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FINAL
Detailed Project Report
And
Integrated Environmental Assessment

APPENDIX 5

HTRW and Geotechnical Report

North Park Lake
Allegheny County, PA
Section 206 Aquatic Ecosystem Restoration Project

DETAILED PROJECT REPORT

AND

INTEGRATED ENVIRONMENTAL ASSESSMENT

NORTH PARK LAKE

SECTION 206

AQUATIC ECOSYSTEM RESTORATION PROJECT

APPENDIX 5-HTRW AND GEOTECHNICAL REPORT

TABLE OF CONTENTS

Subject Page 5-

1. INTRODUCTION 1
2. REFERENCES 1
3. LOCATION.....1
3.1 NORTH PARK LAKE..... 1
3.2 SEDIMENT PLACEMENT SITES..... 1
3.3 ACCESS SITES..... 1
4. HAZARDOUS, TOXIC, AND RADIOACTIVE WASTE ASSESSMENT 2
5. GEOLOGY.....2
5.1 REGIONAL GEOLOGY..... 2
5.2 MINING..... 3
5.3 SEISMICITY 3
5.3.1 LIQUEFACTION POTENTIAL 3
5.4 SURFACE SOILS..... 4
5.4.1 NORTH PARK LAKE..... 4
5.4.2 SEDIMENT PLACEMENT SITES 4
5.4.3 ACCESS AREAS..... 5
5.5 BEDROCK..... 5
5.5.1 NORTH PARK LAKE..... 5
5.5.2 SEDIMENT PLACEMENT SITES 6
5.5.3 ACCESS SITES 6
6. HYDRAULIC DREDGE OPTION.....6
6.1 SEDIMENT GEOTECHNICAL PROPERTIES..... 7
7. MECHANICAL DREDGE OPTION 10
8. SEDIMENT PLACEMENT AREAS.....10
9. EROSION AND SEDIMENT CONTROL 11

PLATES

Number	Title
5-1	North Park Lake Dredging Area Dredging Plan
5-2	County Sediment Placement Area General Plan & Rock Sediment Control Barrier Detail
5-3	Bull Pen Sediment Placement Area General Plan
5-4	Bull Pen Sediment Placement Area Typical Cross Section & Drainage Ditch Details
5-5	Latodami Sediment Placement Site Grading Plan
5-6	Goldstar Access Site Grading Plan
5-7	Goldstar Access Site Wetlands Protection Barrier Profile
5-8	Goldstar Access Site Wetlands Protection Barrier Cross Sections 10+50 to 12+00
5-9	Goldstar Access Site Wetlands Protection Barrier Cross Sections 12+50 to 14+00
5-10	Mars Access Site Grading Plan
5-11	Pearce Mill Road Access Site Detail Plan View, Typical Ramp Section, & Section A-A
5-12	Rose Barn Access Site Detailed Site Plan & Section A-A
5-13	Point Access Site Detailed Site Plan & Section A-A
5-14	Proposed Dredging Line Alignment Bullpen Sediment Placement Area
5-15	Wildwood Mine Sediment Placement Area General Plan, Section, & Detail
5-16	Wildwood Mine Sediment Placement Area Detail Plan
5-17	Wildwood Mine Sediment Placement Area Cross Sections A-A & B-B
5-18	Wildwood Mine Sediment Placement Area Cross Sections C-C & D-D
5-19	Wildwood Mine Sediment Placement Area Exhibit #15, Mine Permit #461M77
5-20	North Park Lake Dredging Area Coir Fiber Log Locations
5-21	North Park Lake Dredging Area Porcupine Crib & Rock Hump Locations
5-22	North Park Lake Dredging Area – Boring Location Plan

TABLES

Number	Title
5-1	Soil Properties by Depth Below Existing Ground
5-2	North Park Lake Geotechnical Soil Test Results

FIGURES

Number	Title
5-1	Access Road Location
5-2	Location of Potential Sediment Placement, Staging, and Access Areas
5-3	Dredge Output vs Geotube Volume
5-4	Typical Geotube Section

EXHIBITS

Number	Title
5-1	Phase 1 Environmental Site Assessment Report
5-2	Supplement to Phase 1 Environmental Site Assessment Report
5-3	ALTECH Sediment Characterization Report Executive Summary
5-4	Hanging Bag Test Report
5-5	WES Dredge Report
5-6	Boring Logs

1. INTRODUCTION

The purpose of this appendix is to present the results of the geotechnical/environmental field investigations, laboratory testing program, and analysis. This appendix supports the recommendations of the Detailed Project Report for the North Park Lake, Allegheny County, PA Section 206 Aquatic Ecosystem Restoration Project. The scope of this report provides a summary of geotechnical/HTRW data and presents boring locations, subsurface boring data, laboratory test results, and sediment soil classifications and characterizations.

2. REFERENCES

a. EM 1110-2-5027, Confined Disposal of Dredged Material

b. Soil Survey of Allegheny County, dated 1981

c. "Design of Sheet Pile Walls", EM 1110-2-2504, dated March 1994

d. Earthquake Design and Evaluation for Civil Works Projects", ER 1110-2-1806, dated 31 July 1995

e. "Earthquake Design Guidance for Structures (EDGS)" update letter, dated 30 October 1996

3. LOCATION

3.1 NORTH PARK LAKE

North Park Lake is located within North Park, a County-operated facility that lies about 10 miles north of the City of Pittsburgh, Pennsylvania within north central Allegheny County in McCandless, Pine, and Hampton Townships. Covering over 3,000 acres of diverse habitat, North Park is the largest and most heavily used park in Allegheny County. North Park Lake is located entirely within McCandless Township. The Pine Township/McCandless Township Line divides Marshall Lake, a small lake located upstream of North Park Lake on the North Fork of Pine Creek in the northwestern section of the park. A small portion of the southeastern section of the park located just downstream from North Park Lake lies within Hampton Township.

FIGURE 1 shows the general location of North Park Lake and the primary highway network surrounding the park. FIGURE 2 shows potential sediment placement, staging, and access areas.

3.2 SEDIMENT PLACEMENT SITES

The final sediment placement sites selected for this study are located within and adjacent to North Park. The County site is located immediately downstream of the dam, along the east side of Babcock Boulevard. The Bull Pen site is located on a knoll between the two arms of the lake. Allegheny County currently disposes leaves on this site collected during the fall. The Latodami site is located above the Park's Latodomi Interpretive Nature Center building complex. The Wildwood mine site is located about 1.5 miles downstream of Pine Creek Dam just off of Wildwood Road.

3.3 ACCESS SITES

The proposed access sites are located immediately adjacent to the lake. The Goldstar site is located on the left descending bank of the Pine Creek arm of the lake near its upstream end. The Mars site is located on the right descending bank of the North Fork of Pine Creek immediately adjacent to the uppermost reach of the Lake. The Pierce Mill site is located just upstream of the Dam on the left descending bank. The Rose Barn site is located near the

handicapped-fishing pier just downstream from the boathouse. The Point Access site is located adjacent to Lakeshore Drive on the right descending bank of the North Fork of Pine Creek just upstream from where Pine Creek and the North Fork of Pine Creek merge within the lake.

4. HAZARDOUS, TOXIC, AND RADIOACTIVE WASTE ASSESSMENT

Two Environment Assessments were completed for this project. The dredging plan was coordinated with and approved by Pennsylvania Department of Environmental Protection. The environmental assessments and the dredging plan are summarized below. The complete environmental assessments and dredging report are included as EXHIBITS 1 through 3.

An environmental assessment was completed for the entire project (EXHIBIT 1) except for the Wildwood Mine site, which was not a part of the project when the contractor was tasked with preparing the report. A supplemental Environmental Assessment was done for the Wildwood Mine sediment placement site (EXHIBIT 2).

The conclusion of both of the environmental assessments was that there are no major sources of potential contamination which might affect the use of the project areas.

The sediment sampling and geotechnical and chemical testing and analyses for this project were conducted, under contract with the USACE – Pittsburgh District, by ALTECH Environmental Services, Inc., Louisville, KY. The geotechnical characterization and testing were designed to provide sufficient data to base selection of viable sediment removal alternatives and placement options. The field screening and laboratory chemical analyses of the sediment samples were designed to provide sufficient data to determine if any chemical contaminants are present at levels that could be toxic to human health and if so to provide a basis for selection of viable placement sites and methods of placement.

For a complete description of the technical project planning process; the number, location and methods of procuring field samples; and the respective laboratory analysis parameters for each sample, see Section 2 of ALTECH's report. Section 3 describes the results of the field sampling activities and Section 4 outlines the results of the analyses and statistical calculations conducted to evaluate all the analyses detected in the sediment samples relative to applicable PADEP criteria. Boring locations and raw data are depicted in the Figures Section and Tables Section, respectively. Appendix A contains the complete set of boring records and geotechnical laboratory test results and Appendix B presents a comprehensive set of summary tables of the chemical analyses.

ALTECH's Sediment Characterization Report is incorporated into this Appendix as EXHIBIT 3.

5. GEOLOGY

5.1 REGIONAL GEOLOGY

The dam at North Park, Pine Creek Dam, is located just east of the axis of the north-northeast trending Brady Bend Syncline. The strata dip approximately 60 feet per mile to the west-northwest and consist of the lower portion of the Conemaugh Group (Pennsylvanian Age).

The strata consist of interbedded shales, claystones and sandstone with a few local coal seams and limestoneseams. The strata in the slopes above the reservoir consist of redbed claystone with the Pine Creek limestone seam located at the base of the rock layer. The Pine

Creek limestone is thin but may be susceptible to solutioning. The Buffalo sandstone, a 30 to 40-feet thick rock unit, is located below the Pine Creek limestone. Below the Buffalo sandstone is interbedded limestone, claystone, and the Brush Creek coal seam. The stratum below the Brush Creek coal is the Mahoning sandstone, a seam of interbedded sandy shale and sandstone approximately 100 feet thick. Below the Mahoning sandstone is the Upper Freeport coal seam.

The Upper Freeport coal seam is located at elevation 752 below the dam. This seam was extensively mined between the dam and the Wildwood Mine site.

The slopes above the reservoir are considered to be susceptible to shallow landslides and soil creep do to the redbeds weathering.

5.2 MINING

The Upper Freeport coal seam underlies much of the area between the dam and the Wildwood Mine site. The coal seam in this area is approximately 6 feet thick, dips toward the northwest, and was mined during the 1960's. The bottom of the coal seam is at approximately elevation 752 under the County placement area and approximately elevation 780 under the Wildwood Mine site.

5.3 SEISMICITY

North Park is located within a Seismic Risk Zone 1, according to the U.S. Army Corps of Engineers ER 1110-2-1806 Appendix C "Uniform Building Code Seismic Zone Map". This engineering regulation states that the magnitude of the seismic motions shall be included in the feasibility stage in sufficient detail to determine if seismic loads control the design. Standard studies may be used to evaluate liquefaction and deformation potential for this project.

Based on the data found at the USGS web site (http://eqint.cr.usgs.gov/eq/cgi-bin/zipcode.cgi), the Peak Ground Acceleration (PGA) for zip code 15044 is 1.99.

5.3.1 LIQUEFACTION POTENTIAL

The potential for liquefaction is a function of soil type, relative density, confining pressure, intensity and duration of ground shaking. Uniformly graded sand at low relative density and at low confining pressure tends to be most susceptible to liquefaction. Rounded particles are more susceptible to liquefaction than are angular particles. Gravel and silt are also susceptible but require more intense and longer ground shaking than fine sand at the same relative density and confining pressure. Cohesive soil with a low liquid limit and high water content is also susceptible to significant strength loss that results in behavior similar to liquefaction.

Other than the loose, saturated sediments to be excavated, no soils that are susceptible to liquefaction were encountered within the lake. Once these soils are dried and compacted into the fill, they will not be susceptible to liquefaction. Based on the limited information available for the Wildwood Mine site, no liquefaction susceptible soils would be expected. Therefore liquefaction and significant strength loss are not considered to be a risk for this project.

The criteria for liquefaction potential of coarse-grained soil used for this project were:

Soils are loose (N'<5), fine-grained uniform sands with less than 10% fines, a D10 between 0.05 and 1.0 mm and a uniformity coefficient of between 2 and 10.

Deposition age is younger than Holocene (10,000 years). (Most of the soils within the project site are younger than Holocene.)

Soils that satisfy all of the following criteria may be considered susceptible to significant strength loss resulting in behavior similar to liquefaction.

Fraction finer than 0.005 mm <15%

Liquid limit < 35

Natural water content >0.9LL

Liquidity index < 0.75

5.4 SURFACE SOILS

5.4.1 NORTH PARK LAKE

Fairly consistent subsurface conditions were encountered in the borings in Management Units 1 through 5 of North Park Lake (the Pine Creek Arm of the lake). The sediment was generally very soft, greenish gray, silty clay with organics. It was generally designated as CL type soil according to the Unified Soil Classification System (USCS). Near the sediment surface, soil particles were nearly in suspension. There was apparent increase in density with depth and measurable decrease in moisture content with depth. Percent recovery in split-spoon samples from each boring also increased with depth of sample interval.

The thickness of these very soft silty clays in Management Units 1 through 5 extended to greater than 11 feet. Very loose silty sand, generally designated as SM according to the USCS, was encountered beneath the very soft silty clay in most of the borings where geotechnical samples were procured. All moisture content values for the underlying sand at these locations were significantly lower than the overlying clays. The consistent greenish gray sediment color indicated the presence of algae and a pervasive reducing environment where anaerobic decomposition of organic matter is occurring.

In Management Units 6 through 8 (North Fork arm of North Park Lake), subsurface conditions were noticeably different from those encountered in Management Units 1 through 5. The thickness of very soft sediment encountered was generally less than two feet before denser, apparently non-lacustrine sediments and soils were encountered. The soils encountered in Management Units 6 through 8 in North Park Lake varied from high plasticity clays with virtually no coarse fraction to silty sands to clayey gravels. USCS designations included; CH, CL, SM, SC and GC type soils. The soils encountered in Management Units 6 through 8 in North Park Lake were generally denser, exhibited more variable grain size distribution characteristics and lower natural moisture content values than the values found for samples from the Management Units up the Pine Creek Arm and in the area adjacent to the dam (Management Units 1-5).

The consistent greenish gray coloring found in all but one surficial sample in Management Units 1 through 8 borings indicated that presence of algae is ubiquitous throughout North Park Lake and that the lake is eutrophic. The yellow-orange clayey sand and gravelly clay encountered in borings AD-7a and AD-7c appear anomalous, but these conditions likely reflect native soil environments near the shore rather than the reducing environment that pervades the lake bottom.

5.4.2 SEDIMENT PLACEMENT SITES

The soils at the County Site, Bull Pen, and the Wildwood Mine site have been totally

disturbed by human activity. The County site consist of fill that has been partially excavated and refilled and regraded at least once. The Bull Pen site was once paved and is currently used as a leaf recycling area. The edges of the site have been graded to facilitate drainage. The Wildwood site was a mine site until it was reclaimed within the last 5 years. The surface soils are now a layer of thin soil mixed with gravel, coal, and rock fragments. The access roads to the Wildwood Mine site will be constructed on existing road beds that were constructed for power line access and mine site reclamation.

The Latodami site was once a farm field that is reverting to an old field condition. The Soil Survey of Allegheny County shows the surface soils to be a majority Gilpin Series with Wharton Series. The Gilpin Series is Gilpin silt loam that is moderately deep, nearly level to steep, well drained soils on uplands. These soils formed from material weathered from shale and fine grained sandstone. Surface runoff is slow to medium and the erosion hazard is slight. The Warton Series consist of deep, nearly level to moderately steep, moderately well-drained upland soils. Seasonally high ground water levels and low permeability are limitations. The erosion hazard is slight.

5.4.3 ACCESS AREAS

Based on the Allegheny County Soil maps, the surface soils surrounding the lake consist of Ernst Series and Atkins Series.

The Ernst Series consists of deep, nearly level to moderately steep, moderately well drained soils that have a fragipan. They formed in colluvium that weathered from shale and sandstone. Permeability is slow and the ground water is usually high. The erosion hazard is slight, but increases as the slope increases.

The soil immediately surrounding the lake is classified as Atkins silt loam (At). This soil is found on narrow floodplains therefore are subject to frequent flooding. High ground water levels and frequent flooding are limitations of this soil. The erosion hazard is slight.

5.5 BEDROCK

5.5.1 NORTH PARK LAKE

None of the sediment analysis borings encountered bedrock.

Boring logs shown on the as-built plan (dated 1937) for the Pearce Mill Road Bridge over Irwin Run show bedrock being located at elevation 945 to 949. The bedrock generally consists of brown and yellow sandy shale interbedded with thin layers of sandstone. No recovery percentages are shown on the logs.

Boring logs (dated 1937) contained in a dam safety inspection report titled “Pine Creek Dam, Phase I Inspection Report, National Dam Inspection Program, 1979”, show that bedrock beneath the dam footprint consists of shale and sandstone. The top of rock varies between about 937 and 948 across the stream valley. Generally there was about 5 to 10 feet of sandy clay overburden.

Boring logs from the same report show that bedrock along the spillway varies from about elevation 945 to 955. This spillway was constructed in cut.

The drawings show that the gatehouse foundation design elevation was 933.75. Based on boring #11, the intent was to place the foundation on bedrock.

5.5.2 SEDIMENT PLACEMENT SITES

No bedrock information was found for any of the sediment placement sites and no bedrock was noted at any sediment placement sites except along the access road from Lake Shore Drive to the Bull Pen site. Along the upper part of this access road, a rock cut will have to be made to widen the road for truck traffic. The rock consists of interbedded shale and sandstone. The orientation and closeness of the rock joints indicates that the excavation could be accomplished by an excavator.

5.5.3 ACCESS SITES

No bedrock information was found for any of the access sites and no bedrock was noted during any of the site visits.

6. HYDRAULIC DREDGE OPTION

One option to dredge the lake is to use a hydraulic dredge. Because there is not sufficient level land to construct a confined disposal area, the sediment would have to be pumped into geotextile bags (geotubes) for dewatering. The dewatering process would take approximately 30 days after which the geotubes would be cut open and the dried material trucked to the appropriate sediment placement area. The geotube material would be gathered and taken to a licensed landfill.

Because of the limited land space around the lake, several geotube staging areas would have to be developed. The sites would be developed to prevent erosion from the water that seeps from the bags and to level the site to prevent the bags from rolling. Generally, the sites must be no more than 2% slope. The sites would have to be rotated as the work progressed. At some times, the contractor may be prevented from working while waiting for an available staging area to become available.

A hanging bag test was performed to model the field conditions. This test is described and documented in EXHIBIT 4.

After the hanging bag test was completed, a sediment sample was collected and blended then tested. The moisture content at the end of 35 days was 10.6 percent. A one-point proctor test was run to correlate with the final moisture content. A sample as compacted to 90% standard proctor at 3% points below optimum moisture content. This sample was then tested in a triaxial shear test machine.

A flocculent was tested as part of the hanging bag test to help accelerate settlement and dewatering in the geotubes. The flocculent was selected on the basis of a bench test, cost, ease of mixing, and compatibility with wildlife.

EXHIBIT 4 contains details about the flocculent and how it was tested, and the laboratory test results.

FIGURE 5-3 shows a graph of dredge output versus the volume of the geotube for various dredge outlet pipe sizes. This graph shows that the geotube volumes often control the dredging rate.

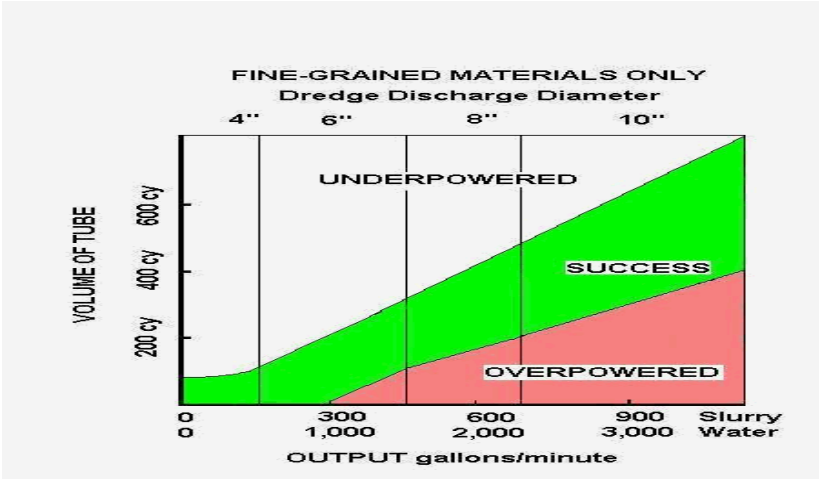

FIGURE 5-3 Dredge Output vs Geotube Volume

A typical section showing a geotube is shown in FIGURE 5-4. Geotubes can be customized to fit project conditions. Typical lengths can be greater than 200 feet. Geotubes must be placed on nearly flat ground, less than 2% grade to prevent rolling. Stability berms, concrete barriers, or tiedowns can be used to improve geotubes stability.

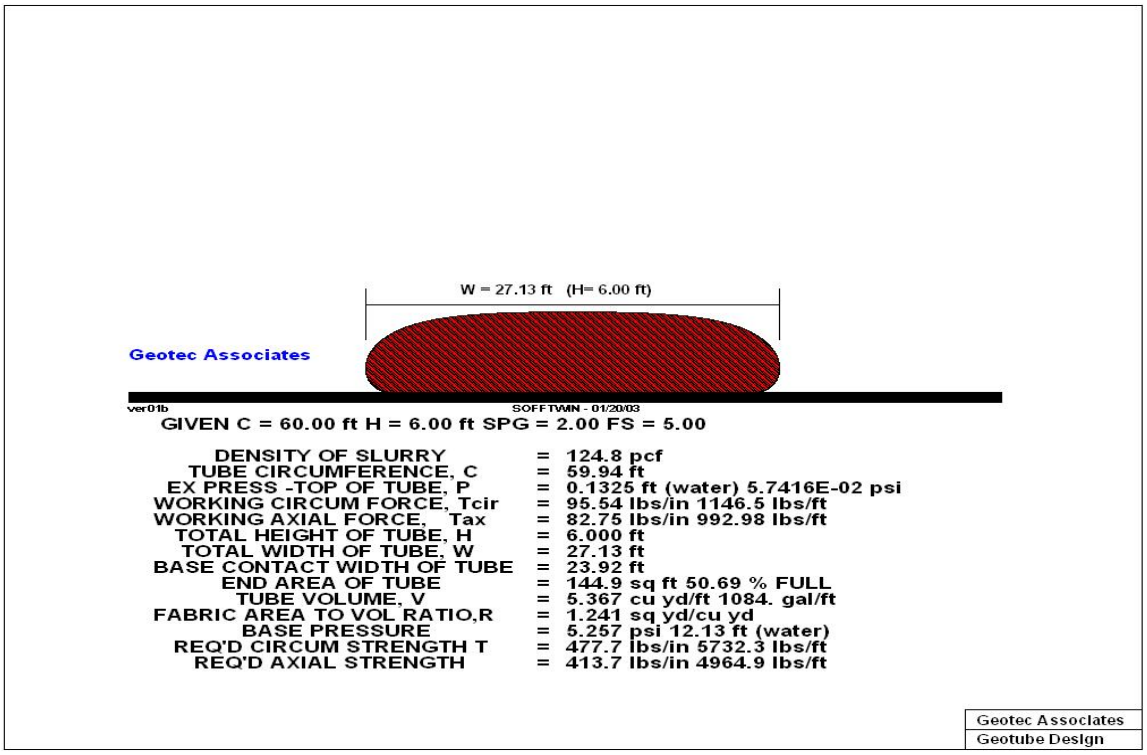

FIGURE 5-4 Typical Geotube Section

The Waterways Experiment Station (WES) provided technical assistance and recommendations concerning types of dredge equipment, dredge output values, and expected times for performing the work. This WES report is included as EXHIBIT 5.

6.1 SEDIMENT GEOTECHNICAL PROPERTIES

As part of the hydraulic dredging evaluation, the laboratory test results from the ALTECH sedimentation characterization report (EXHIBIT 3) were used to determine sediment types and quantities to estimate the number of geotubes needed to dewater the sediments.

The sediments were grouped by depth and the average in-situ water content, in-situ void ration, in-situ dry density, in-situ saturated density, and the buoyant density were calculated. This data is included in TABLE 1. Geotechnical laboratory test results are included in TABLE 2. These values were then used with the hanging bag test to determine the quantities in the geotubes and the final placement quantities.

The laboratory test results confirmed that the sediment changes dramatically from the top of the sediment to the bottom; the upper sediment is much less dense and has a higher water content than the bottom sediment.

Fifteen sediment samples were tested to determine organic content. The organic content was higher in the upper sediments. Values ranged from 1.6 to 4.7 %, with an average of 2.9%.

The average volume from in-situ to dewatered in the geotubes actually increased by 15% due to swelling. The final placed sediment quantity was calculated to be 273,000 cubic yards, or 86 percent of the 317,000 estimated total excavated sediments.

		SOIL PROPERTIES BY DEPTH BELOW EXISTING GROUND					
0-4 FEET DEPTH			USE S.G.=2.68				
BORING	DEPTH	USCS CLASSIFICATION	IN-SITU WATER CONTENT	IN-SITU VOID RATIO	INSITU DRY DENSITY (PCF)	INSITU SAT DENSITY (PCF))	BOUY DENSITY (PCF)
1C	2	CL	101.5	2.72	45.0	90.6	28.5
1C	4	CL	84.5	2.26	51.2	94.5	32.5
2A	2	CL	68.0	1.82	59.3	99.5	37.6
2A	4	CL	68.9	1.85	58.7	99.2	37.3
2C	2	CL	81.1	2.17	52.7	95.4	33.4
2C	4	CL	72.6	1.95	56.8	98.0	36.0
2D	2	CL	82.2	2.20	52.2	95.1	33.1
2D	4	CL	53.5	1.43	68.7	105.5	43.6
3A	2	CL	79.4	2.13	53.5	95.9	33.9
3A	4	CL	82.8	2.22	52.0	95.0	33.0
3B	2	CL	108.0	2.89	42.9	89.3	27.2
3B	4	CL	77.1	2.07	54.5	96.6	34.6
4A	2	CL	82.8	2.22	52.0	95.0	33.0
4A	4	CL	55.7	1.49	67.1	104.5	42.6
4B	2	CL	77.5	2.08	54.3	96.5	34.5
4B	4	CL	25.3	0.68	99.7	124.9	63.2
4C	2	CL	103.5	2.77	44.3	90.2	28.1
4C	4	CL	55.5	1.49	67.2	104.5	42.6
5B	2	CL	151.4	4.06	33.1	83.1	21.0
5B	4	CL	155.3	4.16	32.4	82.7	20.6
5C	2	CL	105.6	2.83	43.7	89.8	27.7
5C	4	CL	124.8	3.34	38.5	86.5	24.4
5D	2	CL	145.1	3.89	34.2	83.8	21.7
5D	4	CL	100.9	2.70	45.1	90.7	28.6
6A	0	CL	59.2	1.59	64.7	102.9	41.0
6B	2	ML	59.2	1.59	64.7	102.9	41.0
6C	2	CH	74.5	2.00	55.8	97.4	35.4
7B	2	CL	43.2	1.16	77.5	111.0	49.2
7A	2	CL					
7C	2	CH					
		AVERAGE	85.0	2.3	54.3	96.5	34.5
		MEDIAN	80.3	2.2	53.1	95.7	33.7
		STAND DEV	31.5	0.8	14.3	9.0	9.1
		COUNT	28.0	28.0	28.0	28.0	28.0
		DF	27.0	27.0	27.0	27.0	27.0
1.703		95% CONF LEVEL FOR ONE TAIL TEST	95.1	2.5	58.9	99.4	37.4
4-8 FEET DEPTH							
BORING	DEPTH	USCS CLASSIFICATION	IN-SITU WATER CONTENT	IN-SITU VOID RATIO	INSITU DRY DENSITY (PCF)	INSITU SAT DENSITY (PCF))	BOUY DENSITY (PCF)
1C	6	CL	53.2	1.4	69.2	105.9	43.5
1C	8	CL	23.6	0.6	102.9	127.2	64.8
2A	6	CL	78.4	2.1	54.1	96.4	34.0
2A	8	CL	47.6	1.3	73.7	108.8	46.4
2C	6	CL	61.9	1.7	63.1	102.1	39.7
2C	8	CL	46.3	1.3	74.9	109.5	47.1
2D	6	CL	46.5	1.3	74.7	109.4	47.0
2D	8	CL	52.5	1.4	69.7	106.3	43.9
3A	6	CL	59.1	1.6	64.9	103.3	40.9
3A	8	CL	62.2	1.7	62.9	102.0	39.6
3B	6	CL	60.6	1.6	63.9	102.6	40.2
3B	8	CL	37.7	1.0	83.5	115.0	52.6
4A	6	CL	86.8	2.3	50.4	94.1	31.7
4A	8	CL	49.7	1.3	71.9	107.7	45.3
4C	6	CL	91.3	2.5	48.6	93.0	30.6
4C	8	CL	77.4	2.1	54.5	96.7	34.3
5B	6	CL	122.7	3.3	39.1	87.0	24.6
5B	8	CL	38.0	1.0	83.2	114.8	52.4
5C	6	CL	91.0	2.5	48.7	93.1	30.7
5C	8	CL	30.3	0.8	92.7	120.7	58.3
5D	6	CL	91.4	2.5	48.6	93.0	30.6
5D	8	CL	20.9	0.6	107.7	130.2	67.8
6C	6	SC	19.5	0.5	110.4	131.9	69.5
		AVERAGE	58.6	1.6	70.1	106.6	44.2
		MEDIAN	53.2	1.4	69.2	105.9	43.5
		STAND DEV	26.3	0.7	19.6	12.3	12.3
		COUNT	23.0	23.0	23.0	23.0	23.0
		DF	22.0	22.0	22.0	22.0	22.0
1.717		95% CONF LEVEL FOR ONE TAIL TEST	68.1	1.8	77.1	111.0	48.6
8-12 FEET							
BORING		USCS CLASSIFICATION	IN-SITU WATER CONTENT	IN-SITU VOID RATIO	INSITU DRY DENSITY (PCF)	INSITU SAT DENSITY (PCF))	BOUY DENSITY (PCF)
2D	12	SC-SM	28.1	0.8	95.8	122.7	60.3
3B	10	CL	26.6	0.7	98.1	124.1	61.7
4A	12	CL	28.7	0.8	94.9	122.2	59.8
4B	10	SC	16.6	0.4	116.3	135.6	73.2
5C	10	CL	27.6	0.7	96.5	123.2	60.8
		AVERAGE	25.5	0.7	100.3	125.6	63.2
		MEDIAN	27.6	0.7	96.5	123.2	60.8
		STAND DEV	5.0	0.1	9.0	5.7	5.7
		COUNT	5.0	5.0	5.0	5.0	5.0
		DF	4.0	4.0	4.0	4.0	4.0
2.132		95% CONF LEVEL FOR ONE TAIL TEST	30.3	0.8	108.9	131.0	68.6

TABLE 5-1

				NORTH PARK LAKE GEOTECHNICAL SOIL TEST RESULTS													
	Boring No.	Depth Ft. (BELOW GL)	FT BELOW DL	Visual Soil Classification	W.C.(%)	GS	L.L.	P.L.	P.I.	Max Size	Grav	Sand	Fines (Pass #200)	% ORGAN CONTENT	E IN SITU	E AT LL	GAMMA INSITU
AD	1C	6	0	CL	23.6	2.66	24	16	8	#10	0	45.5	54.5	2	0.628	0.6384	
AD	2D	8	-1	SC-SM	28.1	2.66	23	16	7	#10	0	60.6	39.4	1.6	0.747	0.6118	95.3
AD	3B	8	0	CL	26.6	2.64	38	22	16	#10	0	14.8	85.2	2.6	0.702	1.0032	97.1
AD	4A	10	0	CL	28.7	2.63	30	17	13	#10	0	23.8	76.2	2.3	0.755	0.789	93.8
AD	4B	8	0	SC	16.6	2.71	29	17	12	1	15.4	41.2	43.4	1.6	0.450	0.7859	117.0
AD	5C	8	0	CL	27.6	2.69	46	25	21	0.35	0.2	10.1	89.7	3.7	0.742	1.2374	96.6
AD	6A	0	0	CL	59.2	2.7	47	22	25	#4	0	13.5	86.5	4.7	1.598	1.269	65.0
AD	6B	2	0	CL	34.5	2.7	42	23	19	#4	0	13.7	86.3	4.1	0.925	1.1256	87.2
AD	6C	4	0	SC	19.5	2.68	34	19	15	0.75	16.9	34.9	48.2	3.5	0.523	0.9112	110.2
AD	7A	2	0	SC	16.2	2.81	31	18	13	1.5	36.3	36.6	27.1	2.1	0.455	0.8711	120.9
AD	7B	0	0	CL	43.2	2.65	38	20	18	0.35	0	14.1	85.9	4.4	1.145	1.007	77.3
AD	7C	2	0	SC	20.1	2.66	26	15	11	0.75	1.8	49.8	48.4	1.4	0.535	0.6916	108.5
AD	7D	0	0	CH	97.5	2.68	59	25	34	#10	0	5.5	94.5	4.2	2.613	1.5812	46.4
AD	8A	0	0	CL	36.5	2.67	40	20	20	1.5	6.8	18.3	74.9	3	0.975	1.068	84.6

TABLE 5-2

7. MECHANICAL DREDGE OPTION

One option to dredge the lake is to drain the lake, maintain the stream flow through the work site and excavate the sediments and load them directly into a contained dump truck. The truck would then take the material to the appropriate sediment placement site where it would be spread and worked to dry it sufficiently to allow it to be compacted.

A rock sediment control barrier will be constructed along Pine Creek, downstream of the concrete spillway to control sediment during construction. This structure will remain after the construction is completed. PLATE 5-2 shows the location and a typical section for the rock sediment control barrier.

8. SEDIMENT PLACEMENT AREAS

The final volume of sediment placed will be less than the volume of sediment excavated due to drying and consolidation. The final placement volume is expected to be approximately 273,000 cubic yards.

Based on the study, the most likely sediment placement areas are the Bull Pen site, the County site, and the Wildwood Mine site. A preliminary placement design was completed for each site, based on maximizing the capacity of each site. PLATES 2, 3, 4, 16, 17, and 18 show typical sections and plan views of the placement design.

Note that the placement design shown on PLATES 16, 17, and 18 was done working with the

assumption that the placement footprint was to be kept to a minimum to minimize the property to be purchased by the County. This design will require very deep fills of up to 50 feet or more and will require removing several acres of trees between the reclaimed mine area and the park. If the County could acquire the entire Wildwood Mine site, the sediment could be placed more uniformly over most of the reclaimed site. This placement strategy would make placement easier, improve the surface soils, make water diversion control more manageable, and would eliminate most of the tree removal. The access road construction would still be needed and some grading and tree removal would be necessary. If the sediment could be placed over the useable reclaimed area of approximately 23 acres, approximately 37,000 cubic yards could be placed for the first foot of depth. Note that this volume per foot of area decreases as the fill rises.

The design capacity for each site is:

Bull Pen 115,000 CY

County 38,000 CY

Wildwood Mine 275,000 CY (if placed as shown on PLATES 16-18)

Note that physically all the sediment could be placed at the County site and the Wildwood Mine site. However, the final cost estimate may show that the project costs could be reduced by also using the Bull Pen site because the trucking distance to the Bull Pen site is less than that of the Wildwood Mine site.

The site development features at the three sediment placement sites are commonly used and are easy to construct. Only the Wildwood Mine site will have an uncommon construction feature. That feature is a rock lined limestone ditch that will carry water diverted around the site and water from the southernmost sediment pond down a steep hillside to Pine Creek. The ditch location and a typical section are shown on PLATE 15.

9. EROSION AND SEDIMENT CONTROL

An erosion and sediment control plan will be submitted to the appropriate state agencies for approval during the plans and specifications phase. The proper state permit for constructing this project will be secured as part of the permitting process. Proposed erosion control measures include rock construction entrances, silt barrier fence, super silt barrier fence, filtering water pumped from excavations, inlet protection, water diversion, staged construction activities, temporary seeding and mulching, and permanent seeding and mulching.

Many of the erosion and sediment control measures constructed for the mine reclamation project are still in place at the Wildwood Mine site. The existing sediment ponds will be upgraded to meet today’s standards.

The access sites and other sediment placement areas will have erosion and sediment control measures planned and constructed as part of the construction project and are shown on the appropriate plates.