

09 September 2010

MEMORANDUM FOR SAJ LEVEE SAFETY OFFICER (DUBA)

SUBJECT: EN-W Position Statement on WCA-3A Regulation Schedule Modifications

The USACE Jacksonville District Water Resources Engineering Branch (EN-W) has conducted a thorough review of the Central and South Florida Project (C&SF) Part 1 Supplement 33: General Design Memoranda (GDM) for Water Conservation Area 3 (June 1960) and the C&SF Part 1 Supplement 49: Agricultural and Conservation Areas General and Detail Design Memorandum (August 1972). The 1960 GDM documents the WCA-3A design criteria and design assumptions, including the 9.5-10.5 feet NGVD regulation schedule for WCA-3A that managed water levels in WCA-3A prior to the start of the Experimental Program of Water Deliveries to Everglades National Park in 1983. Under the Experimental Program, the WCA-3A Regulation Schedule zones and operational rules were initially modified as part of the two-year test of the Rainfall Plan starting in 1985. The modified WCA-3A Regulation Schedule and Rainfall Plan remained in effect through the end of the Experimental Program in 2000. As an outcome of the deliberations during development of the Interim Structural and Operational Plan (ISOP 2000-2002) and the Interim Operational Plan (IOP 2002-present), the WCA-3A regulation schedule was further changed with the modification of Zone D and the establishment of Zone E1.

Based on the review of WCA-3A design documents and in conjunction with the hypothesis that the S-12s are not capable of achieving the original design discharge of 32,000 cfs, EN-W has concluded that a detailed engineering assessment of the effects of the potential S-12s discharge limitations and the WCA-3A Regulation Schedule modifications on the frequency and duration of high water events was warranted. The engineering assessment should include a rigorous evaluation of Standard Project Flood (SPF) conditions within WCA-3A as these conditions have not been evaluated by the USACE Jacksonville District since the original 1960 and 1972 design documents.

EN-W has proposed a two-phase analysis approach for WCA-3A high water events including: phase 1 (ongoing) - identification and assessment of interim water management criteria for WCA-3A, including operational changes proposed as part of the ongoing

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Everglades Restoration Transition Plan (ERTP) NEPA efforts; and phase 2 (future) - a WCA-3A flood routing hydraulic analysis, incorporating current USACE risk analysis requirements focusing on potential human health and safety concerns resulting from WCA-3A stages, with identification of proposed water management operating criteria and potential infrastructure modifications to address identified concerns. The phase 1 effort was limited to hydrology and hydraulics assessment, while the phase 2 analysis will include additional engineering analysis conducted by hydrology and hydraulics, geotechnical, and structural design disciplines.

Findings of Phase 1 - To determine the ERTP interim water management criteria for WCA-3A, EN-W has completed a preliminary assessment based on the methodology identified in the 1960 GDM design document. The original design headwater of the S-12 structures is 12.4 feet and the peak three station average for WCA-3A under the SPF event was 13.90 ft, NGVD (C&SF Part I, Supplement 33). Since the current configuration of WCA-3A inflow and outflow structures differs from the 1960 GDM design document, a simple volumetric spreadsheet was developed of WCA-3A to determine the peak Standard Project Flood (SPF) stage within WCA-3A and at the S-12 structures based on current system conditions. Multiple inflow and outflow variables were identified and quantified to refine the calculations of the peak flows and stages for the SPF evaluation. The latest USGS rating curve for each of the S-12 structures was utilized in the analysis to incorporate the most current stage discharge measurements to more accurately incorporate present flow conditions. The analysis illustrated that under the current system conditions, as represented in the spreadsheet, the peak SPF S-12 headwater stage was computed as 13.76 ft, NGVD and the peak SPF WCA-3A three gage average stage was computed as 15.20 ft, NGVD. The comparison of peak stages between the 1960 GDM WCA-3A design and the 2010 WCA-3A volumetric spreadsheet predictions indicate that the predicted SPF stage is higher than the WCA-3A design stages established in the original GDM and used to set the as-built crest elevation of L-29: 1.36 feet higher at the headwater of the S12 structures; 1.3 feet higher at the three station average for WCA-3A. Sensitivity analysis

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performed utilizing the 2010 WCA3A volumetric spreadsheet tool illustrated that the peak SPF stage is most sensitive to the amount of outflows being discharged from WCA-3A, with the primary outlet being the S-12's, and that the peak SPF stage is less sensitive to the configuration of the WCA-3A Regulation Schedule Zone A.

The schedule and scope for completion of the ongoing ERTTP NEPA analysis precludes consideration of potential structural alternatives which would be proposed and evaluated in Phase 2. For immediate implementation through ERTTP, prior to completion of the Phase 2, EN-W has concluded that the lowering of Zone A of the current WCA-3A Regulation Schedule to the 9.5-10.5 feet NGVD regulation schedule line from the 1960 GDM will provide an interim step to mitigate for the observed effects of the S-12s discharge limitations. Preliminary SFWMM modeling indicated that the following reductions in WCA-3A three station average high water frequency (as a percentage of the SFWMM 36-year period-of record, 1965-2000) may be reasonably expected from the lowering of Zone A: no significant change for stages above 11.75 feet NGVD (corresponds to S-12 headwater stage of 10.92 feet NGVD, based on historical regression); 1% reduction in stages exceeding 11.5 feet NGVD; 2-3% reduction in stages exceeding 11.0 feet NGVD; and 6-7% reduction in stages exceeding 10.5 feet NGVD.

The inclusion of the lowering of Zone A of the current WCA-3A Regulation Schedule within the proposed alternatives of the ongoing ERTTP NEPA effort is a minimum requirement to demonstrate compatibility with the required interim water management criteria for WCA-3A. Additional water management operating criteria to further reduce the frequency and duration of high stages within WCA-3A should also be considered within the context of other ERTTP Project considerations.

The ERTTP Project's water management operating criteria should include the establishment of operational constraints at the S-12 structures based upon safety considerations for WCA-3A features and pertinent downstream areas, including the identification of infrastructure modifications to be implemented on a temporary

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basis to allow the reduction of risk to human health and safety. The stability analysis of the S-12's is predicated on a maximum design headwater stage of elevation 12.4 feet NGVD with the differential head across the structure limited to 5.5 feet; also, the as-built crest elevation of L-29 and crown elevation of Tamiami Trail (US-41) in the S-12A to S-12D reach has been established to protect against the risk of overtopping from an adjacent flood stage of elevation 12.4 feet NGVD. The exceedance of these design conditions should be considered an immediate increase in risk to the human, health and safety afforded by the project features and would require decisive and prescribed measures to reduce the WCA-3A stage. In addition, application of the FDOT road base impact criteria to this reach of Tamiami Trail (estimated crown elevation of 14.95 feet) would result in a not to exceed regulated water stage of approximately elevation 11.5 feet NGVD adjacent to the roadbed (corresponds to S-12 headwater stage of 12.45 feet NGVD, based on historical regression). While this water stage could be temporarily exceeded and does not present the immediate risk of the SPF stage violation, nevertheless, it should be considered adverse with operational measures applied to reduce its duration.

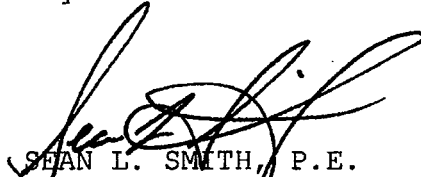
Outside of the ERTTP project, additional NEPA assessment would be required to implement infrastructure modifications on a temporary basis to allow the reduction of risk to human health and safety, or to implement other permanent structural alternatives which may result from the future phase 2 analyses. Considering the limitations on discharge through the S-12 structures, downstream conveyance improvements at the S-12 structures (potentially including removal of portions of the old Tamiami Trail) or additional outlets are required to mitigate for increased SPF stages within WCA-3A. The most effective additional measure investigated under phase 1 to alleviate the problem involves further degradation of the L-28 to increase outflows, although the potential for downstream effects, including impacts to the Tamiami Trail roadway and hydro-period/nesting condition effects on Cape Sable Seaside Sparrow Sub-population A, would require further investigations. Implementation of the Modified Water Deliveries Conveyance and

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Seepage Control Features and Tamiami Trail Improvements would
also provide additional outlet capacity.

If you have any questions or require additional information,
please contact me directly at extension 2105.



SEAN L. SMITH, P.E.

Chief, Water Resources Engineering Branch

Zediak, John E SAJ

From: Zattau, William C SAJ
Sent: Wednesday, November 05, 2003 10:40 AM
To: Zediak, John E SAJ
Cc: Kinard, Donald W SAJ; Adams, John F SAJ; Tucker, Robert C SAJ; Hashtak, John M SAJ; Zattau, William C SAJ
Subject: RE: Request-Funding for WCA Analysis

John: I spoke with Donnie after discussing this with you last week. O&M funding for this analysis is not currently available. The CR has created challenges as you know, plus this is a very lean year. However, we will be reviewing our funding frequently to identify any money that we can make available for this project.

We will keep you posted and I hope we can have more encouraging news later in the year.
Bill.

> -----Original Message-----

>From: Zediak, John E SAJ
>Sent: Tuesday, October 28, 2003 3:24 PM
>To: Zattau, William C SAJ
>Cc: Kinard, Donald W SAJ; Adams, John F SAJ; Tucker, Robert C SAJ; Hashtak, John M SAJ
>Subject: Request-Funding for WCA Analysis

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>Bill,

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>Earlier this year (FY03), high water levels in WCA 2 prompted EN-HW to request EN-HH and EN-HC to analyze wind and wave effects on L-29. As a result of this analysis as well as continued high water levels in WCA 2 & WCA 3 this year, the need for additional analysis of WCA levees was considered. The attached file includes a summary from EN-HH on a proposed WCA levee analysis for wind & wave effects.

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>From a water management perspective, it is beneficial to know the potential effects of storm events combined with high water levels in the WCAs. This information would aid in the decision making process, that in the case of the WCAs could be used in longterm management and management prior to expected storm events.

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>The results of the analysis could be used to provide a large portion of the science often needed to allow senior decision makers to confidently make often hard decisions. An example of this type of science was referred to during this year's high water levels at Lake Okeechobee allowing a determination of a Lake Okeechobee water that if reached would prompt a temporary deviation that would allow high level discharges.

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>The costs (\$120k) identified in the attached would need to be provided in addition to EN-HW's yearly O&M budget. I realize that funds are very tight this year, but this analysis is very important for EN-HW, especially when high water levels exist. I appreciate any input you may have on this issue and am open to suggestions for achieving this analysis.

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>Thanks,

>John Z.

>x2914

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> << File: Revised - East Coast Protection Levee Analysis.doc >>

East Coast Protection Levee and L-29 Wind Wave Analysis

History

Through C&SF's GDMs it was learned that wind set up and wave run up calculations were made for most of the system's levees. However, it was also learned that levees were built with heights significantly less than what the design wind and wave conditions called for. This may have occurred due to the function of the surrounding lands at the time of construction, i.e. agricultural and natural areas.

Problem

In 2003, EN-HH and EN-HC were asked to analyze WCA-2A using a numerical wave transformation model and analytical methodology to determine critical stages with respect to wind set up and wave run up due to wind speeds ranging from 40 mph to 80 mph. In addition, L 29 west was also evaluated for critical stages. In this case an only an analytical methodology was employed. The following problems were identified:

1. Operations at certain times of the year because of endangered species (CSSS) and excess stages in the WCA lead to the drowning of tree islands.
2. Wet summers prevent stages from falling with the WCA regulatory schedules during a time when tropical storms may lead to elevated wind and wave conditions. This year, for example, WCA-2A came within a couple of feet from the SPF level. A tropical storm could have sent stages above SPF with a high risk to levee integrity.
3. Population shift to the west stops directly adjacent to the East Coast Protection Levee, essentially causing scenarios that will place human life at risk should a levee failure occur. It is know through previous dam-break analyses that normal pools of water from 4 feet to 8 feet deep can pose a risk to human life from ¼ to ½ mile distance from a levee breach.
4. In order to emulate the accepted Natural System Model, CERP teams are functioning now with alternatives that may cause a change in regulatory schedules and a rise in stages within the WCAs during the wet seasons. These proposed increase in stages were not part of the original C&SF levee designs.

Proposed Solution

EN-H is proposing to do a wind wave analysis for six locations where risk to human life would be maximized should a levee failure occur. These six locations are the following:

1. L-29 (WCA-3A), risk to Miccosukee
2. L-29 (WCA-3B), risk to Miccosukee
3. L-30 (WCA-3B), risk to Holly Lakes Traylor Park located in the Everglades Buffer Strip, CERP WPA proposes to flood protect them and not relocate.
4. SE Corner of WCA-2B, risk to park area residents and extensive property damage to Weston
5. SE Corner of WCA-2A, risk to Coral Springs area
6. SE Corner of Loxahatchee, risk to existing area residents and future developable tracts.

The analyses will include an EN-G levee slope stability analysis and an erosion rate analysis. The resulting data will be used in conjunction with wave overtopping flow rates and levee dimensions in an iterative approach to determining critical stages. EN-H will perform wind set up with a unique approach suitable for the WCA environment and wave generation with run up using state of the art numerical modeling. Data to be used for the analysis (topography for bathymetric data) has been collected already by SFWMD for as part of CERP's regional model update. The end deliverable will be a range of critical stages, based on a given set of design wind speeds, which may lead to further erosion of previously degraded levees, placing levee integrity at risk. These stages are necessary for Corps operations of the S-10s, S-11s and S-12s. Stages will also be used by future CERP teams as an important component for alternative formulations. The end product of these analyses will not include any recommendations for levee improvements.

Costs

Geotech	\$12,000 for all six sites
EN-HH	\$15,000 for all six sites
EN-HC	\$90,000 for all six sites

It is important to note that EN-HC cost may be discounted to some extent if other work can be performed while model runs are processing. Also, costs are not necessarily evenly split among the six sites. Site specific model parameters and design considerations may increase or decrease the amount of model preparation time necessary for an individual location. Viewed as a whole, however, no cost over runs are expected to occur.