

**ANNEX E**  
**PROJECT MONITORING PLAN**

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## **E PROJECT MONITORING PLAN**

### **E.1 WATER QUALITY MONITORING**

The proposed Winsberg Farm Wetlands Restoration Project consists of a 5.0 MGD, three-month-average daily flow (TMADF), a 125-acre, man-made wetland, divided into a 75-acre Phase I (3.0 MGD TMADF), and a 50-acre Phase II (2.0 MGD TMADF). Both wetlands have abilities to recirculate the effluent/overflow back through the wetlands. The Winsberg Farm Wetlands is located at latitude 26°29'30"N, longitude 80°10'00"N.

Effluent or reclaimed discharges from the Palm Beach County Southern Region Water Reclamation Facility shall be directed for disposal and reuse, respectively. Disposal shall occur at two underground injection locations -- U-001 and U-002. U-001 is located at the PBC-Southern Region Reclamation Facility (SRWRF) and consists of two 15-MGD peak hourly flow (PHF) Class I underground injection wells, IW-1 and IW-2, which discharge to Class G-IV ground water. The U-002 injection well system consists of one Class I underground injection well, IW-3, located at the Palm Beach County Site 3 Water Treatment Facility. Reuse discharge shall be used for both public access irrigation (R-001) at various locations, industrial reuse (R-003) at the SRWRF, and wetland reuse (R-002) at the Wakodahatchee and Winsberg Farm sites. However, only receiving and effluent (ground) waters entering and leaving the Winsberg wetland area, respectively, shall be monitored under this plan since it is expected that only it will be impacted by the proposed project. Since this project has been designed not to generate surface water discharges, no surface grab samples shall be collected.

#### **E.1.1 Permits**

As of the writing of this document, Phase I is the only permitted phase of the proposed wetland, and a permit application will be submitted for Phase II of the project. Overflow/effluent from the Winsberg Farm Wetlands will be combined with effluent from the Wakodahatchee Wetland and discharged to the Site 3 Deep Injection Well (IW-3) and SFWRF IW-1 and IW-2.

#### **E.1.2 Basis of Rationale**

RECOVER and the Winsberg Farm Project Delivery Team (PDTs) recognize that the effects from implementing CERP projects must be monitored at a system-wide and local scale. Responsibility for the design and implementation of system-wide monitoring is in the hands of RECOVER, while the design and implementation of monitoring to determine local effects and project performance is the responsibility of the Winsberg Farm PDT. To implement the system-wide program, RECOVER has developed the CERP Monitoring and Assessment Plan

(MAP). However, the MAP does not specifically cover the Winsberg project area. As a result, the RECOVER system-wide monitoring plan was not available to be referenced for development of the project-specific plan. Consequently, the local project monitoring plan will be based upon the monitoring scheme established as part of a State of Florida Domestic Wastewater Facility Permit (No. FLA041424). Project-specific monitoring will be coordinated with FDEP and RECOVER to ensure that measures and targets derived from the permit by the project team are consistent with system-wide measures and that duplication of effort is avoided. The Winsberg Farm Water Quality Monitoring Plan will utilize the results of pre-existent, routine Palm Beach County monitoring efforts within the project area of Winsberg Farm whenever possible. For example, Palm Beach County Environmental Resources Management (PBC-ERM) will provide the results of surface water nutrient, pH, and chlorophyll data or analyses (from Storet Stations 27A, 27B, 31C and 31E) to the Palm Beach County Water Utilities Department (PBCWUD). PBC-ERM has been collecting and analyzing total Nitrogen (as N), total Ammonia (as NH<sub>3</sub>), total Phosphorus (as P), Specific Conductance, pH, and chlorophyll quarterly as required by the NPDES Stormwater Permit issued by FDEP's Tallahassee Stormwater Section. PBCWUD will forward these data quarterly to FDEP, in addition to the testing results described in the following tables.

### **E.1.3 Monitoring Scheme**

The following monitoring wells, as shown in **Table E-1**, shall be sampled in accordance with the monitoring frequencies specified in Permit Condition III.12 for the Winsberg Farm portion of Reuse System R-002. For the Winsberg Farm Wetlands (Phase I), monthly sampling must be reasonably spaced to be representative of potentially changing conditions.

The hurricane season is from June 1 through November 30. When there are tropical depressions, tropical storms, and or hurricanes in the Atlantic/Caribbean Basin or Gulf Coast of Florida, the National Hurricane Center (NHC) issues tropical cyclone public advisories, forecast advisories, forecast discussions, and strike probability forecasts.

Water Management operations within the Winsberg Farm Wetlands Restoration project area for hurricanes or tropical storms should follow the Water Management (SFWMD) Emergency Preparedness Manual – Suggested Hurricane Operating Procedures, April 2004. CESAJ SOP 500-1-1 should be consulted for emergency preparation and actions.

**TABLE E-1: MONITORING WELLS TO BE USED FOR SAMPLING.**

Monitoring Well ID	Alternate Well Name and/or Description of Monitoring Location	Depth (Feet)	Screening Elevation (Feet)	Aquifer Monitored	New or Existing
MWC-6	South of L-29 Canal & North of Winsberg Farm	19	11.5 to 16.5	Superficial	new
MWB-7	East of Winsberg Farm boundary	19	0.5 to 16.5	Superficial	new
MWC-8	North of L-30 Canal & South of Winsberg Farm	19	11.5 to 16.5	Superficial	new
MWB-9	East of Hagen Ranch Rd. & West of Winsberg Farm	19	0.5 to 16.5	Superficial	new
MWC-10	South of L-29 Canal & East of the MWC-6 at Winsberg Farm	19	7.0 to 12.0	Superficial	new
MWC-11	North of L-30 Canal & East of the MWC-8 at Winsberg Farm	19	7.0 to 12.0	Superficial	new

MWB = Background; MWI = Intermediate; MWC = Compliance

The following parameters shown in **Table E-2** shall be analyzed for each of the monitoring wells (except background wells) identified in Permit Condition III.11. For Winsberg Farm Wetlands (Phase I), the following parameters shall be monitored:

**TABLE E-2: MONITORING WELL PARAMETERS**

Parameter	Compliance Well Limit	Units	Sample Type	Monitoring Frequency
Water Level Relative to MSL	Report	FEET	In-situ	Note 1 below
Nitrogen, Nitrate, Total (as N)	10	MG/L	Grab	Note 1 below
Solids, Total Dissolved	500	MG/L	Grab	Note 1 below
Arsenic, Total Recoverable	50	UG/L	Grab	Note 1 below
Cadmium, Total Recoverable	5	UG/L	Grab	Note 1 below
Chloride (as Cl)	250	MG/L	Grab	Note 1 below
Chromium, Total Recoverable	100	UG/L	Grab	Note 1 below
Lead, Total Recoverable	15	UG/L	Grab	Note 1 below
pH	6.5-8.5	SU	In-situ	Note 1 below
Sulfate, Total	250	MG/L	Grab	Note 1 below
Coliform, total	4	#/100ML	Grab	Note 1 below
Trihalomethanes, Total	80	UG/L	Grab	Note 1 below
Nitrogen, Total (as N)	Report	MG/L	Grab	Note 1 below
Phosphorus, Total (as P)	Report	MG/L	Grab	Note 1 below

Note 1: The permittee shall monitor the above parameters monthly for the first year of this permit issuance, except during the first two months of the wetland operation during which the permittee shall monitor the above parameters biweekly. After the first year of monitoring the above parameters, the monitoring frequencies will be reduced to quarterly unless there is an objection from FDEP.

### E.1.3.1 Groundwater Monitoring

Ground-water monitoring test results shall be submitted on Part D of Form 62-620.910(10). For reuse or land application projects, results shall be submitted with the discharge monitoring report (DMR) for each month listed in the following schedule (**Table E-3**). The submitted results shall be for each year during the period operation allowed by the permit in accordance with Permit Condition I.C.10. [62.522.600(10) and (11)(b), 62-601.300(3), 62.601.700, and Figure 3 of 62-601 and 62-620.610(18)]

**TABLE E-3: REUSE AND LAND APPLICATION PROJECT RESULTS SCHEDULE**

Sample Period	Report Due Date
January – March	April 28
April – June	July 28
July – September	October 28
October – December	January 28

Nutrient monitoring frequencies are weekly in accordance with 62-601, FAC. FDEP will increase these monitoring frequencies when Phase II of the Winsberg Farm Wetlands is permitted in the future.

## E.2 VEGETATION MONITORING

Planting and vegetation maintenance will initially be the responsibility of the contractor (planting subcontractor) until a satisfactory level of plant survival is attained. Continuing plant growth maintenance will be the responsibility of the PBCWUD and aquatic vendor. Flooding of all wetland cells should be frequent enough to provide adequate soil moisture at the ground surface. Wetland operations staff will also need to maintain any other landscaping and plantings associated with upland areas. To maintain optimum treatment efficiencies, a uniform distribution of flow must be maintained in the wetland cells. Channeled flow (short circuiting) will reduce the detention time in the cells and reduce the level of reclaimed water treatment.

### E.2.1 Vegetation Overview

The planter will excavate the creation and enhancement area in accordance with project drawings. Drawings can be found in the Winsberg Farm Wetlands

Restoration Project contract documents prepared by CH2MHILL, August 2001. A list of plants to be used can also be found in these documents. All trees will be planted randomly and not in rows. Plants should be evenly distributed throughout the wetland. As they grow, they may begin to obstruct reclaimed water flow in areas of the cell and cause short circuiting. If areas become overgrown, they should be thinned out to maintain a uniform flow pattern through the cells. The aquatic vendor can wade into the cells with wading boots to remove the plants in shallow zones by uprooting them by hand, or utilize an approved herbicide such as Round-Up.

**Table E-4** is taken from the CH2MHILL, August 2001, contract document. It provides planting details for the first part (Phase 1 – 80 acres) of the project that has been constructed by the Palm Beach County Water Utilities Division. The same planting species, mix and spacing will be used in the 45 acres of Phase 2 of the project. The number of each species for Phase 2 will be estimated proportionally relative to the Phase 1 acreage (40 acres relative to 80 acres). See **Table E-4** for an estimate of the number of plants for each phase and planting zone.

**TABLE E-4: ESTIMATE OF NUMBER OF PLANTS BY PHASE AND PLANTING ZONE**

	Phase 1 (80 Acres)	Phase 2 (45 Acres)	Total
Deep Zones	30,605	17,215	47,820
Marsh Zones	392,232	219,649	611,881
Transition/Upland Zones	3,125	1,750	4,875
Total Plants	425,962	238,614	664,576

### **E.2.2 Precautions**

Snakes (both poisonous and non-poisonous) and alligators will be attracted to the wetland cells because of the presence of fish and frogs. Workers in the wetland should be observant and avoid any interactions with snakes or alligators. Also, workers must be aware that reclaimed water in the wetland cells may contain disease-causing organisms. Proper sanitary precautions, such as the use of gloves, boots and other personal protective equipment, are very important for safe operation and maintenance.

### **E.2.3 Plant Cover and Biomass**

Establishment of a vigorous and dense vegetative cover is the primary goal of wetland maintenance. Maintaining shallow water depths is crucial to the rapid

establishment of plant cover. Periodic monitoring through ground or aerial photographs will be utilized to measure plant growth, providing a record of this process, and may illustrate growth patterns related to season and/or operational phases.

In any environment, plants are subject to attack by insect and fungal pathogens, or other environmental stressors. It is normal and reasonable to expect periodic occurrence of these stressors within the wetland. Water depths of one foot or greater sustained for months can also be expected to have a severe effect on wetland cover and condition. County staff should look for evidence of leaf tip browning, extensive yellowing, and chlorosis of leaves when water levels are being maintained at depths of six inches or greater within the marsh wetlands. Water levels should be lowered if these symptoms are extensive and continuing. If vegetative dieback occurs within the wetland, then open areas shall be replanted with the same species of plants.

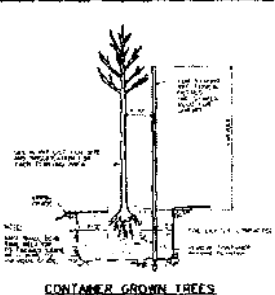
#### **E.2.4 Invasive Species Control**

Nuisance plants, such as cattails, shall be controlled manually and removed through application of approved herbicides. In addition, invasive plants should be controlled manually and through application of approved herbicides during early stages of wetland plant cover establishment. The contractor and PBCWUD will utilize the most updated version of the following web site to determine which plant species are invasive and should be removed: [www.fleppc.org](http://www.fleppc.org).

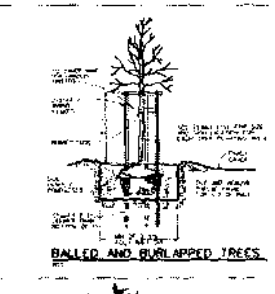
#### **E.2.5 Embankment Maintenance**

Wetland embankments are being developed as landscape buffers and are representations of natural South Florida upland plant communities. The focus of embankment maintenance should be on maintenance of native diversity through selective planting and erosion control to maintain usable wetland acreages.

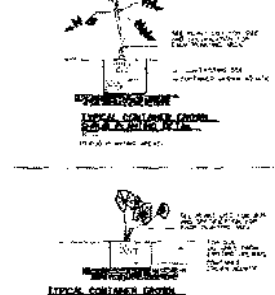
MASTER PLANTING TABLE						
Common Name	Botanical Name	Container	Spacing (ft. x ft.)	Elevations (ft)		Total Quantity
				Cell 1,2	Cell 3,4	
<b>Deep Zone</b>						
Cow Lily	Nigella arvensis	1 gallon	3	17.0 - 20.0	15.5 - 18.5	18,161
Flagrant Water Lily	Nymphaea odorata	1 gallon	5	17.0 - 20.0	15.5 - 18.5	10,051
Yellow Lotus	Nelumbo lutea	1 gallon	5	17.0 - 20.0	15.5 - 18.5	7,393
<b>Marsh Area</b>						
Pickeringweed	Perfoliaris nodosa	bare root	3	20.0 - 21.0	18.5 - 19.5	33,513
Dark Knotweed	Sagittaria angustifolia	bare root	3	20.0 - 21.0	18.5 - 19.5	16,147
Arrow Arise	Sagittaria virginica	bare root	3	20.0 - 21.0	18.5 - 19.5	7,109
Slough Bulrush	Scirpus occidentalis	bare root	3	20.0 - 21.0	18.5 - 19.5	159,898
Soft-stem Bulrush	Scirpus validus	bare root	3	20.0 - 21.0	18.5 - 19.5	9,773
Flare Flag	Thalassia geniculata	bare root	3	20.0 - 21.0	18.5 - 19.5	63,415
Spikerush	Eleocharis geniculata	bare root	3	20.0 - 21.0	18.5 - 19.5	25,643
Har Sedge	Empetrum hyemale	bare root	3	20.0 - 21.0	18.5 - 19.5	25,648
Blue Flag	Iris virginica	bare root	3	20.0 - 21.0	18.5 - 19.5	7,315
Canna Lily	Canna flaccida	bare root	3	20.0 - 21.0	18.5 - 19.5	3,234
Sawgrass	Cyperus tenuis	bare root	3	20.0 - 21.0	18.5 - 19.5	62,604
Swamp Lily	Crinum americanum	bare root	3	20.0 - 21.0	18.5 - 19.5	1,582
Golden Club	Utricularia aquatilis	bare root	3	20.0 - 21.0	18.5 - 19.5	4,038
<b>Transition zone</b>						
Soft Mistle	Muhlenbergia capillaris	4 plug	3	21.0 - 22.0	19.5 - 20.5	308
Meadow Beauty	Rhexia sp.	bare root	3	21.0 - 22.0	19.5 - 20.5	387
Sand Cordgrass	Spartina bakeri	4" plug	3	21.0 - 22.0	19.5 - 20.5	308
Spikewort	Tripsacella virginiana	bare root	3	21.0 - 22.0	19.5 - 20.5	357
Bulrush	Cyperus occidentalis	1 gallon	5	21.0 - 22.0	19.5 - 20.5	128
Butterbush	Lyonia lucida	1 gallon	5	21.0 - 22.0	19.5 - 20.5	128
Leather Plant	Adiantum-nigrum-paniculatum	1 gallon	5	21.0 - 22.0	19.5 - 20.5	294
Sedgemoor Willow	Koeleria glauca	1 gallon	5	21.0 - 22.0	19.5 - 20.5	111
St. Andrew's Cross	Hypericum hypericoides	5 gallon	5	21.0 - 22.0	19.5 - 20.5	248
St. John's Wort	Hypericum fasciculatum	5 gallon	5	21.0 - 22.0	19.5 - 20.5	248
Virginia Willow	Ilex virginica	1 gallon	5	21.0 - 22.0	19.5 - 20.5	266
Blackberry	Rubus coccineus	10 gallon	10	21.0 - 22.0	19.5 - 20.5	34
Carolin Holly	Ilex carolinensis	10 gallon	10	21.0 - 22.0	19.5 - 20.5	170
Myrtle	Myrica floridana	10 gallon	10	21.0 - 22.0	19.5 - 20.5	79
Rough Apple	Amelanchier	10 gallon	10	21.0 - 22.0	19.5 - 20.5	67
Red Cypress	Taxodium ascendens	10 gallon	10	21.0 - 22.0	19.5 - 20.5	68
Wax Myrtle	Myrica cerifera	10 gallon	10	21.0 - 22.0	19.5 - 20.5	101



**CONTAINER-GROWN TREES**



**BALLED AND BURLAPPED TREES**



**BARE-ROOT TREES**

SCALE OF DIMENSIONS IS AS SHOWN. ALL DIMENSIONS ARE APPROXIMATE. SEE DRAWING FOR SPECIFIC DIMENSIONS OF EACH TREE.

50% SUBMITTAL

**PRELIMINARY**

NO. 1000

CONSTRUCTION

NO. 1000

CONSTRUCTION

NO. 1000

CONSTRUCTION

NO. 1000


CONSTRUCTION

NO. 1000

CONSTRUCTION

NO. 1000

CONSTRUCTION



PLANTING

**OVERALL SPECIES/QUANTITY TABLE AND PLANTING DETAILS**

DATE: 07/13/2004

PROJECT: WINSBERG FARM WETLANDS RESTORATION PROJECT

DATE: 07/13/2004

PROJECT: WINSBERG FARM WETLANDS RESTORATION PROJECT

FIGURE E-1: MASTER PLANTING TABLE

### **E.2.6 Field Sampling**

Field sampling will be conducted for six years following initial wetland planting to determine the success of the established wetlands. The sampling shall be conducted according to the following schedule:

- Start upon completion of plantings
- Follow-up one month after complete inundation of the wetland
- Quarterly thereafter for one year
- Biannually (every six months) for the next five years (include dry season and wet season)

The sampling shall be conducted as follows:

- a) A number of belt transects will be established within the creation and enhancement area. Within each of the transects, monitoring stations will be established. The U.S. Army Corps of Engineers (USACE) will consult with the U.S. Fish and Wildlife Service (USFWS) and other interested parties regarding the appropriate number of transects and stations. The field sampling reports will include the following information:
  1. A count of live stems of survived planted vegetation by species within a 100-foot radius of each station,
  2. Assessment of growth (height) of planted tree species within a 100-foot radius of each station,
  3. Relative health of plantings observed within a 100-foot radius of each station, indicating any problems such as fungal infection, insect damage, etc.
  4. Percentage (aerial coverage) of invasive, exotic or nuisance species present within each transect,
  5. Wildlife utilization (qualitative) observed during a survey of each transect,
  6. Recruitment of hydrophytic vegetation observed in each belt transect,
  7. A notation of additional plant species observed in each of the belt transects that were not present in the previous sample, and

8. An observation of hydric soil indicators within the upper six inches of the substrate, including measurements of any organic detritus accumulation on the soil surface.
- b) These reports shall be submitted to USACE within 60 days of completion of the monitoring event. The report shall include quantitative or qualitative data, narrative description, monitoring of water levels, and a one-page summary. The one-page summary shall highlight any potential problems. Some examples of potential problems are concerns with the hydrological conditions (deviations from hydrograph projections), a decline in wetland species (less than 85 percent obligate wetland and/or facultative wetland species in each area), an increase in nuisance or invasive species (more than 10 percent in any transect, poor average growth of woody tree plantings, and any other potential problems that may cause the established wetland area to fail. The county will utilize the 1988 List of Vascular Plants occurring in the Southeast Region to determine indicator status, such as facultative wetland or obligate.
  - c) The wetland will be considered successful if, at the end of the six-year monitoring period, the created and enhanced wetlands have achieved the following results:
    1. Developed a hydrological regime in general accordance with the projected hydrograph. General accordance will be defined as "water levels that mirror the approximate projections indicated in the hydrograph." For instance, a permanently flooded wetland creation area during a normal rainfall year will be considered unsuccessful, as drawdown during winter months has been indicated on the hydrograph. Extreme rainfall events during months of normally decreased rainfall events will be taken into full consideration if water levels are higher than projected.
    2. Sustained a minimum 85 percent obligate wetland and/or facultative wetland species as defined by the "1988 List of Vascular Plants occurring in the Southeast Region."
    3. Does not contain more than 10 percent nuisance or invasive species. Updated lists of invasive species in the state of Florida can be found at the following Web site: [www.fleppc.org](http://www.fleppc.org)
    4. For the purpose of this creation and enhancement site, *Typha sp.* will be considered aggressive, nuisance species within the submerged planting area. The submerged planting area will not contain more than 10 percent of these species.

5. Plantings have achieved an 85 percent survivability rate.

### **E.3 WILDLIFE MONITORING**

Wildlife surveys will be conducted from the perimeter of the wetland to document wildlife abundance, species diversity, and nesting activity and recommended in the Draft USFWS Coordination Act Report. Surveys will consist of half-day events scheduled to coincide with the vegetation monitoring described above. Reports will be submitted to USACE within 60 days of the monitoring event. USACE, in turn, will make annual reports to the USFWS.

### **E.4 HYDROLOGIC MONITORING**

It is unknown at this time if flow monitoring will be required at the 15-HP recirculation pump. This document will be updated as needed.