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Restoration Monitoring Report – 1st Year

Pfohl Brothers Landfill
Town of Cheektowaga,
Erie County, NY

October 11, 2003

Ecological Solutions, LLC

Prepared For:

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1.0 INTRODUCTION

1.1 Project Background

Sevenson Environmental Services (SES) has prepared this monitoring report in accordance with the work plan for the Pfohl Brothers Landfill closure on Aero Drive in the Town of Cheektowaga, New York. The restoration involved installing plants along an approximate 2,000 linear foot stretch along the north end of the siteand consisted of three habitat types: emergent wetlands, wet meadow, and upland transition zone. The entire restoration measured approximately 3.0 acres. The restoration area was graded in the spring and summer of 2002 and plants were installed during September 2002 in accordance with the work plan.

SES is implementing the first year of a two - year monitoring plan to assess the relative success of the restoration effort. The purpose of this monitoring plan is to evaluate the success of the wetland/upland transition restoration area by measuring the vegetation and hydrology within the landscaped areas. This report describes the results of the monitoring study performed by Ecological Solutions, LLC (ES), at the Pfohl Brothers Landfill restoration site one year after construction.

The monitoring study consisted of the measurement of vegetation within forty plots measuring approximately 3' X 3' along a 2,000 (+-) foot transect that encompassed the emergent wetland, wet meadow and upland transition zone of the restoration area. These plots were examined in relation to the landscaping design prepared by Conestoga - Rovers & Associates and plant material installed by Southern Tier Consulting in September 2002. Hydrology and habitat measurements were also recorded in the restoration area.

1.2 Wetland Restoration Objectives and Performance Goals

The general goal of the restoration effort was to establish wetland and upland transition community conditions along existing adjacent wetlands through grading, the addition of hydric soil material, and planting of the wetland/upland restoration zone. The overall goal of the monitoring plan is to evaluate the relative success of the wetland and upland transition zone restoration effort in meeting criteria specified in the work plan. The specific performance goal pertaining to the planting suggested in the work plan is as follows:

- The restoration effort shall have a minimum of at least 75% cover of the restoration area at the end of the first year of monitoring (2003);

- The restoration effort shall have a minimum of at least 85% cover of the restoration area and 75% survival rate of planted species at the end of the second year of monitoring (2004), and;

- Wetland frequency indicator values must be less than or equal to the following values by wetland type: Emergent Wetland = 3.00 and Wet Meadow = 3.00 at the end of the first year.

The success of the restoration depends on adequate hydrology to support the plantings and the use of the wetland/upland transition area as suitable habitat by wildlife. The creation of a functioning wetland/upland transition zone by the end of the two-year monitoring period is the ultimate goal of the restoration area and is reviewed in this monitoring report.

2.0 METHODOLOGY

2.1 Study Area

The Pfohl Brothers Landfill site is located on Aero Drive in the Town of Cheektowaga, Erie County, New York (Figure 2.1). The site is bordered on the north by Aero Creek and on the south by the landfill. The wetland restoration area extends east to west approximately 2,000 feet.

Figure 2.1
Location Map

2.2 Field Sampling Procedures

2.2.1 Hydrology

For this report, hydrologic data were obtained through characterization and measurement of surface water storage monthly from April through October 2003. The hydrologic data collected during this years monitoring effort is provided in Table 3.1-3.

Water levels were determined through the monitoring of two staff gages located within the wetland restoration (emergent/wet meadow cover types). Water levels at each of the staff gage locations were recorded once per month from April through October 2003. Monitoring will resume once per month beginning in April 2004.

2.2.2 Vegetation and Habitat

Community type and character were determined by calculating the wetland frequency indicator value, status number, and percent cover of the dominant plant species in forty plots located along a transect in the restoration area during 2003 as shown in Table 3.1-2. The Average Status Number (ASN) for each plot in both the emergent wetland and wet meadow habitat types was also calculated and is also shown in Table 3.1-2.

2.3 Assessment of the Ecological Stability of the Restoration Area

The ecological stability of the restoration area was assessed using information gathered during the field surveys in 2003, as described in Sections 2.2.1 and 2.2.2. Factors evaluated through observation include:

- Hydrologic stability;
- Vegetative diversity;
- Relative health and vigor of dominant indicator plant species in each community;
- Presence of undesirable aggressive plant species, and;
- Degree of soil saturation and/or surface water elevation.

Relative height and vigor of dominant plant species was assessed by visual observation of plant material. Presence and abundance of undesirable aggressive plant species, such as purple loosestrife was recorded during general fieldwork.

3.0 RESULTS AND DISCUSSION

3.1 General Observations

The Pfohl Brothers Landfill restoration area was observed to be in conformance with the approved work plan. The restoration was established with three functioning zones or wetland habitat types - emergent wetland, wet meadow, and an upland transition zone. A total of 34 species were identified in the emergent wetland, wetland meadow, and upland transition zone (see Table 3.1-1). The dominant species observed in the restoration area were Speckled Alder, Red Osier Dogwood, Grey Dogwood, Elderberry, Staghorn Sumac, Pussy Willow, American Cranberry Bush, Black Chokeberry, and Buttonbush. Emergent vegetation was dominated by soft rush and tussock sedge in the restoration area.

Table 3.1-4 lists the depths of water at the two staff gages as measured during the monitoring events.

Table 3.1-1
Plant Species Inventory
Pfohl Brothers Landfill Restoration Area
1st - Year Post-Construction - 2003

Scientific Name **Status (a) Category (b)**	**Common Name**
Alnus rugosa (OBL)[1] (NE)[2]	Speckled Alder
Cornus sericea (FACW) (NE)	Red-Osier dogwood
Cephalanthus occidentalis (OBL) (NE)	Buttonbush
Cornus racemosa (FACW) (NE)	Grey Dogwood
Sambucus canadensis (FACW) (NE)	Elderberry
Viburnum trilobum (FACW) (NE)	American Cranberry Bush
Carex crinita (FACW) (NE)	Fringed Sedge
Aronia melanocarpa (FACW) (NE)	Black Chokeberry
Rhus typhina (FACU) (NO)	Staghorn Sumac

[1]Indicator Status: OBL = Obligate Wetland (1.0), FACW = Facultative Wetland (2.0), FAC = Facultative (3.0), FACU = Facultative Upland (4.0), UPL= Obligate Upland (5.0).

[2]Category: AN = Alien/noxious, AL = Alien, ND = Native/disturbance, NE = Native/early Successional, NO = Native/other

Table 3.1-1
Plant Species Inventory
Pfohl Brothers Landfill Restoration Area
1st - Year Post-Construction - 2003

Scientific Name **Status (a) Category (b)**	**Common Name**
Salix discolor (FACW) (NE)	Pussy Willow
Carex stricta (OBL) (NO)	Tussock Sedge
Juncus effusus (FACW) (NE)	Soft Rush
Sparganium eurycarpum (OBL) (NE)	Common Bur Reed
Lythrum salicaria (FACW) (AN)	Purple Loosestrife
Viburnum lentago (FAC) (NO)	Nannyberry
Acer rubrum (FAC) (NO)	Red Maple
Sparganium americanum (OBL) (NE)	Nuttall Bur Reed
Juncus Canadensis (FACW) (NE)	Canadian Rush

Table 3.1-1
Plant Species Inventory
1st - Year Post-Construction - 2003 Continued

Verbena hastata (FACW) (NE)	Blue Vervain
Typha angustifolia (OBL) (NE)	Broad-leaved Cattail
Sagittaria latifolia (FACW) (NE)	Common Arrowhead
Acorus calamus (OBL) (NE)	Sweetflag
Eupatorium perfoliatum (FACW) (NE)	Thoroughwort
Scirpus cyperinus (FACW) (NE)	Woolgrass
Fraxinus pennsylvanicum (FACW) (NO)	Green Ash
Carex vulpinoides (FACW) (NE)	Foxtail Sedge
Ambrosia artemsiifolia (FACU) (ND)	Ragweed
Erigeron linearis (FAC) (NE)	Daisy Fleabane
Scirpus validus (FACW) (NE)	Soft Stem Bulrush
Trifolium pratense (FACU) (AN)	Red Clover

Table 3.1-1
Plant Species Inventory
1st - Year Post-Construction - 2003 Continued

Iris versicolor (FACW) (NE)	Blue Flag
Caltha palustris (OBL) (NE)	Marsh Marigold
Scirpus pungens (FACW) (NE)	Three Square Bulrush
Scirpus atrovirens (FACW) (NE)	Green Bulrush

Table 3.1-2a.
Wetland Frequency Indicator Value/Average Status Number/Percent Cover
Pfohl Brothers Landfill Restoration Area
1st - Year Post-Construction - 2003

	Scientific Name	WFIV	%Cover
PLOT #1 - ASN= 1.8 Wet Meadow	Carex stricta	1.0	25
	Juncus effusus	2.0	25
	Verbena hastata	2.0	10
	Carex vulpinoidea	2.0	5
	Scirpus atrovirens	2.0	10
	Cornus sericea	2.0	20
	Open Area/Mud		5
PLOT #2 - ASN= 1.8 Wet Meadow	Eupatorium perfoliatum	2.0	10
	Juncus effusus	2.0	35
	Verbena hastata	2.0	15
	Lythrum salicaria	2.0	5
	Viburnum lentago	3.0	15
PLOT #3 - ASN= 3.0 Upland Transition	Rhus typhina	4.0	20
	Aronia melanocarpa	3.0	20

	Viburnum lentago	3.0	25
	Lythrum salicaria	2.0	5
	Cornus racemosa	3.0	20
	Open Area		10
PLOT #4 Upland Transition - **ASN= 3.2**	Rhus typhina	4.0	20
	Sambucus canadensis	2.0	20
	Trifolium pratense	4.0	25
	Salix discolor	2.0	15
	Erigeron linearis	4.0	20
PLOT #5 Emergent Wetland - **ASN= 1.0**	Typha angustifolia	1.0	40
	Sparganium americanum	1.0	20
	Carex stricta	1.0	25
	Open Area/Mud		15
PLOT #6 Emergent Wetland - **ASN= 1.4**	Sagittaria latifolia	1.0	30
	Cephalanthus occidentalis	2.0	15
	Sparganium eurycarpum	1.0	15
	Typha angustifolia	1.0	35
	Scirpus pungens	2.0	5

PLOT #7 Wet Meadow - **ASN= 2.0**	Carex crinita	2.0	20
	Verbena hastata	2.0	5
	Scirpus atrovirens	2.0	15
	Juncus canadensis	2.0	30
	Juncus effusus	2.0	10
	Scirpus cyperinus	2.0	10
	Carex vulpinoidea	2.0	10
PLOT #8 Emergent Wetland - **ASN= 1.6**	Alnus rugosa	2.0	30
	Scirpus validus	2.0	15
	Sparganium eurycarpum	1.0	20
	Typha angustifolia	1.0	30
	Lythrum salicaria	2.0	5
PLOT #9 Emergent Wetland - **ASN= 1.0**	Sagittaria latifolia	1.0	20
	Sparganium eurycarpum	1.0	15
	Typha angustifolia	1.0	35
	Acorus calamus	1.0	30

PLOT #10 Upland Transition - **ASN= 2.5**	Cornus sericea	3.0	20
	Aronia melanocarpa	3.0	10
	Acer rubrum	3.0	20
	Verbena hastata	2.0	30
	Carex vulpinoidea	2.0	10
	Scirpus atrovirens	2.0	10
PLOT #11 Emergent Wetland - **ASN= 1.7**	Acorus calamus	1.0	20
	Juncus effusus	2.0	10
	Scirpus atrovirens	2.0	10
	Carex stricta	1.0	30
	Scirpus validus	2.0	10
	Alnus rugosa	2.0	10
	Cephalanthus occidentalis	2.0	10
PLOT #12 Emergent Wetland - **ASN= 1.8**	Typha angustifolia	1.0	25
	Scirpus atrovirens	2.0	20
	Carex crinita	2.0	20
	Lythrum salicaria	2.0	5
	Juncus effusus	2.0	30

PLOT #13 Emergent Wetland - **ASN= 1.0**	Typha angustifolia	1.0	20
	Caltha palustris	1.0	10
	Sparganium eurycarpum	1.0	20
	Carex stricta	1.0	10
	Acorus calamus	1.0	20
	Iris versicolor	1.0	10
	Open Area/Mud		10
PLOT #14 Wet Meadow - **ASN= 2.0**	Alnus rugosa	2.0	30
	Verbena hastata	2.0	30
	Lythrum salicaria	2.0	10
	Carex crinita	2.0	30
PLOT #15 Emergent Wetland - **ASN= 1.2**	Sagittaria latifolia	1.0	15
	Scirpus validus	2.0	15
	Sparganium eurycarpum	1.0	15
	Typha angustifolia	1.0	25
	Carex stricta	1.0	30
PLOT #16 Upland Transition - **ASN= 3.0**	Viburnum trilobum	3.0	25
	Verbena hastata	2.0	15

	Rhus typhina	4.0	15
	Cornus sericea	3.0	25
	Open Area		20
PLOT #17 Upland Transition - **ASN= 2.8**	Rhus typhina	4.0	30
	Sambucus canadensis	2.0	15
	Cornus racemosa	3.0	30
	Verbena hastata	2.0	25
PLOT #18 Emergent Wetland - **ASN= 1.3**	Sagittaria latifolia	1.0	20
	Sparganium eurycarpum	1.0	15
	Iris versicolor	2.0	35
	Carex stricta	1.0	10
	Open Area		20
PLOT #19 Wet Meadow - **ASN= 1.8**	Juncus canadensis	2.0	20
	Caltha palustris	1.0	15
	Juncus effusus	2.0	50
	Carex crinita	2.0	15

PLOT #20 Wet Meadow - **ASN= 2.0**	Alnus rugosa	2.0	20
	Juncus effusus	2.0	40
	Scirpus atrovirens	2.0	10
	Eupatorium perfoliatum	2.0	10
	Verbena hastata	2.0	10
	Carex vulpinoidea	2.0	10
PLOT #21 Wet Meadow - **ASN= 2.0**	Salix discolor	2.0	30
	Scirpus atrovirens	2.0	20
	Juncus effusus	2.0	20
	Iris versicolor	2.0	30
PLOT #22 Upland Transition - **ASN= 2.8**	Cornus sericea	3.0	40
	Salix discolor	2.0	25
	Viburnum trilobum	3.0	25
	Acer rubrum	3.0	10
PLOT #23 Upland Transition - **ASN= 3.5**	Cornus sericea	3.0	20
	Rhus typhina	4.0	20

	Open Area		60
PLOT #24 Emergent Wetland - **ASN= 1.0**	Sagittaria latifolia	1.0	25
	Caltha palustris	1.0	25
	Sparganium americanum	1.0	25
	Carex stricta	1.0	25
PLOT #25 Emergent Wetland - **ASN= 1.5**	Typha angustifolia	1.0	30
	Carex crinita	1.0	25
	Iris versicolor	2.0	25
	Juncus effusus	2.0	20
PLOT #26 Emergent Wetland - **ASN= 1.3**	Acorus calamus	1.0	30
	Scirpus validus	2.0	15
	Sparganium eurycarpum	1.0	20
	Typha angustifolia	1.0	35
PLOT #27 Wet Meadow - **ASN= 2.0**	Carex crinita	2.0	20
	Cephalanthus occidentalis	2.0	15
	Alnus rugosa	2.0	35

	Open Area		30
PLOT #28 Emergent Wetland - **ASN= 1.8**	Typha angustifolia	1.0	35
	Juncus effusus	2.0	25
	Verbena hastata	2.0	10
	Carex vulpinoidea	2.0	15
	Scirpus atrovirens	2.0	15
PLOT #29 Upland Transition - **ASN= 2.7**	Rhus typhina	4.0	20
	Cornus racemosa	3.0	40
	Cornus sericea	3.0	10
	Eupatorium perfoliatum	2.0	10
	Verbena hastata	2.0	10
	Carex vulpinoidea	2.0	10
PLOT #30 Upland Transition - **ASN= 2.7**	Rhus typhina	4.0	50
	Sambucus canadensis	2.0	20
	Viburnum trilobum	2.0	30
PLOT #31 Upland Transition - **ASN= 2.6**	Aronia melanocarpa	3.0	20
	Cornus sericea	2.0	25

	Salix discolor	2.0	25
	Ambrosia artemsiifolia	3.0	25
	Acer rubrum	3.0	5
PLOT #32			
Emergent Wetland - **ASN= 1.0**	Acorus calamus	1.0	25
	Sparganium eurycarpum	1.0	25
	Alnus rugosa	1.0	25
	Open Area/Mud		25
PLOT #33	Cephalanthus occidentalis	1.0	25
Emergent Wetland - **ASN= 1.3**	Scirpus validus	2.0	15
	Sparganium eurycarpum	1.0	50
	Typha angustifolia	1.0	10
PLOT #34	Salix discolor	2.0	20
Upland Transition - **ASN= 2.4**	Verbena hastata	2.0	25
	Scirpus atrovirens	2.0	15
	Rhus typhina	4.0	30
	Carex vulpinoidea	2.0	10

PLOT #35 Upland Transition - **ASN= 3.5**	Cornus racemosa	3.0	30
	Erigeron linearis	4.0	20
	Trifolium pratense	4.0	20
	Viburnum lentago	3.0	30
PLOT #36 Upland Transition - **ASN= 3.7**	Cornus racemosa	3.0	20
	Rhus typhina	4.0	15
	Trifolium pratense	4.0	35
	Open area		30
PLOT #37 Wet Meadow - **ASN= 1.8**	Typha angustifolia	1.0	50
	Juncus effusus	2.0	20
	Verbena hastata	2.0	10
	Carex vulpinoidea	2.0	5
	Scirpus atrovirens	2.0	5
PLOT #38 Upland Transition - **ASN=2.0**	Viburnum trilobum	2.0	50
	Scirpus atrovirens	2.0	10
	Eupatorium perfoliatum	2.0	20
	Verbena hastata	2.0	20

PLOT #39 Upland Transition - **ASN= 2.3**	Viburnum lentago	3.0	40
	Scirpus atrovirens	2.0	20
	Salix discolor	2.0	40
PLOT #40 Upland Transition - **ASN= 3.0**	Rhus typhina	4.0	50
	Aronia melanocarpa	3.0	25
	Sambucus canadensis	2.0	25

Table 3.1-2b.
Wetland Frequency Indicator Value/Habitat Type
Pfohl Brothers Landfill Restoration Area
1st - Year Post-Construction - 2003

Wetland Frequency Indicator		
	Actual	**Maximum Allowable (2003)**
Emergent Wetland	**1.1**	**3.00**
Wet Meadow	**1.9**	**3.00**

Table 3.1-3
Landscape Species Survival
Pfohl Brothers Landfill Restoration Area
1st - Year Post-Construction - 2003

Scientific Name	# Planted	#Survived
Alnus rugosa	79	75
Cornus sericea	116	110
Cephalanthus occidentalis	55	52
Sambucus canadensis	71	70
Salix discolor	56	55
Viburnum lentago	10	10
Juncus effusus	793	>750
Juncus canadensis	122	>100
Aronia melanocarpa	61	61
Cornus racemosa	61	61
Viburnum trilobum	62	55
Rhus typhina	61	60
Iris versicolor	122	>100
Carex stricta	122	>100
Carex crinita	125	>100
Sparganium eurycarpum	671	>650

Sparganium americanum	671	>650
Scirpus validus	671	>650
Sagittaria latifolia	671	>650
Acorus calamus	671	>650

Table 3.1-4
Monthly Water Levels
Pfohl Brothers Landfill Restoration Area 1st - Year Post-Construction - 2003

Water Level By Monitoring Period

Date	Elev. @ Staff Gage #1	Elev. @ Staff Gage #2
4/15/03	692.5	693.8
5/8/03	692.5	693.8
6/21/03	692.3	693.5
7/10/03	691.8	693.4
8/14/03	691.8	693.5
9/20/03	691.8	693.5
10/09/03	691.8	693.5

Table 3.1-5
List of Wildlife Species Observed Via Track, Scat, Sighting
Pfohl Brothers Landfill Restoration Area
1st - Year Post-Construction - 2003

Common Name	Scientific Name
Raccoon	*Procyon lotor*
White-tailed Deer	*Odocoileus virginianus*
Canadian Geese	*Branta canadensis*
Mallard	*Anas platyrhyncous*
Killdeer	*Charadrious vociferous*

4.0 SUMMARY

The monitoring effort performed following construction indicated that the Pfohl Brothers Landfill restoration is meeting the criteria established in the work plan. Based on vegetation measurements and hydrologic sampling, the restoration effort was successful in creating the communities specified in the work plan. Each zone possessed good vegetative diversity. The presence of moist soil in the restoration area was a positive indicator of hydrologic stability.

The only undesirable species of vegetation observed at the fringe of the wetland restoration area were purple loosestrife and reed grass. These plants do not, however, contribute a significant portion of cover in the wetland at this stage after construction. Based on the vegetation in the wetland and large volume of water available (Pond), and probable continued low disturbance level, the spread of invasive plants has been limited.

Activities pertaining to the maintenance, enhancement, and monitoring of the wetland restoration will continue. Potential provisions for enhancing the wetland restoration and ensuring long-term stability will be identified, as necessary. As a result of observations made during this monitoring event, as described in this report, additional plantings are not required to establish vegetation. Efforts were made to eradicate purple loosestrife (*Lythrum salicaria*) through manual removal of individual plants and or spot herbicide application. Control of reed grass (*Phragmites communis*) is also to be performed if observed in the wetlands adjacent to Aero Creek. Control of this invasive species will be performed annually during September and early October, prior to seed set, by spraying or wiping the invasive species with "RODEO" herbicide (Glyphosphate).

Sampling and characterization of hydrology and habitat of the wetland restoration occurred from the April 2003 through October 2003 in compliance with the monitoring plan and will continue in April 2004.

5.0 REFERENCES

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