# MONITORING NETWORK WORK PLAN
## (Existing Condition Surface Water Monitoring)

**For Project Entitled**

# DAIRY BEST AVAILABLE TECHNOLOGIES IN THE OKEECHOBEE BASIN

**South Florida Water Management District**
**Contract No. C-11652**

**Developed by**

**SOIL AND WATER ENGINEERING TECHNOLOGY, INC.**

**In association with**

**MOCK, ROOS & ASSOCIATES, INC.,**

**CH2M HILL**

**And**

**ENTEL ENVIRONMENTAL COMPANIES, INC.**

**August 2, 2001**

**The information provided in this report has been prepared under my direct supervision and is intended to be in conformity with modern engineering principles applicable to water resource monitoring.**

Signed and Sealed by

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Adelbert (Del) B. Bottcher, Ph.D., P.E.
License No. PE0031056

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# INTRODUCTION

This monitoring work plan presents the activities and procedures that will be used by Soil & Water Engineering Technology, Inc. (SWET) and its subconsultants, Mock, Roos & Associates, Inc. (Mock·Roos), CH2M Hill (CH2M), and ENTEL Environmental Companies, Inc. (ENTEL), to complete monitoring aspects of the project entitled "Dairy Best Available Technologies in the Okeechobee Basin" for the South Florida Water Management District (herein referred to as the District). The project has been divided into two phases that include for Phase I, dairy assessment and ranking; develop Comprehensive Nutrient Management Plans (CNMPs); technologies formulation, and monitoring plans development. Phase II will include installation of selected technologies, installation and testing monitoring stations; collection of bi-weekly surface water samples, and evaluation of alternative performance.

This plan covers the monitoring activities associated with determining the existing conditions on the dairies. Flow and water quality (total phosphorus, TP) will be measured at up to three discharge locations per dairy. These monitoring sites are assumed to represent both surface and subsurface flow from the dairy because the flatwoods soils on the dairies prevent deep ground flow, and therefore most, if not all, shallow groundwater will reemerge within field and farm ditches upstream of the monitoring location. Monitoring will continue at these locations throughout the project to obtain a before and after picture of the net P discharge from the dairies as influenced by the implemented technology(ies). Additional monitoring will be implemented to specifically test the performance of the technology(ies), but monitoring plans associated with the technology(ies) will be not be developed until the technology(ies) have be selected and Phase II is approved.

## Objectives

The overall objective of the monitoring activities is to determine the phosphorus (P) removal efficiency of the technology(ies) to be applied to the dairies and if the targeted goal of 40 ppb P in the dairies' discharge waters can be obtained. The specific tasks associated with the overall monitoring program are:

Phase I

1. Develop monitoring plan for up to three monitoring sites for the existing flow and water quality conditions on the three selected dairies.
2. Locate and develop monitoring site maps for up to three monitoring stations per dairy.
3. Develop a Department of Environmental Protection (FDEP) approved Quality Assurance Project Plans (QAPPs) for the project.

Phase II

4. Install and test monitoring equipment for existing condition monitoring.
5. Finalize contractual arrangement for laboratory.
6. Conduct routine sample collection activities for existing condition monitoring.
7. Develop monitoring plan for up to two monitoring sites per dairy for evaluating the performance of the implemented technology(ies) on the three selected dairies.
8. Locate and develop monitoring site maps for up to two monitoring stations per dairy.

9. Develop/modify Department of Environmental Protection (FDEP) approved Quality Assurance Project Plan (QAPP) for additional monitoring sites.
10. Install and test monitoring equipment for technology monitoring.
11. Perform routine quality assurance assessments of monitoring activities.
12. Process and develop reports on monitoring activities and technology(ies) performance.

# FLOW AND WATER QUALITY MONITORING PLAN

The development of this monitoring plan is Task 2.3 under the project's scope of work. This monitoring plan will describe the monitoring activities associated with initial "existing condition" monitoring program. The monitoring sites presented in this plan should be considered preliminary because more site-specific data for the dairies will come available during the Comprehensive Nutrient Management Plan development, which might indicate more appropriate sites. A draft of the QAPP to be submitted to FDEP is attached to this plan.

**Monitoring Approach and Station Configuration**

The goal of existing condition monitoring program is to measure as accurately as possible the dairies' outflow and total phosphorus (TP) concentrations prior to and after the implementation of new technology(ies) in order to better quantify the potential benefits of the technology(ies). The before implementation sampling time period will be limited because sampling will not start until Phase II is approved. The existing condition sampling locations, as much as possible, have been located at existing District monitoring locations, but the overall intent is to representatively monitoring as much of the water leaving the dairies as possible. Three automated sampling stations will be available for each dairy for the existing condition monitoring program. These stations will be assigned to the most representative outflow locations for the dairy, which would ideally be edge-of-farm discharge points.

Once the technology(ies) have been selected and implemented on the dairies, up to two additional monitoring stations per dairy will be installed to specifically test the performance of the technology(ies). The monitoring plans and QAPPs for these stations will be developed during Phase II and therefore are not presented this report.

Each monitoring station will have automated flow and sampling equipment to provide continuous flow records and flow-proportional water sampling. The ISCO Model 6700 Auto Sampler with an ISCO Model 750 Low Profile Area Velocity Flow Module will be installed at each monitoring station. The flow module has a broad beam Doppler sonic and depth transducers that provide average flow velocity and water depth (converted to cross-sectional area) through a closed conduit. A metal sleeve inserted within a corrugated culvert will be used to provide a better-defined control-section for flow measurements within the culvert. The sonic and depth transducers are positioned on the bottom of the culvert to minimize flow interference. The 6700 datalogger will record the hourly average flow and will integrate the flow volume passing the transducers to trigger the autosampler to take flow-proportional samples. Flow-proportional sampling will be accomplished by collecting 250 ml subsamples

for every 0.25 cm of discharge into a 10 liter composite polypropylene bottle. Subsample and discharge sizes may vary depending on the flow conditions of the specific site.

A cellular phone and modem system will be installed with each ISCO datalogger so that the stations can be remotely and routinely polled for data download and equipment status checks. Having remote access to the stations will assist in sampling trip scheduling and reduce data loss due to equipment failure. A solar panel will be installed to ensure continuous battery power for the stations.

The field monitoring equipment will be housed in the custom-built wooden enclosure that is 4'x4'x7' in size. The enclosure provides protection from the weather for field staff during equipment maintenance and sample collection. The enclosure, which is securely anchored against severe weather, also provides additional protection against rodents, insects, vandals, and lightning plus extends the life of the equipment.

**Equipment Setup, Calibration, and Maintenance**

The monitoring stations will be installed as soon as possible once District authorization is obtained for Phase II (see monitoring schedule below). The intent is to have the flow/sampler stations on-line within one month of authorization provided equipment delivery is timely.

All monitoring equipment will be programmed and thoroughly tested after installation. The only equipment that will require calibration are the ISCO 6700 AutoSampler's subsample volume and the ISCO Modal 750 Velocity Flow Module average velocity measurement. Calibration of the subsample volumes will be done by physical measurement of sample volumes. The Flow Module comes pre-calibrated, but will be initially verified using a portable mechanical flow meter. Semi-annual checks of the Flow Module will be done and if recalibration is needed then a portable mechanical flow meter will be used or the Module will be returned to the vendor for repair and recalibration. Equipment maintenance will be performed in accordance with the equipment manuals and the QAPP.

**Sampling Procedures and Sample Handling**

The targeted collection schedule for the autosampler composited samples is that they be collected biweekly over a two-year period. However, to maximize the information obtained from the monitoring program the following flexible banking protocol will be used:

> The monitoring stations will be polled via cellular connection on a routine basis to determine the daily flow conditions. If no flow had occurred at the majority of the stations during the two-week sampling period, then the biweekly sampling trip may be banked. However, no two consecutive sampling trips will be banked, i.e. the stations will be visited for sample collection at least once a month regardless of flow conditions. During the two-week sampling period, the sampling crew will be dispatched to collect samples as soon as possible after any significant flow event. If banked sampling trips are available and a second significant flow event occurs during

the two-week sampling period then the sampling crew will be dispatched to collect samples a second time or even a third time.

The composite samples from the autosamplers will be analyzed for total phosphorus (TP) only for 52 biweekly samplings over two years. This represents a total of 468 samples (3 samples per dairy times 3 dairies times 52 samplings). Additional quality assurance (QA) samples will be collected in accordance with the QAPP, see Appendix A.

Once a month, additional grab samples will be collected at every monitoring station where flow is present. These samples will be analyzed for TSS and fecal coliform. This represents a total of 234 samples (3 samples per dairy times 3 dairies times 26 samplings). The TSS and fecal coliform grab samples will be collected as independent grab samples using a sterile sampling container from the dominant flow regime at the monitoring station. The grab samples will be collected and stored in accordance with FDEP's Standard Operational Procedures (SOPs) with the following exception. The holding times for the fecal coliform have been approved by the District and FDEP to be extended from the normal 6 hours to 24 hours because of the long travel distances between the sites and the laboratory.

**Preliminary Monitoring Sites Location**

All of the dairies' QAPPs provided in Appendix A are similar except for the project site descriptions and maps. Figures 3.2 in the QAPPs show the proposed existing condition monitoring locations for Butler Oaks, Davie, and Dry Lake 1 dairies. As can be seen, three monitoring sites have been proposed for each of the dairies because of the multiple discharge locations on all of them. The sites location should be considered tentative because the dairy assessments are not complete and may provide a better indication of drainage basins and problem areas on the dairies. In general, the sites were selected to caption as much of the dairies discharge and as little offsite on-flow as possible. Butler Oaks Dairy sites are the same as the District current sites and are considered as good locations. The Davie Dairy sites are more problematic because of on-farm flow and the fact that the sprayfield are not well represented in the current District sites. Therefore a sprayfield site is being considered along with a site far enough downstream to capture the some of the south pivot's runoff. Site 3 may need to be moved to better represent just the south pivot because it is highly influenced by offsite on-flow. If a defined drainage feature is found for the south pivot then the site will be moved. Dry Lake Dairy barn 1's sites are considered good. The indicated site 1 pickups the sprayfield and forage fields in the northwest part of the dairy before the west drainage ditch gets much offsite flow the neighboring subdivision.

**Quality Assurance (QA) Program**

The QA procedures for the project are provided in the QAPPs (Appendix A) and will be strictly followed. The laboratory used for sample analyses will have an approved FDEP Quality Assurance Plan.

## Monitoring Schedule

The schedule for the monitoring program is presented in Tables 1 and 2 for Phases I and II, respectively. As can be seen, the monitoring plans and QAPPs are to be developed in two phases. Only the monitoring plan and QAPPs development for the existing condition monitoring program will be done during Phase I (this report). Development of the technology(ies) specific monitoring plan and QAPPs and the actual monitoring activities will not initiate until Phase II is approved, because there is a **STOP/GO DECISION POINT** between Phase I and II**.** Upon review of the final CNMPs, the project's Technical Review Team (TRT) will examine nutrient control activities in the watershed and determine the feasibility of continuing the work under this contract. If the CNMPs support/concur with other planned multi-agency team activities and the Governing Board has authorized proceeding with Phase II, the monitoring activities can begin. If the CNMPs do not agree with the other planned activities and/or the Governing Board does not give its approval to proceed, then SWET shall be notified to stop work. The District reserves the right at this point to terminate the contract for convenience with no further liability to the District if it is in the best interest of the District to do so.

Table 1. Tasks and Deliverable Schedule for Phase I

| Task/Deliverable Schedule | Date |
|---|---|
| 2.3 Develop and Submit Draft QAPP and Monitoring Plans for Existing Dairy Conditions | 6/2/2001 |
| 2.5 Finalize and Submit Final QAPP and Monitoring Plans for Existing Dairy Conditions | 8/2/2001 |

Table 2. Tasks and Deliverable Schedule for Phase II

| Task/Deliverable Schedule | Date |
|---|---|
| 3.1 Farm Level P Load Monitoring | |
| 3.1.1 Equipment purchase (up to a total of 9 sites) | 11/2/2001 |
| 3.1.2 Install and Test Monitoring Stations (9 stations assumed) | 11/2/2001 |
| 3.1.3 Conduct Routine Field Monitoring Activities – TP (52 Biweekly trips from RPB*) | Starting 11/2/2001 |
| 3.1.4 Laboratory Analyses for 9 biweekly samples for 52 trips, TP only | Starting 1/2/2002 |
| 3.1.5 Labor & Lab Analyses for 9 monthly samples for 24 mo. Fecal and TSS | Starting 1/2/2002 |
| 3.2 Preparation and Submittal of Quarterly Reports | Starting 11/2/2001 |
| 3.6 Development of the Draft Monitoring Plan for Selected Technologies | 3/2/2002 |
| 3.8 Develop and Submit Final Monitoring Plan for Selected Technologies | 5/2/2002 |
| 3.8.1 Equipment Purchase (up to a total of 6 sites) | Starting 6/2/2002 |
| 3.8.2 Install and Test Monitoring Stations (Assumed 6 additional stations) | Starting 6/2/2002 |
| 3.8.3 Conduct Routine Monitoring Activities - TP (34 Biweekly trips from RPB) | Starting 8/2/2002 |
| 3.8.4 Laboratory Analyses (assume 6 TP samples @ $15/sample)* | Starting 8/2/2002 |

## Progress Reports

Quarterly progress reports will be submitted to the District's Project Manager, which shall detail, at a minimum, the current status of work in progress, problems encountered and solutions implemented, data obtained during the reporting period (farm load data as well as

technology monitoring), analysis of data obtained to date, the work planned for the next reporting period, and the financial status of project activities (percent expended vs. percent complete).

# APPENDIX A. Draft Quality Assurance Project Plans (QAPPs)

The QAPPs are presented in the following order:

Butler Oaks Dairy
Davie Dairy, Inc.
Dry Lake 1 Dairy