South Florida Water Management District

Pre-Acquisition Environmental Assessment Process

- **Identification of Residual Agrochemicals Resulting from Current or Historical Agricultural Activities**
- **Corrective Actions and Ecological Risk Assessment**

Working Group Meeting

April 20-21, 2006

Pre-Acquisition Environmental Assessment (EA) Process

Purpose of the EA Process

- **Represents an enhanced version of the industry standard practices**
- **The program is designed to:**
  - **identify areas of environmental impairment associated with properties proposed for acquisition**
  - **evaluate potential remedial alternatives**
  - **estimate required corrective action costs**
- **The program utilizes independent laboratory analysis and also includes provisions for regulatory input and comments.**
- **These functions have evolved to:**
  - **include extensive remedial capabilities and ecological risk assessment expertise**
  - **effectively serve to limit the environmental liability associated with the Districts land acquisition efforts**
  - **as secure approval for funding from federal and state agencies acting as partners.**
- **Provides a decision making tool for District management as well as to our funding partners as to the viability of the specific acquisition and the ancillary costs.**

Pre-Acquisition Environmental Assessment (EA) Process

Purpose of the EA Process

- **Properties are evaluated based upon the projected land use**
  - **water attenuation reservoirs, storm water treatment areas, reclaimed wetlands.**

- **The Program has been enhanced to include an evaluation of potential environmental concerns associated with continued current land use (i.e. residential, industrial, agricultural)**

- **This bifurcation of corrective action responsibilities provides an additional tool for District management to apportion attendant costs (property owner versus District).**

Pre-Acquisition Environmental Assessment (EA) Process

District Problem Statement

- **To evaluate the risk and cost of acquiring lands currently and formerly used in agriculture, which are considered essential to CERP**
- **To quickly make decisions regarding the acquisition of properties for the construction of water impoundment areas and habitat restoration**
- **To develop innovative remediation strategies to render the properties suitable for their intended use since most of the properties are impacted with agrochemicals (this may include conducting site specific risk assessments)**
- **To make meaningful and defensible decisions related to habitat protection**
- **To gain corrective action concurrence from applicable regulatory bodies such as USFWS, USACOE and FDEP**

Evolution of the EA Process

1980's Practice

- **Prior to the late 1980's the standard industry practice for the assessment process was inconsistent**
- **Minimal evaluation of cultivated areas**
- **District initiated the pre-acquisition EA process in the late 1980s**
- **Initial environmental assessments contracted by both the property owners and the District**

Pre-Acquisition Environmental Assessment (EA) Process

Evolution of the EA Process

1990's Practice

- **Focused on identification of areas of concern**
- **Basic visual observations of site conditions**
- **Identification of known point sources**
  (i.e. pump stations, chemical storage, mix and load)
- **Limited evaluations of historical site conditions**

Pre-Acquisition Environmental Assessment (EA) Process

Evolution of the EA Process

1990's continued

- **1994 – FDEP contracts MacDonald to establish Sediment Quality Assessment Guidelines (SQAGs)**
- **SQAGs focused on chemicals of concern for sediment dwelling organisms**
- **1997 - ASTM guidelines established**
- **1998 – Began comparing soil quality data with SQAGs in property evaluations (Talisman)**
- **1998 – Lake Apopka bird kill increased USFWS involvement**

Pre-Acquisition Environmental Assessment (EA) Process

Evolution of the EA Process

2000 – Present Day

- **2000 – Began discrete and composite sampling of cultivated areas**
- **District & USFWS develop grid sampling protocol for cultivated areas (2000)**
- **Point source areas continued to be addressed within State and Federal regulatory frameworks (i.e. contamination assessments, remediations, corrective actions)**
- **Nonpoint source analytical data evaluation from cultivated areas**
- **Evaluate site suitability for use as water treatment area, reclaimed wetlands, or water attenuation reservoirs**

Pre-Acquisition Environmental Assessment (EA) Process

Evolution of the EA Process

2000 – Present Day cont.

- **MacDonald SQAGs revised in 2003**
- **Regionally consistent residual chemicals of concern identified within portions of cultivated areas**
- **Statistical analysis to evaluate overall concentrations**
- **Screening Level Ecological Risk Assessments (SLERAs) are included in Phase II documents**
- **Site-Specific Ecological Risk Assessments (ERA) have been conducted on multiple tracts:**

  (Florida Crystals, Woerner Farm 2 and 3, McMurrain Farms Ltd, Berry Groves, SGGE, and Sunrise Boys)

Pre-Acquisition Environmental Assessment (EA) Process

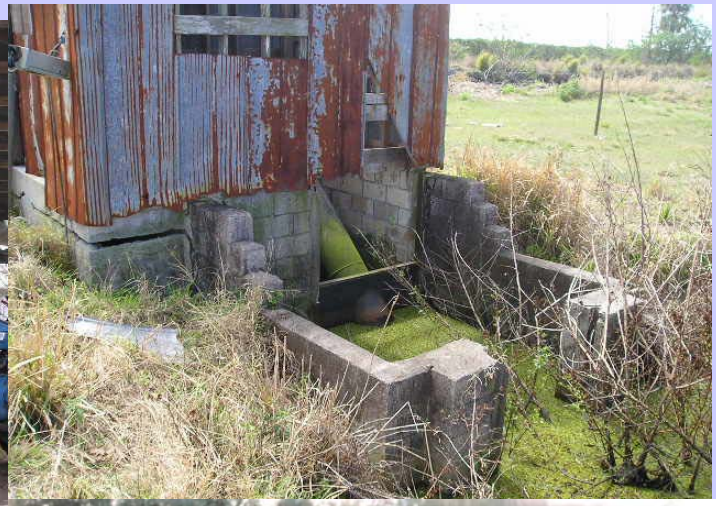
Evolution of the EA Process **2000 – Present Day cont.**

Ecological Risk Assessment

- **Process is formulated to address site specific conditions**
- **Laboratory simulations for measuring release and toxicity of residual agrochemicals is performed**
- **Simulations used to predict effects and risks of chemicals to ecologically relevant receptors**
- **If required, these data are used to develop site specific cleanup goals**

Pre-Acquisition Environmental Assessment (EA) Process

Conversion of Agricultural Lands



Pre-Acquisition Environmental Assessment (EA) Process

Conversion of Agricultural Lands

- **Thousands of acres of agricultural lands will be inundated to create reservoirs and STA's**
- **Lands determined feasible for CERP are limited and expensive with competition from commercial and residential development**
- **Some properties with historical row cropping typically involved frequent application of organochlorine pesticides such as DDT, chlordane, and toxaphene**
- **Even modern pesticides, although not as persistent, are highly toxic to wildlife**

Pre-Acquisition Environmental Assessment (EA) Process

Conversion of Agricultural Lands

- **Large reservoirs and STAs will cover large expanses of thousands of acres establishing local and regional aquatic ecosystems**
- **Conversion of these properties will likely promote the release of these residual agrochemicals**
- **Appropriate risk management is needed and attention to design alternatives to minimize impacts from pesticides and trace metals into CERP wetlands, reservoirs, and conveyance system, which could provide exposure pathways to fish and sensitive wildlife communities**

Pre-Acquisition Environmental Assessment (EA) Process

Conversion of Agricultural Lands

How do we get from Agricultural Land to Project Implementation?

- **SLERA**
- **Selective utilization of full scale ERA**
- **Point source and cultivated area remediation to meet SQAGs or SCTLs (if appropriate)**
- **Development of innovative remedial technologies to address large scale corrective actions such as soil inversion and pan scraping**
- **USFWS, USACOE, and FDEP concurrence with corrective action completion**

Pre-Acquisition Environmental Assessment (EA) Process

Screening Level Risk Assessment

Table D-4 Exposure and Risk Calculations for Avian Receptors at Woerner Farm 3 - Maximum Concentration Among 50-Acre Tracts

Toxaphene		Bald Eagle		Snail Kite		Osprey*		White Pelican		Tri-colored Heron*		Little blue heron*		White Ibis*		Wood Stork		Clapper rail	
Woerner Turf Farm 3 (max conc = 11.89 mg/kg)		NOAEL-Based HQ	LOAEL-Based HQ	NOAEL-Based HQ	LOAEL-Based HQ	NOAEL-Based HQ	LOAEL-Based HQ	NOAEL-Based HQ	LOAEL-Based HQ	NOAEL-Based HQ	LOAEL-Based HQ	NOAEL-Based HQ	LOAEL-Based HQ	NOAEL-Based HQ	LOAEL-Based HQ	NOAEL-Based HQ	LOAEL-Based HQ	NOAEL-Based HQ	LOAEL-Based HQ
		5.42E-01	**3.75E-01**	**7.76E-01**	**5.37E-01**	**9.16E-01**	**6.34E-01**	**5.78E-01**	**4.00E-01**	**9.19E-01**	**6.36E-01**	**1.02E+00**	**7.08E-01**	**5.39E-01**	**3.73E-01**	**5.11E-01**	**3.54E-01**	**7.69E-01**	**5.33E-01**
		NOAEL TRV Used	LOAEL TRV Used	NOAEL TRV Used	LOAEL TRV Used	NOAEL TRV Used	LOAEL TRV Used	NOAEL TRV Used	LOAEL TRV Used	NOAEL TRV Used	LOAEL TRV Used	NOAEL TRV Used	LOAEL TRV Used	NOAEL TRV Used	LOAEL TRV Used	NOAEL TRV Used	LOAEL TRV Used	NOAEL TRV Used	LOAEL TRV Used
		5.40E-01	7.80E-01	5.40E-01	7.80E-01	5.40E-01	7.80E-01	5.40E-01	7.80E-01	5.40E-01	7.80E-01	5.40E-01	7.80E-01	5.40E-01	7.80E-01	5.40E-01	7.80E-01	5.40E-01	7.80E-01
		Body Weight (kg)	3.75	Body Weight (kg)	0.378	Body Weight (kg)	1.486	Body Weight (kg)	7	Body Weight (kg)	0.75	Body Weight (kg)	0.34	Body Weight (kg)	0.9	Body Weight (kg)	2.376	Body Weight (kg)	0.297
Chemical Parameters		Area Use Factor (AUF)	1	Area Use Factor (AUF)	1	Area Use Factor (AUF)	1	Area Use Factor (AUF)	1	Area Use Factor (AUF)	1	Area Use Factor (AUF)	1	Area Use Factor (AUF)	1	Area Use Factor (AUF)	1	Area Use Factor (AUF)	1
Chemical $\log_{10}K_{ow}$	4.49	Food Ingestion Rate (kg/day)	0.1125	Food Ingestion Rate (kg/day)	0.030893716	Food Ingestion Rate (kg/day)	0.072569248	Food Ingestion Rate (kg/day)	0.252496605	Food Ingestion Rate (kg/day)	0.048260061	Food Ingestion Rate (kg/day)	0.0288347	Food Ingestion Rate (kg/day)	0.0497969	Food Ingestion Rate (kg/day)	0.103235	Food Ingestion Rate (kg/day)	0.0216574
Chemical $\log_{10}K_{oc}$	4.10	Foraging Area Size (acres)	741	Foraging Area Size (acres)	1	Foraging Area Size (acres)	2243	Foraging Area Size (acres)	1	Foraging Area Size (acres)	1322	Foraging Area Size (acres)	1632	Foraging Area Size (acres)	391	Foraging Area Size (acres)	1	Foraging Area Size (acres)	3.3
Chemical Henry's	6.00E-06	ADD	2.93E-01	ADD	4.19E-01	ADD	4.95E-01	ADD	3.12E-01	ADD	4.96E-01	ADD	5.53E-01	ADD	2.91E-01	ADD	2.76E-01	ADD	4.15E-01

Dietary Components - Assumed Lipid Content, Percent in ROC Diet and Estimated Concentrations (mg/kg)	Percent Lipid	Water Ingestion Rate (L/day) and Dietary Percentages	Chemical Concentration (mg/kg)[1]	Water Ingestion Rate (L/day) and Dietary Percentages	Chemical Concentration (mg/kg)[1]	Water Ingestion Rate (L/day) and Dietary Percentages	Chemical Concentration (mg/kg)[1]	Water Ingestion Rate (L/day) and Dietary Percentages	Chemical Concentration (mg/kg)[1]	Water Ingestion Rate (L/day) and Dietary Percentages	Chemical Concentration (mg/kg)[1]	Water Ingestion Rate (L/day) and Dietary Percentages	Chemical Concentration (mg/kg)[1]	Water Ingestion Rate (L/day) and Dietary Percentages	Chemical Concentration (mg/kg)[1]	Water Ingestion Rate (L/day) and Dietary Percentages	Chemical Concentration (mg/kg)[1]	Water Ingestion Rate (L/day) and Dietary Percentages	Chemical Concentration (mg/kg)[1]
Water		1.43E-01	3.09E-04	3.07E-02	3.09E-04	7.69E-02	3.09E-04	2.17E-01	3.09E-04	4.87E-02	3.09E-04	2.86E-02	3.09E-04	5.50E-02	3.09E-04	1.05E-01	3.09E-04	2.62E-02	3.09E-04
Soil		0.0%	0.00E+00	0.0%	0.00E+00	0.0%	0.00E+00	0.0%	0.00E+00	0.0%	0.00E+00	0.0%	0.00E+00	0.0%	0.00E+00	0.0%	0.00E+00	0.0%	0.00E+00
Sediment		0.0%	1.19E+01	3.0%	1.19E+01	0.0%	1.19E+01	1.0%	1.19E+01	3.0%	1.19E+01	3.0%	1.19E+01	3.0%	1.19E+01	4.0%	1.19E+01	10.0%	1.19E+01
Emergent Aquatic Plants	1%		2.65E+00		2.65E+00		2.65E+00		2.65E+00		2.65E+00		2.65E+00		2.65E+00		2.65E+00	12.0%	2.65E+00
Algae	1%		4.77E-01		4.77E-01		4.77E-01		4.77E-01		4.77E-01		4.77E-01		4.77E-01		4.77E-01		4.77E-01
Zooplankton	2%		1.91E+00		1.91E+00		1.91E+00		1.91E+00		1.91E+00		1.91E+00		1.91E+00	10.0%	1.91E+00	10.0%	1.91E+00
Aquatic Benthic Invertebrates	1%		4.77E+00	100.0%	4.77E+00	1.0%	4.77E+00		4.77E+00	10.0%	4.77E+00	30.0%	4.77E+00	90.0%	4.77E+00	20.0%	4.77E+00	65.0%	4.77E+00
Forage Fish (Trophic Level II)	3%	25.0%	6.10E+00		6.10E+00	30.0%	6.10E+00	60.0%	6.10E+00	55.0%	6.10E+00	60.0%	6.10E+00	10.0%	6.10E+00	60.0%	6.10E+00	8.0%	6.10E+00
Trophic Level III Fish	4%	35.0%	1.07E+01		1.07E+01	38.0%	1.07E+01	20.0%	1.07E+01	15.0%	1.07E+01	10.0%	1.07E+01		1.07E+01	10.0%	1.07E+01	2.5%	1.07E+01
Trophic Level IV Fish	5%	25.0%	1.37E+01		1.37E+01	30.0%	1.37E+01	20.0%	1.37E+01		1.37E+01		1.37E+01		1.37E+01		1.37E+01		1.37E+01
Semi-Aquatic Herbivorous Vertebrates	3%	5.0%	6.25E+00		6.25E+00		6.25E+00		6.25E+00		6.25E+00		6.25E+00		6.25E+00		6.25E+00		6.25E+00
Semi-Aquatic Omnivorous Vertebrates	3%	5.0%	5.76E+00		5.76E+00		5.76E+00		5.76E+00		5.76E+00		5.76E+00		5.76E+00		5.76E+00	2.5%	5.76E+00
Semi-Aquatic Insectivorous Vertebrates	3%	5.0%	9.62E+00		9.62E+00	1.0%	9.62E+00		9.62E+00	20.0%	9.62E+00		9.62E+00		9.62E+00		9.62E+00		9.62E+00
Terrestrial Plant Foliage	1%		0.00E+00		0.00E+00		0.00E+00		0.00E+00		0.00E+00		0.00E+00		0.00E+00		0.00E+00		0.00E+00
Terrestrial Plant Roots	3%		0.00E+00		0.00E+00		0.00E+00		0.00E+00		0.00E+00		0.00E+00		0.00E+00		0.00E+00		0.00E+00
Terrestrial Plant Seeds and Nuts	3%		0.00E+00		0.00E+00		0.00E+00		0.00E+00		0.00E+00		0.00E+00		0.00E+00		0.00E+00		0.00E+00
Terrestrial Plant Fruits	1%		0.00E+00		0.00E+00		0.00E+00		0.00E+00		0.00E+00		0.00E+00		0.00E+00		0.00E+00		0.00E+00
Terrestrial Invertebrate Soil Detritivores	1%		0.00E+00		0.00E+00		0.00E+00		0.00E+00		0.00E+00		0.00E+00		0.00E+00		0.00E+00		0.00E+00
Terrestrial Invertebrate Herbivores	2%		0.00E+00		0.00E+00		0.00E+00		0.00E+00		0.00E+00		0.00E+00		0.00E+00		0.00E+00		0.00E+00
Terrestrial Invertebrate Carnivores	3%		0.00E+00		0.00E+00		0.00E+00		0.00E+00		0.00E+00		0.00E+00		0.00E+00		0.00E+00		0.00E+00
Upland Herbivorous Vertebrates	3%		7.78E-04		7.78E-04		7.78E-04		7.78E-04		7.78E-04		7.78E-04		7.78E-04		7.78E-04		7.78E-04
Upland Omnivorous Vertebrates	3%		7.23E-04		7.23E-04		7.23E-04		7.23E-04		7.23E-04		7.23E-04		7.23E-04		7.23E-04		7.23E-04
Upland Insectivorous Vertebrates	3%		9.21E-04		9.21E-04		9.21E-04		9.21E-04		9.21E-04		9.21E-04		9.21E-04		9.21E-04		9.21E-04

System Parameters

System Temperature (°C)	25
Soil % Organic Carbon	0.50%
Soil % Air Space	5%
Soil % Moisture	30%
Soil density (g/cm³)	2

Sediment % Organic Carbon	30.60%
Sediment % Moisture	30%
Sediment density (g/cm³)	2.5

Plant Foliage % Moisture	0.82
Plant Root % Moisture	0.75
PlantSeed/nut % Moisture	0.1
Plant Fruit % Moisture	0.85
Plant Foliage Density (g/cm³)	0.82
Plant Root Density (g/cm³)	0.75
Plant Fruit Density (g/cm³)	0.5
Plant Seed/Nut Density (g/cm³)	0.85

OUTLOOK FOR FUTURE ACQUISITIONS

- **There will always be some degree of ecological risk if properties with current or former agrochemical use are to be acquired**
- **Lake Apopka should be a lesson, but it should not be an impediment with respect to project implementation**
- **Appropriate strategies (risk assessment, corrective action, operational constraints, and design modifications, etc.) should be employed to limit the potential for a recurrence of such an event**