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3301 Gun Club Road
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60/21853.300.03

Subject: Basin Specific Feasibility Studies -
Peer Review of Preliminary Alternatives for
Wellington/ACME Basin B

Dear Ms. Piccone:

Brown and Caldwell and members of our subconsultant team have reviewed three of the District's preliminary alternative combinations of water quality solutions for ACME Basin B. Two of these alternatives were described in the District document entitled *"Preliminary Alternative Combinations for Wellington/ACME Basin B*, Final Draft, dated December 20, 2001. A third alternative was identified during presentation of the preliminary alternatives by District staff and the Village of Wellington's Surface Water Action Team (SWAT) at a workshop at the District's offices in West Palm Beach on January 7, 2002. The following summarize our comments on the three preliminary alternatives reviewed by the Brown and Caldwell team.

Alternative 1

Alternative 1 involves implementation of source controls and the diversion of ACME Basin B runoff south to the Agricultural Reserve Reservoir to be constructed in August 2013 along the east side of the Loxahatchee National Wildlife Refuge (Refuge) as part of CERP. Prior to 2013, runoff from ACME Basin B would continue to be discharged to the Refuge, as is currently the practice.

As originally proposed, this alternative would have directed flow from ACME Basin B south into the Lake Worth Drainage District (LWDD) system for conveyance to the Agricultural Reserve Reservoir. However, the LWDD has since taken the position that they do not have capacity in their system for the additional water and do not want to accept any runoff from ACME Basin B. Accordingly, Alternative 1 has been modified to include a new canal, beginning at the southeast corner of Section 34 in Basin B and running south along the east side of the Strazzula property directly to the Agricultural Reserve Reservoir.

It is our understanding that the modified alternative will require the new canal to pass under at least one LWDD canal to avoid mixing of waters from the two drainage systems. While this will increase the cost of the ACME Basin B diversion project, it should be technically feasible to accomplish.

This alternative has the advantage of not requiring any treatment of stormwater runoff because the water would be diverted away from the Everglades Protection Area (EPA) for other beneficial purposes. Conversely, this alternative also results in the discharge of water to the EPA until 2013 that very likely will not meet water quality standards.

Alternative 2

Alternative 2 includes implementation of basin-scale source controls, as in Alternative 1, and continued discharge to the EPA. Chemical treatment would be used to reduce phosphorus (P) concentrations in the stormwater runoff to levels that meet water quality standards prior to it being pumped into the Refuge. In 2000/2001, HSA Environmental Engineers, Inc. (HSA) completed a pilot scale investigation of chemical treatment of stormwater runoff from ACME Basin B. That investigation showed that it is possible to reduce the P concentration in runoff from Basin B to 10 ppb or less using conventional chemical addition, flocculation, settling, and filtration processes. Additionally, none of the treated effluent streams showed any toxicity effects and none of the residual sidestreams (sludges, etc.) were found to be hazardous. This work demonstrates that, based upon the research completed to date, chemical treatment of stormwater runoff from ACME Basin B to meet water quality standards is technically feasible.

As proposed, Alternative 2 would include construction of a multi-purpose reservoir in Section 24, west of Basin B, for flood control, water supply and water quality treatment. Water from the reservoir would be treated in a chemical treatment facility, assumed to be similar in process configuration to that developed by HSA for the pilot scale investigations. The multi-purpose reservoir in Section 24 would serve to equalize flow through the treatment facility. Chemically treated water would be discharged into a linear, shallow retention area to be constructed between the existing C-27 canal and L-40 levee, before being pumped into the Refuge through existing Pump #1, Pump #2 or both. This results in highly treated water, but water that has a limited amount of natural "conditioning" prior to being discharged into the EPA. Since the chemical treatment process can achieve less than 10 ppb of total phosphorus, untreated stormwater could be blended with the treated effluent to achieve a 10 ppb effluent, thus producing a combined effluent of treated and naturally conditioned waters.

An alternate approach might be to construct the project with the reservoir in Section 24 being used only for flood control and water supply purposes, thereby maximizing its value for flow equalization upstream of the chemical treatment facility. After

chemical treatment, the water would flow though the linear retention area as before, but would then pass through a wetland system before being discharged into the Refuge. The size and type of wetland system to be used for effluent conditioning would need to be determined as part of the alternatives evaluation. Some insight in this regard may be gained from recent data from research in North Test Cell 14 which suggests that the increase in effluent P concentration from a conditioning wetland system such as SAV and PSTA may be reduced significantly after only several months. This alternate approach would involve additional infrastructure and additional cost, but could result in very high quality water which includes a natural buffering system between the chemical treatment facility and the EPA.

Alternative 3

Alternative 3 was identified in the January 7, 2002 District workshop. In this alternative, a stormwater treatment area (STA) would be constructed in Section 24 instead of the multi-purpose reservoir proposed in Alternative 2. The STA would be designed and operated to obtain maximum treatment with flood control and water supply being secondary objectives. Water discharged from the STA would flow through a linear retention area between the C-27 canal and the L-40 before being pumped into the Refuge using existing Pump #1, Pump #2, or both.

As part of our review of this alternative, Brown and Caldwell team members ran the Dynamic Model for Stormwater Treatment Areas (DMSTA) on stormwater runoff from ACME Basin B. The following assumptions were made in performing the DMSTA model runs:

1. A land area of 410 acres was assumed to be available for an STA (Section 24).

2. The flow-weighted mean inflow P concentration to the STA is 94 ppb.

3. A composite STA, consisting of 40 percent emergent macrophytes followed by 60 percent submerged aquatic vegetation (SAV), was assumed for the analysis. This composition of wetland vegetation was discussed and verbally accepted for preliminary evaluation purposes by District staff at the STA Design Group Meeting on January 8, 2002. This preliminary composition will be reassessed during the alternatives evaluation once the final calibration of the DMSTA model is available.

4. The model parameters used to simulate emergent vegetation cells and SAV cells are those from ENR Cell 2 and ENR Cell 4, respectively. These model parameters are taken from a draft version of DMSTA dated January 23, 2001. A final version of DMSTA is expected to be available for use in the Basin Specific Feasibility Studies in February 2002.

5. Source controls (BMPs, ordinances, etc.) were assumed to reduce the flow-weighted mean inflow P concentration to the STA by 0%, 10%, 20%, 30%, 40% and 50%.

Table 1 presents the results of the preliminary DMSTA simulations for Alternative 3. Using a 410-acre STA, and the other assumptions as identified above, it is possible to reduce flow weighted mean P concentrations from 94 ppb to 32 ppb without source controls and to 21 ppb if 50% of the P load is removed by source controls prior to treatment. This equates to geometric means of 20 ppb and 14 ppb, respectively.

TABLE 1

DMSTA Predictions for Various Levels of Source Reduction for the ACME B Basin

STA Area (ac)	Inflow Reduction (%)	Flow-Weighted P Inflow (ppb)	Flow-weighted P Outflow (ppb)	Geometric Mean P Outflow (ppb)
410	0	94.2	31.9	20.3
410	10	84.6	29.8	19.1
410	20	75.2	27.6	17.9
410	30	65.8	25.4	16.7
410	40	56.4	23.2	15.4
410	50	47.0	20.9	14.2

Notes:
Based on 3 cells in series with 40% Emergent / 60% SAV
Tanks-in-Series: Emergent - 3 TIS, SAV - 3 TIS
Calibration Data: EMA - ENR Cell 2, SAV - ENR Cell 4
ACME B Mean flow 31,500 ac-ft/yr

As an additional preliminary analysis, BC used the DMSTA model to evaluate the amount of land required for a STA with 50% source control to reach a flow weighted mean outflow P concentration of 15 ppb. We chose this P concentration as a target because (1) it generally equates to a geometric mean outflow concentration of 10 ppb, the planning level target for the Basin Specific Feasibility Studies, and (2) it generally represents the lower limit of P concentration currently achievable with biological technologies. Ongoing research sponsored by the SFWMD is anticipated to provide further data regarding the P concentration limits that can ultimately be achieved using biological technologies. However, based on this preliminary analysis, it is estimated that approximately 1200 acres of STA will be required to achieve a flow weighted mean outflow P concentration of 15 ppb (10 ppb geometric mean) if 50% of the P is removed through source controls beforehand. This analysis will be updated and refined during the actual Task 4 alternatives evaluation using the final version of the DMSTA model that will be available in February 2002.

Summary

In our opinion, the alternatives proposed for ACME Basin B are reasonable in concept and should all be evaluated as part of the Basin Specific Feasibility Studies. We have suggested a possible alternate concept for the District to consider as part of Alternative 2. All of the alternatives will require additional work to define their components in sufficient detail to support engineering evaluation.

We hope these comments will be of benefit to the District in finalizing the alternatives to be evaluated by the Brown and Caldwell team in the Basin Specific Feasibility Studies. We will be glad to meet with you and other District Staff at your convenience to discuss them. In the meantime, if you have any questions, please do not hesitate to contact me.

Sincerely,

BROWN AND CALDWELL

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