination is appropriate for the EIS of a project covering approximately 600,000 acres. Onsite determinations are more accurate and are used on site-specific locations, but it is not practicable to use onsite methods for this large of an area.

Adequate data were available to perform this wetland determination. The hydric soils layer, which was developed by the Waterways Experiment Station for the Vicksburg District, could have been used to refine the estimate; however, this would have reduced the estimated acreage. The Vicksburg District, instead, desired a more conservative estimate that would be more inclusive of potential wetlands.

The commenters correctly note that the 1987 Manual states that lands inundated or saturated to the surface for 5 percent of the growing season may be wetlands (see DEIS 6-45 and 6-46 for the complete definition of jurisdictional wetlands), then they proceed to evaluate a nominal 2-year flood scene for wetland delineation. The nominal 2-year frequency flood scene was produced at the request of the FWS. The 10 Mar 89 scene was selected by the Vicksburg District to delineate wetlands, because it closely matches the 5 percent duration elevation (this is 5 percent of the growing season, which amounts to 14 days in the Delta) at most gauge locations in the study area (see Table 1).

TABLE 1

Gage	10 Mar 89 Elevation	2-year Flood Elevation	5 Percent Duration Elevation
Steele Bayou Structure	89.7	91.0	88.56
Steele Bayou at Grace	89.7	94.0	90.99
Little Sunflower Structure	90.0	91.6	89.85
Big Sunflower at Holly Bluff	90.1	93.0	90.88
Big Sunflower at Anguilla	93.1	97.1	92.74
Big Sunflower at Little Callao	94.0	101.8	93.52

The 5 percent duration elevations were determined by the computer program WETSORT, using the period of record data at the above gage locations. Although the 2-year frequency elevations are close to the 5 percent duration elevations in the lower part of the basin, they are much higher than the 5 percent durations in the upper areas of the basin. The use of a 2-year frequency elevation flood scene greatly over estimate the jurisdictional wetlands in the study area based on actual ground truthing observations.

The commenters also state that the use of satellite imagery to determine wetlands does not account for wetlands that occur due to ponding or saturation. Thematic Mapper imagery has seven bands of data. Bands 1,4,5 and 7 all can be used to help delineate soils based on water content. The Vicksburg District uses a classification schema with 10 classes. Three of the ten classes are for saturated conditions. This information is then used to adjust the flood classes based on field or office verification data. Satellite imagery provides a synoptic view of the landscape. Any lands which are flooded, are classed appropriately. When discussing the classed satellite scenes, the term flooded is loosely applied to all lands which have water on the surface. The source of the water on the landscape is not determined. The water could come from several sources, which include over bank or backwater flow, surface runoff, or artificial sources. The 2 Dec 87 and 1 Feb 93 scenes have considerable agricultural acreage that has ponded water. These areas have characteristic straight edges and right angles, which indicate that the water is captured behind agricultural levees. Stream water surface elevations in the 2 Dec 87 scene had been low for weeks prior to the date of acquisition and the water did not get into the fields by out-of-bank flooding. In the 10 days prior to the 10 Mar 89 scene, the gage at Little Callao dropped 8 feet, while the gage at Anguilla dropped 6 feet. As the weather is generally mild in March, areas holding ponded water would not likely have evaporated and thus would still be retaining water. If the ponded areas were large enough, the satellite sensors would detect them.

The USGS also makes a comment regarding unsupervised classifications. Unsupervised does not mean that the results are not field verified. Image classification is the process through which the individual pixels are grouped into classes of like data. There are two general categories of image classification. They are termed 'supervised' and 'unsupervised'. In an unsupervised classification, the raw data layers are statistically grouped into classes without input from the operator. In a supervised classification, the operator selects training pixels or groups to pixels and statistics are developed from these training areas to class the rest of the image. Both methods require field verification to assess the accuracy of the classification.

Wetland Extent: Estimations for Wetlands within the 2-year Flood Plain:

a. Comment. There are 96,518 acres of forested wetlands within the 2 year flood plain, based on the Corps nominal 2-year flood image, overlain with hydric soils.

Response. The Vicksburg District sums for that scene vary a little, but it certainly is close on the acreage. It is based on the 5 percent duration elevation. Appendix 10 has been revised in the Final Report and FSEIS.

b. Comment. This is a landscape-level, remote assessment, and not a detailed analysis in combination with field-level assessment.

Response. It is a landscape-level (offsite) assessment, which is appropriate for a planning study. It was field verified by the Vicksburg District, Regulatory Branch using field-level assessment techniques. Additional wetland analysis and coordination have been conducted with EPA and are contained in the final Wetland Appendix.

c. Comment. This method underestimates wetland extent as it does not comprehensively assess ponding, and does not assess saturation at all.

Response. This method does assess ponding. By utilizing multiple bands of data, the basin can be divided into areas covered by water or not covered by water. TM bands 4 and 5 measure reflectance in the infrared spectrum. Water absorbs infrared radiation and thus has low reflectance values. The satellite sensors cannot, however, determine how the water got on top of the land. All wet areas including intentionally ponded areas, such as catfish ponds are classed as wet. The wet areas are then sandwiched with the land use data layer to produce a map showing the land use of flooded or wet areas. The intentionally ponded areas such as catfish ponds are then removed from the sum of the flooded area. Permanent water bodies such as lakes can also be removed in this manner. With regard to saturation, although the major purpose of the flood scenes was to develop a stage-area relationship, which by definition does not include saturated areas, some scenes do include saturated areas. This occurs because the elevation of the water

within flooded areas may be greater than the river stage on that date. In the 10 Mar 89 flood scene, the Holly Bluff gage is at 90 feet, NGVD, but the land near there is inundated up to elevation 92 feet. The strip of land between 90 and 92 feet, NGVD, accounts for some of the saturated zone. The revised wetland delineation made several conservative assumptions which increased the extent and degree of impact to wetlands. One assumption was to use the 5 percent duration as the upper extent of wetlands. This assumption increased the wetland extent by more than 100,000 acres. The Vicksburg District believes that the overestimation of wetland extent resulting from these assumptions accounts for any effect to wetlands sustained by saturation.

d. Comment. This assessment does not include the estimate of additional wetland acres that exist above the 2-year flood plain.

Response. The revised Appendix 10 includes an analysis of wetlands above the 5 percent duration. Wetlands above the 2-year flood plain are likely sustained by hydrologic sources other than backwater flooding and would not be affected by the project.

e. Comment. There are approximately 76,827 acres of cropped wetlands within the 2-year floodplain. Of that total cropped lands acreage, there were approximately 45,000 acres of soybeans and 23,000 acres of rice classified on the land use image during the 1988 growing season. The fact that 89 percent of the farmland was planted in crops which have a short growing season (soybeans) or are somewhat water tolerant (rice), lends credence to the idea that most of the land in the two year floodplain, on hydric soil, is in fact wetland area. Site-specific field assessments would be required to determine if drainage ditches or other forms of improved drainage have altered the hydrology on these cropped wetlands as identified at a landscape-level. It should be noticed that less than 3 percent of the land within the 2-year floodplain was classified as supporting cotton and corn, which are crops normally planted on well drained, infrequently flooded areas.

Response. Concur.

f. Comment. This assessment does not provide direct information on duration, specifically identifying lands that are inundated for 15 consecutive days (5 percent of the growing season). The criteria (Food and Security Act) for farmed wetlands is "inundated for 15 consecutive days or more during the growing season in most years."

Response. The wetland delineation in the revised Appendix 10 is based on a minimum 5 percent (14 days) duration, which accounts for impacts to farmed wetlands. The areas delineated by this scene were field verified to assess the accuracy of the delineation.

g. Comment. This is a conservative acreage figure, because the satellite scenes used for the composite nominal image were taken at a time when the gage reading did not reach 91’, the elevation of the 2-year flood (according to Draft EIS, page 6-36).

Response. The 10 Mar 89 flood scene approximates the 5 percent duration elevations within the backwater area, not the 2-year frequency flood elevations. The difference between the 2-year frequency elevation and the 5 percent duration elevation ranges from 1.8 to 7.8 feet for the six gages utilized in the analysis.

Wetland Impacts: Estimations of Wetland Impact within the 2-year Flood Plain Due to a Pumping Plant Operating at 87 Feet*:*

a. Comment. Based on this method, it is anticipated that the pumping plant operating to 87' will result in hydrologic impacts to 96,518 acres of forested wetlands and 76,827 acres of cropped wetlands within the 2-year floodplain.

Response. The wetland analysis was revised in the Final Report and SEIS.

b. Comment. Important-this estimate does not include the additional anticipated impacts above the 2-year floodplain.

Response. Wetlands above the 2-year flood plain are likely sustained by hydrologic sources other than backwater flooding and would not be affected by the project.

c. Comment. Hydrologic changes resulting from the pumping plant at 87' will include a combination (not quantified) of the following impacts:

-loss of jurisdictional wetland status due to resulting stage reduction caused by pumping (according to Corps, the recommended plan #5 will reduce the existing stages at 91.0' in the Lower Ponding area and 91.6' in the Upper Ponding Area to 87.8' and 88.9', respectively);

-some wetland acres will have a decrease in depth of inundation;

-some wetland acres will have shorter periods (decrease in duration) of both inundation and saturation;

-some wetland acres will have a decrease in frequency of inundation.

Response. The wetland analysis was revised in the Final Report and SEIS. The revised report includes an analysis of changes in depth, frequency, and duration.

d. Comment. To determine the anticipated loss of jurisdictional wetland status within the 2-year floodplain, we would need to know the acreage difference between 87.8' and 91' for the Lower Ponding Area; and 88.9' and 91.6' for the Upper Ponding Area (based on claimed stage reductions in Corps Table 6-9). That information was not available in the Draft EIS.

Response. The maximum aerial extent of wetland impacts would be determined by the difference between 87.8 and 88.6 feet in the Lower Ponding Area, and 88.9 and 90.0 feet in the Upper Ponding Area (the 5 percent duration elevation should be used, not the 2-year frequency flood elevation). These areas can be determined from the stage-elevation curves. The Engineering Appendix was revised in the Final Report and SEIS and includes this information.

GIS Estimates of Wetland Extent above the 2-year Flood Plain Elevation (91 Feet) Using Hydric Soils and Topographic Depressions:

Comment.

Background:

This methodology is also GIS-based, and combines information on flood frequency (lands above the 2-year floodplain), hydric soils, and topographic depressions. The topographic depressions data layer was developed by USGS-Pearl, MS, and shows the locations of local sinks of depressions on the landscape within the study area. "Topographic depressions indicate places on the landscape where water is likely to pond because these are points of low elevation surrounded by points of higher elevation. Once water enters a depression, there is no outlet through which the water can drain, which causes the water to remain in the sink until evaporation and/or seepage occurs resulting in flood-water storage and possible interaction with ground-water resources." In short, these are areas that can support a natural wetland, due to long-term storage, lack of drainage, and very low permeability, clay soils. Site-specific field assessment would be required to determine if drainage ditches or other forms of improved drainage have altered the altered the hydrology of these depressions as identified at a landscape-scale by the GIS method. Note-as in the above analysis of within 2-year floodplain, this analysis is not a site-specific, comprehensive analysis, as would be required under the 404 program, but rather a landscape-level tool appropriate for planning purposes.

In addition to the topographic depressions coverage, the same coverage used in method number one described above—the nominal 2-year satellite image/land use provided by the Corps Vicksburg District, and the hydric soils provided by ERDC—were also used with this methodology. We have given the resulting acreage figures, and statements of the benefits and limitations of this method below.

Response. The Vicksburg District acknowledges that there are depressional wetlands above the 2-year frequency flood plain (elevation 91.0 feet, NGVD, at the Steele Bayou structure). These wetlands are discussed in the revised Appendix 10. The Vicksburg District believes that depressional wetlands above the 2-year frequency flood plain are sustained by direct capture of precipitation or other sources and will not be affected by the project. Appendix 10 includes independent estimates of wetland extent by the Vicksburg District and EPA.

Wetlands Extent: Estimations for Wetlands above the 2-year Flood Plain:

Comment.

-There are a total of 96,180 acres of land above the 2-year elevation (91') that have hydric soils and occur within topographic depressions.

-This is a landscape-level, remote assessment and not a detailed analysis in combination with field-level assessment.

-This assessment does not provide direct information about duration, however hydric soils combined with depressional areas are good surrogates for areas of ponding. This method gives us an estimation of ponded areas above 91'.

Response. See previous response.

Wetlands Impacts: Estimations of Wetland Impact above the 2-year Flood Plain due to a Pumping Plant Operating at 87 Feet:

Comment.

-Extensive wetland areas are present above the 2-year elevation level. With this landscape-level technique, we estimate that above the 2-year elevation (91') there are 96,180 acres that can potentially support a natural wetland, due to long-term storage, lack of drainage, and very low permeability clay soils.

-Above the 2-year elevation level, hydrologic changes resulting from the pumping plant at 87' will include a combination (not quantified) of the following impacts to these topographic depressions/hydric areas:

-some wetland acres will lose their jurisdictional wetland status;

-some wetland acres will have a decrease in depth of inundation;

-some wetland acres will have shorter periods of both inundation and saturation;

-some wetland acres will have a decrease in frequency of inundation.

-If site-specific examination can show that some portion of these areas of topographic depressions/hydric soils will not be drained by the pumping plant, then it would also be erroneous to claim any economic flood protection benefits on these areas.

Response. See previous response.

Final Conclusions:

Comment. There is an insufficient amount of information to comprehensively state the extent of wetland acreages within the lower Yazoo Basin project area. However, GIS methods allow for an estimation of the wetland extent at a landscape-level, and additionally allow for an estimation of anticipated hydrologic impacts due to a pumping plant operating to 87 feet. These GIS-based methods do not provide a definitive, detailed analysis on wetland extent and impacts, however, the examples given do provide an estimate based on surrogate, landscape-level indicators of wetlands extent, and allows for a comparison to the Corps of Engineers-Vicksburg District estimates provided in the DEIS for the Yazoo Backwater Area. The anticipated hydrologic impacts will include a combination some wetland acres losing their jurisdictional wetland status, and some wetland acres having impacts form decreases in the depth of inundation, in the duration of both saturation and inundation, and in the frequency of inundation.

Based on Method #1- we can anticipate hydrologic impacts to 96,518 acres of forested wetlands within the 2 year floodplain. Additionally, we can anticipate hydrologic impacts to 76,827 acres of cropped wetlands within the 2-year floodplain. Site-specific field assessments would be required to determine if drainage ditches or other forms of improved drainage have altered the hydrology on these cropped wetlands as identified at a landscape-level. The portion of these forested and cropped wetland acres impacted that would become non-jurisdictional cannot be quantified with the current available information, however, would include the acreages between 87.8’ and 91’ for the Lower Ponding Area; and 88.9’ and 91.6’ for the Upper Ponding Area.

Response. The wetland analysis was revised in the Final Report and FSEIS. The analysis in the revised Appendix 10 uses the 5 percent duration flood method to delineate wetland extent. This method determined there were 189,600 acres of wetlands in the study area. This estimate is four times larger than the estimate in the Draft Report, and the wetland extent was field verified by EPA, NRCS, FWS, and the Vicksburg District.

Comment. Based on Method #2, we can anticipate hydrologic impacts to an additional 96,180 acres of land above the 2-year elevation. Site-specific field assessment would be required to determine if drainage ditches or other forms of improved drainage have altered the hydrology of these depressions as identified at a landscape-scale by this GIS method. If a site-specific examination can show that the pumping plant will not drain some portion of these areas of topographic depressions/hydric soils, then it would be erroneous to claim any economic flood protection benefits on these areas.

Response. True topographic depressions above the 5 percent duration elevation will not be affected by the pump project. Areas which pond water due to inadequate drainage may or may not be wetlands. USGS hydrology data layer (DLG) indicates that hydraulic connections do exist to most of the above-mentioned depressions. Because these areas are above the 5 percent duration elevation, they likely do not have the required 14-day duration of inundation or saturation to be determined jurisdictional wetlands.