2012 ANNUAL OPERATION, MAINTENANCE AND MONITORING REPORT

LCP BRIDGE STREET SITE (OU-1)
Solvay, New York

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ACRONYMS

cy	cubic yards
GAC	granulated activated carbon
LCP	Linden Chemicals and Plastics
METRO	Metropolitan Wastewater Treatment Facility
ng/L	nanograms per liter
NYSDEC	New York State Department of Environmental Conservation
OM&M	Operation Maintenance & Monitoring
OU	Operating Unit

2012 ANNUAL OPERATION, MAINTENANCE AND MONITORING REPORT

1.0 INTRODUCTION

This report details the operation, maintenance and monitoring (OM&M) activities conducted at the site in 2012. It has been prepared consistent with the Linden Chemicals and Plastics (LCP) Operation Maintenance and Monitoring (OM&M) Plan (Parsons, 2009a) and provides a summary of the collected data and status of OM&M activities.

Under direction of the New York State Department of Environmental Conservation (NYSDEC), the remediation of LCP involved a combination of sewer system closure, mercury removal from soil on the former plant property, excavation of impacted sediments in surrounding areas with relocation to the soil/sediment containment area, construction of an underground cut-off wall and low-permeability soil cover over the soil/sediment containment area, and installation of an on-site groundwater collection system. As part of the project, excavation areas were restored to provide habitats for wading birds, ducks, amphibians, fish, and mammals (Parsons, 2009b).

OM&M operations consist of site and equipment maintenance in addition to monitoring of groundwater, sediment, surface water, wetlands, and biota. Upgrades to the site systems are performed as needed, and more detail is provided in the respective sections below.

2.0 SYSTEM OPERATION

Groundwater extracted by the 15 pumping wells within the soil/sediment containment area was pumped to two 10,000-gallon tanks in the on-site extraction building (Figure 1). On January 21, 2010, the LCP pre-treatment system began operation. The pre-treatment system consists of a filter feed pump, two 5-micron bag filters, two fiberglass-reinforced plastic granular activated carbon vessels and a flow meter. The design pumping rate is approximately 5 to 25 gpm. Pre-treated groundwater is discharged to the Onondaga County West Side Trunk Sewer from which it flows to the Onondaga County Metropolitan Wastewater Treatment Facility (METRO). In 2012, approximately 1,190,381 gallons were pre-treated on-site and sent to METRO.

Monthly summaries are provided in Table 1 of this report.

3.0 MAINTENANCE

The OM&M contractor providing maintenance activities for the specified period was CH2M HILL OMI. Maintenance conducted included system equipment maintenance, mowing, and snow removal. Specific maintenance activities outside of the normal maintenance activities previously noted included:

- Fixed several pumping well counters

- Periodic replacement of granulated activated carbon (GAC) for the water collection system throughout the year as necessary

Maintenance conducted to system equipment was described in the weekly inspection, operation and monitoring reports generated by OMI and submitted to the NYSDEC and associated distribution list with the monthly reports for the LCP Operating Unit (OU)-1 site.

4.0 MONITORING

4.1 Groundwater

Containment of impacted sediments in the soil/sediment containment area is monitored both hydraulically and analytically using the piezometer and monitoring well network shown in Figure 1. The piezometer monitoring system will be updated during final closure of the landfill.

The static water level elevations presented in each monthly report for 2012 have been consolidated and provided in Table 2 of this report. During the time period covered by this report, water levels measured by the piezometers have remained generally consistent and below the elevation of the top of the cut-off wall. An inward gradient will be achieved when the interior shallow, intermediate, and deep piezometer readings are less than the corresponding exterior shallow, intermediate, and deep piezometer readings. It is anticipated that it will take several years after the final low-permeability cap is constructed to fully achieve an inward and upward gradient at the site.

The piezometers outside of the cut-off wall along the north side of the containment area (PZ 1B: shallow, intermediate and deep through PZ 4B: shallow, intermediate and deep) were sampled quarterly by CH2M HILL OMI and analyzed for total mercury by SW 846 Method 7470. The analytical results are provided in Table 3 of this report.

The analytical results for the exterior piezometer sampling are predominantly non-detect and generally within the same range or lower than the pre-remediation mercury results presented in the RI for the LCP OU-1 site. The exterior shallow piezometer data ranges from non-detect to 2.6 µg/L. The exterior intermediate piezometer data ranges from non-detect to 0.07 µg/L. The exterior deep piezometer data were all non-detect. The piezometer data indicates that the cut-off wall is effectively containing contaminated groundwater.

As part of OM&M monitoring, wells 34D, 35D, and 36D located within the containment area are sampled quarterly by CH2M HILL OMI and analyzed for total mercury by SW 846 Method 7470. During the first quarter of 2012 only one well (MW-36D) was sampled due to ongoing construction activities. The monitoring well results are provided in Table 4 of this report. During each sampling event, the monitoring wells were also inspected for elemental mercury by the use of a copper probe. Elemental mercury was not detected during the sample events. The total mercury concentrations in the wells have been stable.

4.2 Surface Water

The OM&M Plan established nine monitoring locations (Figure 2) in the West Flume and Wetland A/B complex that are sampled for total mercury, methylmercury, and dissolved mercury annually (Parsons 2009a). In 2012, the data range for total mercury was 3.1 nanograms per liter

(ng/L) to 8.6 ng/L from the West Flume (excluding the upstream sample location (LCP1-SW-63)), 29 ng/L to 69 ng/L for Wetland A and 1.4 ng/L to 8 ng/L for Wetland B. Individual sample results are provided in Table 5 of this report.

4.3 Sediment

The OM&M Plan also established nine sediment monitoring locations at the same points as surface water that are sampled for total and methyl mercury annually. The total mercury data ranges were 0.36 mg/kg to 0.45 mg/kg for the West Flume (excluding the upstream sample location (LCP1-SW-63)), 0.29 to 1.0 mg/kg for Wetland A and 0.04 mg/kg to 0.13 mg/kg for Wetland B. Individual sample results are provided in Table 6 of this report.

4.4 Biota

Baseline sampling was conducted in 2005 to establish body burden at the site prior to remediation. The OM&M Plan established a long-term monitoring program that analyzes mercury concentrations in forage fish, benthic macroinvertebrates, small mammals and earthworms (Parsons 2009a). The OM&M Plan specifies that monitoring should continue regularly (every two to three years) until results indicate that the remedy has been effective and the contaminant concentrations have stabilized (Parsons 2009a). Five annual sampling events (post remediation) have been conducted following completion of initial remedial activities in 2007. Remedial activities continued in 2011 in the West Ditch, Wetland A, and the Dredge Spoils Area.

In general, field crews target organisms captured during the baseline monitoring event to provide consistent comparisons between organisms. Mercury concentrations in biota that were most consistently sampled from year to year are presented in Figure 3. Crayfish show a decline in mercury concentrations since baseline efforts in 2005 and creek chub in Reach C of the West Flume show a general decline during the post-remedy period. Clear trends in the other data are not evident. The presence of contamination in these areas since 2007 and the remedial activity work in 2011 at both the LCP and Geddes Brook sites may have impacted mercury concentrations in the biota included in the monitoring program.

In 2012, total mercury concentrations (mg/kg wet weight) ranged from undetected (0.01 detection limit) to 0.15 in crayfish (n=21), 0.038 to 0.33 in creek chub (n=17), 0.086 to 0.19 in brook stickleback (n=2), 0.3 to 0.48 in earthworm (n=2). Mercury was undetected in three of four small mammal samples (at a detection limit of 0.01 mg/kg). Mercury was detected at 0.24 mg/kg in the one short-tailed shrew sample. Individual sample results are provided in Table 7 of this report.

4.5 Wetlands Monitoring

Wetland A, Wetland B, and the West Flume were originally dominated by a monoculture of the invasive grass common reed and had limited habitat value. These areas were restored following the removal of impacted sediments by placement of 1 ft. of clean imported topsoil and installation of a diverse assemblage of wetland plant species. The restoration design placed an emphasis on the development of aquatic bed and deep emergent marsh habitat types in order to limit invasive species (EPA, 2009). The OM&M Plan indicates that two monitoring events will

occur during the mid and later parts of the growing season during each year that monitoring occurs following restoration (Parsons, 2009a). The parameters monitored include:

- Vegetation (type, percent cover, and frequency)
- Hydrology
- Invasive species (species, location, and approximate size of patch)
- Wildlife usage

Wetland monitoring and maintenance of invasive species is intended to facilitate restoration success by ensuring that newly created habitats are allowed to establish, mature, and diversify to a point that they can naturally defend against invasive species, disease, and weather extremes (Parsons 2009a). The OM&M Plan calls for monitoring of Wetlands A and B for five years at which point data are to be evaluated to determine if restored conditions have been met and if they can be maintained in the future (Parsons, 2009a). Note that additional monitoring consistent with OM&M methods has been conducted annually in the West Flume to ensure that these restored areas do not act as a source of invasive species to Wetlands A and B. The primary restoration efforts were completed in 2007 and monitoring began in 2008 making 2012 the fifth, and possibly last, year of monitoring in these areas. In addition, remedial activities in the dredge spoils area and a small portion of Wetland A in 2011 resulted in additional restoration that was completed in 2012. Approximately 1.5 acres in the dredge spoils area was restored as a deep emergent wetland surrounded by emergent, shallow emergent and riparian edges (this area is now being referred to as Wetland C). Approximately 0.6 acres in Wetland A was also restored as emergent and shallow emergent wetlands (referred to as Wetland A1). It is anticipated that these newly restored areas will be monitored and maintained using the same methods and timeframes consistent with the original program.

Overall, restoration of the LCP Wetland A and B areas has been very successful. Areas that were previously dominated by a monoculture of the invasive common reed with little habitat value are now diverse wetlands, supporting a mix of plant and animal species and containing a wide variety of aquatic habitat. For example, the trend in the number of native plant species recorded each year has increased steadily from 77 species the first year after restoration in 2008, to 97 in 2009, 115 in 2010, 148 in 2011, and 155 in 2012. The comprehensive 2012 wetlands report is provided in Appendix A of this report. The improvement in habitat value of these areas is significant and wildlife usage of the restored areas is extensive including continued use and nesting of a State listed threatened waterfowl species; the Pied-billed Grebe.

5.0 SOIL REMOVALS

Soil/sediment removals begun in 2011 were completed in 2012 in the Dredge Spoils Area of the site to address impacted material identified during previous OM&M sampling events (Figure 4). Removals were completed in accordance with the *LCP OU-1 Proposed Soil Removal – West Ditch, Wetland A and Dredge Spoils Areas* (Parsons, 2011). Impacted soils in these areas were discovered during OM&M sampling and it was determined that additional remedial excavations would be required to remove the contaminated soils. It is believed that mercury contamination in

the dredge spoils area was caused by placement of West Flume sediments in the area during mid-1970's dredging of the West Flume.

As noted in the 2011 Annual Operations, Maintenance, and Monitoring Report (Parsons, 2012), several issues during excavation of the Dredge Spoil Area north of the West Flume resulted in expansion of the remedial activities. The original scope of work called for the removal of approximately 12,000 to 12,500 cubic yards (cy) of material from this area. Previous sampling in the area that was used to delineate remedial areas indicated a clay layer at approximately 2 ft. in depth. During remedial construction, it became evident, based upon confirmatory sampling that this was a reworked layer intermingled with mercury-impacted material. Excavation depths increased to remove this impacted material and prevent recontamination of the remediated areas. Excavation depths continued through the reworked material into a native silty clay layer. In addition, areal limits of excavation were expanded in some areas based upon confirmatory sampling results.

The removal of the additional volume resulted in a corresponding increase in the 2011 schedule causing operations to continue into winter weather conditions. Removal efforts were stopped in early January 2012 due to the inability to continue to treat construction water at the Geddes Brook construction water treatment plant and to continue to receive stabilizing cement from our vendor. As a result, approximately 2,000 cy of material from the western portion of the Dredge Spoils Area (Dredge Spoils Area#1) was left in place for removal in the 2012 construction season. Overall, approximately 33,400 cy were removed during 2011 and 2012 (5,900 cy from the East Ditch; 2,800 cy from the West Ditch; 700 cy from Wetland A; and 24,000 cy from the Dredge Spoils Area (Wetland C)). In addition, restoration activities in Dredge Spoils Area #1 and # 2 were also delayed until 2012.

During excavations completed in the area at the end of 2011, it was also observed that in areas along the western limits of the excavation, the silty clay layer dropped significantly in elevation as it was excavated. Based upon the presence of abandoned utilities, it was believed that this is the result of historic excavation in this area for the installation of these utilities. Excavation to the native silty clay layer in this area would have potentially undermined and damaged the existing sewer force main and railroad tracks located to the north of the excavation area. Impacted material in this area was removed to a depth of 4 ft. and remaining concentrations were mitigated by installing a low-permeability material along the excavation bottom and sidewalls as shown on Figure 4. The installation of the low permeability material over impacted materials will isolate the impacted materials and mitigate any potential for recontamination into the restored wetland.

Following excavation, post-excavation samples were collected in accordance with the remedial work plan indicated above. As agreed upon by Honeywell and NYSDEC, confirmatory sample results are summarized in Table 8 and a tag map is provided in Figure 4. Soils/sediment removed during remedial excavation were relocated to the LCP landfill and managed with the Geddes Brook IRM sediment.

Due to the additional depth of excavations in Dredge Spoils Areas #1 and #2, the restoration plan in the approved removal work plan was modified in conjunction with the NYSDEC to

reflect the as-built excavation depths. The revised restoration grading plan is shown on Figure 5. In addition to the revised grading, minor modifications were made to the wetland seed mix, and several trees, shrubs, and basking features were added to the revised restoration plan.

6.0 MONITORING AND MAINTENANCE PROGRAM RECOMMENDATIONS FOR 2013

To date, the monitoring and maintenance program being implemented at the LCP site has been effective. The OM&M Plan (Section 6.4) calls for a Five Year Monitoring Review Report that will summarize the first five years of activities, present site monitoring trends, and provide recommendations concerning potential long-term modifications to the site monitoring program. This report will be completed in 2013 and in the interim it is recommended that:

1. The effort previously used to monitor and control invasive species in Wetlands A and B should be transferred to Wetland C and A1 and invasive species controls should also be maintained in the West Flume to control this potential source population.
2. Conduct the next biota sampling event in 2014. This is consistent with the original OMM plan which states that sampling will occur during the first two years (2008 and 2009) and then continue regularly (every two to three years) until results indicate that the remedy is effective and contaminant concentrations have stabilized (Section 4.6.1). In addition, substantial improvements in tissue concentrations associated with additional removals in 2011 and 2012 will not likely be fully evident until 2014 at the earliest. Honeywell is committed to sampling and analysis of biological tissue samples in 2014, after DEC reviews and approves the recommendations in the five year review report.
3. Conduct other monitoring and maintence components in 2013 as specified in the OM&M Plan.

7.0 REFERENCES

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Parsons. 2009a. *Operation, Maintenance, and Monitoring Plan for the LCP Bridge Street Site.* Prepared for Honeywell, Syracuse, New York. September 2009.

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Parsons, 2012. *2011 Annual Operations, Maintenance, and Monitoring Report for the LCP Bridge Street Site (OU-1).* Prepared for Honeywell, Syracuse, NY. July 2012.

Parsons, 2013. *2010 Annual Operations, Maintenance, and Monitoring Report for the LCP Bridge Street Site (OU-1).* Prepared for Honeywell, Syracuse, NY. January 2013.

TABLES

TABLE 1: MONTHLY PUMPING SUMMARY		
Month	**Pre-Treatment System - METRO**	**Trucked to Willis Avenue Treatment Plant**
January	222,243	
February	151,858	
March	161,465	
April	93,678	
May	104,442	
June	56,298	
July	46,067	
August	28,540	
September	32,370	
October	76,695	
November	72,238	
December	144,487	
Sub-Totals	1,190,381	0
Total	**1,190,381**	
	2.26 gpm	

Table 2: Piezometer Static Water Elevations

	PZ-1 Wall Top	PZ-1A-Shallow	PZ-1A-Mid	PZ-1A-Deep	PZ-1B-Shallow	PZ-1B-Mid	PZ-1B-Deep	PZ-2 Wall Top	PZ-2A-Shallow	PZ-2A-Mid	PZ-2A-Deep	PZ-2B-Shallow	PZ-2B-Mid	PZ-2B-Deep
1/5/12	393.3	389.12	374.57	374.54	384.11	374.35	374.43	392.5	383.0	374.6	374.2	377.9	374.1	374.3
1/26/12	393.3	389.0	374.7	374.7	384.1	374.5	374.6	392.5	382.4	374.7	374.4	377.8	374.2	374.5
2/9/12	393.3	389.0	374.8	374.7	384.1	374.6	374.7	392.5	382.5	374.8	374.4	377.8	374.3	374.5
3/1/12	393.3	389.4	374.7	374.7	384.3	374.5	374.6	392.5	382.5	374.8	374.4	378.0	374.2	374.5
3/22/12	393.3	388.9	374.6	374.6	384.2	374.4	374.5	392.5	382.4	374.1	374.8	377.9	374.1	374.3
4/13/12	393.3	388.6	374.2	374.1	384.1	373.9	374.0	392.5	382.1	374.2	373.8	377.4	373.6	373.8
4/27/12	393.3	388.5	374.4	374.4	384.2	374.2	374.2	392.5	382.3	374.5	374.0	377.7	373.8	374.1
5/11/12	393.3	388.7	374.7	374.7	384.2	374.5	374.6	392.5	382.4	374.8	374.3	378.0	374.2	374.4
6/15/12	393.3	388.4	374.0	373.9	384.1	373.7	373.8	392.5	382.0	374.0	373.6	377.0	373.5	373.7
6/22/12	393.3	388.4	373.9	373.9	384.1	373.6	373.7	392.5	382.0	374.0	373.5	376.7	373.4	373.6
7/13/12	393.3	388.2	373.5	373.4	383.9	373.2	373.3	392.5	381.8	373.6	373.0	375.9	372.9	373.1
8/3/12	393.3	388.1	373.5	373.4	384.0	373.1	373.2	392.5	381.9	373.6	373.0	376.0	372.9	373.0
8/17/12	393.3	388.1	373.5	373.4	384.0	373.1	373.2	392.5	381.9	373.5	373.0	376.3	372.9	373.1
10/17/12	393.3	388.0	373.4	373.4	384.2	373.1	373.2	392.5	381.7	373.1	373.0	376.9	372.9	373.0
10/31/12	393.3	388.2	373.7	373.7	384.3	373.4	373.5	392.5	382.0	373.8	373.3	377.5	373.2	373.3
11/19/12	393.3	388.1	373.5	373.4	dry	373.2	373.2	392.5	381.9	373.5	373.0	377.3	373.0	373.1
11/29/12	393.3	388.1	373.4	373.4	384.1	373.1	373.2	392.5	373.7	372.8	381.7	377.1	372.9	373.0
12/17/12	393.3	388.4	373.8	373.7	384.2	373.6	373.6	392.5	382.1	373.9	373.4	377.6	373.3	373.5
12/31/12	393.3	388.7	374.1	374.1	387.3	373.9	373.9	392.5	NA	NA	NA	NA	NA	NA

NA: Some locations were not sampled during the 12/31/12 event due to excessive amounts of snow

Table 2: Piezometer Static Water Elevations

	PZ-3 Wall Top	PZ-3A-Shallow	PZ-3A-Mid	PZ-3A-Deep	PZ-3B-Shallow	PZ-3B-Mid	PZ-3B-Deep		PZ-4 Wall Top	PZ-4A-Shallow	PZ-4A-Mid	PZ-4A-Deep	PZ-4B-Shallow	PZ-4B-Mid	PZ-4B-Deep
1/5/12	393.0	388.7	374.6	374.3	386.2	374.1	374.3		393.5	388.9	374.7	376.2	384.4	374.7	376.2
1/26/12	393.0	388.8	374.6	374.5	387.7	374.2	374.4		393.5	389.0	374.8	376.4	384.4	374.9	376.3
2/9/12	393.0	388.7	374.8	374.5	385.7	374.3	374.4		393.5	388.8	374.9	376.4	Dry	374.9	376.4
3/1/12	393.0	388.8	374.7	374.5	388.9	374.2	374.4		393.5	389.1	374.9	376.3	384.7	374.8	376.3
3/22/12	393.0	388.7	374.7	374.3	386.0	374.1	374.3		393.5	388.9	374.8	376.3	384.3	374.7	376.3
4/13/12	393.0	388.4	374.2	373.8	385.5	373.6	373.8		393.5	388.5	374.4	375.8	383.7	374.2	375.8
4/27/12	393.0	388.3	374.6	374.1	387.2	373.8	374.0		393.5	388.3	374.7	375.9	384.2	374.4	375.9
5/11/12	393.0	388.4	374.9	374.4	387.5	374.2	374.4		393.5	388.5	375.0	376.3	384.5	374.8	376.2
6/15/12	393.0	388.1	374.1	373.7	384.3	373.4	373.6		393.5	388.2	374.3	375.6	383.8	374.0	375.6
6/22/12	393.0	388.1	373.6	373.9	0.0	373.3	373.5		393.5	388.2	374.2	375.5	383.3	373.9	375.5
7/13/12	393.0	387.9	373.7	373.1	0.0	372.9	373.1		393.5	387.9	373.8	375.0	0.0	373.4	375.0
8/3/12	393.0	387.8	373.7	373.0	384.7	372.8	373.0		393.5	387.8	373.8	374.9	383.9	373.4	374.9
8/17/12	393.0	387.8	373.7	373.1	385.7	372.8	373.0		393.5	387.7	373.8	372.9	384.6	373.4	374.9
10/17/12	393.0	387.5	373.6	373.0	387.5	372.8	373.0		393.5	387.5	373.7	374.8	383.9	373.4	374.8
10/31/12	393.0	387.7	373.9	373.4	389.3	373.1	373.3		393.5	387.9	374.0	375.1	384.7	373.7	375.1
11/19/12	393.0	387.8	373.6	373.1	386.0	372.9	373.1		393.5	388.0	373.8	374.9	384.5	373.5	374.9
11/29/12	393.0	387.9	373.6	373.1	385.5	372.8	373.0		393.5	387.9	373.7	374.8	384.2	373.4	374.9
12/17/12	393.0	388.1	374.0	373.5	387.3	373.3	373.5		393.5	388.4	374.1	375.3	384.7	373.9	375.3
12/31/12	393.0	NA	NA	NA	NA	NA	NA		393.5	388.8	374.4	375.6	NA	NA	375.6

NA: Some locations were not sampled during the 12/31/12 event due to excessive amounts of snow

Table 2: Piezometer Static Water Elevations

	PZ-5 Wall Top	PZ-5A-Shallow	PZ-5A-Mid	PZ-5A-Deep	PZ-5B-Shallow	PZ-5B-Mid	PZ-5B-Deep		PZ-6 Wall Top	PZ-6A-Shallow	PZ-6A-Mid	PZ-6A-Deep	PZ-6B-Shallow	PZ-6B-Mid	PZ-6B-Deep
1/5/12	394.8	389.1	374.9	383.6	388.7	378.1	381.2		393.4	389.5	375.3	381.8	390.5	378.0	391.3
1/26/12	394.8	389.9	374.9	383.8	388.5	378.2	381.3		393.4	389.4	375.4	381.9	390.7	378.2	391.4
2/9/12	394.8	388.9	375.1	384.0	388.6	378.3	381.6		393.4	389.4	375.4	381.9	390.6	378.2	391.5
3/1/12	394.8	391.2	375.0	383.4	388.9	378.2	381.1		393.4	389.5	375.5	381.6	390.8	378.2	391.2
3/22/12	394.8	388.9	374.9	383.6	388.6	378.1	381.4		393.4	389.3	375.2	381.8	391.2	378.0	390.6
4/13/12	394.8	388.3	374.5	383.1	387.9	377.6	380.9		393.4	389.0	374.9	381.1	390.3	377.5	390.1
4/27/12	394.8	389.8	374.8	383.2	388.0	377.8	380.9		393.4	388.7	375.2	381.6	390.6	377.7	390.9
5/11/12	394.8	389.2	375.1	383.7	388.6	378.2	381.1		393.4	388.8	375.5	382.4	390.6	378.1	392.2
6/15/12	394.8	387.9	374.4	382.6	387.6	377.3	380.6		393.4	388.6	374.7	381.0	390.2	377.3	389.9
6/22/12	394.8	387.8	374.3	382.4	387.5	377.2	380.4		393.4	388.6	374.6	380.9	389.9	377.2	389.6
7/13/12	394.8	387.5	374.0	381.8	386.9	376.8	380.0		393.4	388.5	374.3	380.4	389.2	376.7	388.8
8/3/12	394.8	0.0	374.0	381.7	387.0	376.7	379.6		393.4	388.4	374.3	380.5	389.5	376.6	389.0
8/17/12	394.8	0.0	373.9	381.6	387.3	376.7	379.5		393.4	388.3	374.3	380.4	389.8	376.6	389.2
10/17/12	394.8	391.1	373.8	381.7	388.5	376.7	379.5		393.4	386.6	374.2	380.8	390.2	376.5	389.7
10/31/12	394.8	390.9	374.1	381.9	389.5	377.0	380.1		393.4	388.4	374.5	381.1	390.5	376.8	390.2
11/19/12	394.8	388.7	373.9	381.9	388.5	376.9	379.8		393.4	388.5	374.3	381.0	390.1	376.7	389.6
11/29/12	394.8	388.4	373.9	381.6	388.3	376.8	379.7		393.4	388.1	374.2	380.7	390.1	376.6	389.0
12/17/12	394.8	390.7	373.3	382.2	388.8	377.3	379.9		393.4	388.7	373.6	381.8	390.6	377.1	390.4
12/31/12	394.8	NA	NA	NA	NA	NA	NA		393.4	389.1	375.0	382.1	390.8	377.4	390.7

NA: Some locations were not sampled during the 12/31/12 event due to excessive amounts of snow

Table 2: Piezometer Static Water Elevations

	PZ-7 Wall Top	PZ-7A-Shallow	PZ-7A-Mid	PZ-7A-Deep	PZ-7B-Shallow	PZ-7B-Mid	PZ-7B-Deep
1/5/12	394.4	389.5	374.9	378.3	388.9	374.8	377.7
1/26/12	394.4	389.4	375.0	378.4	388.6	375.0	378.0
2/9/12	394.4	389.3	375.0	378.6	388.6	375.0	378.1
3/1/12	394.4	389.5	375.0	378.4	389.2	375.0	377.9
3/22/12	394.4	389.3	374.9	378.4	388.8	374.8	378.0
4/13/12	394.4	388.8	374.9	378.0	388.0	374.4	377.5
4/27/12	394.4	388.7	374.7	378.0	388.6	374.6	377.6
5/11/12	394.4	389.3	375.0	378.3	388.9	374.9	377.9
6/15/12	394.4	388.7	374.3	377.7	388.0	374.2	377.3
6/22/12	394.4	388.6	374.2	377.6	387.6	374.1	377.3
7/13/12	394.4	388.4	373.8	377.2	386.7	373.6	376.8
8/3/12	394.4	388.5	373.7	377.0	386.9	373.5	376.7
8/17/12	394.4	388.7	373.7	377.0	386.9	373.5	376.6
10/17/12	394.4	389.0	373.6	376.7	388.4	373.5	376.5
10/31/12	394.4	388.9	373.9	377.0	389.0	373.8	376.7
11/19/12	394.4	388.9	373.7	376.9	386.1	373.6	376.6
11/29/12	394.4	388.6	373.7	376.9	387.8	373.5	376.6
12/17/12	394.4	389.3	374.1	377.3	388.5	374.0	377.0
12/31/12	394.4	389.5	374.4	377.7	389.2	374.3	377.4

NA: Some locations were not sampled during the 12/31/12 event due to excessive amounts of snow

TABLE 3: PIEZOMETER ANALYTICAL RESULTS								
	1st Quarter (March) 2012		2nd Quarter (May) 2012		3rd Quarter (July) 2012		4th Quarter (October) 2012	
	Mercury		Mercury		Mercury		Mercury	
	Result ug/L	Qualifier	Result ug/L	Qualifier	Result ug/L	Qualifier	Result ug/L	Qualifier
PZ-1B-S	Not Sampled		Not Sampled		Not sampled		Not Sampled	
PZ-1B-I	ND (0.038)	U	ND (0.038)	U	ND (0.038)	U	ND (0.038)	U
PZ-1B-D	ND (0.038/0.038)	U	0.046/ND (0.038)	J	ND (0.038)/ND (0.038)		ND (0.038)	U
PZ-2B-S	2.6		2.4		2		2.5	
PZ-2B-I	0.044	J	ND (0.038)	U	ND (0.038)	U	ND (0.038)	U
PZ-2B-D	0.038	U	ND (0.038)	U	ND (0.038)	U	ND (0.038)	U
PZ-3B-S	ND (0.038)	U	Not Sampled		Not Sampled		ND (0.038)	U
PZ-3B-I	ND (0.038)	U	ND (0.038)	U	ND (0.038)	U	ND (0.038)	U
PZ-3B-D	ND (0.038)	U	ND (0.038)	U	ND (0.038)	U	ND (0.038)	U
PZ-4B-S	Not Sampled		Not Sampled		Not Sampled		ND (0.038)	U
PZ-4B-I	0.07	J	ND (0.038)	U	ND (0.038)	J	0.057	J
PZ-4B-D	ND (0.038)	U	ND (0.038)	U	ND (0.038)	U	ND (0.038)	U

Table Notes:
ND: Non-Detect, method detection limit shown in paranthesis.
U: Not detected.
J: Result is considered an estimate.

TABLE 4: MONITORING WELL ANALYTICAL RESULTS												
	1st Quarter (March) 2012			2nd Quarter (May) 2012			3rd Quarter (July) 2012			4th Quarter (October) 2012		
	Mercury		elemental mercury	Mercury		elemental mercury	Mercury		elemental mercury	Mercury		elemental mercury
	Result ug/L	Qualifier	detected? (y/n)	Result ug/L	Qualifier	detected? (y/n)	Result ug/L	Qualifier	detected? (y/n)	Result ug/L	Qualifier	detected? (y/n)
MW-34D	Not Sampled		N	Not Sampled		N	Not Sampled		N	Not Sampled		N
MW-35D	Not Sampled		N	Not Sampled		N	Not Sampled		N	Not Sampled		N
MW-36D	7.1		N	Not Sampled		N	Not Sampled		N	Not Sampled		N

Table Notes:
ND: Non-Detect, method detection limit shown in paranthesis.
U: Not detected.
J: Result is considered an estimate.

TABLE 5: SURFACE WATER ANALYTICAL RESULTS						
	September 2012					
	Total Mercury		Methyl Mercury		Dissolved Mercury	
	Result ng/L	Qualifier	Result ng/L	Qualifier	Result ng/L	Qualifier
West Flume						
LCP1-SW-60	8.6	J	0.26		1.2	J
LCP1-SW-61	3.1		0.1		1.7	
LCP1-SW-62	3.1		0.17		1.0	
LCP1-SW-63	2.3		0.15		0.8	
Wetland B						
LCP1-SW-64	1.4		0.3		0.73	
LCP1-SW-65	1.4		0.37		0.91	
LCP1-SW-66	8.0		0.58		2.3	
Wetland A						
LCP1-SW-67	69		0.14		16	
LCP1-SW-68	29		6.2		8.9	

Table Notes:
J: Result is considered an estimate.
U: Not dectected.
ND: Non-Detect, method dectection limit shown in paranthesis.

TABLE 6: SEDIMENT ANALYTICAL RESULTS				
Location ID	September 2012			
	Mercury		Methyl Mercury	
	Result mg/kg	Qualifier	Result ng/g	Qualifier
West Flume				
LCP1-SW-60	0.42	J	1.2	
LCP1-SW-61	0.45	J	1.9	
LCP1-SW-62	0.36	J	1.7	
LCP1-SW-63	0.45	J	1.9	
Wetland B				
LCP1-SW-64	0.038	J	0.14	U
LCP1-SW-65	0.13	J	0.72	
LCP1-SW-66	0.084	J	1.2	
Wetland A				
LCP1-SW-67	0.29	J	3.2	
LCP1-SW-68	1	J	3.6	

Table Notes:
J: Result is considered an estimate.

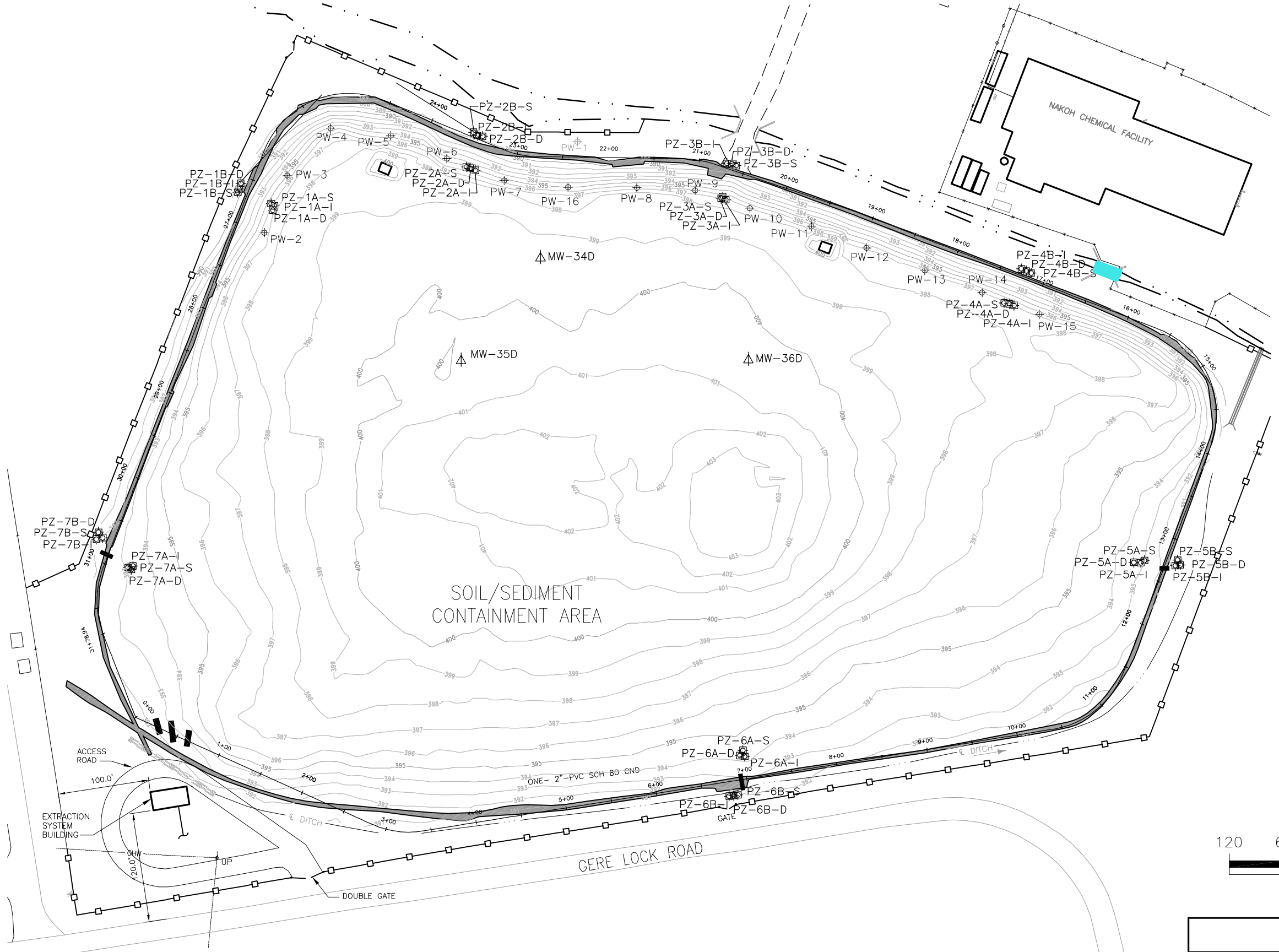
TABLE 7: BIOTA RESULTS					
August 2012					
Location	Mercury		Methyl Mercury		Organism
	Result mg/kg	Qualifier	Result ug/kg	Qualifier	
West Flume Reach A	0.23				Creek Chubs
West Flume Reach A	0.21				Creek Chubs
West Flume Reach A	0.17				Creek Chubs
West Flume Reach A	0.086				Brook Stickleback
West Flume Reach A	0.19				Brook Stickleback
West Flume Reach A	0.023	J	19	J	Crayfish
West Flume Reach A	0.073		56	J	Crayfish
West Flume Reach A	0.1		80	J	Crayfish
West Flume Reach A	0.036		43	J	Crayfish
West Flume Reach A	0.032		27	J	Crayfish
West Flume Reach B	0.29				Creek Chubs
West Flume Reach B	0.33				Creek Chubs
West Flume Reach B	0.21				Creek Chubs
West Flume Reach B	0.21				Creek Chubs
West Flume Reach B					
West Flume Reach B	0.065		79	J	Crayfish
West Flume Reach B	0.026	J	24	J	Crayfish
West Flume Reach B	0.054		40	J	Crayfish
West Flume Reach B	0.025	J	21	J	Crayfish
West Flume Reach B	0.051		52	J	Crayfish
West Flume Reach C	0.14				Creek Chubs
West Flume Reach C	0.13				Creek Chubs
West Flume Reach C	0.12				Creek Chubs
West Flume Reach C	0.15				Creek Chubs
West Flume Reach C	0.11				Creek Chubs
West Flume Reach C	0.01	UJ	8.8	J	Crayfish
West Flume Reach C	0.026	J	24	J	Crayfish
West Flume Reach C	0.029	J	29	J	Crayfish
West Flume Reach C	0.019	J	14	J	Crayfish
West Flume Reach C	0.019	J	25	J	Crayfish
Wetland A	0.14		130	J	Dragonfly Nymphes
Wetland A	0.15		42	J	Crayfish
Wetland A	0.1	J	120	J	Crayfish
Wetland A	0.073	J	67	J	Crayfish
Wetland A	0.48				Earthworms
Wetland B	0.033		38	J	Dragonfly Nymphes
Wetland B	0.06		51	J	Dragonfly Nymphes
Wetland B	0.069				Creek Chubs
Wetland B	0.038				Creek Chubs
Wetland B	0.047				Creek Chubs
Wetland B	0.047				Creek Chubs
Wetland B	0.041				Creek Chubs
Wetland B	0.32	J	29	J	Crayfish
Wetland B	0.018	J	25	J	Crayfish
Wetland B	0.029	J	35	J	Crayfish
Wetland B	0.3				Earthworms
Wetland A/B	0.01	U			White Footed Mouse
Wetland A/B	0.011	U			Meadow Vole
Wetland A/B	0.24				Shorttail Shrew
Wetland A/B	0.01	U			White Footed Mouse

TABLE 8: SOIL SAMPLING ANALYTICAL RESULTS					
				Mercury	
		Depth (ft)		Result (mg/kg)	Qualifier
	Number From Figure	Start	End		
Dredge Spoils Area					
LCP1-DSA2-SS-110	110	0	0.5	19.000	
LCP1-DSA2-SS-111	111	0	0.5	11.000	
LCP1-DSA2-SS-112	112	0	0.5	3.300	
LCP1-DSA2-SS-113	113	0	0.5	0.280	
LCP1-DSA2-SS-114	114	0	0.5	0.270	
LCP1-DSA2-SS-115	115	0	0.5	0.340	
LCP1-DSA2-SS-116	116	0	0.5	0.320	
LCP1-DSA2-SS-117	117	0	0.5	0.270	

Table Notes:
J: Result is considered an estimate.

- All highlighted sample concentrations represent final bottom of excavation validated concentrations, non-highlighted concentrations indicate areas where additional excavation was conducted based on agreement between Honeywell and the NYSDEC.

FIGURES



LEGEND:

- PUMPING WELL LOCATIONS
- PIEZOMETER LOCATIONS
- GROUNDWATER MONITORING WELL LOCATIONS

120 60 0 120 240

SCALE: 1"=120'

FIGURE 1

Honeywell FORMER LINDEN CHEMICAL PLANT
SOLVAY, NEW YORK

PIEZOMETER/MONITORING WELL LOCATIONS

PARSONS
301 PLAINFIELD ROAD, SUITE 350, SYRACUSE, N.Y. 13212, PHONE: 315-451-9560

FILE NAME: P:\HONEYWELL -SYR\444224 LCP OU1 2008\10 TECHNICAL CATEGORIES\10.1 CAD\ANNUAL REPORT-2009\444224-RPT010.DWG
PLOT DATE: 1/31/2013 12:27 PM PLOTTED BY: MENGES, ALLISON

NEW YORK STATE FAIR GROUNDS

HANLIN GROUP, INC. 10.1

MATLOW COMPANY, INC. LOT 01.1

NORTH DITCH EXCAVATION AREA

WEST FLUME EXCAVATION AREA

LCP1-SW-61

REACH B

REACH A

BRINE MUD AREA

LCP1-SW-62

OU-2

ORONZO SUSCO LOT 02.1

REACH C

EXISTING ACCESS ROAD (UNPAVED)

CULVERT #5

CULVERT #6

LCP1-SW-60

LCP1-SW-65

LCP1-SW-64

LCP1-SW-66

WETLAND A EXCAVATION AREA

LCP1-SW-67

MW-26 EXCAVATION AREA

LCP1-SW-68

NAKOH CHEMICAL CO. INC. LOT 10.5

LCP1-SW-63

HORAN ROAD (DO NOT USE)

HANLIN GROUP, INC. 09.2

HANLIN GROUP, INC. 09.2

GEDDES BROOK

RESIDENTIAL LOTS

WETLAND B EXCAVATION AREA

HANLIN GROUP, INC. 10.1

SOIL/SEDIMENT CONTAINMENT AREA

HANLIN GROUP, INC. 10.1

RESIDENTIAL LOTS 06, 08, 09.1

HORAN ROAD

TOWN OF GEDDES VILLAGE OF SOLVAY

TOWN OF GEDDES VILLAGE OF SOLVAY

BELLE ISLE ROAD

MATTHEWS AVE

300 150 0 300 600

SCALE: 1"=300'

FIGURE 2

Honeywell

FORMER LINDEN CHEMICAL PLANT
SOLVAY, NEW YORK

ANNUAL SURFACE WATER/SEDIMENT SAMPLING LOCATION

PARSONS

301 PLAINFIELD ROAD, SUITE 350, SYRACUSE, N.Y. 13212, PHONE: 315-451-9560

FILE NAME: P:\HONEYWELL -SYR\444224 LCP OU1 2008\10 TECHNICAL CATEGORIES\10.1 CAD\ANNUAL REPORT-2009\444224-RPT002.DWG
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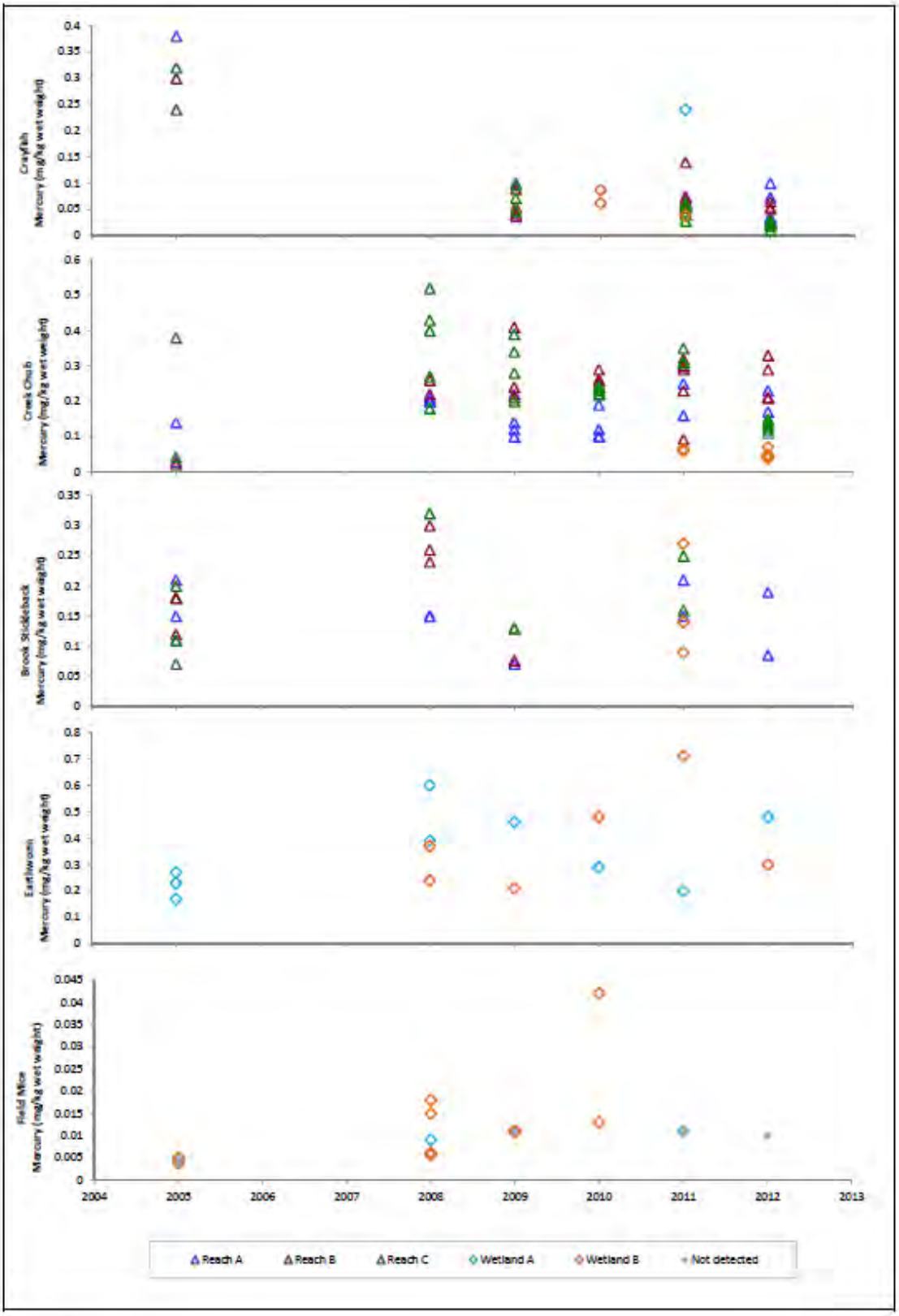


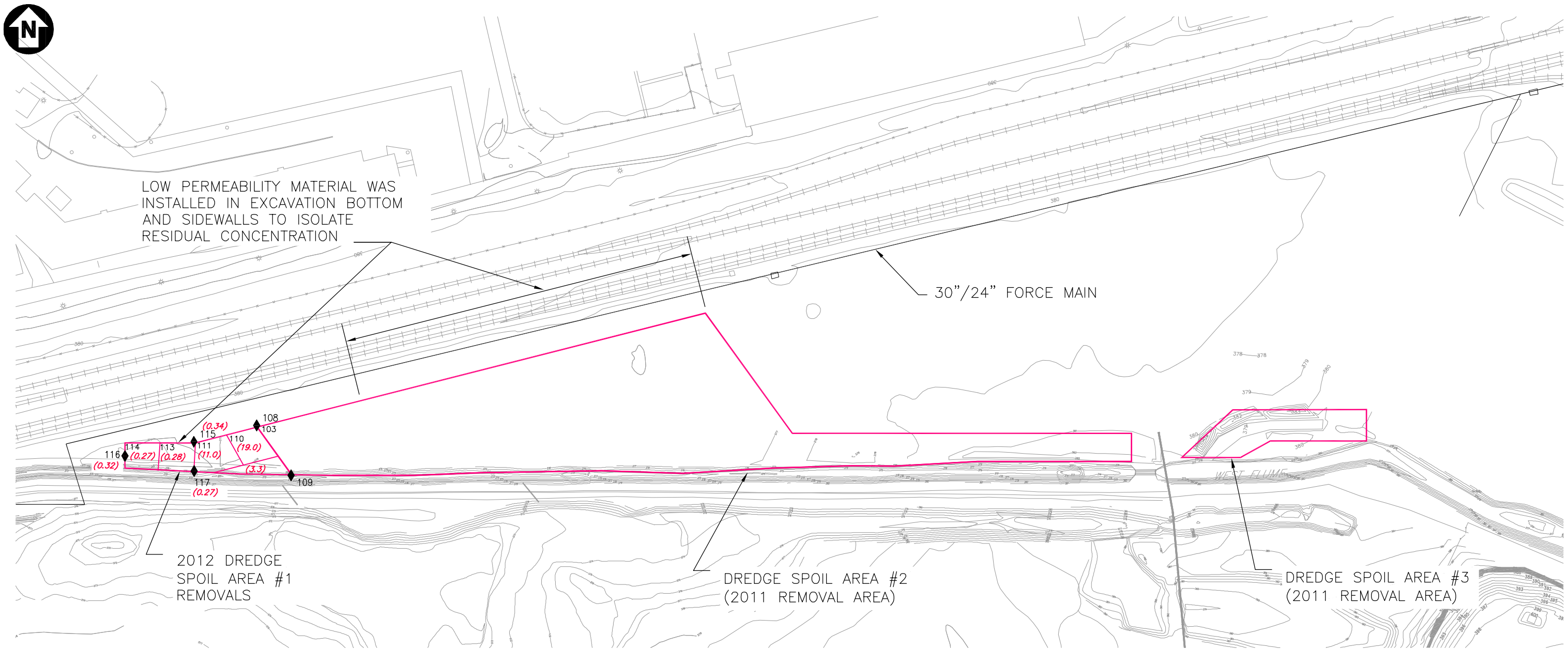
FIGURE 3

Honeywell FORMER LINDEN CHEMICAL PLANT SOLVAY, NEW YORK

MERCURY CONCENTRATIONS IN TISSUE BIOTA SAMPLES

PARSONS

301 PLAINFIELD ROAD, SUITE 350, SYRACUSE, N.Y. 13212, PHONE: 315-451-9560



LEGEND

- REMOVAL BOUNDARY
- 50x50 SQUARE USED FOR CONFIRMATORY SAMPLING
- C4 SAMPLE NUMBER
- (0.120) SAMPLE RESULT (mg/kg)
- (0.120) SAMPLE RESULT EXCEEDS CRITERIA (mg/kg)
- SIDEWALL SAMPLE

150 0 150 300

SCALE: 1"=150'

DRAFT

PRELIMINARY DRAFT
SETTLEMENT CONFIDENTIAL
NOT INTENDED FOR PUBLIC REVIEW

FIGURE 4

Honeywell

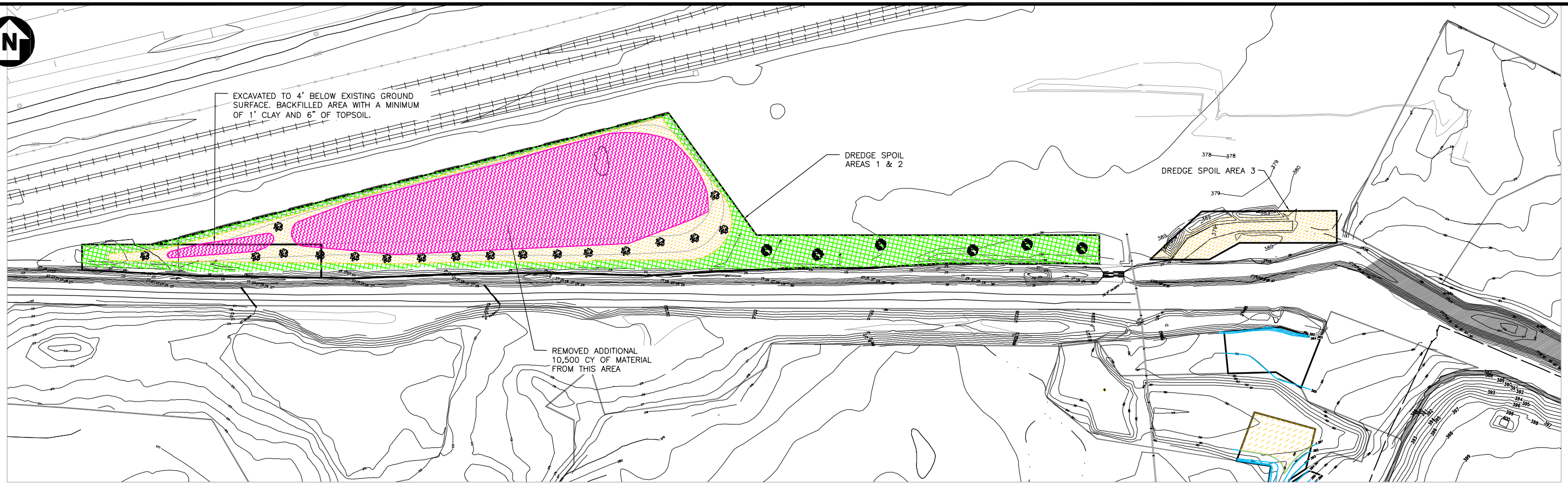
LCP OM&M REMOVALS 2011

2012 DREDGE SPOILS AREA SAMPLE RESULTS AND EXCAVATION PLAN

PARSONS

310 PLAINFIELD ROAD * SUITE 350 * SYRACUSE, NY 13212 * 315/451-9560
OFFICES IN PRINCIPAL CITIES

FILE NAME: P:\HONEYWELL -SYR\446662 - LCP O&M SUPPORT\10.0 TECHNICAL CATEGORIES\10.3 CAD\FIGURES\SAMPLE AREAS\446662-SK004.DWG
PLOT DATE: 2/6/2013 11:40 AM PLOTTED BY: RUSSO, JILL



NOTES:

1. PROJECTED WATER ELEVATIONS IN DREDGE SPOILS AREA IS 376.
2. CONSTRUCTED LOW BERM ACROSS THE MOUTH OF DREDGE SPOILS AREA 3, USING UNCLASSIFIED FILL AND TOPSOIL. INSTALLED PERMANENT EROSION CONTROL FABRIC (SI LANDLOK C2 OR EQUAL) OVER BERM TO A MINIMUM OF 10' PASS THE TOE OF SLOPE ON EITHER SIDE OF BERM.
3. GRADES SHOWN ARE FINAL GRADES AFTER APPLICATION OF 6 INCHES OF TOPSOIL.
4. DREDGE SPOILS AREAS WERE BE RESTORED TO A MAXIMUM SLOPE OF 3 HORIZONTAL TO 1 VERTICAL (3:1).
5. VEGETATION PLANTINGS ARE SPECIFIED IN THE RESTORATION SECTION OF THE WORK PLAN.
6. TOPSOIL DETAILS ARE SPECIFIED IN THE RESTORATION SECTION OF THE WORK PLAN.

WETLAND GRADING/ PLANTING ZONES

ZONE A – WETLAND EDGES AND SIDE SLOPES
A–1: SIDE SLOPES
A–2: WETLAND EDGES

ZONE B – EMERGENT WETLAND

B–1: SHALLOW EMERGENT

B–2: DEEP EMERGENT

SHRUBS/TREES FOR SHADE

ELEVATIONS BETWEEN ZONES DREDGE SPOIL AREA 3	ELEVATIONS BETWEEN ZONES DREDGE SPOIL AREAS 1 & 2
ZONE A: A–1: 383+ A–2: 381–383'	ZONE A: A–1: 377+ A–2: 375–377'
ZONE B: B–1: 379–381' B–2: NA	ZONE B: B–1: 374–375' B–2: 372–374'

LEGEND

EXISTING CONTOURS

RESTORATION CONTOURS

150 0 150 300

SCALE: 1"=150'

DRAFT

PRELIMINARY DRAFT
SETTLEMENT CONFIDENTIAL
NOT INTENDED FOR PUBLIC REVIEW

FIGURE 5

Honeywell

LCP OM&M REMOVALS 2011

DREDGE SPOILS RESTORATION PLAN

PARSONS
310 PLAINFIELD ROAD • SUITE 350 • SYRACUSE, NY 13212 • 315/451-9560
OFFICES IN PRINCIPAL CITIES

FILE NAME: P:\HONEYWELL –SYR\446662 – LCP O&M SUPPORT\10.0 TECHNICAL CATEGORIES\10.3 CAD\FIGURES\SAMPLE AREAS\446662–SK005.DWG
PLOT DATE: 10/31/2013 9:54 AM PLOTTED BY: RUSSO, JILL

APPENDIX A

WETLANDS MONITORING REPORT YEAR 5 - 2012

WETLAND MONITORING REPORT – YEAR 5 (2012)
LCP BRIDGE STREET SITE

TOWN OF GEDDES
ONONDAGA COUNTY, NEW YORK

Prepared for:

PARSONS
301 Plainfield Road, Suite 350
Syracuse, New York 13212

Prepared by:

TERRESTRIAL ENVIRONMENTAL SPECIALISTS, INC.
23 County Route 6, Suite A
Phoenix, New York 13135

November 2012

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Table 6. Vegetation Data Summary, Wetland B, Emergent Cover Type, LCP Bridge Street Restoration Area (2012)

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1.0 INTRODUCTION

Terrestrial Environmental Specialists, Inc. (TES) worked with Parsons and the New York State Department of Environmental Conservation (NYSDEC) to develop a wetland restoration plan to restore wetlands and the West Flume following remediation work at the LCP Bridge Street site. The wetland restoration site is located in the Town of Geddes, Onondaga County, New York (Figure 1).

Remediation work involved the excavation of wetlands in portions of NYSDEC freshwater wetland SYW-14 (Figure 2) and an adjacent drainage feature called the West Flume (Figures 1 and 2). An April 2006 aerial photograph (Figure 3) shows the areas while remediation was underway. An April 2009 aerial photograph (Figure 3a) and a November 2008 oblique aerial photograph (Figure 3b) show the areas after completion of the remediation. The wetland restoration area occurred south of a gravel road that parallels the West Flume. The West Flume drains to the northwest into Geddes Brook, which flows under railroad tracks before discharging into Ninemile Creek, a tributary to Onondaga Lake.

In 2011, additional remediation occurred in the West Ditch and the upper (eastern) portion of Wetland A. Excavation occurred in these areas in September 2011.

The wetland areas and the West Flume were restored under a restoration plan approved by the review agencies. The plan is briefly described in Section 2.0 of *Wetland Monitoring Report – Year 1 (2008) LCP Bridge Street Site* (TES 2009).

Wetland monitoring was part of the restoration plan, with monitoring required for a minimum of five years specified in the *Operation, Maintenance, and Monitoring Plan for the LCP Bridge Street Site, Solvay, New York* (Parsons 2008). Methods and results for Year 5 (2012) of wetland monitoring are provided in Sections 3.0 and 4.0, respectively, of the following report. Maintenance procedures implemented in the wetland restoration area during the year are provided in Section 5.0.

2.0 WETLAND REMEDIATION/RESTORATION EFFORTS

Remediation at the LCP Bridge Street site required the excavation of portions of NYSDEC wetland SYW-14 and the adjacent West Flume. The remediation design was presented in the *Final (100%) Design Report for the LCP Bridge Street (OU-1) Site* (Parsons 2004). Details about the wetland restoration and reclamation plans can be found in the *Wetland Monitoring Report – Year 1 (2008) LCP Bridge Street Site* (TES 2009). Additional remediation occurred in the West Ditch and the eastern portion of Wetland A in 2011.

Native plant species were selected for the vegetation restoration efforts. Species, quantities, and types of stock planted in the wetland restoration area, West Flume, and adjacent uplands are presented in Table 1. Seeding and mulching details are provided in Table 2. Some supplemental tree and shrub plantings were performed in 2008. These are detailed in Section 5.0 of the Year 1 report (TES 2009), and are also listed in Table 3.

3.0 MONITORING METHODS

Methods proposed to monitor the restored wetland areas and West Flume are provided in Parsons (2008). The proposed parameters to be monitored included: vegetation, hydrology, wildlife usage, and invasive species.

3.1 Vegetation

Vegetation monitoring included field reconnaissance surveys, qualitative assessments, and quantitative sampling. Field reconnaissance surveys occurred at several times from May to October, 2012. More detailed qualitative assessments were performed in July and August, 2012. Quantitative sampling of vegetation occurred in August 2012.

Vegetation sampling was conducted on August 28, 2012 to assess the vegetation in Wetland A, Wetland B, and the West Flume. The vegetation data were collected from 18 permanent circular sample plots. The plots were located in each of the three restored areas and in the different vegetation cover types present in each area; plot locations are shown on Figures 5 and 5a.

Each permanent sample plot was 10 feet in diameter. Wooden stakes were installed to mark the center of each plot, which was also located using GPS equipment. To establish the 10-foot diameter, a cloth tape measure was attached to the stake, extended to 5 feet and walked around the stake.

Vegetation data collected in each sample plot consisted of the following: 1) the vegetation cover type present, 2) total percent areal cover of vegetation, 3) plant species observed, and 4) the percent areal cover of each species. Sample plot data sheets used are presented in Appendix A.

Photographs were taken at various times during the 2012 monitoring. At the time of the quantitative sampling, photographs were taken at each plot and at permanent photograph points shown on Figure 5. The location and direction of the photographs are shown on Figure 5a (Sheets 1 and 2), and the photographs are presented in Appendix B.

3.2 Hydrology

The hydrology conditions in the restoration areas were monitored during the growing season using staff gauges. The gauges were installed in Wetland A and Wetland B on June 11, 2008. Staff gauge locations are shown on Figure 5 (Sheets 1 and 2).

Water level monitoring occurred ten times from June through October 2012. Water depths were also recorded at the center of each vegetation sample plot during the quantitative vegetation sampling that occurred on August 28, 2012.

3.3 Wildlife

During field reconnaissance visits to the restoration areas, records were kept of all wildlife species seen in or in the vicinity of the area. Specific efforts occurred during the breeding season for birds and amphibians in 2012.

4.0 MONITORING RESULTS

4.1 Introduction

The restoration area is composed of three areas: Wetland A, Wetland B, and the West Flume. An April 2009 aerial photograph (Figure 3a) and a November 2008 oblique aerial photograph (Figure 3b) show the three areas after restoration. The post-remediation grading plan for these three areas is provided as Figure 4. Figure 6 shows the location and extent of the vegetation cover types found in the restoration areas during the 2012 monitoring effort. Plant species observed in the areas are listed in Table 4. The vegetation, hydrology, and wildlife usage of the restored areas is described in the following sections.

4.2 Vegetation

A total of 155 plant species were recorded in and around Wetlands A and B and the West Flume in 2012 (Table 4). This is an increase of 7 species from the 2011 sampling and an increase of 40 species from the 2010 sampling.

Wetland A

Plant species observed in Wetland A are presented in Table 4. Vegetation plot data for Wetland A are provided in Appendix A, with a summary of the data presented in Table 5.

Wetland A contained primarily an emergent wetland cover type during the August 2012 quantitative vegetation monitoring, with a small area of aquatic bed in the recently remediated area (Figure 6). Three sampling plots were located in Wetland A, all occurring in emergent wetland (Figure 5).

The dominant plant species in Wetland A were broad-leaf cattail (*Typha latifolia*) and common reed (*Phragmites australis*). These two species account for approximately 88 percent (%) of the total vegetation cover (Table 5). Broad-leaf cattail has a wetland indicator status of obligate (OBL) and common reed has an indicator status of facultative-wet (FACW). Broad-leaf cattail continues to be the dominant plant in Wetland A, and this is consistent with what was found by the 2010 and 2011 monitoring efforts. Common reed cover has continued to increase.

Wetland B

Plant species observed in Wetland B are listed in Table 4. Vegetation plot data are presented in Appendix A, with summaries of the data presented in Tables 6 and 7.

Wetland B contained two vegetation cover types during the August 2012 quantitative vegetation monitoring (Figure 6). The two cover types were emergent wetland and aquatic bed. The area of emergent wetland was reduced somewhat from prior years. A total of twelve sampling plots were located in Wetland B, with seven in the emergent wetland area and five in the aquatic bed area.

The emergent wetland portions of Wetland B were dominated by white cattail *(Typha x glauca*) and broad-leaf cattail. These two dominants were also closely associated with narrow-leaf cattail (*Typha angustifolia*) and common reed. These four species account for approximately 75% of the total plant vegetation cover in the emergent wetland areas of Wetland B (Table 6). The above mentioned species have a wetland indicator status of OBL with the exception of common reed, which is FACW. As in 2011, the 2012 sampling data show broad-leaf cattail as a dominant plant.

The aquatic bed portion of Wetland B contained three dominant plant species: coontail (*Ceratophyllum demersum*), white water lily (*Nymphaea odorata*), and star duckweed *(Lemna trisulca*). The three dominant plant species account for approximately 75% of the total cover in the Wetland B aquatic bed area (Table 7). All of the plant species have a wetland indicator status of OBL. Dominant plants in the aquatic bed of Wetland B in 2012 were the same as 2011, with the exception of broad-leaf cattail. The relative cover of broad-leaf cattail has decreased by 6% since 2011.

West Flume

Plant species observed in the West Flume in 2012 are presented in Table 4. Vegetation plot data for the West Flume are provided in Appendix A, with a summary of the data presented in Table 8.

The West Flume contained one vegetation cover type (emergent wetland) during the August 2012 vegetation monitoring. Three sampling plots were located in the West Flume.

Common reed, white cattail, and broad-leaf cattail were the dominant plants in the West Flume in 2012 (Table 8). These species, which all have an indicator status of facultative wet or wetter, account for approximately 83% of the total cover. The relative cover of common reed and broad-leaf cattail increased from 2011 to 2012, while the relative cover of white cattail decreased.

An interesting plant species was found growing in the West Flume during the 2008 monitoring effort. The plant found is seaside bulrush (*Scirpus maritimus* spp. *paludosus*, currently *Schoenoplectus maritimus*). The species continued to persist in the upper portions of the West Flume through 2011. Although it was not documented in 2012, it is likely still present. Seaside bulrush is a state-listed endangered plant. It is listed as endangered in New York under the Protected Plant Act (Section 9-1503 of the Environmental Conservation Law). It has a limited distribution in upstate New York; it is confirmed extant in Cayuga and Onondaga Counties and also occurs in Nassau and Suffolk Counties (Young 2008).

Seaside bulrush was historically known from several locations in the Onondaga Lake area, including areas near the State Fair Grounds. These historical sightings are summarized in McMullen (1993). Recent records of the species are from near the Onondaga Lake Parkway in the southeastern portion of the lake.

4.3 Hydrology

Water levels in Wetland A were monitored nine times and levels in Wetland B were monitored ten times in 2012 (Table 9). Based on the water elevation data collected in 2012 water levels continually decreased from June through September.

In Wetland A, the water surface elevation fluctuated between less than 378.84 feet to 380.25 feet (Table 9). The lowest water elevations were observed during August and September when there was no water recorded at the staff gauge location. The highest water elevation was recorded on October 11, 2012.

In Wetland B, the water surface elevation fluctuated between 374.68 feet to 376.02 feet (Table 9). The lowest water elevations were observed in September. The highest water elevation was observed on June 8, 2012.

There was a near record drought during the summer of 2012. This is the first year since the monitoring was initiated in 2008 that water levels in the wetlands did not remain near the design water level elevation during the growing season. Wetlands throughout central New York were affected by the drought conditions.

4.4 Wildlife

Wildlife observations from the restoration areas are presented in Table 10. These observations were made at various times during the 2012 season. Mammals, fish, amphibians, and macroinvertebrates collected during the 2012 bioassessment surveys are presented in Table 11. One amphibian, a northern green frog tadpole (*Lithobates clamitans melanota*) was captured during the bioassessment surveys (Table 11).

Fish

Fish were noted in the West Flume and Wetland B during the 2012 monitoring. TES did not sample for fish, but fish collected during the biota assessment were identified by TES and are presented in Table 11. Fish species collected in the West Flume included brook stickleback (*Culaea inconstans*) and creek chub (*Semotilus atromaculatus*). Creek chub was the most abundant species. Only creek chub was observed in Wetland B in 2012.

Macroinvertebrates

Macroinvertebrates were sampled in the West Flume and Wetlands A and B during the 2012 bioassessment monitoring. Three groups of macroinvertebrates were collected, including crayfish, dragonflies/damselflies, and earthworms (Table 11).

Amphibians/Reptiles

One toad and three species of frogs were noted in the restoration area and vicinity during 2012 (Table 10). Eastern American toad (*Anaxyrus americanus*) was found in Wetland A. American bullfrog (*Lithobates catesbeianus*) was found in Wetland B. Northern green frog (*Lithobates clamitans melanota*) and northern leopard frog (*Lithobates pipiens*) were found in Wetland A, Wetland B, and the West Flume. The observation of bullfrog is of note because it is not currently known from Onondaga Lake or the adjacent wetlands.

Eastern snapping turtle (*Chelydra s. serpentina*) and painted turtle (*Chrysemys picta*) were observed in Wetland B during the 2012 monitoring effort. These observations are important because they further indicate the restored wetland's suitability and success in supporting wildlife.

Birds

Table 10 lists the bird species seen or heard in the vicinity of the restoration areas. Species observed included several wetland species, such as Canada goose (*Branta canadensis*), mallard (*Anas platyrhynchos*), wood duck (*Aix sponsa*), American coot (*Fulica americana*), pied-billed grebe (*Podilymbus podiceps*), green heron (*Butorides virescens*), willow flycatcher (*Empidonax traillii*), and red-winged blackbird (*Agelaius quiscula*). Red-winged blackbird is a common nesting species in the restored wetland areas. Pied-billed grebe is listed as a threatened species by the NYSDEC. This species was observed in Wetland B. This is the third year that pied-billed grebe has successfully nested in Wetland B. Another interesting bird record in 2012 was an observation of a brood of wood ducks in Wetland B, an indication that this species nested in the trees adjacent to the wetland.

Mammals

White-tailed deer (*Odocoileus virginianus*) sign was observed in the vicinity of Wetland A. Muskrat (*Ondatra zibeticus*) sign was observed in Wetland A, Wetland B, and the West Flume. In Wetland B an American beaver (*Castor canadensis*) and its sign were observed, which is the first record of it in this wetland. During the bioassessment work, several species of small mammal were collected. These included: short-tailed shrew (*Blarina brevicauda*), white-footed mouse (*Peromyscus leucopus)*, and meadow vole (*Microtus pennsylvanicus*).

5.0 WETLAND RESTORATION SUCCESS AND MAINTENANCE

Restoration of the LCP remediation areas, including Wetland A, Wetland B, and the West Flume, has been tremendously successful. Areas that were previously dominated by a monoculture of the invasive common reed with little aquatic habitat component, are now diverse wetlands, supporting a mix of plant and animal species and containing an interspersion of aquatic habitat. The improvement in habitat value of these areas is significant. As previously noted, the nesting of a state-listed bird is also an indication of restoration success.

While the restoration of the LCP remediation areas is considered very successful based on the five years of monitoring, maintenance of the areas is considered necessary to maintain the habitat value. The two concerns are: 1) the encroachment of common reed into the areas, and 2) the success of the plantings, particularly woody species.

5.1 Invasive Species Control

Common reed occurs in various locations within and around the edges of Wetlands A and B, and the West Flume. Most of the common reed is in upland areas or in wetland fringes but it has increased significantly from 2011 to 2012 in portions of Wetland A and especially in the West Flume. The more abundant areas are shown on Figure 7. Additional remediation work occurred in 2011 in the eastern portion of Wetland A, where common reed occurred previously.

Measures were implemented in 2012 to control common reed grass. These measures included the application of the herbicide Rodeo® (glyphosate) and Clearcast to many of the areas where common reed grass was abundant. The herbicide did not occur until very late in the season (October 9 and 10), which did not allow for a complete treatment or an assessment of the effectiveness of the treatment. Additional treatment is planned for 2013 after the monitoring of the areas.

6.0 SUMMARY

Remediation efforts at the LCP Bridge Street site were focused on wetland areas and a drainage feature called the West Flume. The wetland areas (Wetland A and Wetland B) are part of NYSDEC Wetland SYW-14.

Detailed plans were developed by Parsons, TES, and NYSDEC to restore these areas. These plans are presented in Parsons (2004).

The wetlands and the West Flume were originally dominated by a monoculture of the invasive grass common reed and had limited aquatic habitat. Design for the restoration targeted a wetter wetland system to diversify the habitats, provide areas unsuitable for common reed, and increase the aquatic habitat component. Shrub and tree plantings were provided around the restored areas. Remediation efforts occurred from 2005 to 2007. Some additional remediation occurred in the West Ditch and the eastern portion of Wetland A in 2011. Initial restoration of the wetlands and West Flume occurred in the latter portion of this time period, with extensive vegetation planting in the fall of 2007.

Monitoring of the restored areas was required and is described in the Operation, Maintenance and Monitoring Plan (Parsons 2008). Monitoring occurred in 2008, 2009, 2010, 2011, and 2012. Results of the fifth year of monitoring (2012) are presented in the current report.

Vegetation, hydrology, and wildlife usage were monitored during 2012 in the restored wetlands and the West Flume. A vegetation cover map of the restored areas is provided. Vegetation in the restored wetlands and West Flume was primarily persistent emergent and

aquatic bed. A total of 155 plant species were observed in the area, most of which were wetland species. Seaside bulrush, a state-listed endangered plant which was noted in the West Flume since 2008, was not found this year, although it likely occurs there.

Hydrology was monitored in Wetlands A and B from June through October 2012 using staff gauges. With the near record drought conditions in 2012, water levels continually decreased from June through September. This is the first year that water levels were not maintained near design elevations.

Wildlife usage of the restored wetlands and the West Flume was extensive. Species of fish were observed in Wetland B and the West Flume in 2012. Leopard frogs were particularly abundant in the restored wetlands, with toads, bullfrogs, and green frogs being noted as well. Snapping turtles and painted turtles were observed in Wetland B in 2012. Numerous wetland birds were observed in the area during the year, including the state-listed threatened pied-billed grebe, which has successfully nested for the third year in Wetland B. A few mammals were noted, and muskrat usage continues; many additional species likely utilize the area.

Overall, the restored areas were found to be very successful during the five years of monitoring. Common reed still occurs in several locations in uplands around the restored areas and has increased in percent cover in certain areas, especially the West Flume. Herbicide treatment or cuttings to control common reed occurred in 2008 and 2009. Mowing and hand cutting to control common reed occurred in 2010. Control measures of herbicide application were implemented late in the growing season in 2012. Additional treatment is planned for 2013.

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TABLES

Table 1.

Plantings at the LCP Bridge Street Restoration Area

WETLAND PLANTING ZONE A2 (edge of water to 2 feet above water)		
Quantity	**Scientific Name[a]**	**Common Name**
118	*Populus deltoides*	Eastern cottonwood
118	*Fraxinus pennsylvanica*	Green ash
30	*Populus tremuloides*	Trembling aspen
88	*Quercus bicolor*	Swamp white oak
59	*Sambucus canadensis*	Elderberry
59	*Salix amygdaloides*	Peach-leaf willow
118	*Salix discolor*	Pussy willow
118	*Cornus amomum*	Silky dogwood
WETLAND PLANTING ZONE B1 (water 0 to 1 foot deep)		
348	*Sagittaria latifolia*	Arrowhead
348	*Sparganium americanum*	Burreed
348	*Scirpus tabernaemontani*	Soft-stem bulrush
348	*Leersia oryzoides*	Rice cutgrass
348	*Juncus effusus*	Soft rush
348	*Eleocharis obtusa*	Creeping spikerush
348	*Carex vulpinoidea*	Fox sedge
348	*Scirpus cyperinus*	Woolgrass
348	*Polygonum hydropiperoides*	Swamp smartweed
WETLAND PLANTING SUB-ZONE B2 (water 1 to 2 feet deep)		
3432	*Alisma subcordatum*	Water plantain
500	*Pontederia cordata*	Pickerel weed
280	*Pontederia cordata*	Pickerel weed
624	*Utricularia vulgaris*	Bladderwort
WETLAND PLANTING ZONE C AQUATIC BED (water 2 to 4 feet deep)		
1155	*Elodea canadensis*	Water weed
924	*Coleogeton pectinatum*	Sago pondweed
231	*Nymphaea odorata*	Water lily
231	*Nuphar lutea*	Yellow water lily
WEST FLUME AREA (side slopes to flume)		
90	*Populus deltoides*	Eastern cottonwood
90	*Fraxinus pennsylvanica*	Green ash
30	*Populus tremuloides*	Trembling aspen
60	*Quercus bicolor*	Swamp white oak
45	*Sambucus canadensis*	Elderberry
45	*Salix amygdaloides*	Peach-leaf willow
90	*Salix discolor*	Pussy willow
90	*Cornus amomum*	Silky dogwood

[a] Nomenclature follows Mitchell and Tucker (1997).

Table 2.

Seeding and Mulching at the LCP Bridge Street Restoration Area

WETLAND SEED MIX[b]	
Scientific Name[a]	**Common Name**
Agrostis alba	Redtop
Carex comosa	Cosmos sedge
Carex vulpinoidea	Fox sedge
Carex scoparia	Blunt broomsedge
Scirpus atrovirens	Green bulrush
Typha latifolia	Broad-leaf cattail
Bidens cernua	Beggars-tick
Glyceria striata	Fowl mannagrass
Polygonum pensylvanicum	Pennsylvania smartweed
Polygonum hydropiperoides	Marsh smartweed
Eleocharis obtusa	Spikerush
Juncus effusus	Soft rush
Sparganium americanum	Eastern burreed
Verbena hastata	Blue vervain
Leersia oryzoides	Rice cutgrass

CONSERVATION SEED MIX[c]		
Scientific Name[a]	**Common Name**	**Lbs./Acre**
Trifolium repens	White clover, Dutch	2.5
Agrostis perennans	Autumn bentgrass, PA Ecotype	5
Lolium perenne	Perennial ryegrass, “Saint” (turf type)	10
Phleum pratense	Timothy	10
Dactylis glomerata	Orchard grass, “Potomac”	10
Bromus inermis	Smooth brome	10
Agrostis scabra	Ticklegrass (rough bentgrass), PA Ecotype	4
	Total	51.5

[a] Nomenclature follows Mitchell and Tucker (1997).
[b] Seeding rate – 15 bulk lbs./acre.
[c] Seeding rate – 51.51 lbs./acre.

Table 3.

Supplemental Tree and Shrub Plantings on May 19, 2008

Quantity	Scientific Name[(a)]	Common Name
9	*Populus deltoides*	Eastern cottonwood
9	*Fraxinus pennsylvanica*	Green ash
10	*Salix purpurea*	Streamco willow
10	*Salix discolor*	Pussy willow
10	*Cornus amomum*	Silky dogwood

[(a)] Nomenclature follows Mitchell and Tucker (1997).

Table 4.

Plant Species Observed in 2012, LCP Bridge Street Restoration Area

TREES

Scientific Name[a]	Common Name	Wetland Indicator Status[b]	Wetland A	Wetland B	West Flume
Acer negundo	Box elder	FAC	✓	✓	✓(E)
Fraxinus pennsylvanica	Green ash	FACW	✓(E)	✓(E)	✓(E)
Juglans nigra	Black walnut	FACU	✓		✓
Populus deltoides	Eastern cottonwood	FAC	✓(E)	✓(E)	✓(E)
Populus tremuloides	Quaking aspen	FACU	✓	✓	(E)
Quercus bicolor	Swamp white oak	FACW		✓	
Robinia pseudoacacia	Black locust	FACU	✓	✓(E)	
Salix amygdaloides	Peach-leaf willow	FACW	✓	✓(E)	✓(E)
Salix sp.	Willow	FACW		✓(E)	(E)

SHRUBS

Scientific Name[a]	Common Name	Wetland Indicator Status[b]	Wetland A	Wetland B	West Flume
Cornus alba	Red-osier dogwood	FACW		✓	✓
Cornus amomum	Silky dogwood	FACW	✓	✓	✓
Cornus racemosa	Grey dogwood	FAC			(E)
Lonicera morrowii	Morrow's honeysuckle	FACU	✓(E)	(E)	(E)
Rhamnus cathartica	Common buckthorn	FACU	(E)	✓(E)	✓(E)
Rhus hirta	Staghorn sumac	UPL		(E)	✓(E)
Salix discolor	Pussy willow	FACW		✓(E)	✓
Salix purpurea	Streamco willow	FACW	✓	✓	✓
Sambucus canadensis	Elderberry	FACW			✓

HERBACEOUS

Scientific Name[a]	Common Name	Wetland Indicator Status[b]	Wetland A	Wetland B	West Flume
Agrostis gigantea	Redtop	FACW	✓	✓	✓
Agrostis hyemalis	Ticklegrass	FAC		(E)	
Agrostis stolonifera	Creeping bentgrass	FACW			✓

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[a] Nomenclature follows Mitchell and Tucker (1997).

[b] Obligate Wetland (OBL): occur almost always (estimated probability >99%) in wetlands. Facultative Wetland (FACW): usually occur in wetlands (estimated probability 67%-99%), but occasionally found in non-wetlands. Facultative (FAC): equally likely to occur in wetlands or non-wetlands (estimated probability 34%-66%). Facultative Upland (FACU): usually occur in non-wetlands (estimated probability 67%-99%), but occasionally found in wetlands (estimated probability 1%-33%). Obligate Upland (UPL): occur almost always (estimated probability >99%) in non-wetlands.

(E) - Found primarily along the edge of the restoration area.

Table 4. (cont.)

HERBACEOUS (cont.)

Scientific Name[a]	Common Name	Wetland Indicator Status[b]	Wetland A	Wetland B	West Flume
Alisma subcordatum	Water plantain	OBL	✓		✓
Ambrosia artemisiifolia	Ragweed	FACU	(E)		(E)
Andropogon gerardii	Big bluestem	FACU	(E)		
Apocynum cannabinum	Indian hemp	FAC	✓(E)	✓(E)	(E)
Arctium minus	Common burdock	FACU	✓(E)	(E)	
Artemisia vulgaris	Felon-herb mugwort	FACU	✓(E)		
Asclepias syriaca	Common milkweed	FACU			✓(E)
Aster ericoides	White heath aster	FACU		(E)	
Aster sp.	Aster	FAC	✓	✓	✓
Atriplex patula	Seaside orach	FACW			✓
Bidens frondosa	Devil's Beggar-ticks	FACW			✓
Bidens trichosperma	Large-fruit beggar-ticks	OBL	✓		
Bromus inermis	Smooth brome	FACU	✓(E)	(E)	(E)
Carex comosa	Long-hair sedge	OBL	✓	✓	✓
Carex cristatella	Sedge	FACW			✓
Carex granularis	Meadow sedge	FACW	✓	✓	
Carex lurida	Shallow sedge	OBL	✓	✓	✓
Carex scoparia	Broom sedge	FACW	✓	✓	✓
Carex sp.	Crested sedge	FACW	✓		
Carex stipata	Awlfruit sedge	OBL	✓		
Carex vulpinoidea	Fox sedge	OBL	✓	✓	✓
Centaurea maculosa	Spotted knapweed	FACU	✓	✓	✓(E)
Ceratophyllum demersum	Coontail	OBL		✓	✓
Chara sp.	Moss	OBL	✓	✓	
Chenopodium album	Lamb's-quarters	FACU	(E)		
Chenopodium glaucum	Oak-leaf goosefoot	FACW	✓		
Cichorium intybus	Chicory	FACU	(E)	(E)	(E)
Cirsium arvense	Canada thistle	FACU	✓(E)	(E)	(E)
Cirsium vulgare	Bull thistle	FACU	(E)	(E)	
Conyza canadensis	Horseweed	FACU		(E)	
Coronilla varia	Crown-vetch	UPL		(E)	(E)
Cyperus esculentus	Yellow nutsedge	FACW	✓		(E)
Dactylis glomerata	Orchard grass	FACU	✓(E)	✓	(E)
Daucus carota	Wild carrot	FACU	✓(E)	✓(E)	(E)
Dipsacus fullonum	Teasel	FACU	✓(E)	✓	✓(E)
Echinochloa crusgalli	Barnyard grass	FACU	✓	✓	
Eleocharis sp.	Spikerush	FACW	✓		
Elodea nuttallii	Western water-weed	OBL		✓	
Elodea sp.	Water-weed	OBL		✓	
Elymus virginicus	Virginia wild rye	FACW	(E)	(E)	
Epilobium coloratum	Purple-leaf willow-herb	OBL	✓	✓(E)	✓

Table 4. (cont.)

HERBACEOUS (cont.)

Scientific Name[a]	Common Name	Wetland Indicator Status[b]	Wetland A	Wetland B	West Flume
Epilobium hirsutum	Hairy willow-herb	FACW	✓	✓	✓
Equisetum arvense	Common horsetail	FAC		(E)	(E)
Erechtites hieracifolia	Pilewort	FACU			✓
Erigeron annuus	Daisy fleabane	FACU	(E)	✓(E)	
Eupatorium maculatum	Spotted Joe-pye-weed	OBL			✓
Eupatorium perfoliatum	Boneset	FACW	✓	✓	✓
Euthamia graminifolia	Flat-top goldenrod	FAC	✓	(E)	
Fragaria virginiana	Strawberry	FACU		(E)	(E)
Galium palustre	Marsh bedstraw	OBL	✓	✓	✓
Galium sp.	Bedstraw	FAC	✓		
Geum aleppicum	Yellow avens	FAC	✓		
Geum laciniatum	Rough avens	FACW	✓	(E)	(E)
Geum macrophyllum	Large leaf avens	FACW		(E)	✓
Glechoma hederacea	Ground ivy	FACU	(E)		(E)
Glyceria striata	Fowl meadowgrass	OBL	✓		
Holcus lanatus	Velvet grass	FACU	✓	✓	
Hypericum punctatum	St. John's-wort	FAC	✓	(E)	✓(E)
Impatiens capensis	Jewelweed	FACW		✓	✓
Inula helenium	Elecampane	FACU		(E)	
Juncus brachycephalus	Small-headed rush	OBL	✓		✓
Juncus dudleyi	Dudley's rush	FACW	✓		
Juncus effusus	Soft rush	OBL	✓	✓	✓
Juncus inflexus	Blue rush	OBL	✓	✓	
Juncus sp.	Rush	FAC		✓	
Juncus tenuis	Path rush	FAC	✓	✓	
Lactuca sp.	Lettuce	FACU	✓	(E)	
Lathyrus sylvestris	Flat pea	FAC	✓(E)		(E)
Leersia oryzoides	Rice cutgrass	OBL	✓	✓	✓
Lemna minor	Lesser duckweed	OBL	✓	✓	
Lemna trisulca	Star duckweed	OBL		✓	
Lepidium sp.	Peppergrass	FACU	✓(E)	(E)	
Lotus corniculata	Bird's-foot trefoil	FACU	✓(E)	✓	(E)
Lythrum salicaria	Purple loosestrife	OBL	✓	✓	✓
Melilotus alba	White sweet clover	FACU		(E)	(E)
Melilotus officinalis	Yellow sweet clover	FACU	(E)	(E)	
Mimulus ringens	Winged monkeyflower	OBL		✓	
Muhlenbergia sp.	Muhly	FAC	✓		
Myriophyllum spicatum	Eurasian milfoil	OBL		✓	
Nymphaea odorata	White water-lily	OBL		✓	
Oenothera biennis	Evening primrose	FACU	✓	(E)	

Table 4. (cont.)

HERBACEOUS (cont.)

Scientific Name[a]	Common Name	Wetland Indicator Status[b]	Wetland A	Wetland B	West Flume
Onoclea sensibilis	Sensitive fern	FACW			(E)
Panicum sp.	Panic grass	FAC	(E)		
Panicum virgatum	Panic grass	FACW		✓(E)	
Parthenocissus quinquefolia	Virginia creeper	FACU	✓		
Penstemon digitalis	False-foxglove	FAC	✓	✓	✓
Persicaria hydropiperoides	Marsh water pepper	OBL			✓
Persicaria maculosa	Lady's-thumb	FAC	✓		✓
Persicaria pensylvanica	Pennsylvania smartweed	FACW	✓		
Phalaris arundinacea	Reed canary grass	FACW	✓	✓	✓
Phleum pratense	Timothy	FACU	✓(E)		(E)
Phragmites australis	Common reed	FACW	✓		✓
Picris hieracoides	Ox-tongue	FACU	✓(E)	✓(E)	(E)
Plantago lanceolata	Narrow-leaf plantain	FACU	✓(E)	✓(E)	(E)
Plantago major	Common plantain	FACU	✓(E)	✓(E)	(E)
Poa compressa	Canada bluegrass	FACU	✓	✓	
Poa pratensis	Kentucky bluegrass	FACU			✓
Potamogeton crispus	Curly pondweed	OBL		✓	
Potentilla recta	Sulfer cinquefoil	UPL		✓	
Prunella vulgaris	Heal-all	FAC		(E)	
Ranunculus sp.	Buttercup	FAC	✓		
Rorippa nasturtium-aquaticum	Watercress	OBL		✓	
Rubus occidentalis	Black raspberry	UPL			(E)
Rumex sp.	Dock	FAC	✓(E)		✓
Schoenoplectus tabernaemontani	Soft-stem bulrush	OBL	✓	✓	✓
Scirpus atrovirens	Green bulrush	OBL	✓	✓	✓
Scirpus cyperinus	Woolgrass	OBL	✓		
Scirpus pedicellatus	Stalked bulrush	OBL	✓	✓	
Setaria faberi	Giant foxtail	FACU	(E)		
Solanum carolinense	Horse nettle	UPL			✓
Solanum dulcamara	Bittersweet nightshade	FAC			✓
Solidago canadensis	Canada goldenrod	FACU	✓(E)	(E)	(E)
Solidago rugosa	Rough goldenrod	FAC	✓		
Sonchus asper	Spiny sow-thistle	FACU	✓(E)		
Sonchus oleraceus	Sow-thistle	FACU	✓(E)		
Sparganim americanum	American burreed	OBL	✓	✓	
Stuckenia pectinata	Sago pondweed	OBL	✓	✓	
Symphyotrichum lanceolatum	Lance-leaved aster	FACW		(E)	
Symphyotrichum pilosum	White heath aster	FACU	(E)	(E)	(E)
Symphyotrichum puniceum	Purple-stemmed aster	OBL		(E)	

Table 4. (cont.)

HERBACEOUS (cont.)

Scientific Name[(a)]	**Common Name**	**Wetland Indicator Status**[(b)]	**Wetland A**	**Wetland B**	**West Flume**
Taraxacum officinale	Dandelion	FACU		(E)	
Trifolium hybridum	Alsike clover	FACU	✓(E)	✓(E)	
Trifolium pratense	Red clover	FACU			(E)
Tussilago farfara	Colt's foot	FACU	✓(E)	✓	
Typha angustifolia	Narrow-leaf	OBL	✓	✓	✓
Typha latifolia	Broad-leaf cattail	OBL	✓	✓	✓
Typha x glauca	White cattail	OBL	✓	✓	✓
Utricularia macrorhiza	Common bladder-wort	OBL		✓	
Verbascum blattaria	Moth-mullein	FACU		✓	✓(E)
Verbena hastata	Blue vervain	FACW	✓	✓	
Verbena urticifolia	White vervain	FAC		✓	
Vicia sp.	Vetch	FAC	✓(E)	✓(E)	(E)
Vitis riparia	Riverbank grape	FAC		(E)	(E)
Xanthium strumarium	Common cocklebur	FAC		✓	

Table 5.

Vegetation Data Summary, Wetland A, Emergent Cover Type
LCP Bridge Street Restoration Area (2012)

Scientific Name[a]	**Common Name**	**Indicator Status[b]**	**Relative Cover (%)**
Typha latifolia	Broad-leaf cattail	OBL	63.43
Phragmites australis	Common reed	FACW	24.25
Typha x glauca	White cattail	OBL	7.47
Schoenoplectus tabernaemontani	Soft-stem bulrush	OBL	3.73
Lythrum salicaria	Purple loosestrife	OBL	0.75
Lemna minor	Lesser Duckweed	OBL	0.37
		Total	100.00

[a] Nomenclature follows Mitchell and Tucker (1997).

[b] Obligate Wetland (OBL): occur almost always (estimated probability >99%) in wetlands. Facultative Wetland (FACW): usually occur in wetlands (estimated probability 67%-99%), but occasionally found in non-wetlands. Facultative (FAC): equally likely to occur in wetlands or non-wetlands (estimated probability 34%-66%). Facultative Upland (FACU): usually occur in non-wetlands (estimated probability 67%-99%), but occasionally found in wetlands (estimated probability 1%-33%). Obligate Upland (UPL): occur almost always (estimated probability >99%) in non-wetlands.

Table 6

Vegetation Data Summary, Wetland B, Emergent Cover Type
LCP Bridge Street Restoration Area (2012)

Scientific Name[a]	Common Name	Indicator Status[b]	Relative Cover (%)
Typha x glauca	White cattail	OBL	32.12
Typha latifolia	Broad-leaf cattail	OBL	23.03
Typha angustifolia	Narrow-leaf cattail	OBL	12.73
Phragmites australis	Common reed	FACW	7.27
Schoenoplectus tabernaemontani	Soft-stem bulrush	OBL	5.46
Leersia oryzoides	Rice cutgrass	OBL	4.85
Lythrum salicaria	Purple loosestrife	OBL	4.49
Lemna trisulca	Star duckweed	OBL	3.64
Nymphaea odorata	White water lily	OBL	2.42
Ceratophyllum demersum	Coontail	OBL	2.42
Persicaria hydropiperoides	Mild water pepper	OBL	0.61
Lemna minor	Duckweed	OBL	0.24
Fraxinus pennsylvanica	Green ash	FACW	0.24
Eupatorium perfoliatum	Boneset	FACW	0.12
Cyperus esculentus	Yellow nutsedge	FACW	0.12
Carex sp.	Sedge	FAC	0.12
Populus tremuloides	Quaking aspen	FACU	0.12
		Total	100.00

[a] Nomenclature follows Mitchell and Tucker (1997).

[b] Obligate Wetland (OBL): occur almost always (estimated probability >99%) in wetlands. Facultative Wetland (FACW): usually occur in wetlands (estimated probability 67%-99%), but occasionally found in non-wetlands. Facultative (FAC): equally likely to occur in wetlands or non-wetlands (estimated probability 34%-66%). Facultative Upland (FACU): usually occur in non-wetlands (estimated probability 67%-99%), but occasionally found in wetlands (estimated probability 1%-33%). Obligate Upland (UPL): occur almost always (estimated probability >99%) in non-wetlands.

Table 7.

Vegetation Data Summary, Wetland B, Aquatic Bed Cover Type
LCP Bridge Street Restoration Area (2012)

Scientific Name[a]	Common Name	Indicator Status[b]	Relative Cover (%)
Ceratophyllum demersum	Coontail	OBL	39.09
Nymphaea odorata	White water lily	OBL	20.80
Lemna trisulca	Star duckweed	OBL	15.49
Utricularia macrorhiza	Common Bladderwort	OBL	9.88
Typha latifolia	Broad-leaf cattail	OBL	7.37
Elodea nuttallii	Western water-weed	OBL	2.95
Typha glauca	White cattail	OBL	2.21
Lemna minor	Duckweed	OBL	1.47
Chara sp.	Moss	OBL	0.74
		Total	100.00

[a] Nomenclature follows Mitchell and Tucker (1997).

[b] Obligate Wetland (OBL): occur almost always (estimated probability >99%) in wetlands. Facultative Wetland (FACW): usually occur in wetlands (estimated probability 67%-99%), but occasionally found in non-wetlands. Facultative (FAC): equally likely to occur in wetlands or non-wetlands (estimated probability 34%-66%). Facultative Upland (FACU): usually occur in non-wetlands (estimated probability 67%-99%), but occasionally found in wetlands (estimated probability 1%-33%). Obligate Upland (UPL): occur almost always (estimated probability >99%) in non-wetlands.

Table 8.

Vegetation Data Summary, West Flume, Emergent Cover Type
LCP Bridge Street Restoration Area (2012)

Scientific Name[a]	Common Name	Indicator Status[b]	Relative Cover (%)
Phragmites australis	Common reed	FACW	55.84
Typha glauca	White cattail	OBL	15.58
Typha latifolia	Broad-leaf cattail	OBL	11.17
Lythrum salicaria	Purple loosestrife	OBL	6.49
Sonchus asper	Spiny leaved sow thistle	FACU	5.20
Leeesia oryzoides	Rice Cutgrass	OBL	3.90
Cirsium arvense	Canada thistle	FACU	0.52
Epilobium hirsutum	Hairy willow-herb	FACW	0.52
Solanum dulcamara	Bittersweet nightshade	FAC	0.52
Persicaria hydropiperoides	Mild water pepper	OBL	0.26
		Total	100.00

[a] Nomenclature follows Mitchell and Tucker (1997).

[b] Obligate Wetland (OBL): occur almost always (estimated probability >99%) in wetlands. Facultative Wetland (FACW): usually occur in wetlands (estimated probability 67%-99%), but occasionally found in non-wetlands. Facultative (FAC): equally likely to occur in wetlands or non-wetlands (estimated probability 34%-66%). Facultative Upland (FACU): usually occur in non-wetlands (estimated probability 67%-99%), but occasionally found in wetlands (estimated probability 1%-33%). Obligate Upland (UPL): occur almost always (estimated probability >99%) in non-wetlands.

Table 9.

Staff Gauge Readings, 2012
LCP Bridge Street Restoration Area

Wetland A

Date	Reading on Gauge (feet)	0.0 Elevation (feet)	Water Elevation (feet)
6/8/12	1.26	378.84	380.10
6/14/12	1.22	378.84	380.06
6/28/12	0.88	378.84	379.72
7/31/12	0.58	378.84	379.42
8/14/12	-	378.84	<378.84
8/28/12	0.60	378.84	379.34
9/12/12	-	378.84	<378.84
9/17/12	-	378.84	<378.84
10/11/12	1.41	378.84	380.25

Wetland B

Date	Reading on Gauge (feet)	0.0 Elevation (feet)	Water Elevation (feet)
6/8/12	1.86	374.16	376.02
6/14/12	1.80	374.16	375.96
6/28/12	1.48	374.16	375.64
7/19/12	1.06	374.16	375.22
7/31/12	0.98	374.16	375.14
8/14/12	0.82	374.16	374.98
8/28/12	0.72	374.16	374.88
9/12/12	0.52	374.16	374.68
9/17/12	0.52	374.16	374.68
10/11/12	0.83	374.16	374.99

- Dry conditions

Table 10.

Wildlife Observed, 2012, LCP Bridge Street Restoration Area

BIRDS[a]				
Common Name	**Scientific Name**	**LCP Bridge Street Restoration Area**		
		Wetland A	**Wetland B**	**West Flume**
Canada Goose	*Chen caerulescens*		X	X
Wood Duck	*Aix sponsa*		X	
American Black Duck	*Anas rubripes*		X	
Mallard	*Anas platyrhynchos*	X	X	X
Pied-billed Grebe	*Podilymbus podiceps*		X	
Double-crested Cormorant	*Phalacrocorax auritus*		X	
Great Blue Heron	*Ardea herodias*			X
Green Heron	*Butorides virescens*	X	X	X
Turkey vulture	*Cathartes aura*		f.o. [b]	
Sharp-shinned Hawk	*Accipiter striatus*			f.o.
Red-tailed Hawk	*Buteo jamaicensis*	f.o.		f.o.
American Coot	*Fulica americana*		X	
Killdeer	*Charadrius vociferus*		X	
Rock Pigeon	*Columba livia*		f.o.	
Mourning Dove	*Zenaida macroura*	X		X
Chimney Swift	*Chaetura pelagica*		f.o.	
Belted Kingfisher	*Megaceryle alcyon*		X	
Willow Flycatcher	*Empidonax traillii*		X	
Warbling Vireo	*Vireo gilvus*		X	
Blue Jay	*Cyanocitta cristata*			X
Tree Swallow	*Tachycineta bicolor*	X	X	
Barn Swallow	*Hirundo rustica*		X	
Gray Catbird	*Dumetella carolinensis*	X	X	X
Northern Mockingbird	*Mimus polyglottos*			X
Cedar Waxwing	*Bombycilla cedrorum*	X		
Yellow warbler	*Dendroica petechiax*	X	X	
Song Sparrow	*Melospiza melodia*		X	X
Swamp Sparrow	*Melospiza georgiana*	X	X	X
Northern Cardinal	*Cardinalis cardinalis*			X
Red-winged Blackbird	*Agelaius phoeniceus*	X	X	X
Common Grackle	*Quiscalus quiscula*		X	
American Goldfinch	*Carduelis tristis*	X		X

a. Common and scientific names according to AOU (1998) and supplements through 2008.
b. f.o. = fly over.

Table 10. (cont.)

AMPHIBIANS AND REPTILES[c]				
Common Name	**Scientific Name**	**LCP Bridge Street Restoration Area**		
		Wetland A	**Wetland B**	**West Flume**
Eastern American Toad	*Anaxyrus americanus*	X		
American Bullfrog	*Lithobates catesbeianus*		X	
Northern Green Frog	*Lithobates clamitans melanota*	X	X	X
Northern Leopard Frog	*Lithobates pipiens*	X	X	X
Eastern Snapping Turtle	*Chelydra s. serpentine*		X	
Painted Turtle	*Chrysemys picta*		X	
Common Watersnake	*Nerodia s. sipedon*		X	
Common Gartersnake	*Thamnophis sirtalis*	X	X	X

MAMMALS[d]				
Common Name	**Scientific Name**	**LCP Bridge Street Restoration Area**		
		Wetland A	**Wetland B**	**West Flume**
Short-tailed Shrew[e]	*Blarina brevicauda*			
White-footed Mouse[e]	*Peromyscus leucopus*			
Meadow Vole[e]	*Microtus pennsylvanicus*			
American Beaver	*Castor canadensis*		X	
Common Muskrat	*Ondatra zibethicus*	X	X	X
White-tailed Deer	*Odocoileus virginianus*	X		

c. Common and scientific names according to Crother *et al.* (2008).
d. Common and scientific names according to Whitaker and Hamilton (1998).
e. Collected during Bioassessment

Table 11.

Mammals, Fish, Amphibians, and Macroinvertebrates Collected during 2012 Bioassessment Surveys, LCP Bridge Street Restoration Area

MAMMALS

Common Name	**Scientific Name**
Short-tailed Shrew	*Blarina brevicauda*
White-footed Mouse	*Peromyscus leucopus*
Meadow Vole	*Microtus pennsylvanicus*

FISH

Common Name	**Scientific Name**
Creek Chub	*Semotilus atromaculatus*
Brook Stickleback	*Culaea inconstans*

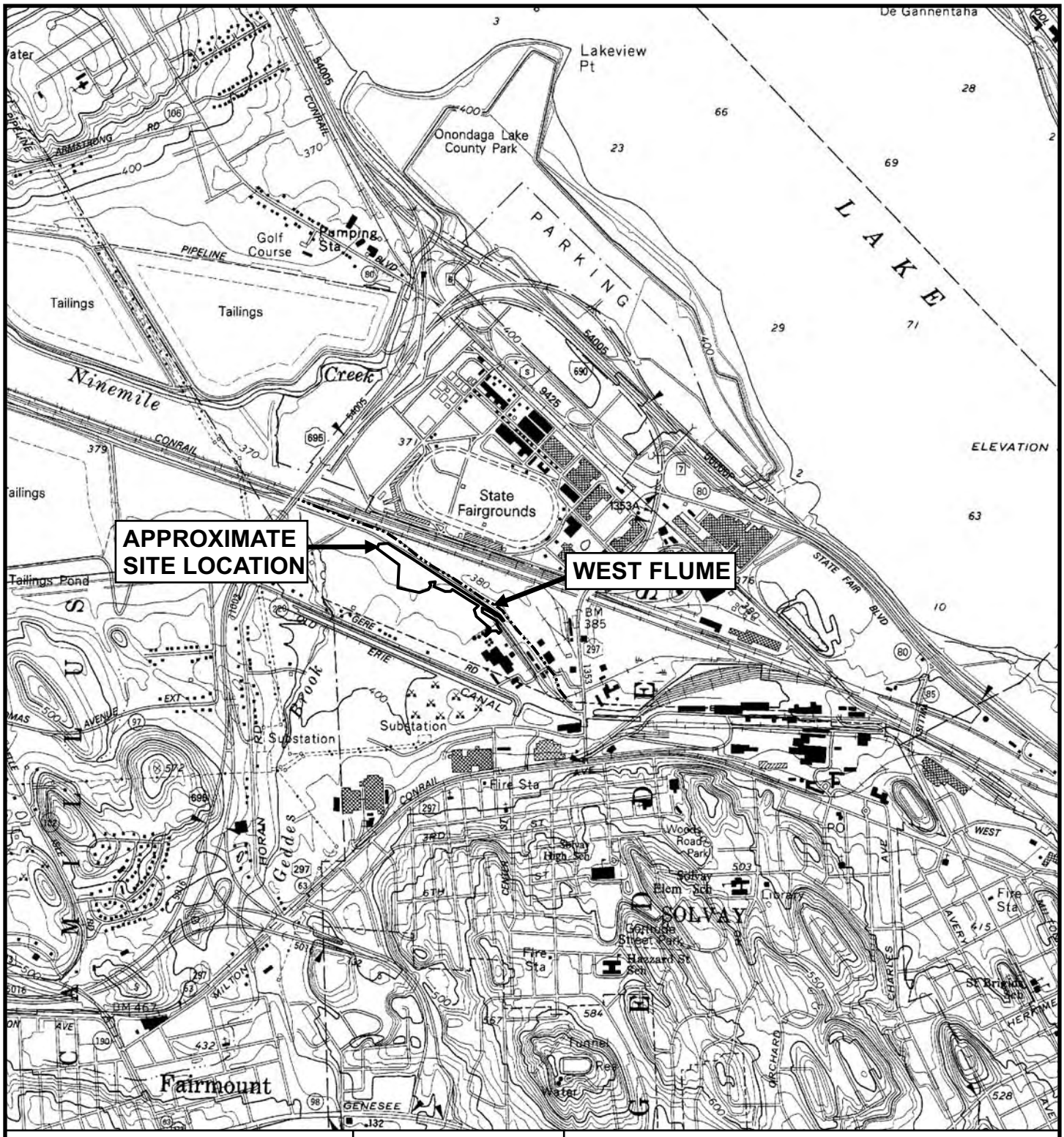
AMPHIBIANS

Common Name	**Scientific Name**
Northern Green Frog (tadpole)	*Lithobates clamitans melanota*

MACROINVERTEBRATES

Common Name	**Invertebrate Order**
Crayfish	Decopoda
Dragonflies and Damselflies	Odonata
Earthworms	Haplotaxida

FIGURES



QUADRANGLE LOCATION

0 1000' 2000'

SCALE 1" = 2000'

NORTH

Figure 1. Site Location

LCP Bridge Street Restoration Area

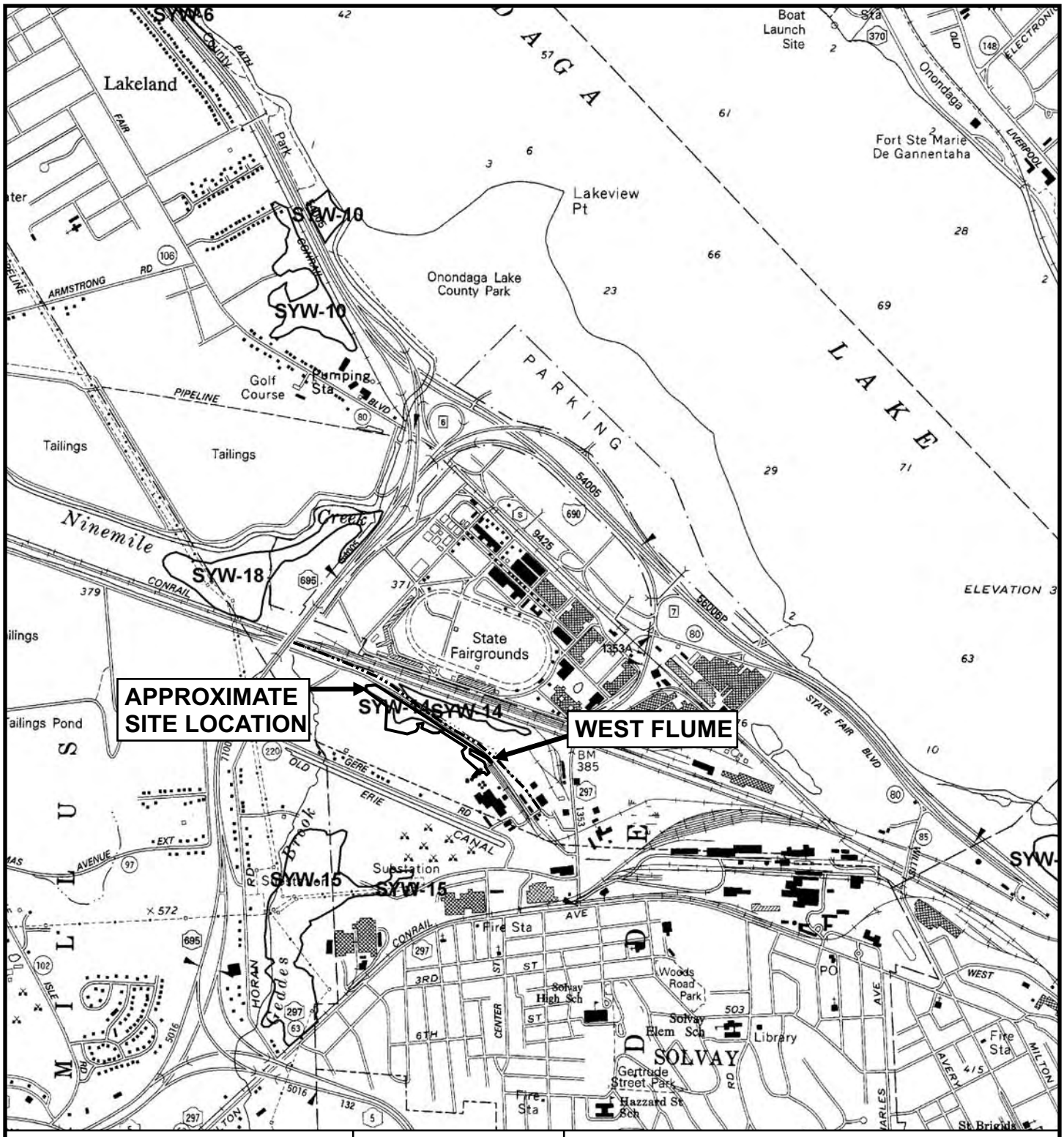
NYS DOT Topographic Map

Syracuse West Quadrangle

1990

Prepared by TERRESTRIAL ENVIRONMENTAL SPECIALISTS, Inc.

TES file: PAR-2682\2682_Monit_Rpt_2011_site_location_1.dsf\10-21-11



0 1000' 2000'

SCALE 1" = 2000'

NORTH

Figure 2. NYS Freshwater Wetlands Map

LCP Bridge Street Restoration Area

NYS Dept. of Environmental Conservation
cugir.mannlib.cornell.edu

Syracuse West Quadrangle
2007

Prepared by TERRESTRIAL ENVIRONMENTAL SPECIALISTS, Inc.

TES file: PAR-2682\2682_Monit_Rpt_2011_DEC_wetlands_2.dsf\10-21-11

NORTH

0 100' 200'

APPROXIMATE SCALE IN FEET

Aerial Photograph obtained from NYS GIS Clearinghouse

Figure Prepared by Terrestrial Environmental Specialists, Inc.

Figure 3.

April 2006 Aerial Photograph Showing Remediation Work (in progress)

LCP Bridge Street Restoration Area

TES file: PAR-2682\2682_Monit_Rpt_2011_Aerial_2006_Site_3.dsf\10-21-11

NORTH

0 100' 200'

APPROXIMATE SCALE IN FEET

Aerial Photograph
obtained from
NYS GIS Clearinghouse

Figure Prepared by
Terrestrial Environmental
Specialists, Inc.

Figure 3a.

**April 2009
Aerial Photograph
Showing
Remediation Work
(completed)**

**LCP Bridge Street
Restoration Area**

TES file: PAR-2682\2682_Monit_Rpt_2011_Aerial_2009_Site_3a.dsf\10-21-11

NORTH

Oblique Aerial Photograph provided by Parsons

Figure Prepared by Terrestrial Environmental Specialists, Inc.

Figure 3b.

November 2008 Oblique Aerial Photograph

LCP Bridge Street Restoration Area

TES file: PAR-2682\2682_Monit_Rpt_2011_Oblique_Aerial_2008_3b.dsf\10-21-11