new jersey department of transportation

January 2012

# Preliminary Engineering Report

# Layton Lake Dam
# NJ Route 48, M.P. 3.06

## Carneys Point Township, Salem County, NJ



McCormick Taylor
Engineers & Planners Since 1946

700 East Gate Drive, Suite 201, Mt. Laurel, New Jersey 08054

# STATE OF NEW JERSEY
# DEPARTMENT OF TRANSPORTATION

## *PRELIMINARY ENGINEERING REPORT*

***for***

**LAYTONS LAKE DAM**
**NJ ROUTE 48, M.P. 3.06**

**CARNEYS POINT TOWNSHIP**
**SALEM COUNTY, NJ**

***Prepared for:***

New Jersey Department of Transportation
Division of Project Management
1035 Parkway Avenue
Trenton, New Jersey 08625

***Prepared by:***

McCormick Taylor, Inc.
700 East Gate Drive, Suite 201
Mt. Laurel, NJ 08054

**January 2012**

**Preliminary Engineering Report**
**Laytons Lake Dam**
**NJ Route 48, M.P. 3.06**
**Carneys Point Township, Salem County, New Jersey**

***Table of Contents***


I. Introduction....1
A. Foreword....1
B. Project Purpose and Need....1
C. Design Standards....1
D. Preliminary Engineering Scope Statement Summary....3

II. Project Survey....32
A. Control Survey....32
1. Control Survey and Report....32
2. Topographic Mapping and Survey....32
3. Prepare Base Maps....32

III. Utility Engineering....32
A. Utility Engineering Summary....32

IV. Roadway Engineering....35
A. Pavement Recommendation Summary....35
B. Preliminary Drainage Design Summary....35
1. Stream Hydrologic and Hydraulic Analysis....35
2. Dam Rehabilitation Alternatives....35
3. Stormwater Quality....36
4. Drawdown Calculations....36
5. Dam Failure Analysis....36
C. Preliminary Traffic Engineering Summary....37
1. Obtain Traffic Loading Data....37
2. Prepare Traffic Loading Data....38
3. Obtain Approvals for Detour....38
4. Establish Lane Restriction Parameters....38
D. Geometrics Summary....38
1. Horizontal Alignment....39
2. Minimum Radius....39
3. Passing Sight Distance....39
4. Stopping Sight Distance....39
5. Superelevation....40
6. Superelevation Transition....40
7. Vertical Alignment....40
8. Grades....40
9. Vertical Curves....40
10. Stopping Sight Distance....41

*Table of Contents (cont'd)*


11. Lane and Shoulder Width ....41
12. Lane Cross Slope ....41
13. Shoulder Cross Slopes ....41
14. Curbing ....41
15. Sidewalks ....41
16. Guiderail ....42
17. At-Grade Intersection....42
18. Access ....42
19. Substandard Design Elements....43

E. Preliminary Road Plans....43

V. Structural Engineering ....44
A. Preliminary Geotechnical Engineering Report Summary....44
B. Preliminary Engineering for Structure Design ....44

VI. Right-of-Way Access....45
A. Project Access Plan....45
B. Right-of-Way Report Summary....45
C. Initial Right-of-Way Estimate....45

VII. Environmental....45
A. Environmental Document Summary....45
1. Wetland Delineation ....45
2. Cultural Resources Technical Studies ....46
3. Section 4(f) Technical Study ....46
4. Ecology/Wetlands Technical Study....46
5. Hazardous Waste Technical Study ....46
6. CED....46
B. Public Information Center Summary....47

VIII. Constructability and Maintenance ....47
A. Public Detour and Construction Staging Plans Summary ....47

IX. Project Plan ....47

X. Cost Estimates....47

XI. Baseline Schedule ....47

XII. Public Involvement Action Plan ....47

*Table of Contents (cont'd)*

***List of Figures***

Figure 1 – Project Location Map .....2

***List of Tables***

Table 1 - Summary of Proposed Condition Peak Flow and Maximum Water Surface Elevations Downstream of Layton Lake Dam.....37

***List of Appendices***

Appendix A – Photos
Appendix B – Subsurface Utility Test Pit Logs
Appendix C – Pavement Recommendations
Appendix D – Existing Conditions – Dam & Spillway
Appendix E – Proposed Conditions- Dam & Spillway
Appendix F – Meetings and Correspondence

Appendix G – Proposed Plans
Appendix H – Geotechnical Report
Appendix I – Environmental – Section 1 – Wetlands
Environmental – Section 2 – Hazardous Waste
Environmental – Section 3 – Categorical Exclusion Documentation (CED)
Appendix J – Cost Estimates
Appendix K – Project Management Plan
Appendix L – NJDOT Scope Statement – Final Design
Appendix M – Design Communication Report
Appendix N – Baseline Schedule
Appendix O – Public Involvement Action Plan

# PRELIMINARY ENGINEERING REPORT
# LAYTONS LAKE DAM
# NJ ROUTE 48 MP 3.06
# CARNEYS POINT TOWNSHIP
# SALEM COUNTY, NEW JERSEY

## I. INTRODUCTION

### A. FOREWORD

Laytons Lake Dam is located at milepost 3.06 of NJ Route 48 in Carneys Point Township, Salem County, NJ. The dam embankment carries NJ Route 48 in a west to east direction over Game Creek. New Jersey Department of Transportation (NJDOT) owns NJ Route 48 and maintains the dam and spillway of Laytons Lake. The lake is used for recreational activities and adjacent landowners have operated the existing sluice gates. Refer to ***Figure 1 – Project Location Map*** and to ***Appendix A – Photos***. At this time NJDOT has requested that MT perform Preliminary Engineering Services for Laytons Lake Dam. This report is based on the Scope of Work approved by NJDOT.

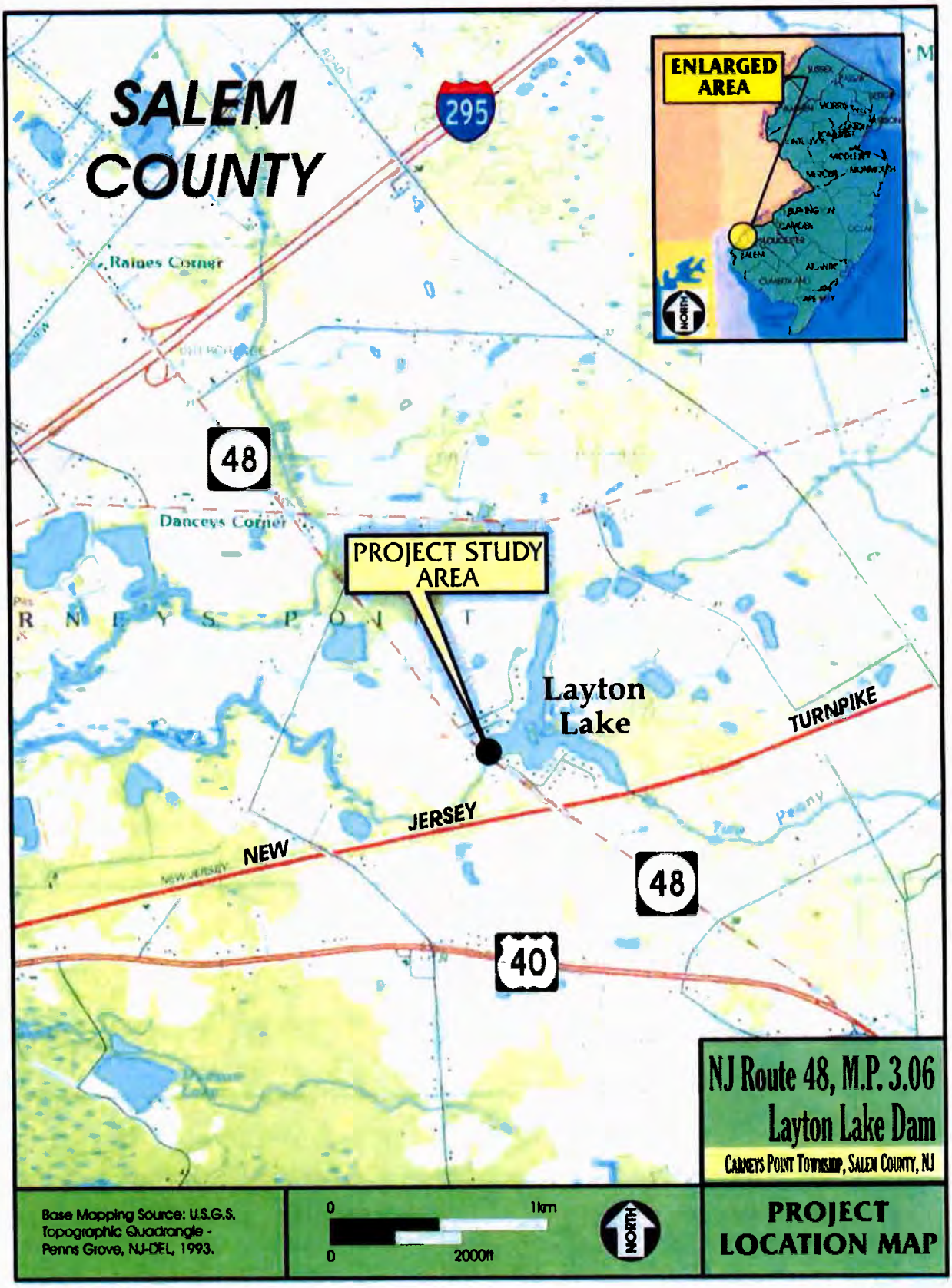
### B. PROJECT PURPOSE AND NEED

Layton Lake Dam is classified as "Significant Hazard" and does not conform to current dam safety regulations. As a result, New Jersey Department of Environmental Protection – Bureau of Dam Safety and Flood Control (NJDEP-BDSFC) mandated that New Jersey Department of Transportation (NJDOT) perform a detailed study of the dam. McCormick Taylor, Inc. (MT) was authorized to perform an analysis of the dam. MT submitted a Spillway Design Report to NJDEP-BDSFC in 2009. A "Significant Hazard" dam is generally required to have a spillway with capacity to discharge flow during a 0.5 Probable Maximum Flood (PMF). However, there are some conditions that may support a decrease of the spillway design storm (SDS). Based on the analysis performed NJDEP-BDSFC accepted the recommendation of MT to decrease the SDS for Laytons Lake Dam to the 100 – year storm event. The existing facility does not have capacity to convey the SDS with the required one foot of freeboard.

The dam is about 13 feet high and 500 feet in length. The spillway is a concrete ogee type in a semi-circular configuration with an effective length of about 90 feet. Two 48 inch diameter sluice gates are located near the eastern limit of the spillway. The gates are operated with hand cranks accessed from a catwalk pier. Laytons Lake Dam was also determined to be affected by Alkali-Silica Reactivity (ASR). ASR is caused by a reaction between the alkaline cement pore solution in the concrete and reactive forms of silica in the aggregate. It can cause expansion and cracking of the concrete resulting in structural problems and possible failure.

### C. DESIGN STANDARDS

All work relative to the rehabilitation of the dam and spillway has been performed in accordance with the NJDEP-BDSFC dam safety regulations (Safe Dam Act N.J.S.A. 58:4 and Dam Safety Standards N.J.A.C. 7:20). Work relative to roadway, storm drains, stormwater management and wetlands has been performed in accordance with the NJDOT Roadway Design Manual and the New Jersey Administrative Code sections 7:8, 7:7A and as may apply.




McCormick Taylor

*FIGURE 1*

## PRELIMINARY ENGINEERING SCOPE STATEMENT SUMMARY

# <Laytons Lake Dam >

**Purpose:** The intent of the Preliminary Engineering (PE) Scope Statement is to provide useful project information to designers who are interested in becoming the designer of record for PE and possibly Final Design and Construction for this project. In addition, it will be used to solicit a man-hour estimate and cost proposal. The PE Scope Statement identifies the key elements of PE that are necessary to advance the proposed project to the Final Design (FD) phase.

The PE Scope Statement is developed by the Division of Project Development (DPD) Lead Engineer and the CD designer near the conclusion of CD, prior to requesting the services of a designer to perform PE. The Scope of Work section is approved by the appropriate Subject Matter Experts (SME).

Section 1 of the document focuses on Proposed Project Identification Information and Concept Development (CD) data including the location and description. Section 2 of the document specifies the Scope of Work for PE.

# PROPOSED PROJECT IDENTIFICATION INFORMATION

## PROPOSED PROJECT SPECIFICS

| **Proposed Project Name** | **Limits** |
|---|---|
| Laytons Lake Dam | MP 2.9 – 3.2 |
| **DPD Lead Engineer** | **DPD Manager** |
| Willie Colquitt | Tom Saylor |
| **Designer** | |
| McCormick Taylor, Inc. | |
| **Counties** | **Municipalities** |
| Salem Select County 2 Select County 3 | Carneys Point Township |
| **UPC Number** | |
| **DB Number** | |
| **Legislative District(s)** | |
| **Congressional District (s)** | |
| **Route NJ Route 48** | |
| **Start Milepost 2.9** | |
| **End Milepost 3.2** | |
| **Alternate Route** | |
| **Alternate Start Milepost** | |
| **Alternate End Milepost** | |
| **STIP Information** | |
| **Structure Numbers** | |
| **Project Classification:** | Dam and Spillway Reconstruction |
| **MPO** | |

## PROPOSED PROJECT ESTIMATE

List the Proposed Project estimates for each category from Concept Development.

| Project Item: | CD Phase Estimated Amount |
|---|---|
| Design | $1,800,000 |
| ROW | $ 50,000 |
| Utility Relocation | $ 300,000 |
| Construction | $8,763,000 |
| Construction Engineering | $1,420,000 |
| Contingencies | $ 318,000 |
| | |
| Total | $12,651,000 |

## CONCEPT DEVELOPMENT INFORMATION

| | | | |
|---|---|---|---|
| **Date of Concept Development Report:** | _____ | **Date of CD Scope Summary Meeting:** | June 4, 2010 |
| **Date of CPC decision to advance project to PE:** | _____ | **Date of Federal Approval of CD Report:** | _____ |
| **CD Designer:** | _____ | | |
| **PE to be Completed by (check one):** | ☐ In-House<br>☒ Consultant | | |

## PRELIMINARY ENGINEERING INFORMATION (to be filled in upon selection of a designer)

### PE Project Information

| | | | |
|---|---|---|---|
| **Designer's Name:** | McCormick, Taylor, Inc. | | |
| **FMIS Contract ID Number (i.e. 89 00766)**: | | **Funding Source:** | |
| **Agreement Number (i.e. 2001PM03)**: | | | |

## APPROVAL

| Name | Title | Date Approved |
|---|---|---|
| | | |
| Willie Collquitt | Division of Project Development | mm/dd/yy |
| Tom Saylor | Manager, Division of Project Development | mm/dd/yy |
| Lynn Rich | Director, Division of Project Development | mm/dd/yy |

| | | |
|---|---|---|
| Janet Fittapaldi | Manager, Bureau of Landscape Architecture and Environmental Services | mm/dd/yy |

# PRELIMINARY ENGINEERING SCOPE OF WORK

**NOTE**: The PE designer will perform the tasks associated with PE as so marked, in preparation for Final Design. The Lead Engineer of the DPD will review and negotiate the proposal, execute the Agreement and instruct the designer to begin work. The DPD Lead Engineer will direct the proposed project through PE.

## Capital Program Management

**Division of Project Development**
**Technical and Administrative Activities**

| | | | |
|---|---|---|---|
| **Sign Off by Division of Project Development Supervisor/Manager** | | **Date:** | |

| Activity No. | Activity Name | Execute | Responsible Unit | Comments |
|---|---|---|---|---|
| 3005 | Initiate Preliminary Engineering | ☒ Yes ☐ No | ☒ DPD ☒ Designer | |
| 3160 | Prepare Draft Preliminary Engineering Report | ☒ Yes ☐ No | ☒ DPD ☒ Designer | |
| 3170 | Prepare Final Design Scope Statement | ☒ Yes ☐ No | ☒ SME's ☒ DPD ☒ Designer | |
| 3175 | Complete Preliminary Engineering Quality Certification | ☒ Yes ☐ No | ☒ Designer | |
| 3180 | Update Project Management Plan | ☒ Yes ☐ No | ☒ DPD | |
| 3195 | Prepare Project Management Plan (**Major Projects**) | ☐ Yes ☐ No | ☐ DPD ☐ Designer | |
| 3200 | FHWA Approves Draft Project Management Plan (**Major Projects**) | ☐ Yes ☐ No | ☐ DPD ☐ Designer FHWA | |
| 3205 | NJDOT Reviews Draft Preliminary Engineering | ☒ Yes ☐ No | ☒ DPD ☐ DPM ☒ SME's | |

| | | | | |
|---|---|---|---|---|
| | Report | | ☐ Designer | |
| 3210 | FHWA Reviews and Approves Preliminary Engineering Report | ☒ Yes ☐ No | ☒ DPD ☐ Designer FHWA | |
| 3215 | Present to Capital Program Screening Committee | ☒ Yes ☐ No | ☒ DPD | |
| 3220 | Capital Program Committee Approves Advancement to Final Design | ☒ Yes ☐ No | ☒ DPD CPC | |
| 3225 | Assess Designer | ☒ Yes ☐ No | ☒ DPD ☒ DPM | |
| 3280 | Hold Project Briefing | ☒ Yes ☐ No | ☒ DPD ☒ DPM | |
| 3285 | Complete PE Closeout | ☒ Yes ☐ No | ☒ DPD | |
| 3960 | Obtain Traffic Loading Data | ☒ Yes ☐ No | ☒ DPD ☒ Designer | |

**ADDITIONAL INPUT**

*This section has been provided for the CD designer and the functional units to state any assumptions, to clarify and customize standard activities, and to add important information. Please be clear and concise. Provide your unit's contact person and number.*

## Division of Right of Way and Access Management
## ROW

| Sign Off by Right of Way Supervisor/Manager | | Date: | |
|---|---|---|---|

| Activity No. | Activity Name | Execute | Responsible Unit | Comments |
|---|---|---|---|---|
| 3110 | Prepare ROW Report | ☒ Yes ☐ No | ☒ Designer | |
| 3115 | Initiate ROW Impact Plan | ☒ Yes ☐ No | ☒ Designer | |
| 3120 | Hold ROW Kick-Off Meeting | ☒ Yes ☐ No | ☒ ROW ☒ DPD ☒ Designer ☐ DPM | |
| 3125 | Prepare Initial ROW Estimate | ☒ Yes ☐ No | ☒ DPD ☒ ROW | |

**ADDITIONAL INPUT**

*This section has been provided for the CD designer and the functional units to state any assumptions, to clarify and customize standard activities, and to add important information. Please be clear and concise. Provide your unit's contact person and number.*

*Examples of information for this section includes number and type of parcels, known environmental problems, riparian parcels, public commitments, etc.*

Two temporary construction easements are necessary for construction of the proposed spillway and bridge abutments – located in the lake Block 233 Lot 14 and Block 236 Lot 2 and one partial take Block 235, Lot 12.

## Division of Right of Way and Access Management
## Office of Access Design

| | | | |
|---|---|---|---|
| **Sign Off by Office of Access Management Supervisor/Manager** | | **Date:** | |

| Activity No. | Activity Name | Execute | Responsible Unit | Comments |
|---|---|---|---|---|
| 3105 | Prepare Project Access Plan and Access Impact Summary | ☒ Yes ☐ No | ☒ Designer ☐ OAD ☒ DPD | |

**ADDITIONAL INPUT**

*This section has been provided for the CD designer and the functional units to state any assumptions, to clarify and customize standard activities, and to add important information. Please be clear and concise. Provide your unit's contact person and number.*

*Examples of information for this section includes number of driveways impacted, pending agreements or major access permit applications, driveway modifications causing circulation issues, alternative access issues, Access Impact Assistance issues, etc.*

Raising and reconstruction of the roadway will impact three roadway intersections and four driveways. The roadways are Oak Lane, Lakeside Lane and Laytons Lake Drive. The driveways affected are located at Block 236 Lot 2, Block 249 Lots 8.0 and 8.01 and Lot 10.

**Division of Capital Program Support**
**Bureau of Landscape Architecture and Environmental Solutions**
**Drainage**

| | | | |
|---|---|---|---|
| **Sign Off by Drainage Supervisor/Manager** | | **Date:** | |

| Activity No. | Activity Name | Execute | Responsible Unit | Comments |
|---|---|---|---|---|
| 3085 | Prepare Preliminary Drainage Design | ☒ Yes ☐ No | ☒ DPD ☒ Designer | |

**ADDITIONAL INPUT**

*This section has been provided for the CD designer and the functional units to state any assumptions, to clarify and customize standard activities, and to add important information. Please be clear and concise. Provide your unit's contact person and number.*

*Examples of information for this section includes drainage deficiencies, new/improved outfalls, storm water management rules, permits, Best Management Practices (structural and non-structural), easements/right-of-way, etc.*

In addition to the reconstruction of the spillway and bridge, proposed improvements would also include new/upgraded storm drainage facilities. Two storm drainage systems are proposed in this alternative. The first or western most system begins near the intersection of Oak Lane with NJ Route 48 and runs east along NJ Route 48 to Game Creek. The second proposed drainage system is located east of the existing bridge and spillway. The system runs along NJ Route 48 to Game Creek. Field investigations were made within the project area to determine if construction of an infiltration basin was viable to provide improvement to the quality of water discharged to Game Creek. It was determined that the depth to the water table would prohibit infiltration as an option for water quality improvement. Two stormwater treatment devices are proposed upstream of the two new outfalls.

# Preliminary Engineering

**Division of Capital Program Support**
**Bureau of Landscape Architecture and Environmental Solutions**
**Landscape Architecture**

| | | | |
|---|---|---|---|
| **Sign Off by Landscape Architecture Supervisor/Manager** | | **Date:** | |

| Activity No. | Activity Name | Execute | Responsible Unit | Comments |
|---|---|---|---|---|
| | | ☐ Yes ☐ No | | |

**ADDITIONAL INPUT**

*This section has been provided for the CD designer and the functional units to state any assumptions, to clarify and customize standard activities, and to add important information. Please be clear and concise. Provide your unit's contact person and number.*

*Examples of information for this section include screens or buffers, aesthetic plantings, non-veg surfaces, reforestation, etc.*

**Division of Capital Program Support**
**Bureau of Landscape Architecture and Environmental Solutions**
**Environmental Solutions**

| | | | |
|---|---|---|---|
| **Sign Off by Environmental Solutions Supervisor/Manager** | | **Date:** | |

| Activity No. | Activity Name | Execute | Responsible Unit | Comments |
|---|---|---|---|---|
| 3300 | Initiate Cultural Resources (Section 106) Process | ☒ Yes ☐ No | ☒ BLAES<br>☒ Designer | |
| 3305 | Conduct CR Survey | ☒ Yes ☐ No | ☒ BLAES<br>☒ Designer | |
| 3310 | Prepare CR Survey Report | ☒ Yes ☐ No | ☒ BLAES<br>☒ Designer | |
| 3315 | Review CR Survey Report | ☒ Yes ☐ No | ☒ BLAES | |
| 3320 | Address Comments on CR Report | ☒ Yes ☐ No | ☒ BLAES<br>☒ Designer | |
| 3325 | Approve CR Survey Report | ☒ Yes ☐ No | ☒ BLAES | |
| 3330 | Obtain SHPO Concurrence (No Resources, No Effect, No Adverse Effect) | ☒ Yes ☐ No | SHPO | |
| 3335 | Prepare Draft MOA (Adverse Effect Only) | ☐ Yes ☒ No | ☐ BLAES<br>☐ Designer | |
| 3340 | Obtain SHPO Concurrence (No Adverse Effect with Conditions or Adverse Effect) | ☐ Yes ☒ No | ☐ BLAES<br>SHPO | |
| 3345 | Obtain FHWA Approval of CR Survey Report | ☐ Yes ☒ No | ☐ FHWA | |
| 3350 | Prepare Adverse Effect Documentation & Submit to FHWA (Adverse Effect Only) | ☐ Yes ☒ No | ☐ BLAES | |

| | | | |
|---|---|---|---|
| 3355 | FHWA Sends Adverse Effect Documentation to ACHP | ☐ Yes ☒ No | FHWA | |
| 3360 | ACHP Reviews and Accepts or Declines Participation | ☐ Yes ☒ No | ACHP | |
| 3365 | Resolve Adverse Effects | ☐ Yes ☒ No | ☐ BLAES<br>FHWA | |
| 3370 | Circulate MOA for Comment | ☐ Yes ☒ No | ☐ BLAES | |
| 3375 | Prepare Final MOA | ☐ Yes ☒ No | ☐ BLAES | |
| 3380 | Execute the MOA | ☐ Yes ☒ No | ☐ BLAES<br>☐ DPD<br>FHWA, ACHP, SHPO | |
| 3390 | Submit Historic Sites Council Application | ☐ Yes ☒ No | ☐ BLAES<br>☐ Designer<br>SHPO | |
| 3395 | Present to Historic Sites Council | ☐ Yes ☒ No | ☐ BLAES<br>Historic Sites Council | |
| 3400 | Inform Jurisdictional Agency Regarding Programmatic Section 4(f) Impacts | ☐ Yes ☒ No | ☐ BLAES | |
| 3405 | Receive Concurrence Regarding Programmatic Section 4(f) Impacts | ☐ Yes ☒ No | Jurisdictional Agencies | |
| 3410 | Prepare Programmatic Section 4(f) Evaluation | ☐ Yes ☒ No | ☐ BLAES<br>☐ Designer | |
| 3420 | Prepare De Minimis Section 4(f) Evaluation | ☐ Yes ☒ No | ☐ BLAES<br>☐ Designer | |
| 3425 | Prepare Programmatic Net Benefit Section 4(f) Evaluation | ☐ Yes ☒ No | ☐ BLAES<br>☐ Designer | |
| 3430 | NJDOT Reviews Programmatic Section 4(f) Evaluation | ☐ Yes ☒ No | ☐ BLAES | |
| 3435 | Revise Programmatic Section 4(f) Evaluation (NJDOT Comments) | ☐ Yes ☒ No | ☐ BLAES<br>☐ Designer | |
| 3440 | FHWA Reviews Programmatic Section 4(f) Evaluation | ☐ Yes ☒ No | FHWA | |

| | | | | |
|---|---|---|---|---|
| 3445 | Revise Programmatic Section 4(f) Evaluation (NJDOT Comments) | ☐ Yes ☒ No | ☐ BLAES<br>☐ Designer<br>FHWA | |
| 3450 | FHWA Approves Programmatic Section 4(f) Evaluation | ☐ Yes ☒ No | FHWA | |
| 3460 | Inform Jurisdictional Agency Regarding Draft Individual Section 4 (f) Impacts | ☐ Yes ☒ No | ☐ BLAES | |
| 3465 | Receive Concurrence Regarding Draft Individual Section 4(f) Impacts | ☐ Yes ☒ No | Jurisdictional Agencies | |
| 3470 | Prepare Draft Individual Section 4 (f) Evaluation | ☐ Yes ☒ No | ☐ BLAES<br>☐ Designer | |
| 3475 | NJDOT Reviews Draft Individual Section 4(f) Evaluation | ☐ Yes ☒ No | ☐ BLAES | |
| 3480 | Revise Draft Individual Section 4(f) Evaluation (NJDOT Comments) | ☐ Yes ☒ No | ☐ BLAES<br>☐ Designer | |
| 3485 | FHWA Reviews and Comments on Draft Individual Section 4(f) Evaluation | ☐ Yes ☒ No | FHWA | |
| 3490 | Revise Draft Individual Section 4(f) Evaluation (FHWA Comments) | ☐ Yes ☒ No | ☐ BLAES<br>☐ Designer<br>FHWA | |
| 3495 | Conduct Draft Individual Section 4(f) Legal Sufficiency Review | ☐ Yes ☒ No | ☐ BLAES<br>☐ Designer<br>FHWA | |
| 3500 | Circulate Draft Individual Section 4(f) Evaluation | ☐ Yes ☒ No | ☐ BLAES<br>☐ Designer | |
| 3505 | Prepare Final Individual Section 4(f) Evaluation | ☐ Yes ☒ No | ☐ BLAES<br>☐ Designer | |
| 3510 | FHWA Approves Final Individual Section 4(f) Evaluation | ☐ Yes ☒ No | FHWA | |
| 3520 | Inform Green Acres Program and Local Officials | ☐ Yes ☒ No | ☐ BLAES | |
| 3525 | Receive Concurrence on Green Acres Impacts | ☐ Yes ☒ No | Green Acres Prog.<br>Local Officials | |
| 3530 | Hold Green Acres Pre-Application Meeting | ☐ Yes ☒ No | ☐ BLAES<br>☐ Designer | |

| | | | | |
|---|---|---|---|---|
| 3535 | Negotiate Green Acres Compensation | ☐ Yes ☒ No | ☐ BLAES<br>☐ Designer<br>Green Acres Prog.<br>Local Officials | |
| 3540 | Identify Alternatives (EA Only) | ☐ Yes ☒ No | ☐ BLAES ☐ DPD<br>☐ Designer | |
| 3545 | Prepare EA or EA/4(f) | ☐ Yes ☒ No | ☐ Designer | |
| 3550 | NJDOT Reviews EA | ☐ Yes ☒ No | ☐ BLAES | |
| 3555 | Revise EA (NJDOT Comments) | ☐ Yes ☒ No | ☐ Designer | |
| 3560 | FHWA Reviews EA | ☐ Yes ☒ No | FHWA | |
| 3565 | Revise EA (FHWA Comments) | ☐ Yes ☒ No | ☐ BLAES<br>☐ Designer | |
| 3570 | FHWA Approves EA | ☐ Yes ☒ No | FHWA | |
| 3575 | Conduct Draft Individual Section 4(f) Legal Sufficiency Review (EA) | ☐ Yes ☒ No | ☐ BLAES<br>☐ Designer<br>FHWA | |
| 3580 | Circulate EA | ☐ Yes ☒ No | ☐ BLAES<br>☐ Designer | |
| 3585 | Hold EA Public Hearing and Comment Period | ☐ Yes ☒ No | ☐ BLAES<br>☐ Designer ☐ OCR | |
| 3590 | Address EA Comments | ☐ Yes ☒ No | ☐ BLAES<br>☐ Designer<br>FHWA | |
| 3595 | Submit FONSI Request Package | ☐ Yes ☒ No | ☐ BLAES | |
| 3600 | FHWA Approves Final Individual Section 4(f) (EA) | ☐ Yes ☒ No | FHWA | |
| 3605 | FHWA Reviews and Issues FONSI | ☐ Yes ☒ No | FHWA | |
| 3610 | Publish Notice of FONSI Availability | ☐ Yes ☒ No | ☐ BLAES<br>☐ Designer ☐ OCR | |

| | | | | |
|---|---|---|---|---|
| 3620 | Publish Notice of Intent in Federal Register (EIS Only) | ☐ Yes ☒ No | ☐ BLAES<br>FHWA | |
| 3625 | Invite Cooperating Agencies (EIS Only) | ☐ Yes ☒ No | FHWA | |
| 3630 | Hold NEPA Scope Meeting (EIS Only) | ☐ Yes ☒ No | ☐ BLAES ☐ DPD<br>☐ Designer<br>FHWA | |
| 3635 | Prepare Alternatives Analysis Report | ☐ Yes ☒ No | ☐ BLAES ☐ DPD<br>☐ Designer | |
| 3640 | Prepare DEIS or DEIS/4(f) | ☐ Yes ☒ No | ☐ Designer | |
| 3645 | NJDOT Reviews DEIS | ☐ Yes ☒ No | ☐ BLAES | |
| 3650 | Revise DEIS (NJDOT Comments) | ☐ Yes ☒ No | ☐ Designer | |
| 3655 | FHWA Reviews DEIS | ☐ Yes ☒ No | FHWA | |
| 3660 | Revise DEIS (FHWA Comments) | ☐ Yes ☒ No | ☐ BLAES<br>☐ Designer | |
| 3665 | FHWA Approves DEIS to Circulate | ☐ Yes ☒ No | FHWA | |
| 3670 | Publish Notice of Availability in Federal Register (DEIS) | ☐ Yes ☒ No | ☐ BLAES<br>EPA | |
| 3675 | Circulate DEIS | ☐ Yes ☒ No | ☐ BLAES<br>☐ Designer | |
| 3680 | Hold EIS Public Hearing and Comment Period | ☐ Yes ☒ No | ☐ BLAES ☐ OCR<br>☐ Designer | |
| 3685 | Address Public and Agency Comments | ☐ Yes ☒ No | ☐ BLAES<br>☐ Designer | |
| 3690 | Select Final Alternative | ☐ Yes ☒ No | ☐ DPD<br>Scope Team | |
| 3700 | Prepare and Submit FEIS | ☐ Yes ☒ No | ☐ BLAES<br>☐ Designer | |
| 3705 | FHWA Reviews and Comments on FEIS | ☐ Yes ☒ No | FHWA | |
| 3710 | Address FEIS Comments | ☐ Yes ☒ No | ☐ BLAES<br>☐ Designer | |

| | | | | |
|---|---|---|---|---|
| 3715 | FHWA Reviews FEIS for Legal Sufficiency and Approval | ☐ Yes ☒ No | ☐ BLAES<br>☐ Designer<br>FHWA | |
| 3720 | Publish EIS Notice of Availability in Newspaper | ☐ Yes ☒ No | ☐ BLAES ☐ OCR | |
| 3725 | Publish FEIS Notice in Federal Register | ☐ Yes ☒ No | ☐ BLAES<br>EPA | |
| 3730 | FHWA Publishes ROD in Federal Register | ☐ Yes ☒ No | ☐ BLAES ☐ DPD | |
| 3735 | Circulate FEIS | ☐ Yes ☒ No | ☐ BLAES<br>☐ Designer | |
| 3740 | Conduct Air Quality Study | ☐ Yes ☒ No | ☐ BLAES<br>☐ Designer | |
| 3745 | Prepare Air Quality TES | ☐ Yes ☒ No | ☐ BLAES<br>☐ Designer | |
| 3750 | NJDOT Reviews Air Quality TES | ☐ Yes ☒ No | ☐ BLAES | |
| 3755 | Address Air Quality TES Comments | ☐ Yes ☒ No | ☐ BLAES<br>☐ Designer | |
| 3760 | Approve Air Quality TES | ☐ Yes ☒ No | ☐ FHWA<br>☐ BLAES | |
| 3765 | Conduct Ecology Study | ☐ Yes ☒ No | ☐ BLAES<br>☐ Designer | |
| 3770 | Prepare Ecology TES | ☐ Yes ☒ No | ☐ BLAES<br>☐ Designer | |
| 3775 | NJDOT Reviews Ecology TES | ☐ Yes ☒ No | ☐ BLAES | |
| 3780 | Address Ecology TES Comments | ☐ Yes ☒ No | ☐ BLAES<br>☐ Designer | |
| 3785 | Approve Ecology TES | ☐ Yes ☒ No | ☐ BLAES | |
| 3790 | Conduct Socio-Economic Study | ☐ Yes ☒ No | ☐ BLAES<br>☐ Designer | |
| 3795 | Prepare Socio-Economic TES | ☐ Yes ☒ No | ☐ BLAES<br>☐ Designer | |
| 3800 | NJDOT Reviews Socio-Economic TES | ☐ Yes ☒ No | ☐ BLAES | |

| | | | | |
|---|---|---|---|---|
| 3805 | Address Socio-Economic TES Comments | ☐ Yes ☒ No | ☐ BLAES<br>☐ Designer | |
| 3810 | Approve Socio-Economic TES | ☐ Yes ☒ No | ☐ BLAES | |
| 3815 | Conduct Noise Study | ☐ Yes ☒ No | ☐ BLAES<br>☐ Designer | |
| 3820 | Prepare Noise TES | ☐ Yes ☒ No | ☐ BLAES<br>☐ Designer | |
| 3825 | NJDOT Reviews Noise TES | ☐ Yes ☒ No | ☐ BLAES | |
| 3830 | Address Noise TES Comments | ☐ Yes ☒ No | ☐ BLAES<br>☐ Designer | |
| 3835 | Approve Noise TES | ☐ Yes ☒ No | ☐ BLAES | |
| 3840 | Conduct Hazardous Waste Study | ☐ Yes ☒ No | ☐ BLAES<br>☐ Designer | |
| 3845 | Prepare Hazardous Waste TES | ☐ Yes ☒ No | ☐ BLAES<br>☐ Designer | |
| 3850 | NJDOT Reviews Hazardous Waste TES | ☐ Yes ☒ No | ☐ BLAES | |
| 3855 | Address Hazardous Waste TES Comments | ☐ Yes ☒ No | ☐ BLAES<br>☐ Designer | |
| 3860 | Approve Hazardous Waste TES | ☐ Yes ☒ No | ☐ BLAES | |
| 3865 | Hold Public Information Center | ☐ Yes ☒ No | ☐ BLAES ☐ OCR<br>☐ Designer ☐ DPD | |
| 3870 | Prepare CED | ☐ Yes ☒ No | ☐ BLAES<br>☐ Designer | |
| 3875 | NJDOT Reviews and Approves CED | ☐ Yes ☒ No | ☐ BLAES | |
| 3880 | Initiate Environmental Technical Studies | ☐ Yes ☒ No | ☐ BLAES | |
| 3890 | Prepare Certified Categorical Exclusion (CED) Document | ☐ Yes ☒ No | ☐ BLAES | |
| 3900 | Review and Approve Certified Categorical Exclusion Document (CED) | ☐ Yes ☒ No | ☐ BLAES | |

| | | | | |
|---|---|---|---|---|
| 3910 | Prepare Draft EO 215 Document | ☐ Yes ☒ No | ☐ BLAES<br>☐ Designer | |
| 3920 | NJDOT Reviews Draft EO 215 Document | ☐ Yes ☒ No | ☐ BLAES | |
| 3925 | Revise Draft EO 215 Document (NJDOT Comments) | ☐ Yes ☒ No | ☐ BLAES<br>☐ Designer | |
| 3930 | NJDEP Reviews EO 215 Document | ☐ Yes ☒ No | NJDEP | |
| 3940 | Address NJDEP Comments and Prepare Final EO 215 Document | ☐ Yes ☒ No | ☐ BLAES<br>☐ Designer | |
| 3945 | NJDEP Approves EO 215 Document | ☐ Yes ☒ No | ☐ NJDEP | |

**ADDITIONAL INPUT**

*This section has been provided for the CD designer and the functional units to state any assumptions, to clarify and customize standard activities, and to add important information. Please be clear and concise. Provide your unit's contact person and number.*

*Examples of information for this section includes a list of the anticipated NEPA document, type of permits anticipated, anticipated environmental impacts and environmental commitments made in CD if any, etc.*

Documents necessary to complete the Cultural Resources Process have been submitted to NJDOT. No impacts were identified. The CED document is attached to the Preliminary Engineering Report. The following permits and/or need for interagency coordination were noted:
NJDEP Dam Safety Permit
NJDEP Freshwater Wetlands General Permit #18 – Dam Repair
NJDEP Stream Encroachment (potential)
NJDEP Waterfront Development (potential)
NJDEP Natural Heritage Program/Section 7 Endangered Species Act (consultation)
NJHPO - Section 106 (consultation)

# Preliminary Engineering

## Division of Capital Program Support
## Value Management

| | | | |
|---|---|---|---|
| **Sign Off by Value Management Supervisor/Manager** | | **Date:** | |

| Activity No. | Activity Name | Execute | Responsible Unit | Comments |
|---|---|---|---|---|
| | | ☐ Yes ☐ No | | |

**ADDITIONAL INPUT**

*This section has been provided for the CD designer and the functional units to state any assumptions, to clarify and customize standard activities, and to add important information. Please be clear and concise. Provide your unit's contact person and number.*

*Examples of information for this section includes VE review, lane occupancy charges/road user cost information, etc.*

## Division of Capital Program Support
## Utilities

| Sign Off by Utilities Supervisor/Manager | | Date: | |
|---|---|---|---|

| Activity No. | Activity Name | Execute | Responsible Unit | Comments |
|---|---|---|---|---|
| 3040 | Establish Utility Engineering Funding | ☒ Yes ☐ No | ☒ DPD ☒ Designer ☐ Program Coordination | |
| 3045 | Send Letter #2 and Plans to Utility Companies | ☒ Yes ☐ No | ☒ DPD ☒ Designer Utility Cos. | |
| 3050 | Prepare Utility Agreement | ☒ Yes ☐ No | ☒ DPD ☒ Designer | |
| 3055 | Update Base Plans and Identify Conflicts | ☒ Yes ☐ No | ☒ DPD ☒ Designer Utility Cos. | |
| 3060 | Execute Utility Agreement | ☒ Yes ☐ No | ☒ DPD Utility Cos. DAG | |
| 3080 | Conduct Subsurface Utility Exploration | ☒ Yes ☐ No | ☒ DPD ☒ Designer SUE Contractor Utility Cos. | |

**ADDITIONAL INPUT**

*This section has been provided for the CD designer and the functional units to state any assumptions, to clarify and customize standard activities, and to add important information. Please be clear and concise. Provide your unit's contact person and number.*

*Examples of information for this section include location of cell towers, location/presence of fiber optic lines, etc.*

Utility test pits were performed and logs are included in Appendix B. Both overhead and underground utilities may be affected.

# Preliminary Engineering

## Division of Capital Program Support
## Jurisdiction

| | | | |
|---|---|---|---|
| **Sign Off by Jurisdiction Supervisor/Manager** | | **Date:** | |

| Activity No. | Activity Name | Execute | Responsible Unit | Comments |
|---|---|---|---|---|
| | | ☐ Yes ☐ No | | |

**ADDITIONAL INPUT**

*This section has been provided for the CD designer and the functional units to state any assumptions, to clarify and customize standard activities, and to add important information. Please be clear and concise. Provide your unit's contact person and number.*

*Examples of information for this section includes the anticipated number of maps and agreements, presence of streetscape or aesthetic treatments, local approval of such, etc.*

# Preliminary Engineering

**Division of Design Services**
**Civil Engineering**
**Geometrics & Safety**

| | | | |
|---|---|---|---|
| **Sign Off by Civil Engineering Supervisor/Manager** | | **Date:** | |

| Activity No. | Activity Name | Execute | Responsible Unit | Comments |
|---|---|---|---|---|
| 3030 | Prepare Horizontal & Vertical Geometry | ☒ Yes ☐ No | ☒ DPD ☒ Designer | |
| 3035 | Prepare Utility Base Plans | ☒ Yes ☐ No | ☒ Designer | |
| 3070 | Prepare Preliminary Roadway Plans | ☒ Yes ☐ No | ☒ DPD ☒ Designer SME's | |
| 3130 | Update Preliminary Detour and Construction Staging Plans | ☒ Yes ☐ No | ☒ DPD ☒ Designer S ME's | |
| 3135 | Prepare Construction Cost Estimate | ☒ Yes ☐ No | ☒ DPD ☒ Designer | |
| 3150 | Prepare Design Exception Report | ☐ Yes ☒ No | ☒ DPD ☒ Designer ☐ Value Management State Trans. Engr. FHWA | |
| 3165 | Finalize Project Plan | ☒ Yes ☐ No | ☒ DPD ☒ Designer | |

**ADDITIONAL INPUT**

*This section has been provided for the CD designer and the functional units to state any assumptions, to clarify and customize standard activities, and to add important information. Please be clear and concise. Provide your unit's contact person and number.*

*Examples of information for this section includes a discussion of substandard design elements, design exceptions, and perhaps a quick description of the proposed geometry if it is unusual, commitments made to community, etc.*

Existing substandard elements will be addressed during raising and reconstruction of the roadway within the project limits.

# Preliminary Engineering

**Division of Design Services**
**Civil Engineering**
**Pavement**

| | | | |
|---|---|---|---|
| **Sign Off by Civil Engineering/Pavement Supervisor/Manager** | | **Date:** | |

| Activity No. | Activity Name | Execute | Responsible Unit | Comments |
|---|---|---|---|---|
| 3095 | Prepare Preliminary Geotechnical Report | ☒ Yes ☐ No | ☒ Pvmt. Design Unit<br>☒ Designer | |
| 3970 | Collect Existing Pavement and Subgrade Soil Information | ☒ Yes ☐ No | ☒ Pvmt. Design Unit<br>☒ Designer | |
| 3975 | Conduct Pavement Testing Program | ☒ Yes ☐ No | ☒ Pvmt. Design Unit<br>☒ Designer | |
| 3980 | Prepare Pavement Recommendation | ☒ Yes ☐ No | ☒ Pvmt. Design Unit<br>☒ Designer | |

**ADDITIONAL INPUT**

*This section has been provided for the CD designer and the functional units to state any assumptions, to clarify and customize standard activities, and to add important information. Please be clear and concise. Provide your unit's contact person and number.*

*Examples of information for this section includes evidence of subsurface drainage issues, settlement problems, stability problems,etc.*

Limited Geotechnical testing was performed for the dam/spillway area.

# Preliminary Engineering

**Division of Design Services**
**Structural Engineering**
**Structures and Geotechnical**

| | | | |
|---|---|---|---|
| **Sign Off by Structural Engineering Supervisor/Manager** | | **Date:** | |

| Activity No. | Activity Name | Execute | Responsible Unit | Comments |
|---|---|---|---|---|
| 3100 | Prepare Structural Design Recommendation Summary | ☒ Yes ☐ No | ☒ Designer | |

**ADDITIONAL INPUT**

*This section has been provided for the CD designer and the functional units to state any assumptions, to clarify and customize standard activities, and to add important information. Please be clear and concise. Provide your unit's contact person and number.*

*Examples of information for this section includes rock slope issues, soil borings, scour, unusual existing or proposed structural elements, clearances, substandard elements, design exceptions, etc.*

Additional borings are recommended to obtain more detailed subsurface information and to assess scour potential.

# Preliminary Engineering

**Division of Design Services**
**Regional Design and Survey Services**
**Geodetic Survey**

| | | | |
|---|---|---|---|
| **Sign Off by Geodetic Survey Supervisor/Manager** | | **Date:** | |

| Activity No. | Activity Name | Execute | Responsible Unit | Comments |
|---|---|---|---|---|
| 3015 | Prepare Control Survey Report | ☒ Yes ☐ No | ☐ DPD ☒ Designer<br>☒ Geodetic Survey | |
| 3020 | Conduct Topographic Survey | ☒ Yes ☐ No | ☐ DPD ☒ Designer<br>☒ Geodetic Survey | |
| 3025 | Prepare Base Maps | ☒ Yes ☐ No | ☐ DPD ☒ Designer<br>☒ Geodetic Survey<br>☒ CADD Support | |

**ADDITIONAL INPUT**

*This section has been provided for the CD designer and the functional units to state any assumptions, to clarify and customize standard activities, and to add important information. Please be clear and concise. Provide your unit's contact person and number.*

*Examples of information for this section includes base mapping obtained in CD, tidal issues, compliance with MAP filing laws, geodetic control issues, etc.*

Level one aerial mapping obtained for the project limits, supplemented by field survey to provide digital mapping with one foot contour intervals. R/W and baselines established using field survey and as-built plans.

# Preliminary Engineering

**Division of Design Services**
**Regional Design and Survey Services**
**Railroads**

| | | | |
|---|---|---|---|
| **Sign Off by Railroads Supervisor/Manager** | | **Date:** | |

| Activity No. | Activity Name | Execute | Responsible Unit | Comments |
|---|---|---|---|---|
| | | ☐ Yes ☐ No | | |

**ADDITIONAL INPUT**

*This section has been provided for the CD designer and the functional units to state any assumptions, to clarify and customize standard activities, and to add important information. Please be clear and concise. Provide your unit's contact person and number.*

*Examples of information for this section includes presence of at-grade crossings, overhead structure clearances, diagnostic team meetings, etc.*

# Preliminary Engineering

## Division of Construction Services and Materials
## Construction Engineering

| | | | |
|---|---|---|---|
| **Sign Off by Construction Engineering Supervisor/Manager** | | **Date:** | |

| Activity No. | Activity Name | Execute | Responsible Unit | Comments |
|---|---|---|---|---|
| 3130 | Update Preliminary Detour and Construction Staging Plans | ☒ Yes ☐ No | ☒ Designer | |
| 3145 | Conduct Constructability and Maintenance Review | ☒ Yes ☐ No | ☒ DPD ☒ Designer ☒ Const. Engineering | |

**ADDITIONAL INPUT**

*This section has been provided for the CD designer and the functional units to state any assumptions, to clarify and customize standard activities, and to add important information. Please be clear and concise. Provide your unit's contact person and number.*

*Examples of information for this section includes commitments made to local officials or other agencies, staging details, detour discussion, schedule constraints, utility conflicts, etc.*

Two lanes of traffic are expected to be available during construction activities. The need to detour traffic is not expected.

# Operations

## Division of Traffic Engineering and Safety
## Traffic Signal and Safety Engineering

| | | | |
|---|---|---|---|
| **Sign Off by Traffic Signal and Safety Engineering Supervisor/Manager** | | **Date:** | |

| Activity No. | Activity Name | Execute | Responsible Unit | Comments |
|---|---|---|---|---|
| 3090 | Determine Traffic Engineering Facility Locations | ☒ Yes ☐ No | ☒ TSSE ☒ Designer | |

**ADDITIONAL INPUT**

*This section has been provided for the CD designer and the functional units to state any assumptions, to clarify and customize standard activities, and to add important information. Please be clear and concise. Provide your unit's contact person and number.*

*Examples of information for this section includes discussion of need for temporary signals, right-of-way constraints (related to traffic signal equipment), utility conflicts, etc.*

# Preliminary Engineering

## Division of Regional Operations
## Roadway and Electrical

| | | | |
|---|---|---|---|
| **Sign Off by Regional Operations Supervisor/Manager** | | **Date:** | |

| Activity No. | Activity Name | Execute | Responsible Unit | Comments |
|---|---|---|---|---|
| | | ☐ Yes ☐ No | | |

**ADDITIONAL INPUT**

*This section has been provided for the CD designer and the functional units to state any assumptions, to clarify and customize standard activities, and to add important information. Please be clear and concise. Provide your unit's contact person and number.*

*Examples of information for this section includes elements of the design that will necessitate and increase in maintenance personnel or equipment, conflicting or overlapping projects with Operations, etc.*

# Statewide Traffic Operations

**Statewide Traffic Operations**
**Traffic Operations and Intelligent Transportation System (ITS) Facilities**

| | | | |
|---|---|---|---|
| **Sign Off by Traffic Operations Supervisor/Manager** | | **Date:** | |
| **Sign Off by ITS Supervisor/Manager** | | **Date:** | |

| Activity No. | Activity Name | Execute | Responsible Unit | Comments |
|---|---|---|---|---|
| 3065 | Prepare Preliminary ITS Facility Design | ☒ Yes ☐ No | ☒ Designer ☐ ITS ☐ Traffic Ops | |

**ADDITIONAL INPUT**

*This section has been provided for the CD designer and the functional units to state any assumptions, to clarify and customize standard activities, and to add important information. Please be clear and concise. Provide your unit's contact person and number.*

*Examples of information for this section includes compliance with latest ITS Investment Strategy and Architecture, consultation with Traffic Ops during CD, etc.*

There are no ITS facilities at or near the project.

# Capital Investment Planning and Grant Administration

**Division of Statewide Planning**
**Commuter Mobility**

| | | | |
|---|---|---|---|
| **Sign Off by Commuter Mobility Supervisor/Manager** | | **Date:** | |

| Activity No. | Activity Name | Execute | Responsible Unit | Comments |
|---|---|---|---|---|
| | | ☐ Yes ☐ No | | |

**ADDITIONAL INPUT**

*This section has been provided for the CD designer and the functional units to state any assumptions, to clarify and customize standard activities, and to add important information. Please be clear and concise. Provide your unit's contact person and number.*

*Examples of information for this section includes bicycle and pedestrian compatibility, presence of bus stops, interruption of pedestrian accommodations during construction, ADA issues, etc.*

# II. PROJECT SURVEY

## A. CONTROL SURVEY

### 1. Control Survey and Report

KMA Consulting Engineers, Inc. (KMA) performed the necessary field survey for this project. A Survey Report will be prepared by KMA and submitted under separate cover. The horizontal datum for this project is NAD83 and the vertical datum is NAVD 88.

### 2. Topographic Mapping and Survey

Mapping for this project was developed by obtaining aerial mapping of the project area. That mapping was then field edited by KMA. The field survey included, but was not limited to; locations and elevations of existing storm drainage facilities such as inlets, manholes and pipes; locations of visible utilities; wetland boundaries; test pits and borings; roadway profiles and cross sections; dam and spillway; etc.

### 3. Prepare Base Maps

Base mapping for the project was developed using data from aerial mapping, field survey performed by KMA, tax maps and as-built plans of NJ Route 48.

# III. UTILITY ENGINEERING

## A. UTILITY ENGINEERING SUMMARY

Utility Companies with facilities in project area are:

- New Jersey American Water
- Carneys Point Township Sewer Authority
- South Jersey Gas
- Verizon- New Jersey, Inc.
- Comcast Cable
- Atlantic City Electric Company, Inc.

Test pits have been performed for the proposed project. Where possible, areas of conflict were redesigned to eliminate the conflicts. Letter #1 and Utility Agreements have been sent to the utility companies, see the follow table. A ***Subsurface Utility Test Pit Log*** is attached as ***Appendix B***. The following data was provided by the responding utility owners:

# Layton Lake Dam
# NJ Rt. 48 M.P. 3.06
# Carneys Point Township, Salem Co.
# UECA- Layton Lake Dam-023100

Updated Feb, 2011

| UTILITY OWNER | CONTACT INFORMATION | P.E ESTIMATE | EXISTING FACILITIES | STATUS |
|---|---|---|---|---|
| **Atlantic City Electric Company, Inc.**<br><br>**Electric**<br><br>UECA-1-Layton Lake Dam-023100 | **Contact:**<br>Alexis Loyie<br>Distribution Engineer<br>Atlantic City Electric Company<br>428 Ellis Street<br>Glassboro, NJ 08028<br>Tel: 856-863-7919<br>Fax: 856-863-7979<br>Cell: 609-625-6080<br>Alexis.Louie@atlanticcityeectric.com<br>**Receives Agreement:**<br>Mike Drabczyk<br>Supervisor<br>428 Ellis Street<br>Glassboro, NJ 08028<br>Tel: 856-863-7902<br>Michael.Drabczyk@delmarva.com | $ 5,000.00 | U. Poles / Aerial | Sent LTR 1 Jan 04/11<br><br>P.E. Est. rcvd. Jan 07/11<br><br>Sent agreement 4/20/11 |
| **Comcast Cable Communications Management, LLC.**<br><br>**Cable T.V.**<br><br>UECA-2-Layton Lake Dam-023100 | **Contact:**<br>Rich Souder<br>Construction Coordinator<br>Comcast of South Jersey LLC<br>1846 North West Blvd.<br>Vineland, NJ 08360<br>rich_souder@cable.comcast.com<br>Tel.: 856-694-6015<br>Fax: 856-694-6052<br><br>**Receives Agreement:**<br>Jim Parkinson<br>Construction Manager<br>Comcast of South Jersey LLC<br>1846 North West Blvd.<br>Vineland, NJ 08360<br>james-parkinson@cable.comcast.com<br>Tel.: 856-694-6018 | $ 2,000.00 | Aerial (other side of Bridge) | Sent LTR 1 Dec. 15/10<br><br>P.E. Est. rcvd. Dec. 30/10<br><br>Sent agreement 4/20/11 |
| **Verizon - New Jersey, Inc.**<br><br>**Telephone**<br><br>UECA-3-Layton Lake Dam-023100 | **Contact:**<br>Tom Reber<br>Verizon - NJ<br>10 Tansboro Rd., Floor 2<br>Berlin, NJ 08009<br>Tel.: 856-753-0795<br>Fax: 888-474-50.55<br>thomas.j.reber@verizon.com<br><br>**Receives Agreement:**<br>Same As Above | $ 30,000.00 | | Sent LTR 1 Dec. 15/10<br><br>P.E. Est. rcvd. Dec 20/10<br><br>Sent agreement 4/20/11 |

| UTILITY UECA | INFORMATION | P.E ESTIMATE | EXISTING FACILITIES | STATUS |
|---|---|---|---|---|
| **Carneys Point Township Sewer Authority**<br><br>**Sewer**<br><br>UECA-4-Layton Lake Dam-023100 | **Contact:**<br>Candice Racite- Business Manager<br>Carneys Point Township Sewer Authority (CPTSA)<br>303 Harding Hwy<br>Carneys Point , NJ 08069<br>Tel.: 856-299-5210<br>canracite@verizon.net<br><br>**Receives Agreement:**<br>Frederick J. Margron, P.E., REM, CEA- President<br>Professional Consulting, Inc.<br>Octagon 10 Office Center<br>1719 Route 10, Suite 314<br>Parsippany, NJ 07054<br>Tel.:973-683-0044<br>Fax:973-683-0077<br>fmargron@pci-engineers.com<br>Inti Athar- Project Manager<br>intimathar@gmail.com | $ 800.00 | Sanitary Gravity Sewer<br><br>6” Force Main | Sent LTR 1 Dec. 15/10<br><br>P.E. Est. rcvd. Feb 2/11<br><br>Sent agreement 4/20/11 |
| **New Jersey American Water Company**<br><br>**Water**<br><br>UECA-5-Layton Lake Dam-023100 | **Contact:**<br>Kenneth J. Kratzer- Construction Supervisor<br>14 Mill Road<br>Mullica Hill, NJ 08062<br>Tel.:856-764-4951<br>Fax:856-478-4131<br>Kenneth.kratzer@amwater.com<br><br>**Receives Agreement:**<br>John J. Graham, Jr.<br>Network Supervisor<br>NJ American Water<br>204 Carriage Lane<br>Delran, NJ 08075<br>Tel.:856-764- 6920<br>Cell:609-314-1385<br>John.Graham@amwater.com | $ 2,000.00 | 12" H.D.P.E. | Sent LTR 1 Jan. 04/2011<br><br>Mark ups rcvd. Jan 28/11<br><br>Sent agreement 4/20/11 |
| **Public Service Electric and Gas Company- Gas**<br><br>**Gas**<br><br>UECA-6-Layton Lake Dam-023100 | **Contact:**<br>Chirag V. Palkhiwala<br>Staff Engineer<br>1 South Jersey Plaza<br>Folsom, NJ 08037<br>Tel.:609-561-9000 ext. 4359<br>Fax:609-704-1802<br>CPalkhiwala@sjindustries.com<br><br>**Receives Agreement:**<br>Same As Above | $ 0,000.00 | No Gas main between Golfwood Ave. and NJ Turnpike on Rt. 48.( by email) | Sent LTR 1 Jan. 04/2011<br><br>Answer received by email Feb 8, 2011<br>Sent agreement 4/20/11 |

# IV. ROADWAY ENGINEERING

## A. PAVEMENT RECOMMENDATION SUMMARY

A full report is attached as ***Appendix C – Pavement Recommendations***. The roadway will be reconstructed within the project limits and pavement will meet all necessary requirements.

## B. PRELIMINARY DRAINAGE DESIGN SUMMARY

### 1. Stream Hydrologic and Hydraulic Analysis

MT performed a HEC-1 analysis of the drainage area to Laytons Lake Dam spillway. Several data sources were referenced to determine data input for HEC-1. The data sources included; 1:24,000 USGS DEM, NJDEP approved "Land Use" ARC/Info, "Soil Type" ARC/Info, and field survey. WMS was used to develop Curve Numbers (Cn) and Time of Concentration (Tc). The Delmarva Unit Hydrograph was used to determine peak inflow to Laytons Lake Dam. The HEC-RAS program was used to develop downstream hydraulics. Calculations were performed for the 100 year-storm event and the Sunny Day event. HEC–1 and HEC-RAS calculations for the dam and spillway are provided in ***Appendix D– Existing Conditions – Dam & Spillway***. The 100-year storm event is the SDS. Based on the calculations, the existing dam does not overtop during the SDS, but has less than the required one foot of freeboard.

### 2. Dam Rehabilitation Alternatives

Two alternatives were developed that would bring the dam into conformance with dam safety regulations.

***Alternative 1***

This alternative would include a new wider bridge with a span of 40 feet and a new ogee spillway in a semi-circular shape with an effective length of 150 feet. This alternative would maintain the existing roadway profile. However, this alternative would necessitate greater impact to the lake and would not address geometric deficiencies of the roadway.

***Alternative 2***

Alternative 2 includes raising the roadway profile by about one foot, a new wider bridge with a span of 40 feet and a new ogee spillway in a semi-circular shape with an effective length of 90 feet. The proposed spillway will be constructed at the same length and at the same elevation as the existing spillway and the alignment of the roadway will not be changed. Construction of the new spillway will require a temporary construction easement. All other proposed improvements would be within the existing right-of-way. In addition to the reconstruction described above, proposed improvements would also include new/upgraded storm drainage facilities. All calculations relative to the storm drainage facilities are provided under separate cover in a report titled "*Drainage Report for NJ Route 48/Laytons Lake Dam*". Two storm drainage systems are proposed in this alternative. The first or western most system begins near the intersection of Oak Lane with NJ Route 48 and runs east along NJ Route 48 to Game Creek. The second proposed

drainage system is located east of the existing bridge and spillway. The system runs along NJ Route 48 to Game Creek. Field investigations were made within the project area to determine if construction of an infiltration basin was viable to provide improvement to the quality of water discharged to Game Creek. It was determined that the depth to the water table would prohibit infiltration as an option for water quality improvement. Calculations for the dam and spillway based on proposed Alternative 2 are provided in ***Appendix E – Proposed Conditions – Dam & Spillway***. This alternative was designated as the Initially Preferred Alternative at the NJDOT Core Group Scoping Meeting held on June 4, 2010. Refer to ***Appendix F – Meetings and Correspondence***.

## 3. Stormwater Quality

The proposed project involves the disturbance of more than one acre. However there is no increase in pavement or impervious area and no increase in discharge quantity, and there is no decrease in recharge area. The pavement box is being removed and replaced with full depth pavement, so according to the Stormwater Quality Standards, the design will have to provide for 50% reduction in Total Suspended Solids (TSS). Field investigations including test pits were made within the project area to determine if construction of an infiltration basin was viable to provide improvement to the quality of water discharged to Game Creek. It was determined that the depth to the water table would prohibit infiltration as an option for water quality improvement. In addition, when the infiltration basin was presented as part of the project at the public information meeting, the residents that owned property in the vicinity of the proposed basin objected strenuously; stating that the basin was a safety concern, would breed mosquitoes, and would be unsightly.

As an alternative to the basin, Manufactured Treatment Devices (MTD's) were incorporated into the proposed drainage systems. There will be two MTD's, one on each side of the stream located in the roadway shoulder for ease of access and maintenance. Refer to ***Appendix G – Proposed Plans.***

## 4. Drawdown Calculations

New Jersey Dam Safety Regulations require dams which impound water on a permanent basis include a means to allow reduction of the reservoir water surface elevation 5 feet in 10 days at a rate not to exceed one (1) foot per day. There may be exceptions that allow/require faster drawdown rates with agency approval. A low-level outlet is recommended for drawdown of Laytons Lake. A gate with a span of 3 feet and a rise of 5 feet is proposed through the ogee spillway. De-watering rates of the lake will vary depending on tailwater conditions and height of gate opening.

## 5. Dam Failure Analysis

Failure analysis of Laytons Lake Dam was performed for two conditions. The first failure calculation was performed for a "Sunny Day" condition or a failure of the dam with the lake at its normal surface elevation without inflow of stormwater runoff Calculation of the second failure condition was performed assuming maximum elevation of the lake water surface during the SDS and minimal tailwater conditions downstream of the dam. **Table 1** below provides a summary of the downstream water surface elevations during each condition. The 100 Yr. flow is based on the proposed dam/spillway.

**Table 1**
**Summary of Proposed Condition Peak Flow and Maximum Water Surface Elevations Downstream of Layton Lake Dam**

| LOCATION (HEC-RAS Station) | STORM EVENT | PEAK FLOW W/O BREAK | PEAK FLOW W/BREAK | WSEL W/O BREAK | WSEL W/BREAK | DIFF. WSEL |
|---|---|---|---|---|---|---|
| **4560 – D/S RTE. 48** | Sunny Day | n/a | 397 | n/a | 4.66 | - |
| | 100-Year | 2901 | 3094 | 8.39 | 8.69 | 0.30 |
| **4160** | Sunny Day | n/a | 392 | n/a | 4.36 | - |
| | 100-Year | 2901 | 3093 | 7.45 | 7.65 | 0.20 |
| **3224** | Sunny Day | n/a | 335 | n/a | 2.63 | - |
| | 100-Year | 2901 | 3086 | 5.79 | 5.95 | 0.16 |

**Notes:**

1. All peak flows are cfs. 100 Yr. flow based on proposed dam/spillway.
2. WSEL = water surface elevation – Normal Depth Start
3. All elevations are in feet.

## C. PRELIMINARY TRAFFIC ENGINEERING SUMMARY

Traffic Engineering Design was initiated as part of the tasks performed for this project. ATR counts were conducted at two locations (NJ Route 48 Eastbound and Westbound) for 24 hours over a continuous 7 day period. Manual turning movement classification counts were also conducted on a typical workday.

### 1. Obtain Traffic Loading Data

#### *a. ATR Counts*

McCormick Taylor conducted ATR counts along NJ Route 48 in the vicinity of Layton Lake Dam in both the eastbound and westbound directions. The ATR's collected data over a 7-day period (7/21/11 – 7/28/11). The data was collected and summarized for directional traffic volume and vehicle classification in 15 minute intervals. The ATR data was used to verify a manual classification count that was performed on 7/26/11. The ATR also provided McCormick Taylor with average daily traffic information which included the identification of peak hours, hourly distribution and directional splits. This information was used in developing traffic and pavement design data.

#### *b. Manual Classification Counts*

McCormick Taylor conducted a manual classification count on 7/26/11 from 7:00 to 9:00 AM and from 3:00 to 6:00 PM. The manual classification count was also conducted in 15 minute intervals and was classified into three categories:

- Automobiles/Motorcycles
- Light Trucks (2-Axle, 4 tires)
- Heavy Trucks (3 or more axles)

There were no incidents or construction activity within the vicinity of the traffic count that would have adversely affected the traffic count.

### 2. Prepare Traffic Loading Data

McCormick Taylor utilized the data collected from the ATR and manual classification count to calculate the Traffic Design Data and the Pavement Design Data for NJ Route 48 over Layton Lake.

Traffic Design Data

- 2011 Base Year AADT (2-way) = 4900
- 2031 Future Year AADT (2-way) = 5400
- 2011 Base Year DHV (2-way) = 380
- 2031 Future Year DHV (2-way) = 420
- Future Year Direction Distribution = 59/41
- Percent Heavy Trucks (Peak Hour) = 3%
- Speed Limit = 50 MPH
- Design Speed = 55 MPH

Pavement Design Data

- 2011 Base Year AADT (2-way) = 2500
- 2031 Future Year AADT (2-way) = 2800
- Percent Heavy Trucks (24 Hour) = 3%
- Percent Total Trucks (24 Hour) = 12%

Future year volumes were developed using an Annual Background Growth Rate (ABGR) for the project area. McCormick Taylor developed the growth rate using the historic and projected population and employment information using available SJTPO population data. McCormick Taylor then applied the growth rate to existing year traffic volumes to forecast Design Year traffic volumes.

### 3. Obtain Approvals for Detour

The project area will not be detoured during construction.

### 4. Establish Lane Restrictions Parameters

It has been determined that one lane of traffic per direction will be maintained throughout the construction process.

## D. GEOMETRICS SUMMARY

Horizontal and vertical alignment of NJ Route 48 at Laytons Lake Dam was evaluated. A Deficiency Analysis was performed for NJ Route 48 between mileposts 2.96 and 3.16. The February 2009 Straight Line Diagram indicates that NJ Route 48 is classified as a Rural Major Collector within the study limits. The posted speed limit is 50 mph therefore the design speed is 55 mph.

A preliminary review of the existing conditions of the roadway was performed from M.P. 2.96 to 3.16. The review is based on a field observation along with review of As-Built Plans. The As-Built Plans used during this review include:

- As-Built Plans of Route 48 (1953) Section 1A
  From West of Oak Lane Road to NJ Turnpike
  Realignment and Bridge
  Township of Upper Penns Neck, Salem County
  October 1971

**1. Horizontal Alignment**

According to the as-built plans listed above, starting from the western end of the study area and heading east, the existing horizontal alignment of NJ Route 48 consists of the following:

- A tangent with a bearing of S 38 degrees-7 minutes- 39.6 seconds E
- A curve to the left with a radius of 3000' and a length of 499.53'.
- A curve to the left with a radius of 3958' and a length of 428.97'.
- A tangent with a bearing of S 53 degrees- 52 minutes- 39.6 seconds E

Two options were evaluated for the proposed alignment. The first alternative was to maintain the existing alignment while the second alternative shifted the roadway approximately twelve (12) feet to allow for less complex construction for the Route 48 bridge over Two Penny Run. Even though the new alignment had no ROW impacts, residents were not happy about the roadway shifting towards their homes. For this reason, the first alternative was selected and the existing horizontal alignment was shown as the proposed in the preliminary plans.

**2. Minimum Radius**

The first horizontal curve within the study area has a radius of 3000' and begins just west the intersection with Oak Lane Road. The second horizontal curve has a radius of 3958'. The posted speed limit on this section of NJ Route 48 is 50 MPH. Table 4-5 of the NJDOT Design Manual states that the minimum radius of a curve for rural highways with a design speed of 55 MPH must be 1060'. Both of the existing curves exceed the minimum NJDOT Design criteria for curve radius.

**3. Passing Sight Distance**

According to Table 4-1 of the NJDOT Design Manual, the minimum Passing Sight Distance (PSD) for a design speed of 55 MPH is 1985'. There is no passing throughout the entire study area. Therefore the minimum PSD does not apply.

**4. Stopping Sight Distance**

According to Table 4-1 of the NJDOT Design Manual, the minimum Stopping Sight Distance (SSD) for a design speed of 55 MPH is 495'. The minimum SSD of a horizontal curve is evaluated using Figure 4-A of the NJDOT Design Manual. Figure 4-A calculates the Horizontal Sightline Offset (HSO), which is the clear distance needed from the middle of the inside lane to an obstruction, based on the radius of the curve and SSD for the design speed. The first horizontal curve is along a section of the roadway with a design speed of 55 MPH and has a radius of 3000'. The first horizontal curve has an HSO of 10.22'. The second horizontal curve is also along a section of the roadway with a design speed of 55 MPH and has a radius of 3958'. The second horizontal curve has an HSO of 7.74'. These values put the two HSO's within the

existing shoulder. There are no obstructions within this clear distance. Therefore this curve meets the NJDOT minimum Stopping Sight Distance standard.

**5. Superelevation**

Based on as-builts and the field observation, the first horizontal curve is superelevated at 3.0% and the second horizontal curve is superelevated at 2.2%. From Figure 4-B (Rural Highways) of the NJDOT Design Manual, a curve with a radius of 3000' and 3958' and a design speed of 55 MPH should be superelevated at a minimum of 3.9% and 3.2% respectively. The existing superelevation of these curves does not meet the minimum requirement for superelevation. The proposed design will use the correct superelevation rates of 3.9% and 3.2%.

**6. Superelevation Transition**

Section 4.3.2.B of the NJDOT Design Manual states that the superelevation transition should be designed to satisfy the requirements of safety and comfort and pleasing appearance. Based on the equations for superelevation runoff and tangent runout and Tables 4-2, 4-3, and 4-4 of section 4.3.2.B, the superelevation transition within the study area meets the minimum design criteria. Standard superelevation transitions were used in the proposed design.

**7. Vertical Alignment**

The existing vertical alignment was evaluated based on the 1971 as-built profiles. Starting from the western end of the study area and heading east, the vertical alignment of NJ Route 48 consists of the following:

- A -0.514% grade west of Lakeside Drive
- A 250' Sag Curve
- A +3.192% grade east of Laytons Lake Drive

The proposed vertical alignment raised the existing alignment by approximately one foot to mitigate flooding and overtopping of the roadway during the SDS. The new vertical alignment can be seen in the preliminary roadway plans.

**8. Grades**

Section 4.4.4 of the NJDOT Design Manual states that the minimum grade rate for freeways and land service highways with a curbed or bermed section is 0.3%. Section 4.4.4 also states that the maximum grade rate for rural land service highways, level terrain and a design speed of 55 MPH is 4%. The existing grades within the project study are within the NJDOT Design Manual standards for minimum and maximum grade rates.

The proposed grades meet the standards for minimum and maximum grade rates.

**9. Vertical Curves**

Based on Section 4.4.5 of the NJDOT Design Manual, the minimum length of a sag curve with a design speed of 55 MPH and the algebraic difference in grades of 3.706, is 426.19'. The existing length of the vertical sag curve within the study area is 250', which does not meet the minimum required length for a vertical curve.

The proposed vertical alignment meets the standards for minimum required lengths of vertical curves.

**10. Stopping Sight Distance**

Table 4-1 of the NJDOT Design Manual states that the minimum stopping sight distance for a roadway with a design speed of 55 MPH is 495'. Table 4-J states that a vertical sag curve with a design speed of 55 MPH and an algebraic difference of 3.706 has a stopping sight distance of 339.08'. This stopping sight distance is substandard to NJDOT design criteria.

The proposed vertical alignment meets the standards for minimum stopping sight distance.

**11. Lane and Shoulder Width**

The NJDOT Design Manual requires a desirable lane width of 12' and a minimum shoulder width of 8' for land service highways. The as-built plans for NJ Route 48 Section 1A, dated October 1971, proposed a lane width of 12' and a shoulder width 8'. A field visit revealed 12' travel lane widths and 8' shoulder widths at the beginning and end of the project limits and 12' shoulder widths at the bridge. Therefore the existing lane and shoulder widths meet the minimum NJDOT design standards.

The proposed lane and shoulder widths match the existing lane and shoulder widths.

**12. Lane Cross Slope**

Section 5.2.2 of the NJDOT Design Manual states that the minimum cross slope for travel lanes is 1.5%. The cross slope in each successive lane should be increased by 0.5%. However, it may be increased on each successive pair of lanes by 0.5% or 1.0%. The as-built plans show cross slopes in the travel lanes of 1.5%. The existing Lane Cross Slopes meet the minimum design criteria.

The proposed lane cross slope for the tangent sections of the project will be 1.5%.

**13. Shoulder Cross Slope**

Section 5.4.3 of the NJDOT Design Manual states that the desirable shoulder cross slope should not be less than 4% to minimize ponding on the roadway. As a minimum, a shoulder cross slope should not be less than 2 percent. The existing shoulder cross slopes exceed the minimum design standards required in the NJDOT Design Manual.

The proposed shoulder cross slope for the tangent sections of the project will be 4.0%

**14. Curbing**

Section 5.6.4 of the NJDOT Design Manual states that for new installations of vertical curb, the curb height shall not exceed a 4" reveal for posted speeds greater than 40 MPH. With a design speed of 55 MPH and an existing curb reveal of 10", the existing curb sections along the bridge within the study area do not meet the maximum requirements for curb height.

The proposed curb height will be the standard 4" reveal.

**15. Sidewalks**

There are no sidewalks with the exception of the small sections of sidewalk along the bridge. Section 5.7.3 of the NJDOT Design Manual states that the desirable width of a sidewalk is 5' (4' minimum) when separated by a buffer strip. Where no buffer strip is provided, the desirable width of the sidewalk should be 7'(6'minimum). The sidewalk along the bridge is 6'wide, meeting the minimum design criteria. Section 5.7.1 of the NJDOT Design Manual states that generally, sidewalks will not be provided in rural areas.

Sidewalks will be placed along the proposed structure.

**16. Guide Rail**

Guide Rail is located along both sides NJ Route 48 at the approaches to the bridge. The guide rail at the beginning of the westbound side of the roadway must be extended to Laytons Lake Drive to protect Laytons Lake. Also, the end of the guiderail along the eastbound side of the roadway must be extended to protect the slope of the lake. The guide rail end treatments meet NJDOT Design Manual standards. However, for safety reasons it is recommended that the existing Beam Guide Rail Anchorages be replaced with a crash worthy end treatment (i.e. Slotted Guide Rail Terminals). Field observations revealed that the guide rail had 8" wooden spacers. These could be replaced with synthetic spacers for a more maintenance free design. There is minor damage at the beginning of the guide rail along the eastbound side of the roadway.

Section 8-03.1.C states that on land service highways where there is a sidewalk or a sidewalk area used by pedestrians, the front face of the guide rail should desirably be 7'or more from the outside edge of the shoulder. Where this is not possible, the guide rail should be installed flush with the gutter line. Field observations revealed that the guide rail along the bridge is only 6' from the outside edge of the shoulder. This does not meet NJDOT design criteria. The guide rail in this area was relocated. It originally was flush mounted to the curb as witnessed by the bolt holes along the bridge being filled with epoxy.

The bridge rail is a three beam rail design. It is not known of the crash worthiness of this design at the time the bridge was constructed. It is recommended that the current four beam rail design with known crash worthiness be utilized when re constructing the bridge.

The field visit also revealed that the non-vegetative surface under the guide rail on both sides of the roadway is sloped back toward the shoulders of the roadway. This is causing a ponding effect along the joint of the non-vegetation surface and the shoulders. This was evidenced during the site visit by large amounts of debris along this joint.

New guide rail will be installed with non-vegetation surface on the approach to the bridge in both directions.

**17. At Grade Intersection**

Section 6.2.3.1 of the NJDOT Design Manual states that regardless of the type of intersection, intersection highways should meet at or nearly at right angles. Intersection angles less than 60 degrees normally warrant realignment closer to 90 degrees. The intersection of NJ Route 48 and Laytons Lake Drive meet at an angle between 30 and 45 degrees.

The proposed design will improve this undesirable angle at the intersection with proper channelization markings.

**18. Access**

The Bureau of Access Design and ROW Engineering Office of Access Design Guidelines state that NJ Route 48 has a desirable Typical Section of 2A which requires a right of way width of 78' and two lanes, with shoulders or parking. NJ Route 48 has an access level of 6, which allows access to and from an access point, limited by edge clearance and safety considerations.

The first property analyzed is the property at the corner of NJ Route 48 and Layton Lake Drive. The existing curbline opening is 33‘ which is greater than the maximum allowable curbline opening of 30‘for a residential property. Also, this property does not meet the minimum unsignalized intersection corner clearance for a residential property of 12’.
Violations: 16:47-3.8d and 16:473.8k(1).

The next property analyzed was along the eastbound side of NJ Route 48 across from Lake Drive. This lot is a commercial lot with an egress curbline opening of 40‘ and an ingress curbline opening of 34’ which are both under the maximum allowable curbline opening of 40‘ for a one-way operation access point for a non-residential lot.
Violations: None

The next property is along the eastbound side of NJ Route 48 just west of the bridge. The residential lot has a curbline opening of 19‘. This width is within the minimum and maximum curbline openings for a residential lot of 12‘ and 30‘ respectively.
Violations: None

The last property is also along the eastbound side of NJ Route 48 across from Lakeside Drive. The residential lot has a curbline opening of 14‘. This width is within the minimum and maximum curbline openings for a residential lot of 12' and 30' respectively.
Violations: None

The proposed design maintains the existing access points for this project.

**19. Existing Substandard Design Elements**
The following is a list of Existing Controlling Substandard Design Elements.

**Superelevation-** The two horizontal curves within the study area do not meet the minimum superelevation rates required by NJDOT Design Criteria. (Approx. M.P. 2.94 and 3.04)

**Stopping Sight Distance (Vertical Curves) -** The stopping sight distance for the vertical sag curve does not meet minimum NJDOT Design Criteria (Approx. M.P. 3.11)

The proposed improvements for Laytons Lake Dam include raising the roadway profile and reconstruction of the roadway, bridge and spillway. Therefore, the substandard design elements will be addressed within the construction limits. No Design Exception Report will be prepared for this project.

## E. PRELIMINARY ROAD PLANS

The proposed improvements for Laytons Lake Dam include minor reconstruction of the NJ Route 48 roadway. The roadway profile will be raised by a maximum of about 1.0 feet to mitigate flooding and overtopping of the roadway during the SDS. Based on early as-built plans it appears that a significant section of NJ Route 48 along Laytons Lake was originally located south/downstream of its current alignment. Raising the profile results in improved sight distance at the sag vertical curve located adjacent to the bridge, improves intersection sight distance at the intersection of NJ Route 48 with Layton Lake Drive and augments superelevation of the roadway. It should be noted that there are no ITS facilities along the roadway and none are proposed. Refer to ***Appendix G –Proposed Plans – Section 1 - Roadway*** for data and calculations supporting the proposed roadway alignment and profile.

# V. STRUCTURAL ENGINEERING

## A. PRELIMINARY GEOTECHNICAL ENGINEERING REPORT SUMMARY

A geotechnical report has been prepared for Laytons Lake Dam and is attached as part of this report in ***Appendix H – Geotechnical Report.*** Based on that report the following recommendations were made:

As a result of the relatively large settlement cause by the factored resistance and the relatively low bearing pressure which induces one inch of settlement, a spread footing foundation is not recommended. In addition, the scour potential of the stream bed has not been assessed. In order to evaluate this condition borings need to be performed in the lake to assess the soil deposits at the bottom of the lake. These deposits may also be liquefiable when subjected to shaking during an earthquake.

Based on the results of the analyses, H-piles driven to an approximate depth of 75 feet below existing ground surface will perform satisfactorily under the assumed loads on a single pile. Likewise the 16-inch diameter steel pipe pile, with 0.5-inch thick wall filled with concrete, driven to a depth of 75 feet below existing grade will perform satisfactorily.

It is recommended that additional borings be drilled at the site to provide ore detailed information concerning the subsurface conditions. At least two of the recommended borings should be performed in the lake close to the location of the proposed spillway. These borings will help in identifying any liquefiable deposits at the bottom of the lake, provide relevant data for seepage analysis and, if applicable, help estimate the magnitude of scour which may occur at the abutments.

## B. PRELIMINARY ENGINEERING FOR STRUCTURE DESIGN

Preliminary engineering was performed in order to complete the CED for the bridge, spillway and roadway improvements proposed for this project. The proposed bridge will have a span of 40 feet and a rise of about 11 feet. The spillway is concrete ogee type in a horseshoe shape with an effective length of 90 feet. The spillway will incorporate a sluice gate for controlling the lake level and drawing down the lake level below the spillway crest. The gate should have the minimum dimensions of 3 feet wide by 5 feet high to provide the draw down requirements of NJDEP. The spillway will also incorporate a sealed opening to accommodate a future fish ladder. Plans showing the proposed structures are attached as ***Appendix G – Proposed Plans – Section 2 - Dam & Spillway Structures***.

A Design Appraisal Statement Report was prepared for the project bridge with various design parameters that would meet the project needs. These guide lines were set forth in the report and recommended a complete bridge replacement. Based on this recommendation and guide lines, various alternates were evaluated as feasible replacement bridge types. Evaluation of these alternate bridges resulted in recommendation of single span Pre-stressed Concrete Spread Box Beam (Alternate 1) superstructure. This bridge type yielded the most economically feasible bridge with least amount of Life Cycle Cost.

The Pre-stressed Concrete Spread Box Beam carries NJ Route 48 with two (2) 12'-0" lanes, two (2) 12'-0" shoulders and two (2) 6'-0" wide sidewalks. This cross section is consistent with approach roadways as it crosses over Game Creek. This new bridge produces curb-to-curb width of 48'-0" and out-to-out width of 62'-0". Pre-stressed Concrete Spread Box beams are composite with one course 9 ½" thick reinforced high performance concrete deck and has an approximate single span length of 42'. Abutments are set back to provide 40' clear opening for the spillway/Game Creek. This bridge will incorporate Semi-Integral Abutment design details to eliminate open joints at the abutments which will reduce its future maintenance cost.

# VI. RIGHT-OF-WAY ACCESS

## A. PROJECT ACCESS PLAN

Construction of the proposed improvements at Laytons Lake Dam will impact the intersections of three roadways identified as Oak Lane, Lakeside Lane and Laytons Lake Drive. The proposed work will also impact four driveways. The proposed work will be limited to re-alignment and re-grading as necessary to meet design requirements.

## B. RIGHT-OF-WAY REPORT SUMMARY

Preliminary right-of-way needs have been determined for this project and preliminary right-of-way plans have been developed. The following table provides the lot and block number, type and area estimated for right-of-way necessary to construct the improvements proposed for this project.

| BLOCK/LOT | AREA/ACRES | TYPE |
|---|---|---|
| 233/14 (Laytons Lake) | 0.2 | Temp. Constr. Esmt. |
| 236/2 | 0.03 | Temp. Constr. Esmt. |
| 235/12 | 0.01 | Partial Fee Take |

## C. INITIAL RIGHT-OF-WAY ESTIMATE

The estimated cost of right-of-way for this project is $50,000.

# VII. ENVIRONMENTAL

## A. ENVIRONMENTAL DOCUMENT SUMMARY

### 1. Wetland Delineation

Wetland delineation for the project area was conducted by MT in accordance with the Federal Manual for Identifying and Delineating Jurisdictional Wetlands, 1989 and the NJDEP Freshwater Wetlands Protection Act Rules (NJAC 7:7A). A report entitled "*Wetland Delineation Report*", dated March 2011 is attached as ***Appendix I – Environmental – Section 1 – Wetlands***. Based on the field investigations and wetland delineation it has been determined that the proposed project will result in minor disturbance to the state open water area of Laytons

Lake and associated transition areas for construction of the new spillway and bridge and raising the roadway profile by about 1.0 feet.

## 2. Cultural Resources Technical Studies

A study of the project area was conducted by MT to identify and address any cultural resources or areas of historical significance that could be affected by the proposed improvements. The study was performed in accordance with NJDEP – Historic Preservation Office (HPO) and New Jersey State Museum requirements. It was determined that the project would not impact cultural resources or areas of historical significance. The Section 106 process was completed and a copy of the letter is provided in ***Appendix F – Meetings and Correspondence***.

## 3. Section 4 (f) Technical Study

Properties subject to Section 4 (f) regulations include publicly owned parks and recreational lands, wildlife and waterfowl refuges and historic sites and bridges on or eligible for National Register of Historic Places. The Green Acres Program provides assistance to local governments in acquiring open space and recreational development. It appears that there will be no Green Acres involvement and that Section 4 (f) will not apply to this project.

## 4. Ecology/Wetlands Technical Study

MT has contacted NJDEP – National Heritage Program (NHP) regarding their Database and Landscape Program for information about rare species or communities on or within ¼ mile of the project site. The US Fish and Wildlife Service (USFWS) website was also reviewed to determine the existence of rare/threatened species within Carneys Point Township. NHP correspondence indicated that bald eagle (*Haliaeetus leucocephalus*) foraging area and great blue heron (*Arde a hero dias*) is present at the project site. It was also noted that the bob cat (*Lynx rufus*) may be present within ¼ mile of the project site. No additional concerns were noted. Refer to ***Appendix F – Meetings and Correspondence.***

## 5. Hazardous Waste Technical Study

Hazardous waste screening was performed by MT for the area of the project and extending 250 feet beyond the project limits. A report entitled *"Hazardous Waste Screening Report"* dated March 2011 is attached herewith as ***Appendix I – Environmental – Section 2 – Hazardous Waste***. Based on the referenced report there are three areas of potential environmental concern. The first area includes the project area due to its historical use for agricultural purposes. The other two properties are farms located at 772 Harding Highway (NJ Route 48) and also at 762 Harding Highway (NJ Route 48). Both are currently in use as residential/agricultural purposes. It is not anticipated that construction activities will occur outside of the existing right-of-way, adjacent to the two farm properties located downstream of the roadway.

## 6. CED

A copy of the CED document was submitted to NJDOT on March 15, 2011.

## B. PUBLIC INFORMATION CENTER SUMMARY

A Public Information Center was held to inform Municipal Officials and the general public of the improvements proposed for this project. The meeting was held on December 8, 2011 from 4 – 7 pm at the Carneys Point Municipal Building.

# VIII. CONSTRUCTABILITY AND MAINTENANCE

## A. PUBLIC DETOUR AND CONSTRUCTION STAGING PLANS SUMMARY

The proposed improvements for Laytons Lake Dam include reconstruction of the NJ Route 48 roadway. The roadway profile will be raised by a maximum of about 1.0 feet to mitigate flooding and overtopping of the roadway during the SDS. Construction activities are not expected to require a detour. There will be one lane of traffic open in each direction during construction. The project will be constructed in stages to maintain traffic on Route 48. Project staging plans are provided in ***Appendix G – Proposed Plans – Section 3 – Project Staging***.

# IX. PROJECT PLAN

Proposed plans are attached in ***Appendix G – Proposed Plans – Section 1 – Roadway, Section 2 – Dam and Spillway Structures, Section 3 – Project Staging.***

# X. COST ESTIMATES

The existing dam and spillway require replacement to meet dam safety requirements. The Total Project Cost is estimated to be $12,651,000. A detailed estimate is provided in ***Appendix J – Cost Estimate***.

# XI. BASELINE SCHEDULE

The Baseline Schedule is provided in ***Appendix N – Baseline Schedule***. The schedule indicates the Final Design Authorization by September 26, 2012; Secure Permits by June 26, 2013; PS&E Submission by May 15, 2014; Construction Authorization by July 7, 2014; Receive Bids by September 9, 2014; Award Contract by September 30, 2014; and Complete Construction by April 20, 2016.

# XII. PUBLIC INVOLVEMENT ACTION PLAN

The Public Involvement Action Plan (PIAP) is in ***Appendix O – Public Involvement Action Plan.*** Also included in this appendix is the Resolution of Support from Carney's Point Township.

# *Appendix A – Photos*



Photo 1 – Dam crest and NJ Route 48 from left (east) side



Photo 2 – Dam crest and roadway from right (west) side



Photo 3 – Upstream slope overgrown with trees and brush looking west



Photo 4 – Upstream slope overgrown with trees and brush looking west



Photo 5 – Downstream embankment slope overgrown with trees and brush looking west



Photo 6 – Downstream embankment slope looking east



Photo 7 – Spillway and outlet works from right abutment



Photo 8 – Spillway from left abutment



Photo 9 – Spillway joint with vegetation



Photo 10 – Horizontal crack in spillway



Photo 11 – Horizontal crack in spillway



Photo 12 – Right upstream wing wall, note cracks



Photo 13 – Top of right upstream wing wall, note cracks



Photo 14 – Left upstream wing wall, note cracks



Photo 15 – Left upstream wing wall, note cracks



Photo 16 – Top of left upstream wing wall, note cracks



Photo 17 – Right downstream wing wall



Photo 18 – Top of right downstream wing wall, note cracks



Photo 19 – Left downstream wing wall



Photo 20 – Bridge and right abutment wall looking downstream



Photo 21 – Right abutment wall with cracks



Photo 22 – Left bridge abutment wall looking upstream



Photo 23 – Left bridge abutment wall note crack pattern



Photo 24 – Downstream outlet channel



Photo 25 – Low level outlet, gate operators, and access bridge



Photo 26 – Reservoir area looking upstream (north)



Photo 27 – Reservoir area looking upstream (north)

# *Appendix B – Subsurface Utility Test Pit Logs*

Test Hole #: T1 DATE : 4/1/11

KMA Job #: 1121

Client: McCormick Taylor

Site Location: Laytons Lake — Route 48

Municipality: Carneys Point County: Salem State: NJ

Paving / Soil / Cond / Thick / Type: Asphalt (5")

Size / Type Utility Anticipated: Telephone Line

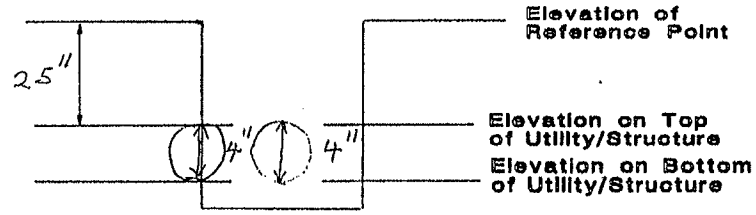
Reason for Test Hole:

I.D./ Type utility Found : Two 4" Plastic (PVC) Telephone Lines

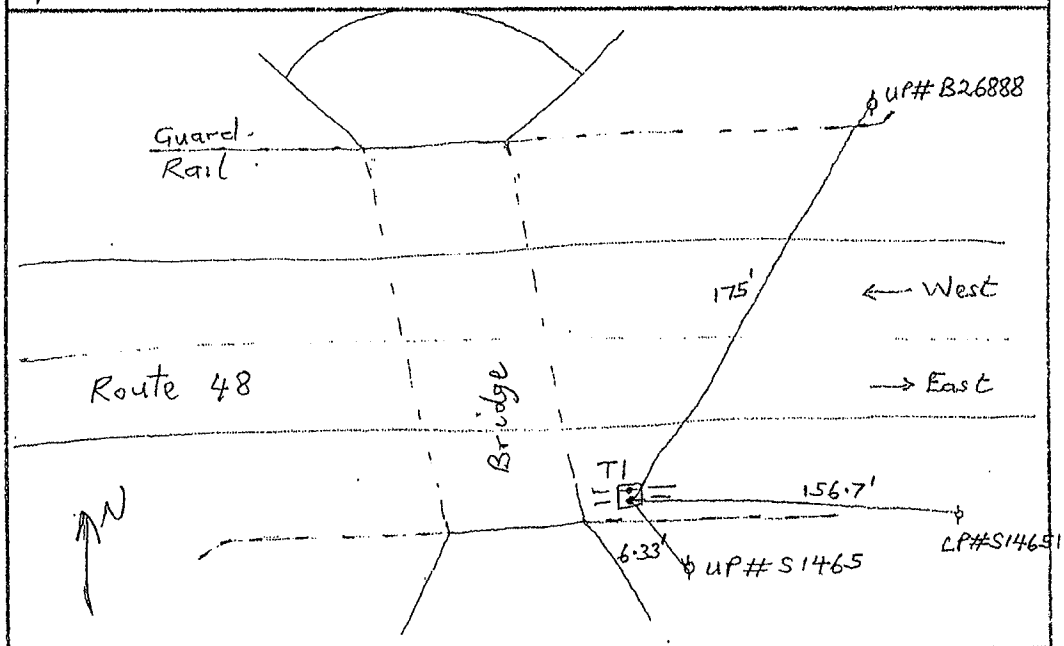
Type of Instrument: VAC Machine

## Profile - Not to Scale

CIRCLE ONE:
(P.K.) / Nail / Stake / X-Cut
(Indicates center of utility)




The two pipes are about 7" apart.




I HEREBY CERTIFY THAT THIS SKETCH WAS PREPARED UNDER MY IMMEDIATE SUPERVISION.

HAREESH DAGGUPATI

UTILITY TEST HOLE PLAN

KMA Consulting Engineers, Inc.
520 Stokes Road Building C, Suite 6
Medford, NJ 08055
Tel: (609) 953-1525 Fax: (609) 722-9250
www.kmaengineering.com

Test Hole #: T2 DATE : 4/2/11

KMA Job #: 1121

Client: McCormick Taylor

Site Location: Laytons Lake – Route 48

Municipality: Carneys Point County: Salem State: NJ

Paving / Soil / Cond / Thick / Type: Soil with grass cover

Size / Type Utility Anticipated: Telephone Line

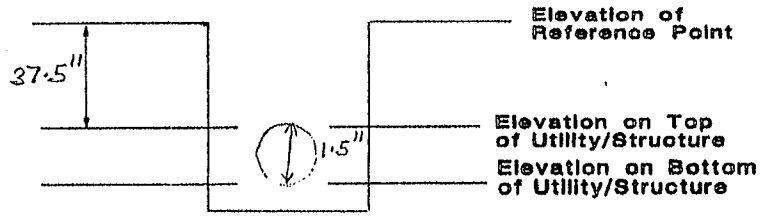
Reason for Test Hole:

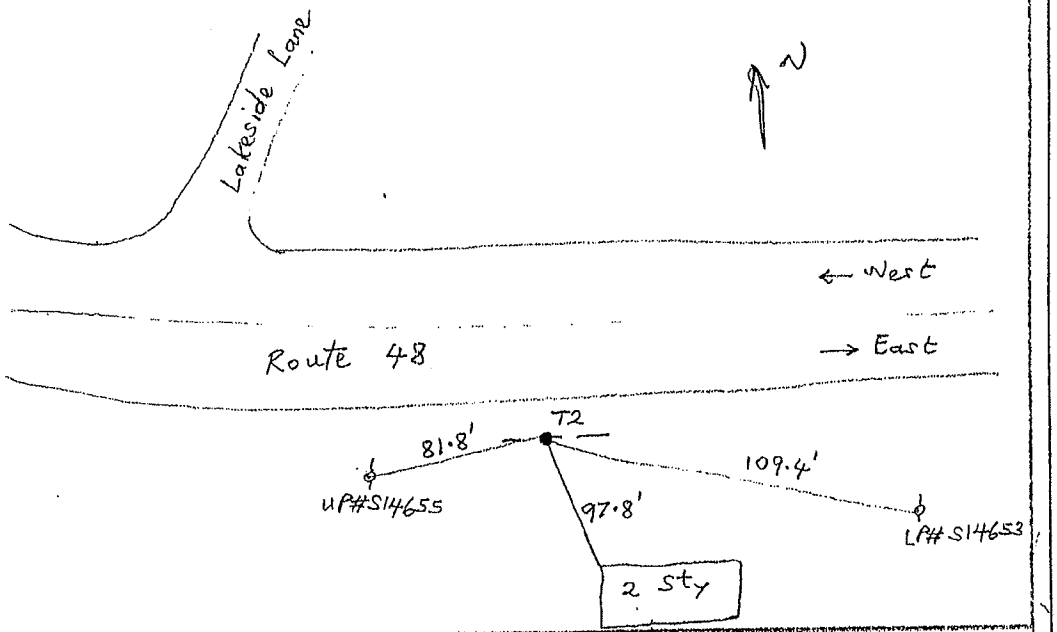
I.D./ Type utility Found : 1.5" Plastic (PVC) Telephone Line

Type of Instrument: VAC Machine

Profile - Not to Scale

CIRCLE ONE:
P.K. / Nail / (Stake) / X-Cut
(indicates center of utility)




I HEREBY CERTIFY THAT THIS SKETCH WAS PREPARED UNDER MY IMMEDIATE SUPERVISION.

HAREESH DAGGUPATI

UTILITY TEST HOLE PLAN

KMA Consulting Engineers, Inc.
520 Stokes Road Building C, Suite 6
Medford, NJ 08055
Tel: (609) 953-1525 Fax: (609) 722-9250
www.kmaengineering.com

Test Hole #: T3 DATE : 4/2/11

KMA Job #: 1121

Client: McCormick Taylor

Site Location: Laytons Lake – Route 48

Municipality: Carneys Point County: Salem State: NJ

~~Paving~~ / (Soil) / Cond / Thick / Type:

Size / Type Utility Anticipated: Telephone Line

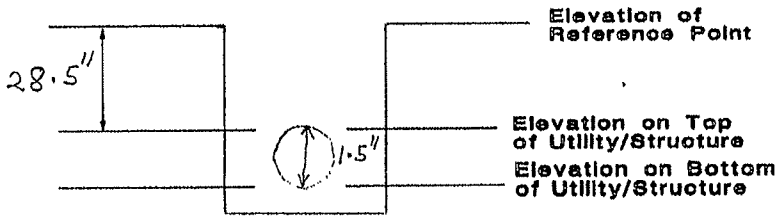
Reason for Test Hole:

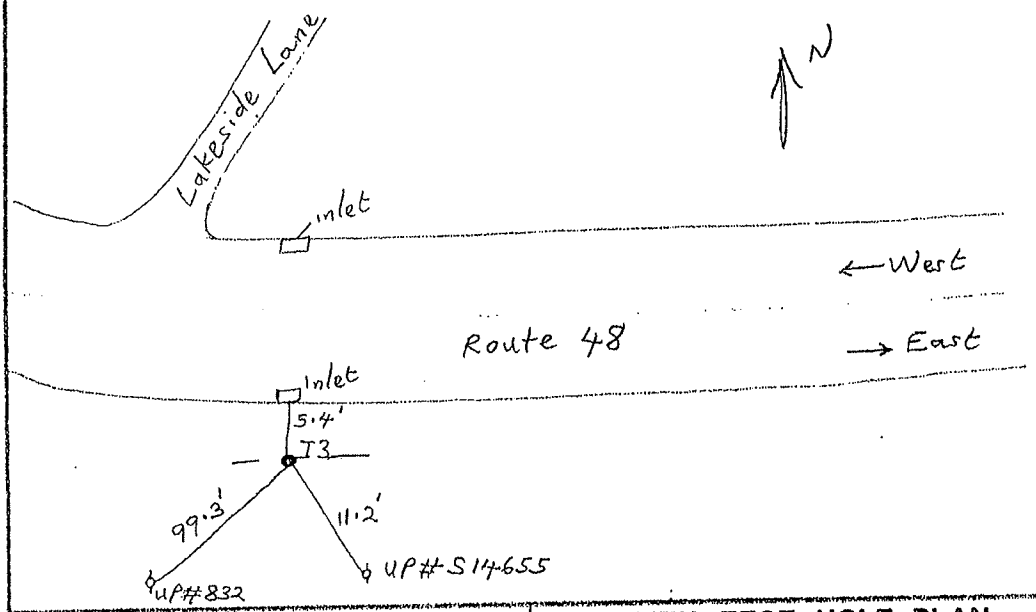
I.D./ Type utility Found : 1.5" Plastic (PVC) Telephone Line

Type of Instrument: VAC Machine

## Profile - Not to Scale

CIRCLE ONE:
(P.K.) / Nail / (Stake) / X-Cut
(Indicates center of utility)




I HEREBY CERTIFY THAT THIS SKETCH WAS PREPARED UNDER MY IMMEDIATE SUPERVISION.

HAREESH DAGGUPATI

UTILITY TEST HOLE PLAN

KMA Consulting Engineers, Inc.
520 Stokes Road Building O, Suite 6
Medford, NJ 08055
Tel: (609) 953-1523 Fax: (609) 722-9250
www.kmaengineering.com

Test Hole #: T4 DATE : 4/2/11

KMA Job #: 1121

Client: McCormick Taylor

Site Location: Laytons Lake – Route 48

Municipality: Carneys Point County: Salem State: NJ

Paving / Soil Cond / Thick / Type: Soil with grass cover

Size / Type Utility Anticipated: Telephone Line

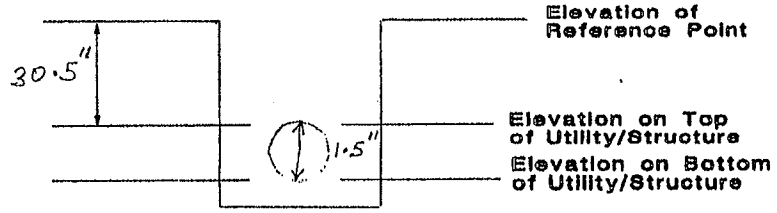
Reason for Test Hole:

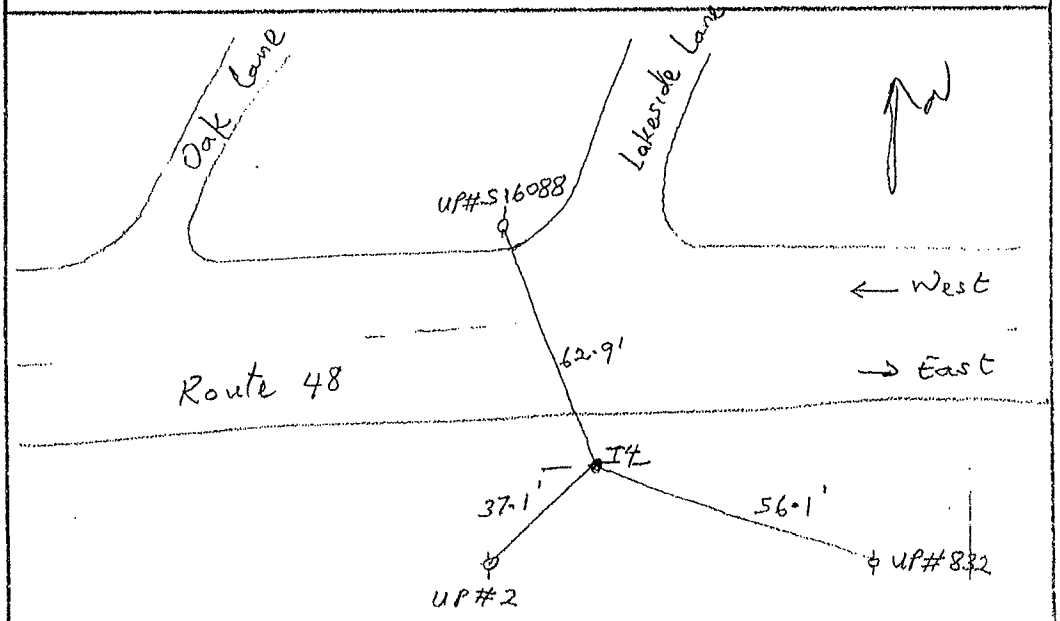
I.D./ Type utility Found : 1.5" Plastic(PVC) Telephone Line

Type of Instrument: VAC Machine

## Profile - Not to Scale

CIRCLE ONE: P.K. / Nail / Stake / X-Cut (indicates center of utility)




I HEREBY CERTIFY THAT THIS SKETCH WAS PREPARED UNDER MY IMMEDIATE SUPERVISION.

HAREESH DAGGUPATI

UTILITY TEST HOLE PLAN

KMA Consulting Engineers, Inc.
520 Stokes Road Building C, Suite 6
Medford, NJ 08055
Tel: (609) 953-1523 Fax: (609) 722-9250
www.kmaengineering.com

...\SUE\Data Form.dgn 3/7/2011 5:12:17 PM

Test Hole #: T5 DATE : 4/2/11

KMA Job #: 1121

Client: McCormick Taylor

Site Location: Laytons Lake – Route 48

Municipality: Carneys Point County: Salem State: NJ

Paving / Soil / Cond / Thick / Type: Soil with grass cover

Size / Type Utility Anticipated: Telephone Line

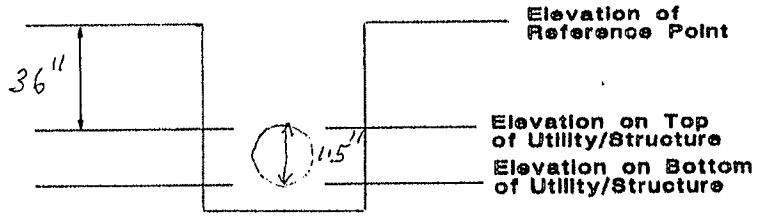
Reason for Test Hole:

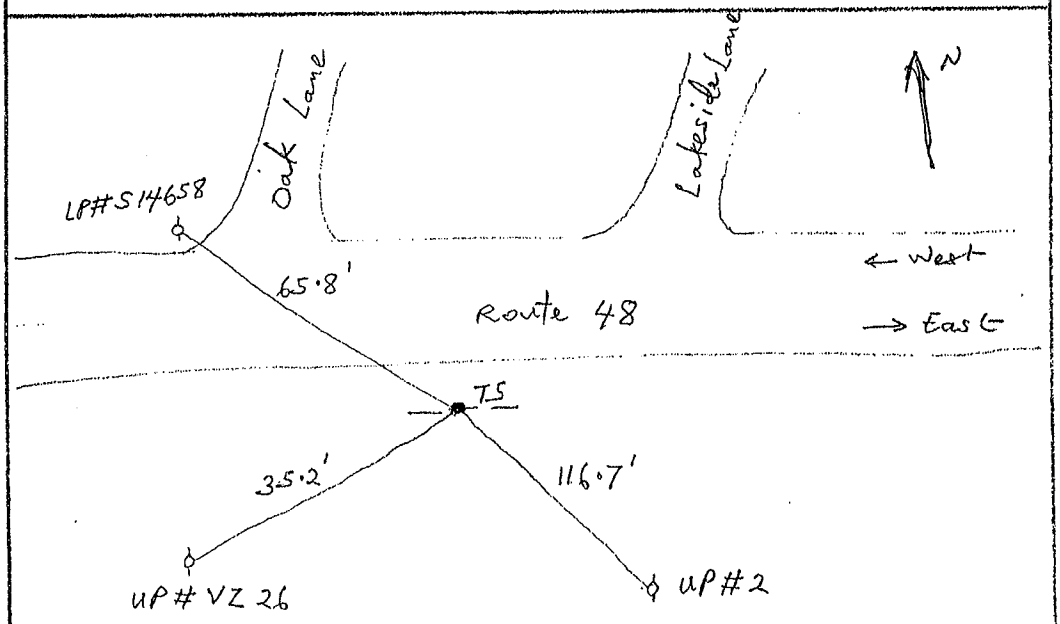
I.D./ Type utility Found : 1.5" Plastic (PVC) Telephone Line

Type of Instrument: VAC Machine

Profile - Not to Scale

CIRCLE ONE:
P.K. / Nail / Stake / X-Cut
(Indicates center of utility)




I HEREBY CERTIFY THAT THIS SKETCH WAS PREPARED UNDER MY IMMEDIATE SUPERVISION.

HAREESH DAGGUPATI

UTILITY TEST HOLE PLAN

KMA Consulting Engineers, Inc.
520 Stokes Road Building C, Suite 6
Medford, NJ 08055
Tel: (609) 953-1523 Fax: (609) 722-9250
www.kmaengineering.com

Test Hole #: T6 DATE : 4/2/11

KMA Job #: 1121

Client: McCormick Taylor

Site Location: Laytons Lake - Route 48

Municipality: Carneys Point County: Salem State: NJ

(Paving) / Soil / Cond / Thick / Type: Asphalt (7")

Size / Type Utility Anticipated: Telephone Line

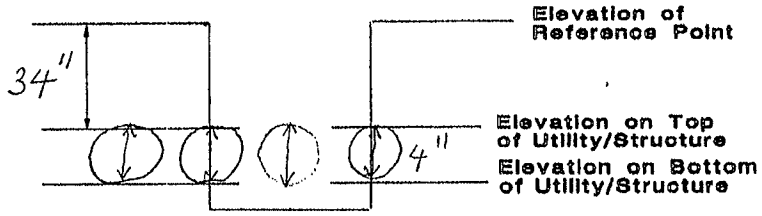
Reason for Test Hole:

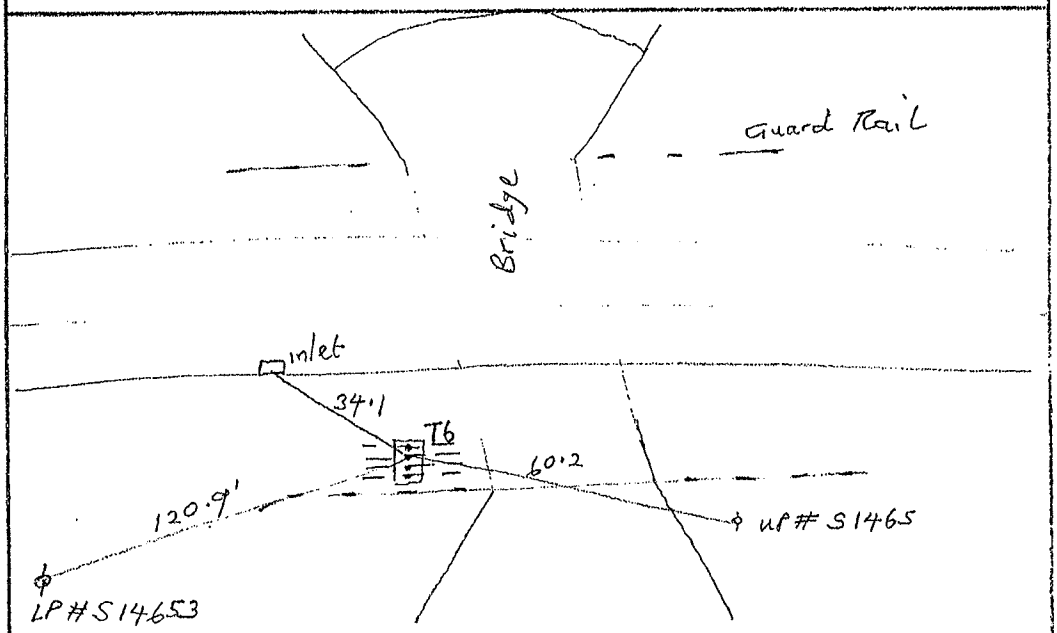
I.D./ Type utility Found : Four 4" Metal(Steel) Telephone Lines

Type of Instrument: VAC Machine

## Profile - Not to Scale

CIRCLE ONE:
(P.K.) / Nail / Stake / X-Cut
(indicates center of utility)




I HEREBY CERTIFY THAT THIS SKETCH WAS PREPARED UNDER MY IMMEDIATE SUPERVISION.

HAREESH DAGGUPATI

UTILITY TEST HOLE PLAN

KMA Consulting Engineers, Inc.
520 Stokes Road Building O, Suite 6
Medford, NJ 08055
Tel: (609) 953-1828 Fax: (609) 722-9250
www.kmaengineering.com

Test Hole #: T 7 DATE : 4/3/11

KMA Job #: 1121

Client: McCormick Taylor

Site Location: Laytons Lake - Route 48

Municipality: Carneys Point County: Salem State: NJ

(Paving) / Soil / Cond / Thick / Type: Asphalt (6.5")

Size / Type Utility Anticipated: Telephone Line

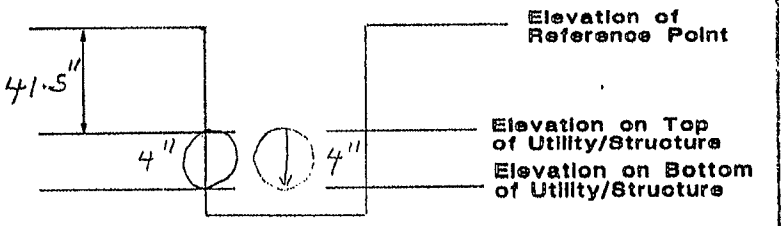
Reason for Test Hole:

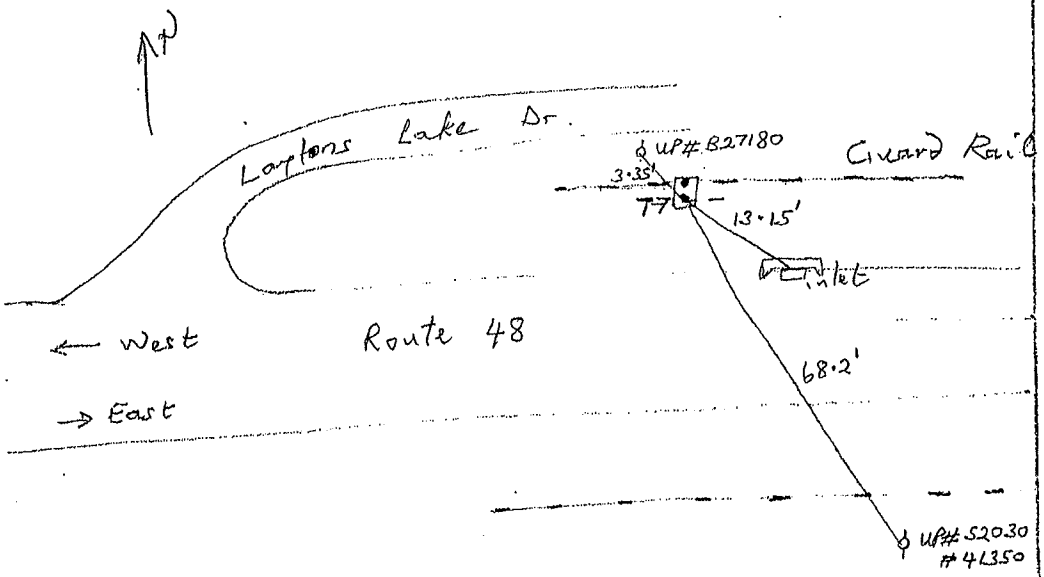
I.D./ Type utility Found : Two 4" Plastic (PVC) Telephone Lines

Type of Instrument: VAC Machine

## Profile - Not to Scale

CIRCLE ONE:
(P.K.) / Nail / Stake / X-Cut
(Indicates center of utility)




I HEREBY CERTIFY THAT THIS SKETCH WAS PREPARED UNDER MY IMMEDIATE SUPERVISION.

HAREESH DAGGUPATI

UTILITY TEST HOLE PLAN

KMA Consulting Engineers, Inc.
520 Stokes Road Building O, Suite 6
Medford, NJ 08055
Tel: (609) 953-1528 Fax: (609) 722-9250
www.kmaengineering.com

Test Hole #: T8 DATE : 4/3/11

KMA Job #: 1121

Client: McCormick Taylor

Site Location: Laytons Lake — Route 48

Municipality: Carneys Point County: Salem State: NJ

Paving / Soil / Cond / Thick / Type: Soil with grass cover

Size / Type Utility Anticipated: Telephone Line

Reason for Test Hole:

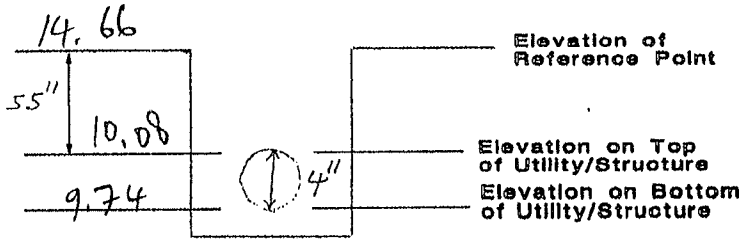
I.D./ Type utility Found : 4" Plastic(PVC) Telephone Lines

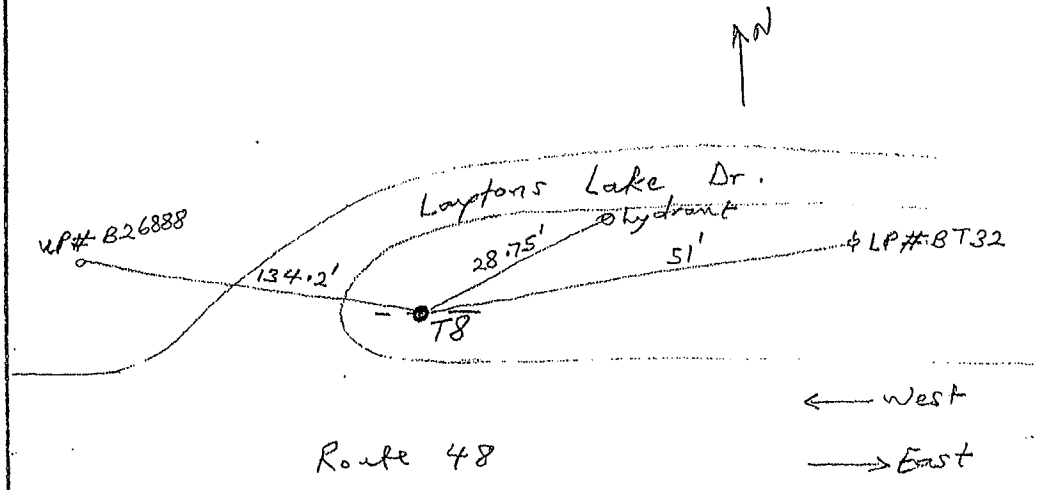
Type of Instrument:

## Profile - Not to Scale

CIRCLE ONE:
P.K. / Nail / (Stake) / X-Cut
(indicates center of utility)

Clearance : 3.4" with prop. Stan pipe




I HEREBY CERTIFY THAT THIS SKETCH WAS PREPARED UNDER MY IMMEDIATE SUPERVISION.

HAREESH DAGGUPATI

UTILITY TEST HOLE PLAN

KMA Consulting Engineers, Inc.
520 Stokes Road Building C, Suite 6
Medford, NJ 08055
Tel: (609) 953-1525 Fax: (609) 722-9250
www.kmaengineering.com

Test Hole #: T9 DATE : 4/3/11

KMA Job #: 1121

Client: McCormick Taylor

Site Location: Laytons Lake — Route 48

Municipality: Carneys Point County: Salem State: NJ

Paving / Soil / Cond / Thick / Type: Soil with grass cover

Size / Type Utility Anticipated: Telephone Line

Reason for Test Hole:

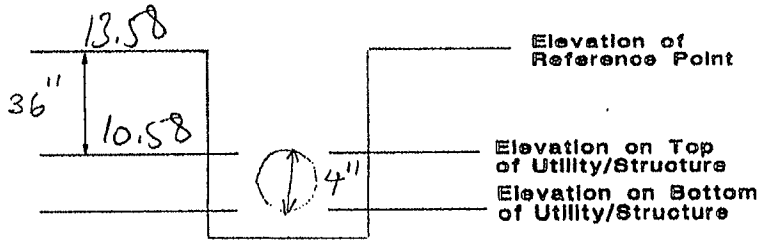
I.D./ Type utility Found : 4" Plastic (PVC) Telephone Line

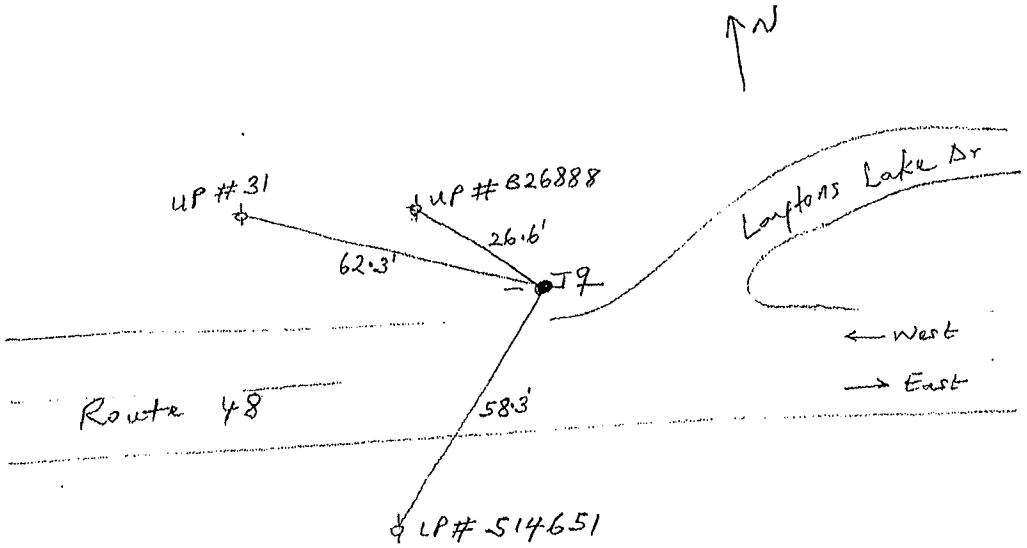
Type of Instrument: VAC Machine

## Profile - Not to Scale

CIRCLE ONE: P.K. / Nail / Stake / X-Cut
(indicates center of utility)

conflict with prop. storm pipe




I HEREBY CERTIFY THAT THIS SKETCH WAS PREPARED UNDER MY IMMEDIATE SUPERVISION.

HAREESH DAGGUPATI

UTILITY TEST HOLE PLAN

KMA Consulting Engineers, Inc.
520 Stokes Road Building C, Suite 6
Medford, NJ 08055
Tel: (609) 953-1525 Fax: (609) 722-9250
www.kmaengineering.com

Test Hole #: T10 DATE : 4/4/11

KMA Job #: 1121

Client: McCormick Taylor

Site Location: Laytons Lake - Route 48

Municipality: Carneys Point County: Salem State: NJ

(Paving) / Soil / Cond / Thick / Type: Asphalt (7½")

Size / Type Utility Anticipated: Telephone Line

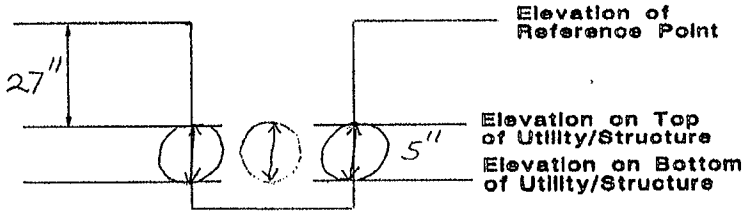
Reason for Test Hole:

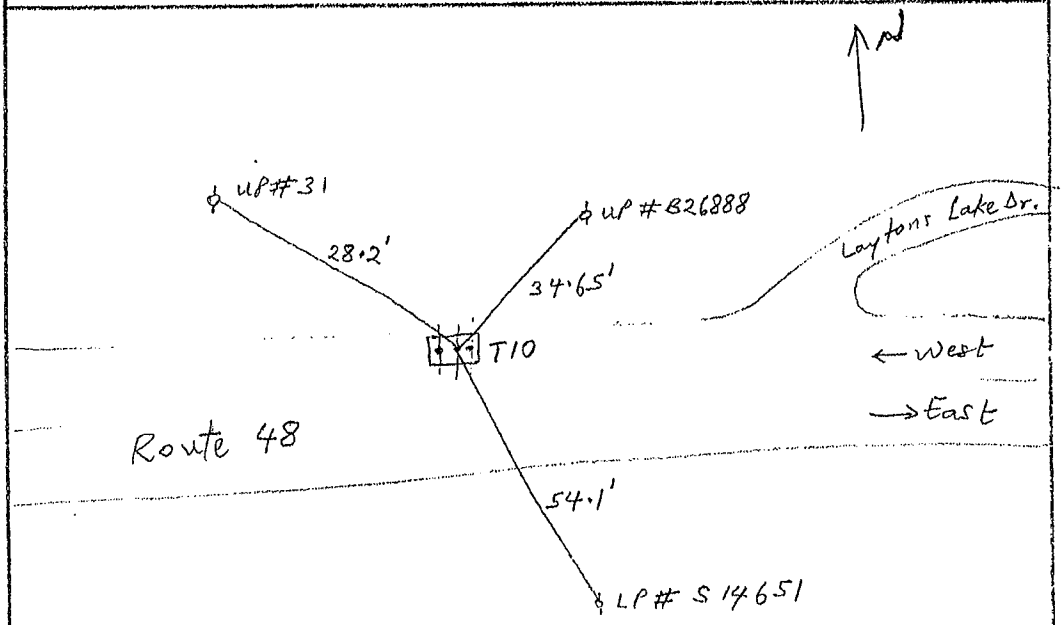
I.D./ Type utility Found : Three 5" Metal (Steel) Telephone Lines

Type of Instrument: VAC Machine

## Profile - Not to Scale

CIRCLE ONE:
(P.K.) / Nail / Stake / X-Cut
(Indicates center of utility)




I HEREBY CERTIFY THAT THIS SKETCH WAS PREPARED UNDER MY IMMEDIATE SUPERVISION.

HAREESH DAGGUPATI

UTILITY TEST HOLE PLAN

KMA Consulting Engineers, Inc.
520 Stokes Road Building O, Suite 6
Medford, NJ 08055
Tel: (609) 953-1525 Fax: (609) 722-9250
www.kmaengineering.com

Test Hole #: CP DATE : 4/2/11

KMA Job #: 1121

Client: McCormick Taylor

Site Location: Laytons Lake – Route 48

Municipality: Carneys Point County: Salem State: NJ

Paving / Soil Cond / Thick / Type: Soil with grass cover

Size / Type Utility Anticipated: Telephone Line

Reason for Test Hole:

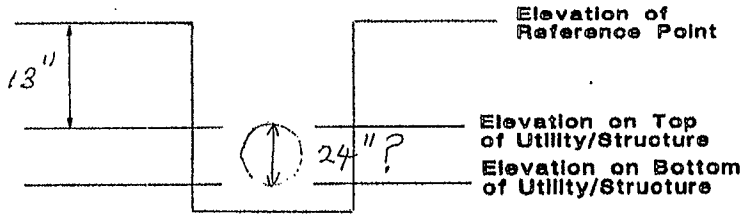
I.D./ Type utility Found : Concrete Pipe (Possibly 24")

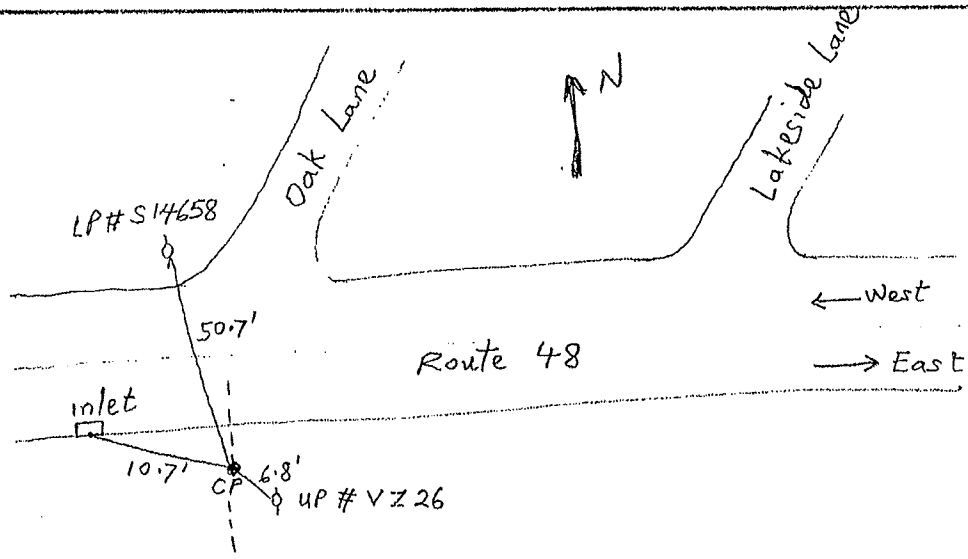
Type of Instrument: VAC Machine

**Profile - Not to Scale**

CIRCLE ONE:
P.K. / Nail / Stake / X-Cut
(indicates center of utility)

Note: Cannot tell which type of pipe is this




I HEREBY CERTIFY THAT THIS SKETCH WAS PREPARED UNDER MY IMMEDIATE SUPERVISION.

HAREESH DAGGUPATI

**UTILITY TEST HOLE PLAN**

KMA Consulting Engineers, Inc.
520 Stokes Road Building C, Suite 6
Medford, NJ 08055
Tel: (609) 955-1525 Fax: (609) 722-9250
www.kmaengineering.com

Test Hole #: SW1 DATE : 4/4/11

KMA Job #: 1121

Client: McCormick Taylor

Site Location: Laytons Lake - Route 48

Municipality: Carneys Point County: Salem State: NJ

(Paving) / Soil / Cond / Thick / Type: Asphalt (6")

Size / Type Utility Anticipated: Water Line

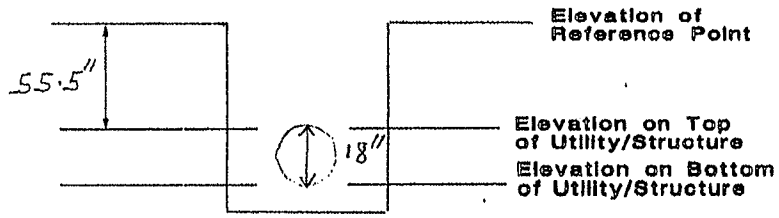
Reason for Test Hole:

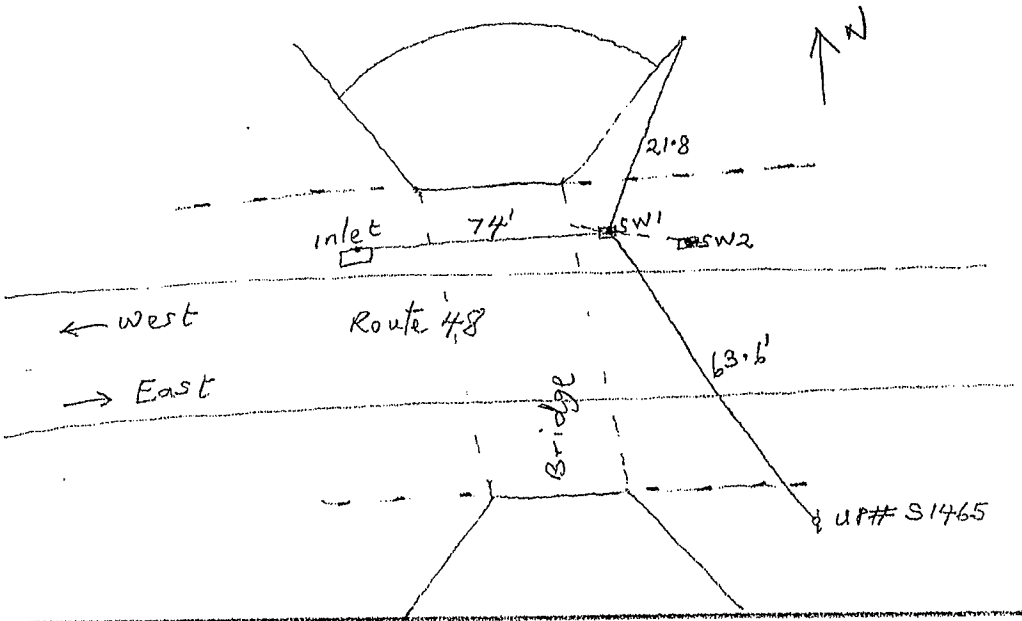
I.D./ Type utility Found : 18" RCP (storm water Pipe)

Type of Instrument: VAC Machine

## Profile - Not to Scale

CIRCLE ONE:
(P.K.) / Nail / Stake / X-Cut
(indicates center of utility)




I HEREBY CERTIFY THAT THIS SKETCH WAS PREPARED UNDER MY IMMEDIATE SUPERVISION.

HAREESH DAGGUPATI

UTILITY TEST HOLE PLAN

KMA Consulting Engineers, Inc.
520 Stokes Road Building O, Suite 6
Medford, NJ 08055
Tel: (609) 953-1525 Fax: (609) 722-9250
www.kmaengineering.com

Test Hole #: SW2 DATE : 4/4/11

KMA Job #: 1121

Client: McCormick Taylor

Site Location: Laytons Lake - Route 48

Municipality: Carneys Point County: Salem State: NJ

(Paving) / Soil / Cond / Thick / Type: Asphalt

Size / Type Utility Anticipated: Waterline

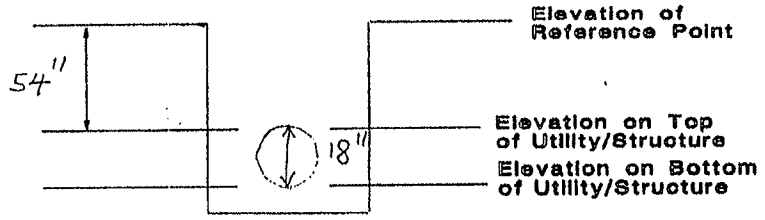
Reason for Test Hole:

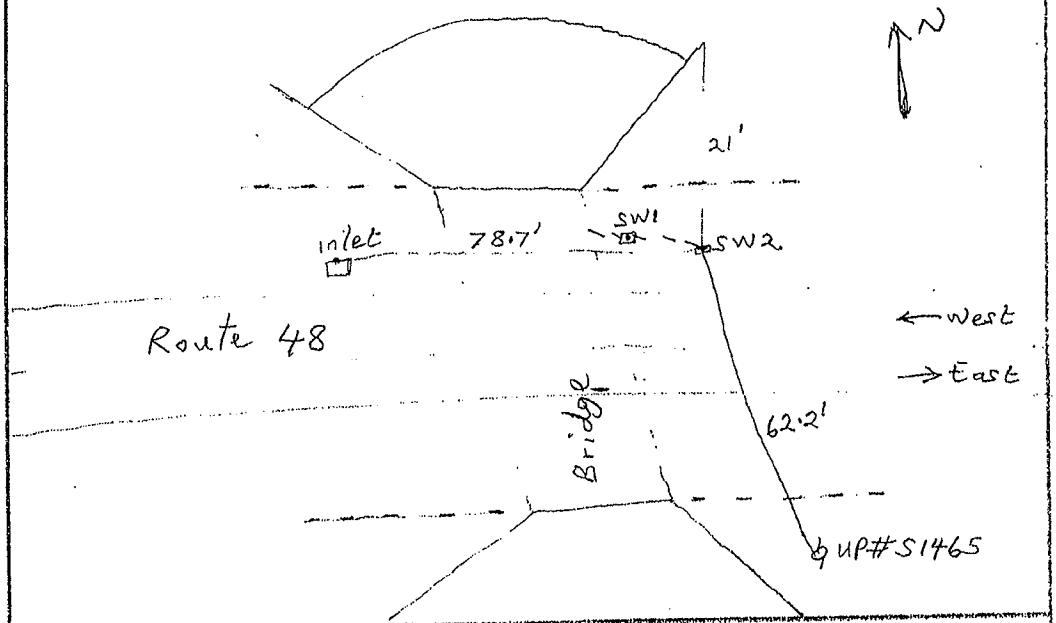
I.D./ Type utility Found : 18" RCP (Storm water Pipe)

Type of Instrument: VAC Machine

## Profile - Not to Scale

CIRCLE ONE:
(P.K.) / Nail / Stake / X-Cut
(Indicates center of utility)




I HEREBY CERTIFY THAT THIS SKETCH WAS PREPARED UNDER MY IMMEDIATE SUPERVISION.

HAREESH DAGGUPATI

## UTILITY TEST HOLE PLAN

KMA Consulting Engineers, Inc.
520 Stokes Road Building O, Suite 6
Medford, NJ 08055
Tel: (609) 953-1525 Fax: (609) 722-9250
www.kmaengineering.com

# *Appendix C – Pavement Recommendations*

# PAVEMENT DESIGN REPORT

LAYTONS LAKE DAM
U.S. ROUTE 48, MP 3.06

CARNEY'S POINT TOWNSHIP
SALEM COUNTY, NEW JERSEY

*Prepared by:*

**KMA Consulting Engineers, Inc.**

*Prepared for:*

**New Jersey Department of Transportation**

**September, 2011**

John Dogbey, P.E.
Professional Engineer
NJ License No. 40322

# TABLE OF CONTENTS

**1. INTRODUCTION ..... 3**
**2. PROJECT DESCRIPTION ..... 3**
**3. FIELD EXPLORATION AND LABORATORY TESTING ..... 4**
**4. SUBSURFACE CONDITIONS ..... 6**
**5. CLIMATIC CONDICTIONS ..... 8**
**6. PAVEMENT DESIGN DATA ..... 8**
6.1 PAVEMENT PERFORMANCE ..... 8
6.2 RELIABILITY (R) AND OVERALL STANDARD DEVIATION ..... 9
6.3 TRAFFIC DATA ..... 9
6.4 ROADBED SOIL ..... 10
6.5 PROPOSED PAVEMENT STRUCTURE ..... 10
6.5.1 Bituminous (HMA) Courses ..... 10
6.5.2 Granular Base Course ..... 11
6.5.3 Granular Subbase Course ..... 12
**7. PAVEMENT DESIGN RESULTS ..... 13**
**8. RECOMMENDATIONS ..... 14**
**9. BASIS FOR RECOMMENDATIONS ..... 14**

## LIST OF TABLES

**TABLE 3. 1: LABORATORY TESTING ..... 5**

**TABLE 7. 1: PROPOSED PAVEMENT STRUCTURE DESIGN OPTIONS ..... 13**

## APPENDICES

**APPENDIX A: SITE LOCATION**
**APPENDIX A-1: SITE LOCATION MAP**
**APPENDIX A-2: BORING LOCATION PLAN**
**APPENDIX B: BORING LOGS**
**APPENDIX C: LABORATORY TESTS RESULTS**
**APPENDIX D: TRAFFIC AND PAVEMENT DESIGN DATA**
**APPENDIX E: AVERAGE EQUIVALENCY FACTORS**
**APPENDIX F: LAYER COEFFICIENTS**
**APPENDIX G: PAVEMENT DESIGN OUTPUT**

## 1. INTRODUCTION

Laytons Lake Dam is located at Milepost 3.06 of NJ Route 48 in Carney's Point Township, Salem County, NJ (see Appendix A, Site Location Map). The dam embankment carries NJ Route 48 in a west to east direction over Two Penny Run. New Jersey Department of Transportation (NJDOT) owns NJ Route 48 and maintains the dam and spillway of Laytons Lake. The lake is used for recreational activities. The dam is classified as "Significant Hazard" and does not conform to current dam safety regulations. As a result, New Jersey Department of Environmental Protection – Bureau of Dam Safety and Flood Control (NJDEP-BDSFC) mandated that New Jersey Department of Transportation (NJDOT) perform a detailed study of the dam.

As informed by McCormick Taylor, Inc. the project will involve raising and re-aligning the roadway. This report presents the pavement design of the proposed roadway.

## 2. PROJECT DESCRIPTION

Information provided by McCormick Taylor Inc. shows that the existing dam is about 13 feet high and 500 feet in length. The abutments and wing walls of the concrete bridge, which is part of the Laytons Lake Dam, has been determined to be affected by Alkali-Silica Reactivity (ASR). ASR is caused by a reaction between the alkaline cement pore solution in the concrete and reactive forms of silica in the aggregate. It can cause expansion and cracking of the concrete resulting in structural problems and possible failure.

The proposed project will involve raising the roadway by about 1.1 feet, re-aligning the roadway and constructing a new bridge with a span of 40 feet.

This report summarizes the design of a new flexible pavement at this site based on factors such as subsurface soil conditions, expected traffic and climate.

The work was performed for the New Jersey Turnpike Authority.

## 3. FIELD EXPLORATION AND LABORATORY TESTING

A site soil investigation had been carried out. The purpose of the investigation was to obtain subsurface soil and ground water data necessary for developing initial design for the proposed roadway, spillway and dam. The investigation involved the drilling of two borings, collection of soil samples, and conducting laboratory tests on selected samples.

### 3.1. FIELD EXPLORATION

The field test for the geotechnical investigation consisted of drilling one borehole, B-1, on the north shoulder of Route 48 west side of the bridge; a second boring, B-2, was also on the northerly shoulder but to the east side of the bridge. Refer to Appendix A-2 for boring locations. The borings were drilled to an approximate depth of 100 feet below existing ground surface. The drilling was performed on March 17 and 18, 2011. CME 45 drill rig mounted on a truck was used.

The borings were advanced by means of rotary drilling method. Bentonite mud was used as the drilling fluid.

Soil samples were obtained using the split-spoon sampler. The split-spoon was driven in accordance with the requirements of the standard penetration test (SPT). This involves driving a 2-inch outside diameter split spoon using a 140 lb automatic hammer free-falling 30 inches. The numbers of hammer blows required to drive the 24-inch long spoon in 6-inch increments (four increments in all) were recorded. The number of blows required to penetrate the middle two increments (6 to 18 inches) is defined as the standard penetration resistance (N). Standard

Penetration Test (SPT) readings were obtained continuously in the upper 12 feet and at 5 ft intervals thereafter. The soil samples recovered from the SPT split-spoons were visually classified in accordance to the "Burmister Soil Classification System."

The boring location and elevation of the existing grade were determined using the GPS surveying method. The survey was performed by the Surveying Department of KMA Consulting Engineers, Inc. The boring logs are presented in Appendix B.

## 3.2. LABORATORY TESTING

All soil samples obtained were sent to the offices of KMA Consulting Engineers, Inc. Field data was reviewed and a number of samples were selected for laboratory testing. The selected samples were tested in-house at KMA Consulting Engineers, Inc.

The selected samples were subjected to sieve and hydrometer analyses, Atterberg limits test, natural moisture content, consolidation, and unconfined compressive strength tests. The tests were conducted in accordance to the American Society of Testing Materials (ASTM) procedures which are summarized in Table 3.1.

**Table 3. 1: Laboratory Testing**

| Laboratory Analysis | ASTM Standard | Soil Properties Tested |
|---|---|---|
| Sieve Analysis | D422 | Soil grain size distribution |
| Hydrometer analysis | D4221 | Silt and clay sizes |
| Atterberg Limits | D4318 | Soil plasticity |
| Natural Moisture Content | D2216 | Soil moisture content |
| Unconfined Compression test | D2166 | Soil unconfined compressive strength |
| Consolidation | D2435 | Soil magnitude and rate of consolidation |

A summary of the test results, including graphic presentation of gradation test curves, Atterberg Limits chart, unconfined compression test plots, and one-dimension consolidation results are presented in Appendix C.

## 4. SUBSURFACE CONDITIONS

Published geologic data was studied to provide valuable information on the types and mode of formation of the soils in the general vicinity of the project. This information helps in evaluating the subsurface conditions encountered in the borings.

### 4.1 PUBLISHED GEOLOGIC DATA

The project site is located in Salem County, New Jersey. The surface soil in this area, according to the Web Soil Survey, consists of Downer-Galestown (DopB) complex. The soil profile consists mainly of Loamy Sand (0-16 inches), Sandy Loam (16 to 36 inches) and Loamy Sand (36-48 inches).

The surficial geological material in the project area consists mainly of Cape May Formation (Qcm2 and Qcm3) which is a late Pleistocene. Qcm2 consists of sand, pebble gravel, minor silt, clay , peat and cobble gravel; with colors varying from very pale brown to yellow, reddish yellow, white, olive yellow and gray. Qcm3 consists of sand, pebble gravel, minor silt, clay, and peat; with colors varying from yellow, to reddish yellow, white, and gray.

The surficial geologic information was taken from the "New Jersey Geological CD Series CD 06-1". Soil survey data was based on information from "Web Soil Survey 2.0" published by the United States Department of Agriculture of Natural Resources Conservative (NRCS).

### 4.2 SOILS ENCOUNTERED

The soils encountered in the boring are in general agreement with the published geologic data. The detail of the subsurface soil conditions are on the boring logs presented in Appendix B of this report. The various soil layers encountered with their relevant properties are summarized in the ensuing paragraphs.

At the existing grade 2 inches asphalt concrete (AC) layer is encountered at both boreholes. In both boreholes, underneath the AC is fill. We believe the fill is part of the dam's embankment. It consists primarily of brown/ yellowish brown sand with trace of gravel. The fill extends to an approximate depth of 8 feet in B-1 and 7 feet in B-2. Standard penetration test resistance (N-values) varies from over 13 blows per foot (bpf) to 30 bpf.

Directly below the fill in both borings and extending to an approximate depth of 19 feet lays a light/dark gray sand layer with trace of gravel. N-values vary between 7 and 35 bpf with an average N-value of approximately 10 bpf in B-1 and 19 bpf in B-2.

Below 19 feet, dark to light gray clay, silty clay, clayey silt and sandy clay layers exist to a depth of 80 feet in B-1 and 70 feet in B-2. The N-value for this layer varies between 10 and 20 bpf with an average value of 12 bpf. The average total unit weight is approximately 119 pounds per cubic foot (pcf). The undrained shear strength ($c_u$) for the clay layer was determined in laboratory unconfined compression test to be 573 pounds per square foot (psf) for the sample from B-1. Two unconfined compression tests were performed on a single undisturbed sample form B-2. The undrained shear strengths obtained are 216 and 676 psf.

Underneath clayey soil layers and extending to the end of each boring is very dense sand. The N-values are higher than 50 bpf.

## 4.3 GROUNDWATER CONDITIONS

Stabilized groundwater surface was measured at a depth of 7 feet and 5 feet below existing grade in borehole B-1 and B-2, respectively.

## 5. CLIMATIC CONDICTIONS

In general, the weather in New Jersey is highly variable being influenced by wet, dry, hot and cold air streams. As over most of North America, the dominant atmospheric circulation is west to east. In the project area the average number of freeze-free days is about 179 and the annual precipitation is between 43 and 47 inches.

According to the AASHTO Guide for Design of Pavement Structures (AASHTO Manual), the project area is within the IB Climatic Zone (Section 3.3.5, Page III-26). This means there is a high potential for moisture presence in the entire pavement structure throughout the year. Severe winters may produce frozen subgrades; however, long term freezing problems are minor.

## 6. PAVEMENT DESIGN DATA

The existing road for Route 48 consists of flexible pavement; it is therefore assumed that the proposed new pavements will also be flexible pavements. The design was performed using the AASHTO pavement design computer software DARWin 3.1. The variable and factors considered in the design are discussed briefly in the ensuing sub sections. Route 48 is classified as Rural Major Collector.

### 6.1 PAVEMENT PERFORMANCE

The functional performance of a pavement is expressed in terms of Serviceability Index (PSI). The performance of a pavement over its life cycle is expressed as loss in Serviceability Index (ΔPSI); that is the difference between the initial design Serviceability Index (Po) and the terminal Serviceability Index (Pt). Index Pt is the serviceability index at the end of the pavement life cycle.

For the present design, the initial design Serviceability Index is taken as 4.2 and the terminal Serviceability Index is 2.5. The loss in serviceability (ΔPSI) is, therefore, 1.7.

## 6.2 RELIABILITY (R) AND OVERALL STANDARD DEVIATION

As stated in Section 6.0, Route 48 is classified as Rural Major Collector road. The recommended level of reliability for Rural Major Collector roads is in the range of 75 to 95%, (Table 2.2, Page II-9, AASHTO Manual). A value of 80% is assumed for the design. This corresponds to a Standard Normal Deviate ($Z_R$) of -0.841 (Table 4.1, Page I-62, AASHTO Manual). For flexible pavements, the recommended overall standard deviation ($S_o$) is in the range from 0.40 to 0.50. A value of 0.45 is used in the design.

## 6.3 TRAFFIC DATA

Traffic data for the design was provided by McCormick Taylor, Inc. This information is in Appendix D of this report. The base year of the data is 2011 and the future year is 2031. The base year 1-way average daily traffic (ADT) was 2,500 vehicles. The corresponding figure for 2031 is 2,800; this gives an annual growth rate of about 0.60%. The traffic stream comprises 11.6% trucks of which 2.5% are heavy trucks.

The mixed traffic is converted to "Equivalent Standard Axle Load" (ESAL) using the average equivalence factors for Route 48 (see Appendix E). The equivalence factor for light trucks for flexible pavement is 0.269; that for heavy trucks is 1.011. The annual growth rate for trucks is assumed to be the as that for the total traffic, i.e. 0.60 % and the annual truck factor growth rate is 0%. The ESAL factor for passenger cars is assumed to be 0.0002. Ninety percent of the cumulative ESAL is assigned to the design lane.

To calculate the cumulative ESAL, exponential growth factor was applied. Both the simplified and the rigorous methods of calculating the ESAL have been used. The simplified method yielded ESAL of 431,181 while the rigorous method result was 851,798. The rigorous method's result (ESAL of 851,798) has been used in the design.

## 6.4 ROADBED SOIL

In general, the surface material encountered in all borings is sandy soil. The natural soil below the fill materials is considered as subgrade soil for design analysis. The grain-size distribution analysis on selected samples of the subgrade soil falls in the A-3, AASHTO Classification (Appendix C). This soil can be described as good roadbed soil.

The effective Roadbed Resilient Modulus was calculated based on the relative roadbed soil quality of good (Table 4.2, Page II-71, AASHTO Manual) and the suggested lengths of the seasons for Climatic Region II (Table 4.1, Page II-71, AASHTO Manual). The calculated effective Resilient Modulus is 4,736 psi.

## 6.5 PROPOSED PAVEMENT STRUCTURE

The proposed pavement structures consist of up to five courses – two or three asphalt surface courses, a granular base and a granular subbase courses. The material for the surface courses is Hot-Mixed-Asphalt (HMA). The material for the granular base course is either NJDOT I-5 Aggregate or Densely Graded Aggregate (DGA). The subbase is NJDOT I-3 Aggregate.

### 6.5.1 Bituminous (HMA) Courses

Two HMA courses are recommended. The top course, the bituminous surface and intermediate courses should be 12.5 H76 HMA; and the lower course, the stabilized bituminous base course, should consist of 25.0 H64 HMA. The elastic modulus of these HMA mixes should be 400,000 psi at 68°F.

On the basis of these recommended properties of the HMA mixes a layer coefficient ($a_1$) of 0.42 was used for the surface and intermediate courses while a value of 0.4 was used for the base course in the pavement design, according to AASHTO. Drainage conditions are assumed not to have any

effect on the performance of the HMA course, consequently the drainage coefficient ($m_1$) is taken as 1 (see Appendix F). For cost analysis the HMA courses are assumed to cost $159.84 per cubic yard or $4.44/SY/in.

### 6.5.2 Granular Base Course

The material for the base course is assumed to be unbound (untreated) NJDOT I-5 Aggregate or Densely Graded Aggregate (DGA). The elastic modulus ($E_{BS}$) can be estimated from the expression:

$E_{BS} = k_1\theta k_2$ (Page II-20)

Where $k_1$ and $k_2$ are regression constants

$\theta$ is stress state (psi)

Based on the assumption that the base course is damp, the HMA layer is at least 6 inches thick, and the roadbed soil resilient modulus is 3,902 psi

$k_1 = 6{,}000$, $k_2 = 0.6$ and $\theta = 6$ psi

$E_{BS} = 21{,}600$ psi

The structural layer coefficient ($a_2$) for the granular base course is given by the expression:

$a_2 = 0.249(\log_{10}E_{BS})-0.977$

$a_2 = 0.102$.

The drainage coefficient for the granular base ($m_2$) is taken as 0.8. This figure is based on the assumption of fair drainage quality and also that the pavement is exposed to saturation for more than 25% of the time (Table 2.4, Page II-25, AASHTO Manual).

The cost per cubic yard of the granular base course is assumed as $44.89 or $1.25/SY/in. for cost analysis.

### 6.5.3 Granular Subbase Course

The material for the subbase course is assumed to be unbound (untreated) NJDOT I-3 Aggregate. The elastic modulus ($E_{BS}$) can be estimated from the expression:

$E_{SB} = k_1 \theta k_2$ (Page II-20)

where $k_1$ and $k_2$ are regression constants

$\theta$ is stress state (psi)

Based on the assumption that the base course is damp, the HMA layer is at least 6 inches thick, and the roadbed soil resilient modulus is 3,902 psi

$k_1 = 4{,}000$, $k_2 = 0.5$ and $\theta = 5$ psi

$E_{SB} = 10{,}000$ psi

The structural layer coefficient ($a_3$) for the granular base course is given by the expression:

$a_3 = 0.227(\log_{10} E_{SB}) - 0.839$

$a_3 = 0.069$

The drainage coefficient for the granular subbase ($m_3$) is taken as 0.8. This figure is based on the assumption of fair drainage quality and also that the pavement is exposed to saturation for more than 25% of the time (Table 2.4, Page II-25, AASHTO Manual).

For cost analysis the cost per cubic yard of the granular subbase course is assumed as $30.52 or $0.848/SY/in.

## 7. PAVEMENT DESIGN RESULTS

The design was performed using the AASHTO pavement design computer software DARWin 3.1. The Specified Layer Design analysis is used. The design is based on the following input data:

| | | |
|---|---|---|
| 1. | 18-kips ESALs over a Performance Period of 20 Years | 851,798 |
| 2. | Initial Serviceability Index | 4.2 |
| 3. | Terminal Serviceability Index | 2.5 |
| 4. | Reliability Level | 80% |
| 5. | Overall Standard Deviation | 0.45 |
| 6. | Roadbed Soil Resilient Modulus (Good Subgrade) | 4,736 psi |
| 8. | Stage Construction | 1 |

The calculated Structural Number (SN) is 3.74.

According to McCormick Taylor Inc., the project will involve the re-alignment and the raising the roadway. Two pavement design options have been considered. The pavement section of the first option (Option I) consists of HMA course (including surface course ACC1, intermediate ACC 2 and base course ACC3), aggregate base course (ABC) and subbase course (SBC). The second design option (Option II) does not consider a subbase course (SBC) layer, as shown in Table 7. 1. For each option, the layered design method was used; then the design was optimized, based on cost. The proposed pavement design results are summarized in Table 7. 1. Detailed results of the analysis are presented in Appendix G.

**Table 7. 1: Proposed Pavement Structure Design Options**

| Pavement Section Components | Option I | | Option II | |
|---|---|---|---|---|
| | Layered | Optimized | Layered | Optimized |
| **HMA Surface Course (ACC1) - in** | 2 | 2 | 2 | 2 |
| **HMA Intermediate Course (ACC2) - in** | 2 | 2 | 2 | 2 |
| **HMA Base Course (ACC3) - in** | 2 | 2.82 | 3 | 3.93 |
| **Aggregate Base Course (ABC) - in** | 6 | 6 | 10.54 | 6 |
| **Subbase Course (SBC) - in** | 14 | 8 | 0 | 0 |
| **Total Pavement Thickness - in** | 26 | 20.82 | 17.54 | 13.93 |
| **Estimated Pavement Section Cost - $/SY** | --- | 43.35 | --- | 40.96 |

As shown in Table 7.1, Optimized designs for Options I and II resulted in aggregate base course (ABC) thicknesses of 2.82 and 3.93 inches, respectively. For all practical purpose, and as recommended by AASHTO pavement design guide, these thicknesses were rounded to 3 and 4 inches; analyses were then conducted for these thicknesses as shown in the specified layer design in Appendix G.

## 8. RECOMMENDATIONS

Since no information is provided on the location of the re-aligned route, the natural soil below the fill materials was considered as the subgrade soil in this preliminary pavement design report. Option II, which does not require a subbase course layer and represents the most economical option, is recommended. This proposed pavement structure option consists of 8 inches thick HMA course (2 inches surface, 2 inches intermediate and 4 inches base HMA courses) underlain by a 6 inches of granular base course.

However, during excavation and re-alignment, if a relatively poor roadbed soil is encountered or used, alternate design options should be considered where subbase course and/or stabilization of subgrade can be used if a substantial thickness of pavement is needed.

## 9. BASIS FOR RECOMMENDATIONS

This report has been prepared to serve as a basis for design of pavement structure for the proposed roadway at Route 48 Project. The opinions, conclusions, and recommendations contained in this report are based upon our professional judgment and generally accepted principles of geotechnical engineering. Inherent to these is the assumption that the earthwork, foundation construction and other relevant aspects of the construction will be performed under the direct supervision of a geotechnical engineer licensed in the State of New Jersey.

These analyses and recommendations are, of necessity, based on the information available at the time of the actual writing of the report and on the site conditions, surface and

subsurface, that existed at the time the exploratory borings were drilled. Further assumption has been made that the limited exploratory boring, in relation both to lateral extent of the site and to depth, are representative of conditions at the site.

The nature and extent of variations in the vicinity of the boring may not become evident until construction. If variations from the anticipated conditions are encountered, it may be necessary to revise the recommendations in this report. We cannot accept responsibility for designs based on recommendations in this report unless we are engaged to make site visits during construction to:

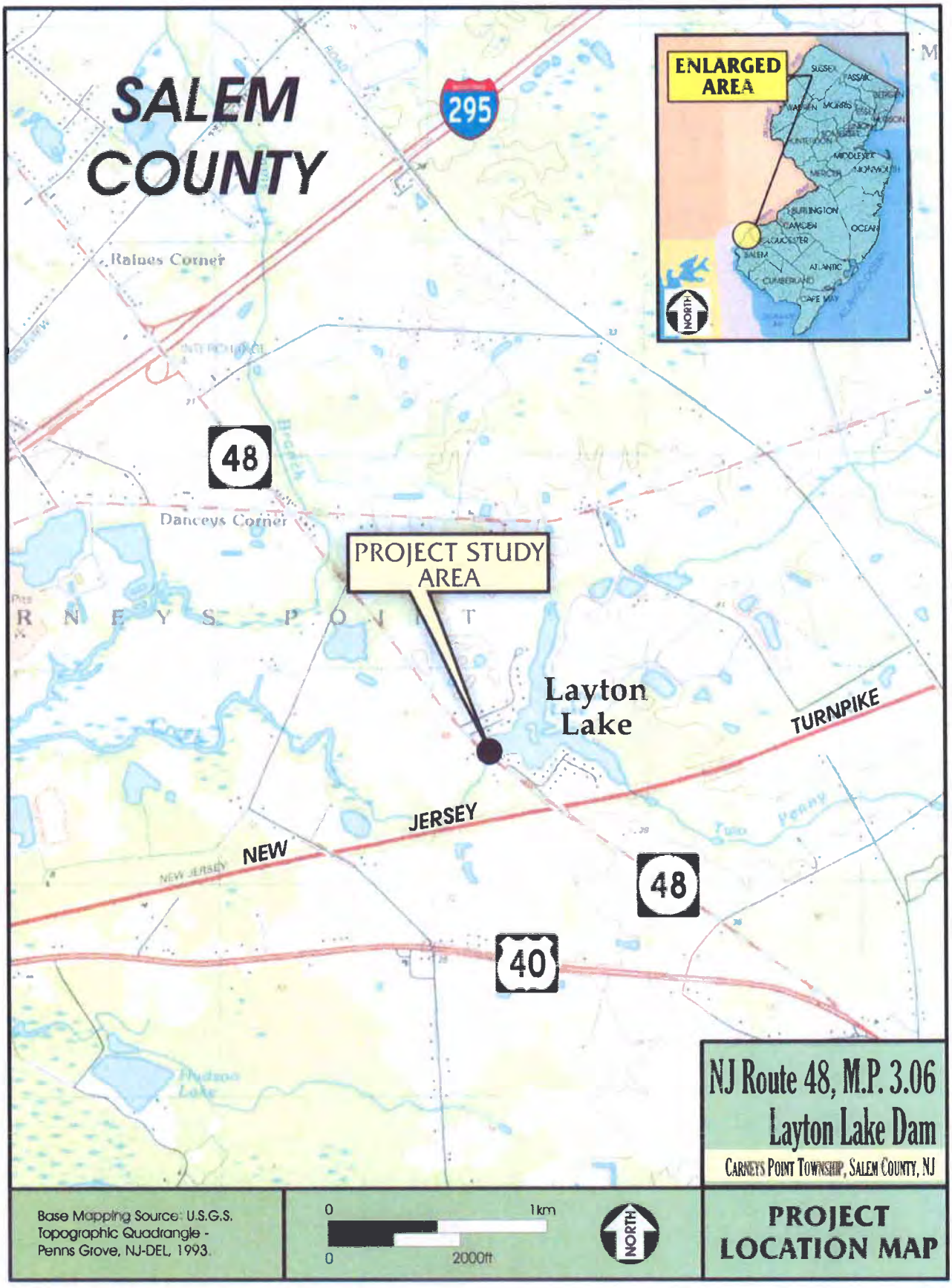
a) check that the subsurface conditions exposed during construction are in general agreement with our design assumptions and

b) ascertain that, in general, the work is being performed in compliance with the contract documents.

Our professional services have been performed in accordance with generally accepted engineering principles and practices; no other warranty, expressed or implied, is made. KMA Consulting Engineers, Inc. assumes no responsibility for interpretations made by others on information presented in this report.

# APPENDIX A: SITE LOCATION

# APPENDIX A-1: SITE LOCATION MAP



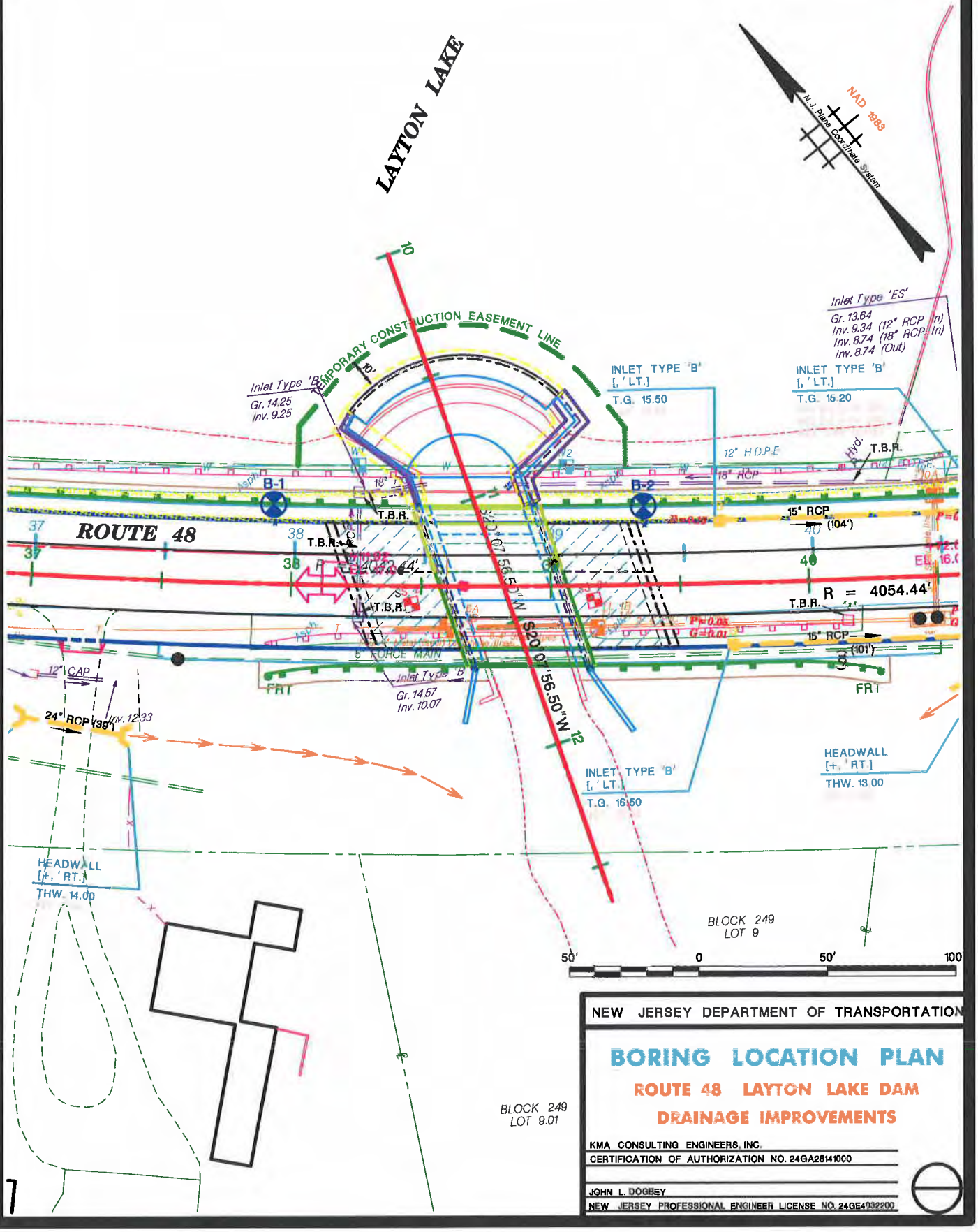

McCormick Taylor
Engineers & Planners Since 1946

FIGURE 1

# APPENDIX A-2: BORING LOCATION PLAN

TOWNSHIP OF CARNEYS POINT

COUNTY OF SALEM




NEW JERSEY DEPARTMENT OF TRANSPORTATION

# BORING LOCATION PLAN

## ROUTE 48 LAYTON LAKE DAM DRAINAGE IMPROVEMENTS

KMA CONSULTING ENGINEERS, INC.
CERTIFICATION OF AUTHORIZATION NO. 24GA28141000

JOHN L. DOGBEY
NEW JERSEY PROFESSIONAL ENGINEER LICENSE NO. 24GE4932200

# APPENDIX B: BORING LOGS

FORM SO-2

# KMA CONSULTING ENGINEERS, INC.

ROUTE: NJ Route 168 LOCAL NAME: Black Horse Pike NJDOT BORING NO. B-1

SECTION: 45 EAST: 325227.2827 NORTH: 389643.8343

STATION: OFFSET: REFERENCE LINE: GROUND ELEVATION: 6.04

BORINGS BY: Unitech Drilling, Inc. DATE STARTED: 2-22-11

INSPECTOR: Charbel Khoury, PhD DATE COMPLETED: 2-22-11

ELEVATION G.W.T.
0 Hr. 5.0 Date: 2-22-11
24 Hr. Date:
ft. P.P. Installed Date:

| DEPTH (ft.) | SAMPLE NO. | DEPTH (ft.) | | BLOWS ON SPOON 0-6" | 6-12" | 12-18" | 18-24" | REC. (in.) | SOIL DESCRIPTION & STRATIGRAPHY | |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | S-1 | 0 | 2.0 | 1 | 5 | 3 | 3 | 12" | 2" Top Soil | 0.2 |
| | | | | | | | | | Brown mf SAND, some Silt(Fill) | |
| | S-2 | 2 | 4.0 | 3 | 4 | 3 | 1 | 13" | | |
| | S-3 | 4 | 6.0 | 3 | 2 | 3 | 2 | 17" | | |
| 5 | | | | | | | | | Gray mf SAND, little clayey Silt, little mf Gravel | 5 |
| | S-4 | 6 | 8.0 | 3 | 4 | 2 | 2 | 19" | | |
| | S-5 | 8 | 10.0 | 3 | 3 | 4 | 2 | 20" | | |
| 10 | | | | | | | | | Reddish brown mf SAND, trace Silt | 9 |
| 15 | | | | | | | | | Reddish brown mf SAND,trace Silt,little mf Gravel | 14 |
| | S-6 | 15 | 17.0 | 3 | 1 | 2 | 2 | 8" | | |
| 20 | | | | | | | | | Gray Clayey SILT, little f Sand | 19 |
| | S-7 | 20 | 22.0 | 3 | 2 | 1 | 1 | 15" | | |
| 25 | | | | | | | | | Reddish brown mf SAND, trace Silt | 24 |
| | S-8 | 25 | 27.0 | 2 | 1 | 1 | 1 | 13" | | |
| 30 | | | | | | | | | Gray Silty CLAY, little f Sand, roots @ 31' | 27 |
| | S-9 | 30 | 32.0 | 2 | 1 | 2 | 1 | 20" | | |
| 35 | | | | | | | | | Gray CLAY, trace f Sand | 34 |
| | S-10 | 35 | 37.0 | 2 | 3 | 3 | 4 | 17" | | |

| | |
|---|---|
| Nominal I.D. of Drive Pipe | |
| Nominal I.D. of Split Barrel Sampler | 1.375" |
| Weight of Hammer on Drive Pipe | |
| Weight of Hammer on Split Barrel Sampler | 140 lb |
| Drop of Hammer on Drive Pipe | |
| Drop of Hammer on Split Barrel Sampler | 30" |

Core Size _____ - _____

Soil descriptions represent a field identification after D.M. Burmister unless otherwise noted.

The subsurface information shown hereon was obtained for State design and estimate purposes. It is made available to authorized users only that they may have access to the same information available to the State. It is presented in good faith, but is not intended as a substitute for investigations interpretation or judgment of such authorized users.

Approximate Change in Strata _____

Inferred Change in Strata — — — —

FORM SO-2

# KMA CONSULTING ENGINEERS, INC.

ROUTE: NJ Route 168 LOCAL NAME: Black Horse Pike NJDOT BORING NO. B-1

SECTION: 45 EAST: 325227.2827 NORTH: 389643.8343

STATION: OFFSET: REFERENCE LINE: GROUND ELEVATION: 6.04

BORINGS BY: Unitech Drilling, Inc. DATE STARTED: 2-22-11

INSPECTOR: Charbel Khoury, PhD DATE COMPLETED: 2-22-11

ELEVATION G.W.T.
0 Hr. 5.0 Date: 2-22-11
24 Hr. Date:
ft. P.P. Installed Date:

| DEPTH (ft.) | SAMPLE NO. | DEPTH (ft.) | | BLOWS ON SPOON 0-6" | 6-12" | 12-18" | 18-24" | REC. (in.) | SOIL DESCRIPTION & STRATIGRAPHY | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | Gray mf SAND, trace Silt,little mf Gravel, | 39 |
| 40 | S-11 | 40 | 42.0 | 7 | 5 | 7 | 8 | 13" | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| 45 | S-12 | 45 | 47.0 | 50/5" | | | | 5" | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| 50 | S-13 | 50 | 52.0 | 26 | 50/5" | | | 4" | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| 55 | S-14 | 55 | 57.0 | 23 | 25 | 34 | 42 | 18" | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | Light gray mf SAND, trace Silt, pieces of ironstone at 71' | 59 |
| 60 | S-15 | 60 | 62.0 | 50/3" | | | | 2" | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| 65 | S-16 | 65 | 67.0 | 50/3" | | | | 3" | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| 70 | S-17 | 70 | 72.0 | 29 | 31 | 35 | 35 | 14" | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

| | |
|---|---|
| Nominal I.D. of Drive Pipe | |
| Nominal I.D. of Split Barrel Sampler | 1.375" |
| Weight of Hammer on Drive Pipe | |
| Weight of Hammer on Split Barrel Sampler | 140 lb |
| Drop of Hammer on Drive Pipe | |
| Drop of Hammer on Split Barrel Sampler | 30" |

Core Size _____ - _____

Soil descriptions represent a field identification after D.M. Burmister unless otherwise noted.

The subsurface information shown hereon was obtained for State design and estimate purposes. It is made available to authorized users only that they may have access to the same information available to the State. It is presented in good faith, but is not intended as a substitute for investigations interpretation or judgment of such authorized users.

Approximate Change in Strata _____

Inferred Change in Strata — — — —

FORM SO-2

# KMA CONSULTING ENGINEERS, INC.

ROUTE: NJ Route 168 LOCAL NAME: Black Horse Pike NJDOT BORING NO. B-1

SECTION: 45 EAST: 325227.2827 NORTH: 389643.8343

STATION: OFFSET: REFERENCE LINE: GROUND ELEVATION: 6.04

BORINGS BY: Unitech Drilling, Inc. DATE STARTED: 2-22-11

INSPECTOR: Charbel Khoury, PhD DATE COMPLETED: 2-22-11

ELEVATION G.W.T.
0 Hr. 5.0 Date: 2-22-11
24 Hr. Date:
ft. P.P. Installed Date:

| DEPTH (ft.) | SAMPLE NO. | DEPTH (ft.) | | BLOWS ON SPOON 0-6" | 6-12" | 12-18" | 18-24" | REC. (in.) | SOIL DESCRIPTION & STRATIGRAPHY | |
|---|---|---|---|---|---|---|---|---|---|---|
| 75 | S-18 | 75 | 77.0 | 50/4" | | | | 3" | | |
| | | | | | | | | | Gray cf SAND, trace Silt | 79 |
| 80 | S-19 | 80 | 82.0 | 50/4" | | | | 4" | | |
| 85 | S-20 | 85 | 87.0 | 50/5" | | | | 3" | | |
| | | | | | | | | | Gray cf SAND, trace Silt,trace f Gravel,pieces of ironstone at 91.5' | 88 |
| 90 | S-21 | 90 | 92.0 | 25 | 31 | 50/5" | | 14" | | |
| 95 | S-22 | 95 | 97.0 | 22 | 18 | 23 | 25 | 16" | | |
| 100 | S-23 | 100 | 102.0 | 50/5" | | | | 2" | End of Boring@ 100.4' | 100.4 |
| 105 | | | | | | | | | | |

| | |
|---|---|
| Nominal I.D. of Drive Pipe | |
| Nominal I.D. of Split Barrel Sampler | 1.375" |
| Weight of Hammer on Drive Pipe | |
| Weight of Hammer on Split Barrel Sampler | 140 lb |
| Drop of Hammer on Drive Pipe | |
| Drop of Hammer on Split Barrel Sampler | 30" |

Core Size _____

Soil descriptions represent a field identification after D.M. Burmister unless otherwise noted.

The subsurface information shown hereon was obtained for State design and estimate purposes. It is made available to authorized users only that they may have access to the same information available to the State. It is presented in good faith, but is not intended as a substitute for investigations interpretation or judgment of such authorized users.

Approximate Change in Strata _____

Inferred Change in Strata — — — —

FORM SO-2

# KMA CONSULTING ENGINEERS, INC.

ROUTE: NJ Route 168 LOCAL NAME: Black Horse Pike NJDOT BORING NO. B-2

SECTION: EAST: 325388.0427 NORTH: 389519.0684

STATION: OFFSET: REFERENCE LINE: GROUND ELEVATION: 7.63

BORINGS BY: UNITECH Drilling Inc., DATE STARTED: 2-21-11

INSPECTOR: Charbel Khoury, PhD DATE COMPLETED: 2-21-11

ELEVATION G.W.T.
0 Hr. 8 ' Date: 2-21-11
24 Hr. Date:
ft. P.P. Installed Date:

| DEPTH (ft.) | SAMPLE NO. | DEPTH (ft.) | | BLOWS ON SPOON 0-6" | 6-12" | 12-18" | 18-24" | REC. (in.) | SOIL DESCRIPTION & STRATIGRAPHY | |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | S-1 | 0 | 2.0 | 4 | 3 | 3 | 3 | 17" | 6" Top Soil | 0.5 |
| | | | | | | | | | Dark brown mf SAND , some Silt, some Gravel, pieces of Asphalt (Fill). | |
| | S-2 | 2 | 4.0 | 3 | 3 | 4 | 3 | 15" | Grayish brown mf SAND, some Silt, trace Gravel(Fill). | 2 |
| | | | | | | | | | | |
| | S-3 | 4 | 6.0 | 3 | 3 | 3 | 3 | 19" | | |
| 5 | | | | | | | | | Grayish brown CLAY, some f Sand | 5 |
| | S-4 | 6 | 8.0 | 3 | 3 | 3 | 2 | 18" | Gray mf SAND, trace Silt | 6 |
| | | | | | | | | | | |
| | S-5 | 8 | 10.0 | 3 | 4 | 3 | 2 | 24" | | |
| 10 | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | Gray mf SAND, little Silt , little mf Gravel | 14 |
| 15 | S-6 | 15 | 17.0 | W.H | 2 | 2 | 6 | 1" | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | Gray CLAY, little f SAND | 18 |
| | | | | | | | | | | |
| 20 | S-7 | 20 | 22.0 | 2 | 2 | 2 | 3 | 23" | | |
| | | | | | | | | | Grayish brown SILT, some f Sand | 21.5 |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | Gray Clayey SILT, little f Sand | 24 |
| 25 | S-8 | 25 | 27.0 | 3 | 3 | 3 | 5 | 24" | | |
| | | | | | | | | | Gray Silty CLAY, little f Sand | 26 |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | Gray Clayey SILT, little f Sand | 29 |
| 30 | S-9 | 30 | 32.0 | 3 | 5 | 7 | 8 | 24" | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | Gray mf SAND, trace Silt | 34 |
| 35 | S-10 | 35 | 37.0 | 50/5" | | | | 5" | | |
| | | | | | | | | | | |

| | |
|---|---|
| Nominal I.D. of Drive Pipe | |
| Nominal I.D. of Split Barrel Sampler | 1.375" |
| Weight of Hammer on Drive Pipe | |
| Weight of Hammer on Split Barrel Sampler | 140 lb |
| Drop of Hammer on Drive Pipe | |
| Drop of Hammer on Split Barrel Sampler | 30" |

Core Size _____ - _____

Soil descriptions represent a field identification after D.M. Burmister unless otherwise noted.

The subsurface information shown hereon was obtained for State design and estimate purposes. It is made available to authorized users only that they may have access to the same information available to the State. It is presented in good faith, but is not intended as a substitute for investigations interpretation or judgment of such authorized users.

Approximate Change in Strata _____

Inferred Change in Strata — — — —

FORM SO-2

# KMA CONSULTING ENGINEERS, INC.

ROUTE: NJ Route 168 LOCAL NAME: Black Horse Pike NJDOT BORING NO. B-2

SECTION: EAST: 325388.0427 NORTH: 389519.0684

STATION: OFFSET: REFERENCE LINE: GROUND ELEVATION: 7.63

BORINGS BY: UNITECH Drilling Inc., DATE STARTED: 2-21-11

INSPECTOR: Charbel Khoury, PhD DATE COMPLETED: 2-21-11

ELEVATION G.W.T.
0 Hr. 8 ' Date: 2-21-11
24 Hr. _____ ft. P.P. Installed Date: Date:

| DEPTH (ft.) | SAMPLE NO. | DEPTH (ft.) | | BLOWS ON SPOON 0-6" | 6-12" | 12-18" | 18-24" | REC. (in.) | SOIL DESCRIPTION & STRATIGRAPHY | |
|---|---|---|---|---|---|---|---|---|---|---|
| 40 | S-11 | 40 | 42.0 | 50/5" | | | | 5" | Yellowish brown mf SAND, trace Silt | 39 |
| 45 | S-12 | 45 | 47.0 | 50/4" | | | | 4" | | |
| 50 | S-13 | 50 | 52.0 | 38 | 50/3" | | | 8" | Gray cm SAND, trace Silt | 49 |
| 55 | S-14 | 55 | 57.0 | 50/5" | | | | 5" | Gray cf SAND and Gravel, trace Silt | 54 |
| 60 | S-15 | 60 | 62.0 | 50/5" | | | | 5" | Light gray GRAVEL, some cf Sand, trace Silt | 59 |
| 65 | S-16 | 65 | 67.0 | 50/3" | | | | 3" | | |
| 70 | S-17 | 70 | 72.0 | 17 | 50/3" | | | 11" | Gray CLAY, trace f Sand | 69 |

| | |
|---|---|
| Nominal I.D. of Drive Pipe | |
| Nominal I.D. of Split Barrel Sampler | 1.375" |
| Weight of Hammer on Drive Pipe | |
| Weight of Hammer on Split Barrel Sampler | 140 lb |
| Drop of Hammer on Drive Pipe | |
| Drop of Hammer on Split Barrel Sampler | 30" |

Core Size _____ - _____

Soil descriptions represent a field identification after D.M. Burmister unless otherwise noted.

The subsurface information shown hereon was obtained for State design and estimate purposes. It is made available to authorized users only that they may have access to the same information available to the State. It is presented in good faith, but is not intended as a substitute for investigations interpretation or judgment of such authorized users.

Approximate Change in Strata _____

Inferred Change in Strata — — — —

FORM SO-2

# KMA CONSULTING ENGINEERS, INC.

ROUTE: NJ Route 168 LOCAL NAME: Black Horse Pike NJDOT BORING NO. B-2

SECTION: EAST: 325388.0427 NORTH: 389519.0684

STATION: OFFSET: REFERENCE LINE: GROUND ELEVATION: 7.63

BORINGS BY: UNITECH Drilling Inc., DATE STARTED: 2-21-11

INSPECTOR: Charbel Khoury, PhD DATE COMPLETED: 2-21-11

ELEVATION G.W.T.
0 Hr. 8 ' Date: 2-21-11
24 Hr. Date:
_____ ft. P.P. Installed Date:

| DEPTH (ft.) | SAMPLE NO. | DEPTH (ft.) | | BLOWS ON SPOON 0-6" | 6-12" | 12-18" | 18-24" | REC. (in.) | SOIL DESCRIPTION & STRATIGRAPHY | |
|---|---|---|---|---|---|---|---|---|---|---|
| 75 | S-18 | 75 | 77.0 | 50/2" | | | | 2" | Light gray mf SAND, trace Silt, trace Gravel | 74 |
| 80 | S-19 | 80 | 82.0 | 50/2" | | | | 2" | | |
| 85 | S-20 | 85 | 87.0 | 50/4" | | | | 4" | Gray mf SAND, trace Silt, trace mf Gravel | 84 |
| 90 | S-21 | 90 | 92.0 | 42 | 50/3" | | | 7" | Gray cf SAND, some Gravel, trace Silt | 89 |
| 95 | S-22 | 95 | 97.0 | 50/3" | | | | 3" | | |
| 100 | S-23 | 100 | 102.0 | 50/4" | | | | 2" | End of Boring @ 100.3' | 100.3 |
| 105 | | | | | | | | | | |

| | |
|---|---|
| Nominal I.D. of Drive Pipe | |
| Nominal I.D. of Split Barrel Sampler | 1.375" |
| Weight of Hammer on Drive Pipe | |
| Weight of Hammer on Split Barrel Sampler | 140 lb |
| Drop of Hammer on Drive Pipe | |
| Drop of Hammer on Split Barrel Sampler | 30" |

Core Size _____ - _____

Soil descriptions represent a field identification after D.M. Burmister unless otherwise noted.

The subsurface information shown hereon was obtained for State design and estimate purposes. It is made available to authorized users only that they may have access to the same information available to the State. It is presented in good faith, but is not intended as a substitute for investigations interpretation or judgment of such authorized users.

Approximate Change in Strata _____

Inferred Change in Strata — — — —

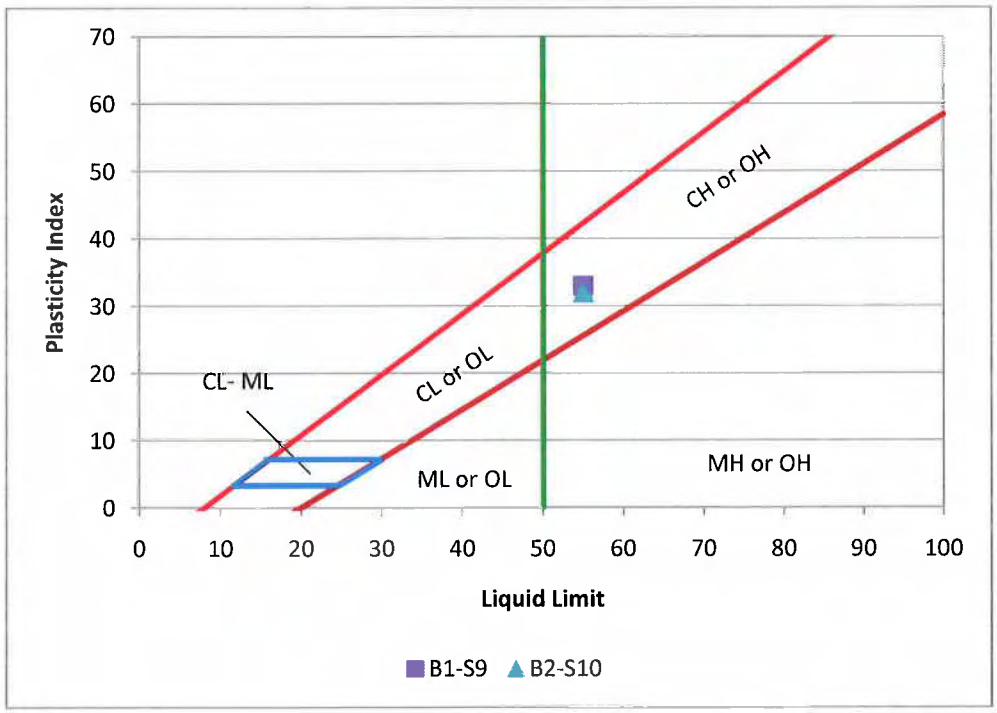
# APPENDIX C: LABORATORY TEST RESULTS

## Summary Results

**Company** KMA Consulting Enginers, Inc.
**Project:** Laytons Lake
**Project #:** 1121
**Tested by:** Khoury
**Date :** 4/10/2011

| Boring | Sample | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | No. | Depth | LL | PL | PI | M.C.* | S.G.** | Cu | Cc | USCS Classification |
| B-1 | S5 | 8'-14' | -- | -- | -- | 18.23 | -- | 3.4 | 0.95 | Poorly Graded Sand (SP) |
| | S9 (SH) | 25'-27' | 55 | 22 | 33 | 40.32 | 2.64 | -- | -- | Fat Clay (CH) |
| | S21/S23 | 80'-100' | -- | -- | -- | 22.05 | -- | 5 | 1.25 | Poorly Graded Sand with Silt (SP-SM) |
| B2 | S6 | 13'-15' | -- | -- | -- | 17.97 | -- | 5 | 0.89 | Poorly Graded Sand with Silt (SP-SM) |
| | S10 (SH) | 30'-32' | 55 | 23 | 32 | 39.12 | 2.65 | -- | -- | Fat Clay (CH) |
| | S19/S21/S23 | 70'-100' | -- | -- | -- | 21.38 | -- | 3.56 | 1.25 | Poorly Graded Sand with Silt (SP-SM) |

Notes:
M.C.* - denotes moisture content
S.G.** - denotes specific gravity



# APPENDIX F: LAYER COEFFICIENTS

## STRUCTURAL LAYER & DRAINAGE COEFFICIENTS FOR HOT-MIXED ASPHALT COURSE

Use Chart I Figure 2.5 (Page II-18)

Assumed Elastic Modulus of 400,000 psi at 68°F for Surface and Intermediate Course

$a_1$ = 0.42

Assumed Elastic Modulus of 365,000 psi at 68°F for Base Course

$a_1$ = 0.40

Drainage coefficient

$m_1$ 1.00

**STRUCTURAL LAYER & DRAINAGE COEFFICIENTS FOR GRANULAR BASE COURSE**

Material

Densely Graded Aggregate (DGA)
NJDOT I-5 Soil Aggregate

Elastic Modulus for Base Course ($E_{BS}$) = $k_1 \theta k_2$

| Moisture Condition: | Damp | |
|---|---|---|
| $k_1$ = | 6000 | See Pge II-20 of AASHTO Manual |
| $k_2$ = | 0.6 | |
| $\theta$ = | 6 | |
| $E_{BS}$ = | 21600 | |
| $a_2$ = | 0.102 | |

For Cement treated base see Chart in Figure 2.8 Page II- 23 for $a_2$ estimate

For Bituminous treated base see Chart in Figure 2.9 Page II- 24 for $a_2$ estimate

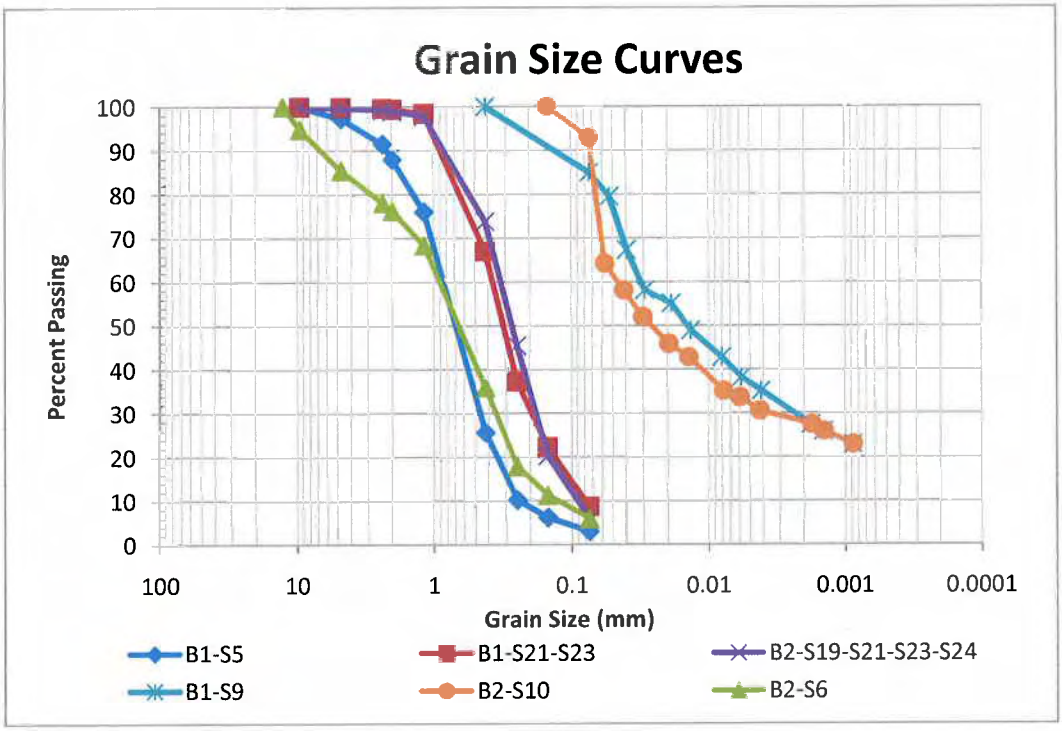
Drainage Charateristics

| Climatic Zone | I-B | See Chart in Figure 3.5 Page III - 27 |
|---|---|---|
| Quality of Drainage: | Fair | |
| $m_2$ | 0.8 | Pavement Saturated more than 25% of the time<br>Table 2.4 page II - 25 |

## Grain Size Results

**Company** KMA Consulting Enginers, Inc.
**Project:** Laytons Lake
**Project No.:** 1121
**Tested by :** Khoury
**Date :** 4/10/2011

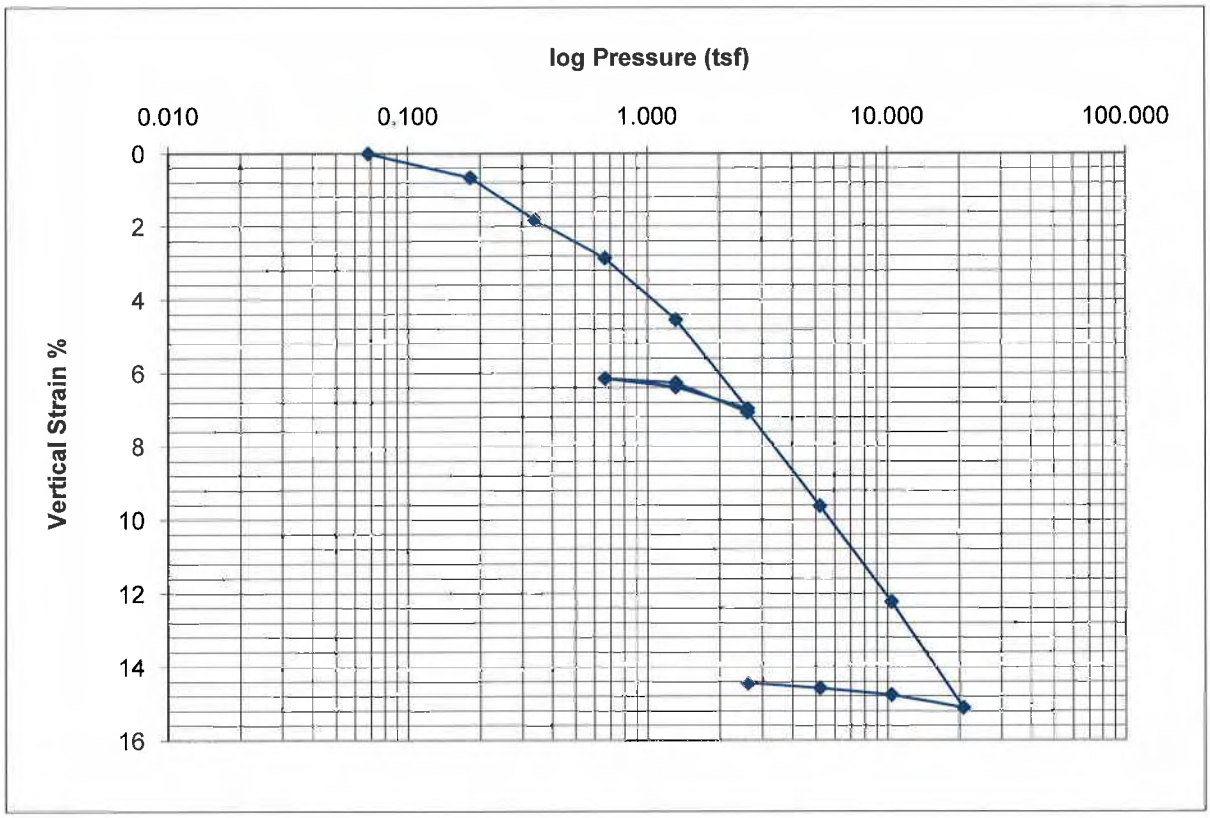
| Boring | Sample | | % Gravel | | | % Sand | | | % Fines |
|---|---|---|---|---|---|---|---|---|---|
| | No. | Depth | Coarse | Medium | Fine | Coarse | Medium | Fine | |
| B-1 | S5 | 8'-14' | 0 | 0 | 3 | 9 | 62 | 23 | 3 |
| | S9 (SH) | 25'-27' | 0 | 0 | 0 | 0 | 0 | 25 | 85 |
| | S21/S23 | 80'-100' | 0 | 0 | 0 | 0.5 | 32 | 58 | 9 |
| B2 | S6 | 13'-15' | 0 | 0 | 14 | 9 | 40 | 30 | 6 |
| | S10 (SH) | 30'-32' | 0 | 0 | 0 | 0 | 0 | 7 | 93 |
| | S19/S21/S23 | 70'-100' | 0 | 0 | 0 | 1 | 25 | 68 | 6 |



# Consolidation Test Report

**Client :** KMA Consulting Enginers, Inc.
**Project:** Laytons Lake
**Project #:** 1121

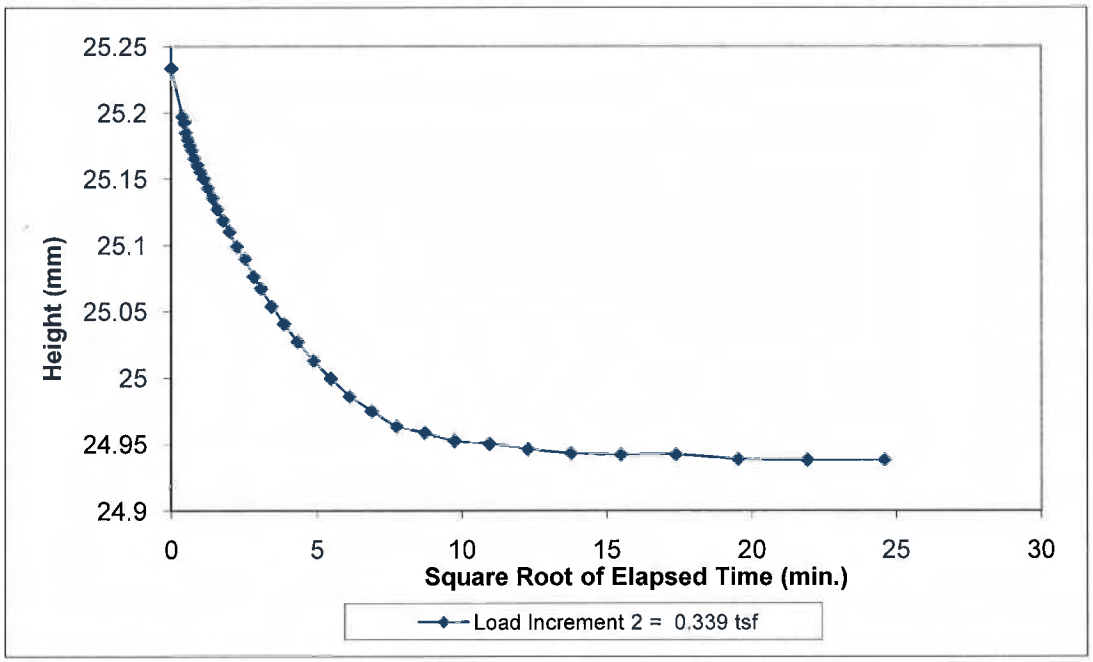
**Tested by:** Khoury
**Date :** 4/10/2011

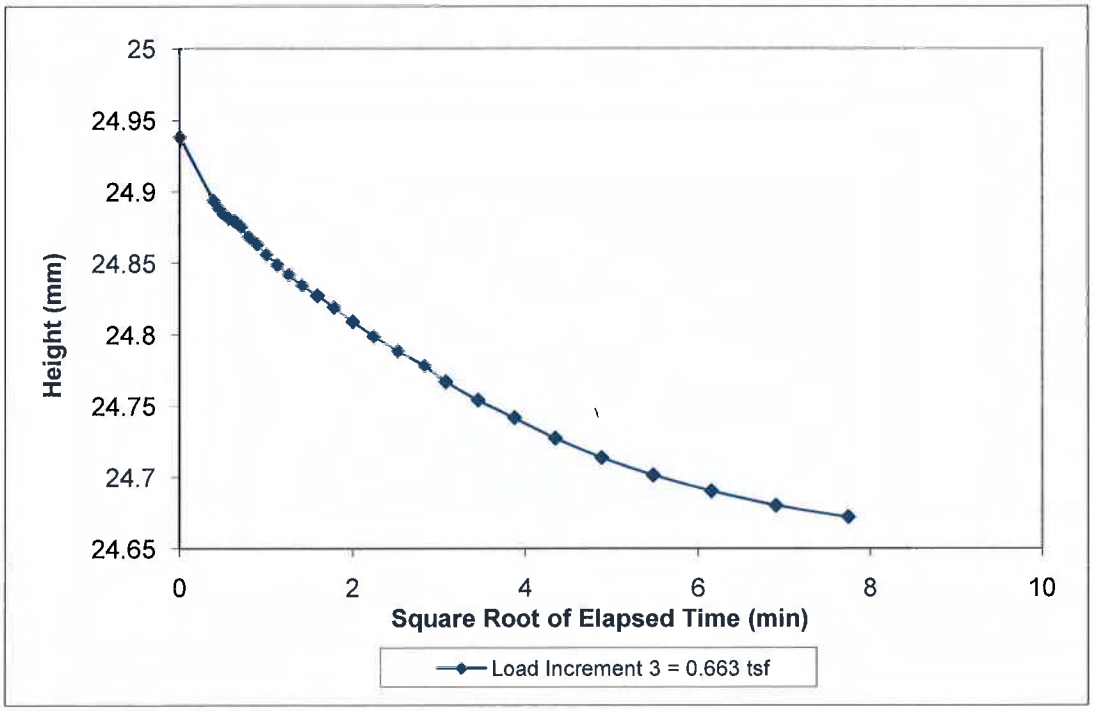



| Borehole # | Sample # | Depth (ft) | LL | PI | Initial dry unit weight (pcf) | M.C. % | Initial Void Ratio | Pc (tsf) | Cs | Cc | Method |
|---|---|---|---|---|---|---|---|---|---|---|---|
| B2 | S10 | 30'-32' | 55 | 32 | 98.23 | 26 | 0.716 | 0.84 | 0.020 | 0.157 | ASTM D2435 |

# Change in Sample Height vs. Time

**Client :** KMA Consulting Enginers, Inc. **Tested by:** Khoury
**Project:** Laytons Lake
**Project #:** 1121 **Date :** 4/10/2011

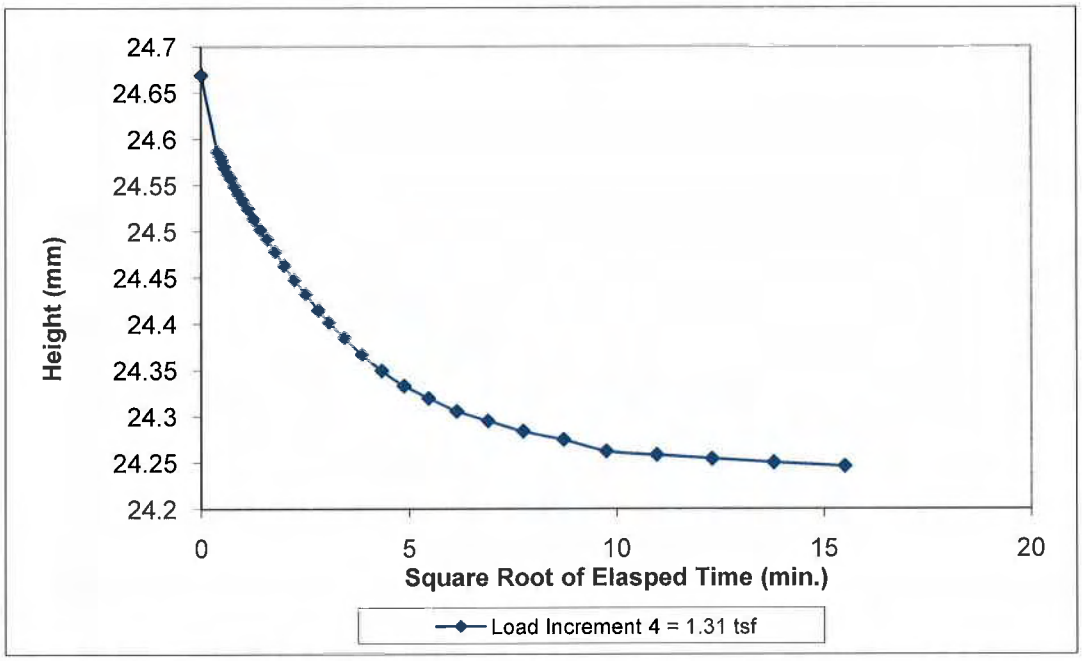


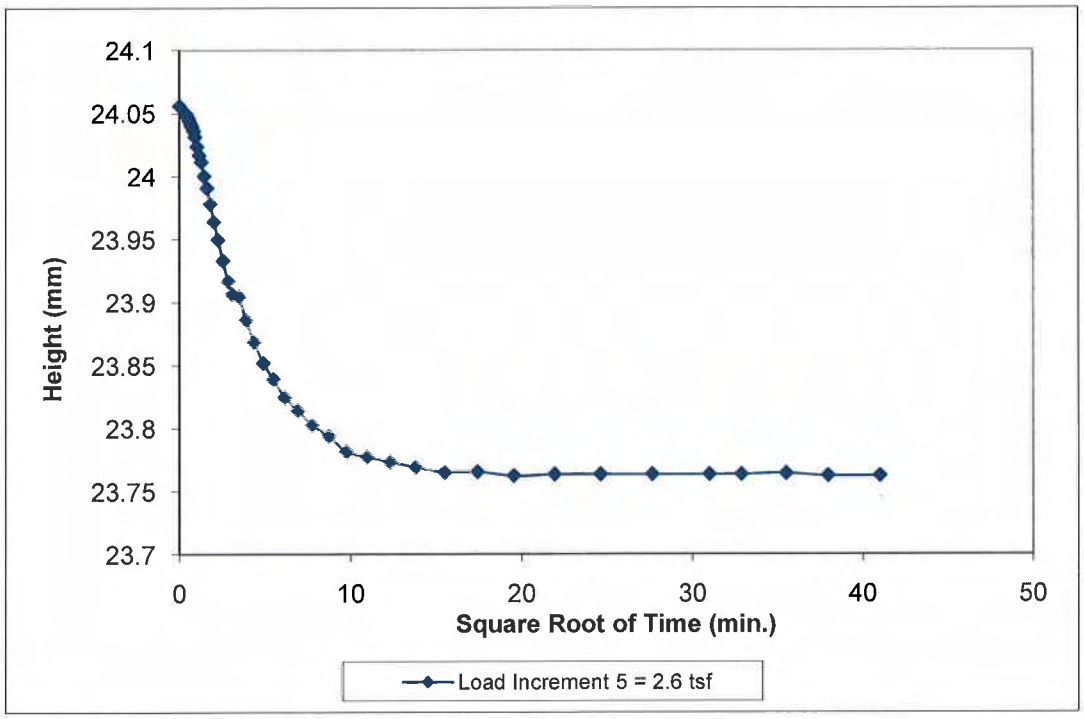



# Change in Sample Height vs. Time

**Client :** KMA Consulting Enginers, Inc.
**Project:** Laytons Lake
**Project #:** 1121

**Tested by:** Khoury
**Date :** 4/10/2011

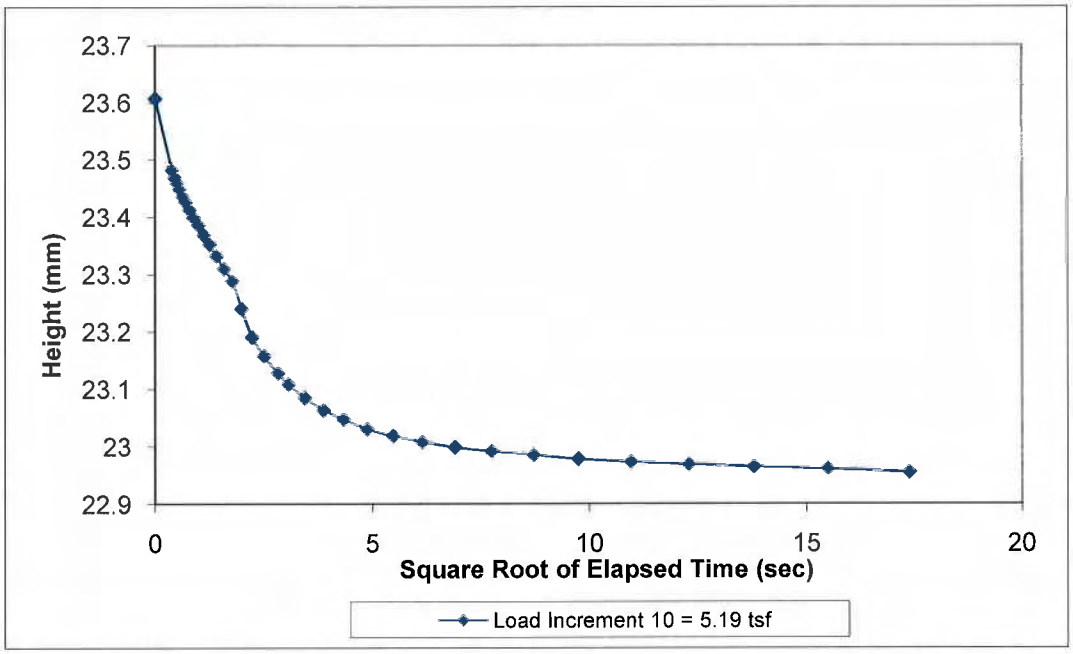


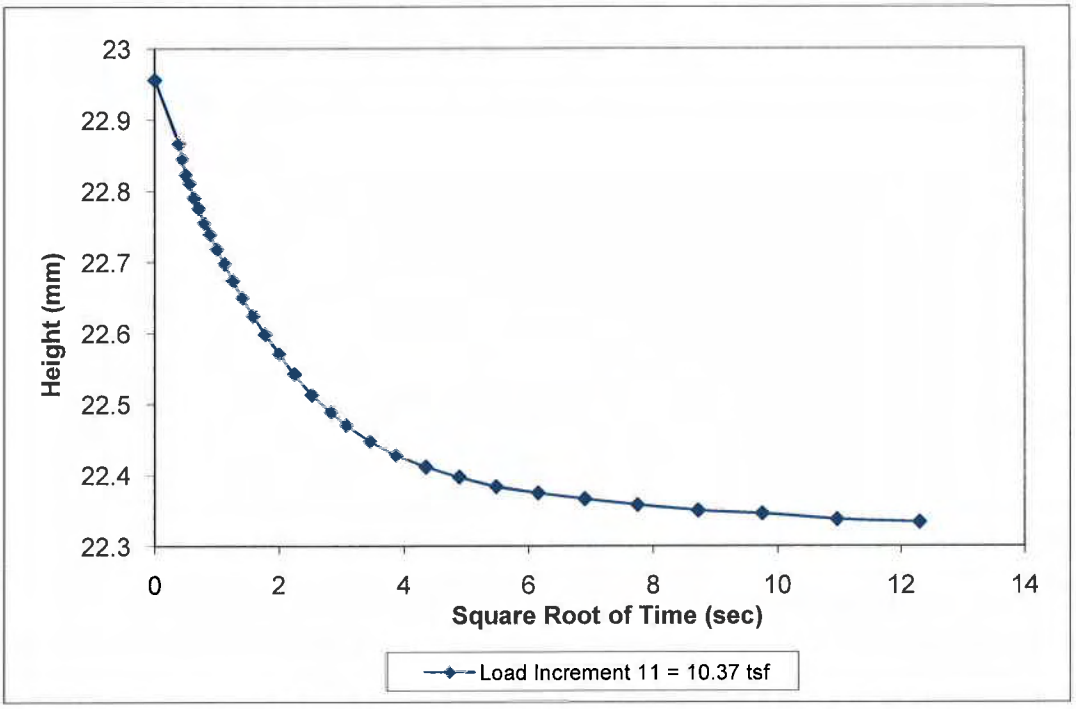



# Change in Sample Height vs. Time

**Client :** KMA Consulting Enginers, Inc.
**Project:** Laytons Lake
**Project #:** 1121

**Tested by:** Khoury
**Date :** 4/10/2011



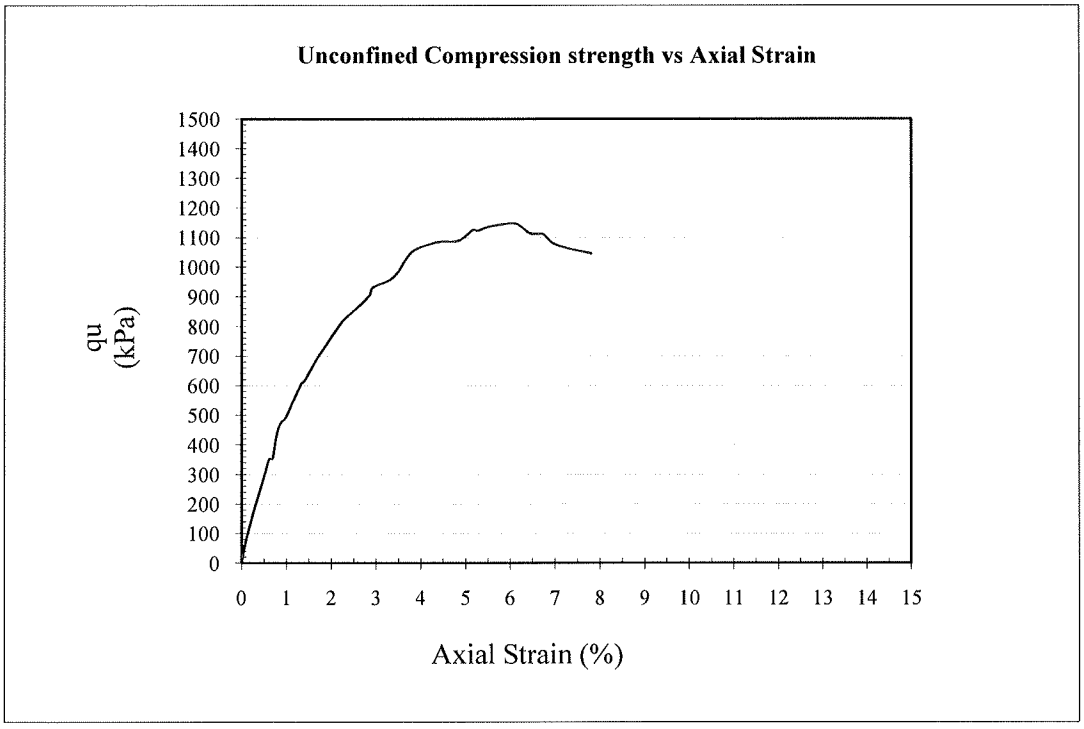
# UCT DATA:

| | |
|---|---|
| **Project:** | KMA |
| **Boring No:** | B1-S9 |
| **Sample depth:** | 25' 4"-25' 10" |
| **Tested By:** | Khoury |
| **Date:** | 4/15/2011 |
| **Shear Rate:** | 1 % /min |

| **Initial Conditions** | |
|---|---|
| **Diameter (inch)** | 2.837 |
| **Height (inch)** | 5.630 |
| **Wet weight (g)** | 1102.1 |
| **Sample Area (in^2)** | 6.320 |
| **Water Content (%)** | 40.32 |
| **$\gamma$ (pcf)** | 117.75 |
| **$\gamma_d$ (pcf)** | 83.92 |

**Maximum $q_u$ =** **1146.6 psf**

**Undrained shear strength $c_u = q_u/2 =$** **573.31 psf**



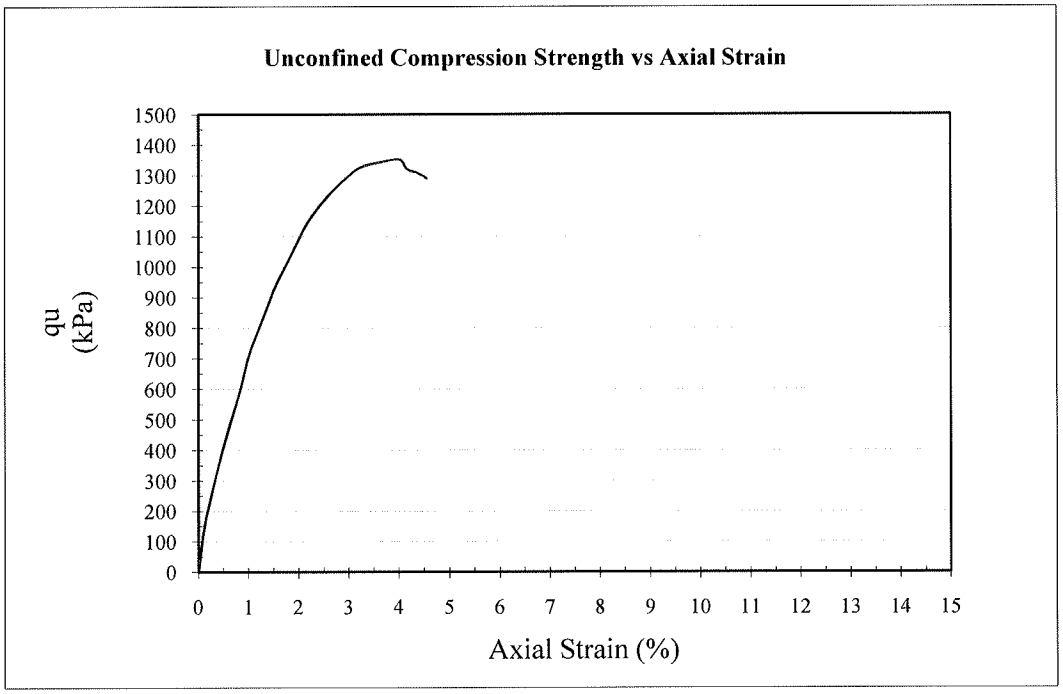
# UCT DATA:

| | |
|---|---|
| **Project:** | KMA |
| **Boring No:** | B2-S10 |
| **Sample depth:** | 31' 6"-32" |
| **Tested By:** | Khoury |
| **Date:** | 4/15/2011 |
| **Shear Rate:** | 1 % /min |

| **Initial Conditions** | |
|---|---|
| **Diameter (inch)** | 2.839 |
| **Height (inch)** | 5.660 |
| **Wet weight (g)** | 1093.6 |
| **Sample Area (in^2)** | 6.329 |
| **Water Content (%)** | 37.48 |
| **$\gamma$ (pcf)** | 116.06 |
| **$\gamma_d$ (pcf)** | 84.41 |

**Maximum $q_u$ =** **1351.7 psf**

**Undrained shear strength $c_u = q_u/2 =$** **675.86 psf**



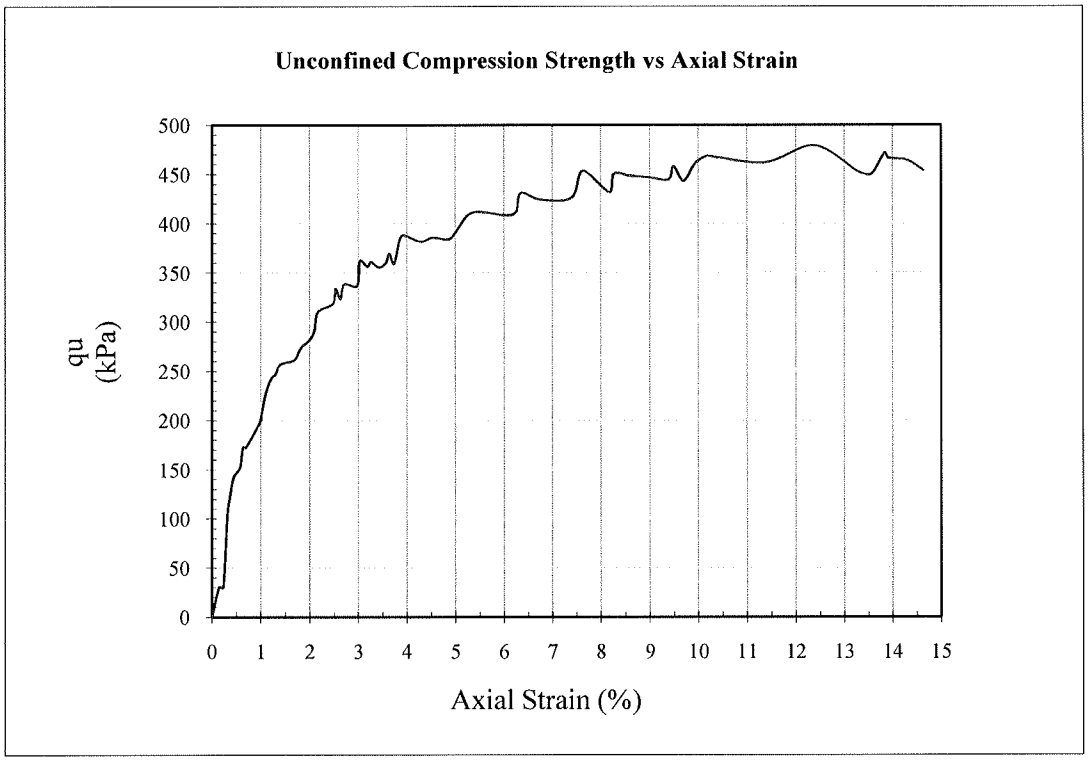
# UCT DATA:

| | |
|---|---|
| **Project:** | KMA |
| **Boring No:** | B2-S10 |
| **Sample depth:** | 30'-30'6" |
| **Tested By:** | Khoury |
| **Date:** | 4/15/2011 |
| **Shear Rate:** | 1 % /min |

| **Initial Conditions** | |
|---|---|
| **Diameter (inch)** | 2.837 |
| **Height (inch)** | 5.650 |
| **Wet weight (g)** | 1163.3 |
| **Sample Area (in^2)** | 6.320 |
| **Water Content (%)** | 40.75 |
| **$\gamma$ (pcf)** | 123.85 |
| **$\gamma_d$ (pcf)** | 87.99 |

**Maximum $q_u$ =** **430.7 psf**

**Undrained shear strength $c_u = q_u/2 =$** **215.35 psf**



# APPENDIX D: TRAFFIC AND PAVEMENT DESIGN DATA

# Laytons Lake Dam Route 48

## Traffic Design Data

| | |
|---|---|
| **Base Year 2011 AADT (2-way)** | 4900 |
| **Future Year 2031 AADT (2-way)** | 5400 |
| **Base Year 2011 DHV (2-way)** | 380 |
| **Future Year 2031 DHV (2-way)** | 420 |
| **Future Year Directional Distribution** | 59% / 41% |
| **Percent Heavy Trucks (Peak Hour)** | 3.40% |
| **Speed Limit** | 50 mph |
| **Design Speed** | 55 mph |

## Pavement Design Data

| | |
|---|---|
| **Base Year 2011 ADT (1-way)** | 2500 |
| **Future Year 2031 ADT (1-way)** | 2800 |
| **Percentage Heavy Trucks (24 Hour)** | 2.50% |
| **Percentage Total Trucks** | 11.60% |

# APPENDIX E: AVERAGE EQUIVALENCY FACTORS

## STRUCTURAL LAYER & DRAINAGE COEFFICIENTS FOR GRANULAR SUBBASE COURSE

Material

NJDOT I-3 Soil Aggregate

Elastic Modulus for Base Course ($E_{BS}$) = $k_1\theta k_2$

Moisture Condition: Damp

| | | |
|---|---|---|
| $k_1$ = | 4000 | See Pge II-20 of AASHTO Manual |
| $k_2$ = | 0.5 | |
| $\theta$ = | 5 | |
| $E_{SB}$ = | 10000 | |
| $a_3$ = | 0.0690 | |

For Cement treated base see Chart in Figure 2.8 Page II- 23 for $a_2$ estimate

For Bituminous treated base see Chart in Figure 2.9 Page II- 24 for $a_2$ estimate

Drainage Charateristics

| | | |
|---|---|---|
| Cimatic Zone | IB | See Chart in Figure 3.5 Page III - 27 |
| Quality of Drainage: | Fair | |
| $m_3$ | 0.8 | Pavement Saturated more than 25% of the time |
| | | Table 2.4 page II - 25 |

# APPENDIX G: PAVEMENT DESIGN OUTPUT

# 1993 AASHTO Pavement Design

# DARWin Pavement Design and Analysis System

## A Proprietary AASHTOWare Computer Software Product

KMA Consulting Engineers, Inc.

## Flexible Structural Design Module

Route 48 - New Construction - Good Subgrade

Option I

## Flexible Structural Design

| | |
|---|---|
| 18-kip ESALs Over Initial Performance Period | 851,798 |
| Initial Serviceability | 4.2 |
| Terminal Serviceability | 2.5 |
| Reliability Level | 80 % |
| Overall Standard Deviation | 0.45 |
| Roadbed Soil Resilient Modulus | 4,736 psi |
| Stage Construction | 1 |
| | |
| Calculated Design Structural Number | 3.74 in |

## Effective Roadbed Soil Resilient Modulus

| Period | Description | Roadbed Resilient Modulus (psi) |
|---|---|---|
| 1 | Fall/SP | 6,000 |
| 2 | Fall/SP | 6,000 |
| 3 | Fall/SP | 6,000 |
| 4 | Fall/SP | 6,000 |
| 5 | Fall/SP | 6,000 |
| 6 | Fall/SP | 6,000 |
| 7 | Fall/SP | 6,000 |
| 8 | SP/Thaw | 2,000 |
| 9 | Winter | 20,000 |
| 10 | Summer | 10,000 |
| 11 | Summer | 10,000 |
| 12 | Summer | 10,000 |

Calculated Effective Modulus 4,736 psi

## Simple ESAL Calculation

| | |
|---|---|
| Performance Period (years) | 20 |
| Two-Way Traffic (ADT) | 4,900 |
| Number of Lanes in Design Direction | 2 |
| Percent of All Trucks in Design Lane | 90 % |
| rcent Trucks in Design Direction | 50 % |
| Percent Heavy Trucks (of ADT) FHWA Class 5 or Greater | 2.5 % |

| | |
|---|---|
| Average Initial Truck Factor (ESALs/truck) | 1.011 |
| Annual Truck Factor Growth Rate | 0 % |
| Annual Truck Volume Growth Rate | 0.6 % |
| Growth | Compound |
| Total Calculated Cumulative ESALs | 431,181 |

## Rigorous ESAL Calculation

| | |
|---|---|
| Performance Period (years) | 20 |
| Two-Way Traffic (ADT) | 4,900 |
| Number of Lanes in Design Direction | 2 |
| Percent of All Trucks in Design Lane | 90 % |
| Percent Trucks in Design Direction | 50 % |

| Vehicle Class | Percent of ADT | Annual % Growth | Average Initial Truck Factor (ESALs/ Truck) | Annual % Growth in Truck Factor | Accumulated 18-kip ESALs over Performance Period |
|---|---|---|---|---|---|
| 1 | 88.4 | 0.6 | 0.0002 | 0 | 3,016 |
| 2 | 9.1 | 0.6 | 0.269 | 0 | 417,601 |
| 3 | 2.5 | 0.6 | 1.011 | 0 | 431,181 |
| Total | 100 | - | - | - | 851,798 |

| | |
|---|---|
| Growth | Compound |
| Total Calculated Cumulative ESALs | 851,798 |

## Specified Layer Design

| Layer | Material Description | Struct Coef. (Ai) | Drain Coef. (Mi) | Thickness (Di)(in) | Width (ft) | Calculated SN (in) |
|---|---|---|---|---|---|---|
| 1 | HMA Surface Course | 0.42 | 1 | 2 | 30 | 0.84 |
| 2 | HMA Intermediate Course | 0.42 | 1 | 2 | 30 | 0.84 |
| 3 | HMA Base Course | 0.4 | 1 | 3 | 30 | 1.20 |
| 4 | Granular Base Course | 0.102 | 0.8 | 6 | 30 | 0.49 |
| 5 | Subbase Course | 0.069 | 0.8 | 8 | 30 | 0.44 |
| Total | - | - | - | 21.00 | - | 3.81 |

## Layered Thickness Design

Thickness precision: Actual

| Layer | Material Description | Struct Coef. (Ai) | Drain Coef. (Mi) | Spec Thickness (Di)(in) | Min Thickness (Di)(in) | Elastic Modulus (psi) | Width (ft) | Calculated Thickness (in) | Calculated SN (in) |
|---|---|---|---|---|---|---|---|---|---|
| 1 | HMA Surface Course | 0.42 | 1 | 2 | 1 | 400,000 | 30 | 2.00 | 0.84 |
| 2 | HMA Intermediate Co... | 0.42 | 1 | 2 | 1 | 400,000 | 30 | 2.00 | 0.84 |
| 3 | HMA Base Course | 0.4 | 1 | 2 | - | 365,000 | 30 | 2.00 | 0.80 |
| 4 | Granular Base Course | 0.102 | 0.8 | - | 6 | 21,600 | 30 | 6.00 | 0.49 |
| 5 | Subbase Course | 0.069 | 0.8 | - | 6 | 10,000 | 30 | 13.96 | 0.77 |
| Total | - | - | - | - | - | - | - | 25.96 | 3.74 |

# Optimized Layer Design

| Layer | Material Description | Struct Coef. (Ai) | Drain Coef. (Mi) | Cost (sq yd/in) | Min Thick (Di)(in) | Max Thick (in) | Width (ft) | Optimum Thick (in) | Calculated SN (in) | Calculated Cost (sq yd) |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | HMA Surface Course | 0.42 | 1 | $4.44 | 2 | - | 30 | 2.00 | 0.84 | $8.88 |
| 2 | HMA Intermediate Co... | 0.42 | 1 | $4.44 | 2 | - | 30 | 2.00 | 0.84 | $8.88 |
| 3 | HMA Base Course | 0.4 | 1 | $4.00 | 2 | - | 30 | 2.82 | 1.13 | $11.29 |
| 4 | Granular Base Course | 0.102 | 0.8 | $1.25 | 6 | - | 30 | 6.00 | 0.49 | $7.50 |
| 5 | Subbase Course | 0.069 | 0.8 | $0.85 | 8 | - | 30 | 8.00 | 0.44 | $6.80 |
| Total | - | - | - | - | - | - | - | 20.82 | 3.74 | $43.35 |

# 1993 AASHTO Pavement Design

# DARWin Pavement Design and Analysis System

## A Proprietary AASHTOWare Computer Software Product

KMA Consulting Engineers, Inc.

## Flexible Structural Design Module

Route 48 - New Construction - Good Subgrade

Option II

## Flexible Structural Design

| | |
|---|---|
| 18-kip ESALs Over Initial Performance Period | 851,798 |
| Initial Serviceability | 4.2 |
| Terminal Serviceability | 2.5 |
| Reliability Level | 80 % |
| Overall Standard Deviation | 0.45 |
| Roadbed Soil Resilient Modulus | 4,736 psi |
| Stage Construction | 1 |
| | |
| Calculated Design Structural Number | 3.74 in |

## Effective Roadbed Soil Resilient Modulus

| Period | Description | Roadbed Resilient Modulus (psi) |
|---|---|---|
| 1 | Fall/SP | 6,000 |
| 2 | Fall/SP | 6,000 |
| 3 | Fall/SP | 6,000 |
| 4 | Fall/SP | 6,000 |
| 5 | Fall/SP | 6,000 |
| 6 | Fall/SP | 6,000 |
| 7 | Fall/SP | 6,000 |
| 8 | SP/Thaw | 2,000 |
| 9 | Winter | 20,000 |
| 10 | Summer | 10,000 |
| 11 | Summer | 10,000 |
| 12 | Summer | 10,000 |

Calculated Effective Modulus 4,736 psi

## Simple ESAL Calculation

| | |
|---|---|
| Performance Period (years) | 20 |
| Two-Way Traffic (ADT) | 4,900 |
| Number of Lanes in Design Direction | 2 |
| Percent of All Trucks in Design Lane | 90 % |
| rcent Trucks in Design Direction | 50 % |
| Percent Heavy Trucks (of ADT) FHWA Class 5 or Greater | 2.5 % |

| | |
|---|---|
| Average Initial Truck Factor (ESALs/truck) | 1.011 |
| Annual Truck Factor Growth Rate | 0 % |
| Annual Truck Volume Growth Rate | 0.6 % |
| Growth | Compound |
| Total Calculated Cumulative ESALs | 431,181 |

## Rigorous ESAL Calculation

| | |
|---|---|
| Performance Period (years) | 20 |
| Two-Way Traffic (ADT) | 4,900 |
| Number of Lanes in Design Direction | 2 |
| Percent of All Trucks in Design Lane | 90 % |
| Percent Trucks in Design Direction | 50 % |

| Vehicle Class | Percent of ADT | Annual % Growth | Average Initial Truck Factor (ESALs/ Truck) | Annual % Growth in Truck Factor | Accumulated 18-kip ESALs over Performance Period |
|---|---|---|---|---|---|
| 1 | 88.4 | 0.6 | 0.0002 | 0 | 3,016 |
| 2 | 9.1 | 0.6 | 0.269 | 0 | 417,601 |
| 3 | 2.5 | 0.6 | 1.011 | 0 | 431,181 |
| Total | 100 | - | - | - | 851,798 |

| | |
|---|---|
| Growth | Compound |
| Total Calculated Cumulative ESALs | 851,798 |

## Specified Layer Design

| Layer | Material Description | Struct Coef. (Ai) | Drain Coef. (Mi) | Thickness (Di)(in) | Width (ft) | Calculated SN (in) |
|---|---|---|---|---|---|---|
| 1 | HMA Surface Course | 0.42 | 1 | 2 | 30 | 0.84 |
| 2 | HMA Intermediate Course | 0.42 | 1 | 2 | 30 | 0.84 |
| 3 | HMA Base Course | 0.4 | 1 | 4 | 30 | 1.60 |
| 4 | Granular Base Course | 0.102 | 0.8 | 6 | 30 | 0.49 |
| Total | - | - | - | 14.00 | - | 3.77 |

## Layered Thickness Design

Thickness precision: Actual

| Layer | Material Description | Struct Coef. (Ai) | Drain Coef. (Mi) | Spec Thickness (Di)(in) | Min Thickness (Di)(in) | Elastic Modulus (psi) | Width (ft) | Calculated Thickness (in) | Calculated SN (in) |
|---|---|---|---|---|---|---|---|---|---|
| 1 | HMA Surface Course | 0.42 | 1 | 2 | 1 | 400,000 | 30 | 2.00 | 0.84 |
| 2 | HMA Intermediate Co... | 0.42 | 1 | 2 | 1 | 400,000 | 30 | 2.00 | 0.84 |
| 3 | HMA Base Course | 0.4 | 1 | 3 | - | 365,000 | 30 | 3.00 | 1.20 |
| 4 | Granular Base Course | 0.102 | 0.8 | - | 6 | 21,600 | 30 | 10.54 | 0.86 |
| Total | - | - | - | - | - | - | - | 17.54 | 3.74 |

## Optimized Layer Design

| Layer | Material Description | Struct Coef. (Ai) | Drain Coef. (Mi) | Cost (sq yd/in) | Min Thick (Di)(in) | Max Thick (in) | Width (ft) | Optimum Thick (in) | Calculated SN (in) | Calculated Cost (sq yd) |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | HMA Surface Course | 0.42 | 1 | $4.44 | 2 | - | 30 | 2.00 | 0.84 | $8.88 |
| 2 | HMA Intermediate Co... | 0.42 | 1 | $4.44 | 2 | - | 30 | 2.00 | 0.84 | $8.88 |
| 3 | HMA Base Course | 0.4 | 1 | $4.00 | 2 | - | 30 | 3.93 | 1.57 | $15.70 |
| 4 | Granular Base Course | 0.102 | 0.8 | $1.25 | 6 | - | 30 | 6.00 | 0.49 | $7.50 |
| Total | - | - | - | - | - | - | - | 13.93 | 3.74 | $40.96 |

# *Appendix D- Existing Conditions*
# *Dam & Spillway*

```
1*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*              JUN  1998                *
*            VERSION 4.1                *
*                                       *
*  RUN DATE   24OCT11  TIME  12:01:32   *
*                                       *
*****************************************
```


```
*****************************************
*                                       *
*    U.S. ARMY CORPS OF ENGINEERS       *
*    HYDROLOGIC ENGINEERING CENTER      *
*          609 SECOND STREET            *
*       DAVIS, CALIFORNIA 95616         *
*           (916) 756-1104              *
*                                       *
*****************************************
```


```
X     X  XXXXXXX   XXXXX          X
X     X  X        X     X        XX
X     X  X        X              X
XXXXXXX  XXXX     X        XXXXX  X
X     X  X        X              X
X     X  X        X     X        X
X     X  XXXXXXX   XXXXX         XXX
```

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL  LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1 HEC-1 INPUT PAGE 1

```
LINE          ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

   1          ID  HEC-1
   2          ID  LAYTON LAKE DAM ROUTE 48 M.P. 3.06
   3          ID  CARNEYS POINT TOWNSHIP, SALEM COUNTY NJ
   4          ID
              *DIAGRAM
   5          IT       6 01JAN94       0     380
   6          IO       4

   7          KK  L_UP_48 ** inflow to Layton Lake
   8          KM   INFLOW IN LAYTON LAKE
   9          KO       0       0     0.0       0      22
  10          QI       0       1       1       1       1       2       2       2       3       4
  11          QI       4       5       6       7       8      09      11      12      14      16
  12          QI      18      20      22      25      27      30      33      36      40      44
  13          QI      48      52      57      62      67      73      79      85      92     100
  14          QI     107     116     125     134     144     155     166     178     191     204
  15          QI     219     234     251     269     289     311     336     366     405     453
  16          QI     512     580     660     751     855    0969    1094    1226    1365    1507
  17          QI    1653    1800    1946    2089    2255    2354    2476    2589    2691    2781
  18          QI    2859    2925    2981    3027    3062    3084    3095    3098    3094    3084
  19          QI    3069    3051    3029    3044    2978    2950    2922    2893    2863    2833
  20          QI    2802    2771    2740    2708    2675    2642    2608    2574    2539    2506
  21          QI    2472    2440    2407    2376    2344    2313    2282    2251    2220    2190
```

```
          22          QI    2159    2128    2097    2066    2035    2004    1974    1945    1916    1887
          23          QI    1859    1832    1805    1779    1753    1728    1703    1678    1654    1630
          24          QI    1606    1583    1560    1538    1516    1494    1473    1451    1430    1409
          25          QI    1388    1367    1347    1327    1308    1289    1270    1252    1234    1217
          26          QI    1200    1183    1167    1151    1135    1119    1104    1088    1073    1058
          27          QI    1043    1029    1015    1001    0988    0974    0961    0948    0935    922
          28          QI     909     896     883     870     857     845     832     819     806    793
          29          QI     780     767     783     739     725     711     697     683     669    655
          30          QI     640     625     611     596     581     567     553     539     525    552
          31          QI     499     487     475     463     451     439     428     416     405    394
          32          QI     384     373     363     353     344     335     326     317     309    301
          33          QI     293     285     277     269     261     254     247     240     234    229
          34          QI     223     218     212     206     200     194     188     182     177    172
          35          QI     167     162     158     154     150     146     143     139     136    132
          36          QI     128     125     121     118     115     113     110     108     105    103
          37          QI     101     099     096     094     092      90      89      87      85     82
          38          QI      80      78      76      74      73      71      69      68      66     65
          39          QI      63      62      60      59      58      57      55      54      53     52
          40          QI      51      49      48      46      44      42      40      38      37     36
          41          QI      35      33      32      32      31      30      29      27      24     24
          42          QI      23      22      20      19      19      18      17      16      16     15
          43          QI      15      14      14      13      13      12      12      11      11     10
          44          QI      11      10       9       9       9       9       8       8       8      7
          45          QI       7       7       7       7       6       6       6       6       6      5
          46          QI       5       5       5       5       5       4       4       4       4      4
          47          QI       4       4       4       3       3       3       3       3       3      3
1                                                  HEC-1 INPUT                                        PAGE  2

        LINE          ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

          48          KK  IAYTON
          49          KM   LAYTON LAKE
          50          KO        0       0     0.0       0      22
                      * RESERVOIR STORAGE
          51          RS        1    ELEV    9.15     0.0
          52          SA      0.2    18.0    35.0    57.0    95.0    200.    210.    225.
          53          SE     0.60     5.0     10.     14.     16.     20.    21.0    22.0
          54          SQ        0     106    0549     952    1422    1811    2252    2611    3049    3696
          55          SE     9.15    9.60   10.50   11.10   11.70   12.15   12.75   13.35   14.10   14.70
          56          ST    13.80     100     0.0     1.5

          57          KK  Layton_C
          58          KM   this is the outflow channel dwonsteam of ROUTE 48
          59          KO        0       0     0.0       0      22
          60          RS        2    FLOW      -1       0
          61          RC     0.07   0.035    0.07    5000   .0018      13
          62          RX        0     820   912.5     990    1010  1087.5    1180    2000
          63          RY       20      10       5     1.8     1.8       5      10      20
          64          ZZ
1
               SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE      (V) ROUTING          (---->) DIVERSION OR PUMP FLOW

    NO.     (.) CONNECTOR        (<----) RETURN OF DIVERTED OR PUMPED FLOW

 *** HEC1 ERROR 4 *** NO HYDROGRAPHS AVAILABLE TO ROUTE
                  V
                  V
     48       IAYTON
```

```
              V
              V
   57      Layton

 (***) RUNOFF ALSO COMPUTED AT THIS LOCATION

         1 ERRORS IN STREAM SYSTEM
1****************************************
 *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
 *               JUN   1998             *
 *            VERSION 4.1               *
 *                                      *
 *  RUN DATE   24OCT11  TIME  12:01:32  *
 *                                      *
 ****************************************
```

```
****************************************
*                                      *
*    U.S. ARMY CORPS OF ENGINEERS      *
*    HYDROLOGIC ENGINEERING CENTER     *
*          609 SECOND STREET           *
*       DAVIS, CALIFORNIA 95616        *
*           (916) 756-1104             *
*                                      *
****************************************
```

```
                        HEC-1
                        LAYTON LAKE DAM ROUTE 48 M.P. 3.06
                        CARNEYS POINT TOWNSHIP, SALEM COUNTY NJ


   6 IO          OUTPUT CONTROL VARIABLES
                       IPRNT           4  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE

     IT          HYDROGRAPH TIME DATA
                        NMIN           6  MINUTES IN COMPUTATION INTERVAL
                       IDATE      1JAN94  STARTING DATE
                       ITIME        0000  STARTING TIME
                          NQ         380  NUMBER OF HYDROGRAPH ORDINATES
                      NDDATE      2JAN94  ENDING DATE
                      NDTIME        1354  ENDING TIME
                      ICENT          19  CENTURY MARK

                 COMPUTATION INTERVAL      .10 HOURS
                      TOTAL TIME BASE    37.90 HOURS

          ENGLISH UNITS
               DRAINAGE AREA          SQUARE MILES
               PRECIPITATION DEPTH    INCHES
               LENGTH, ELEVATION      FEET
               FLOW                   CUBIC FEET PER SECOND
               STORAGE VOLUME         ACRE-FEET
               SURFACE AREA           ACRES
               TEMPERATURE            DEGREES FAHRENHEIT


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


            **************
            *            *
   7 KK     *    L_UP_4  *     8 ** inflow to Layton Lake
            *            *
```

```
          **************
                        INFLOW IN LAYTON LAKE

  9 KO          OUTPUT CONTROL VARIABLES
                      IPRNT           4  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE
                      IPNCH           0  PUNCH COMPUTED HYDROGRAPH
                       IOUT          22  SAVE HYDROGRAPH ON THIS UNIT
                      ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                      ISAV2         380  LAST ORDINATE PUNCHED OR SAVED
                     TIMINT        .100  TIME INTERVAL IN HOURS


                SUBBASIN RUNOFF DATA

  0 BA          SUBBASIN CHARACTERISTICS
                      TAREA         .00  SUBBASIN AREA

                                                
```

```
56 ST          TOP OF DAM
                    TOPEL       13.80  ELEVATION AT TOP OF DAM
                   DAMWID      100.00  DAM WIDTH
                     COQD         .00  WEIR COEFFICIENT
                     EXPD        1.50  EXPONENT OF HEAD
```

***

COMPUTED STORAGE-ELEVATION DATA

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| STORAGE | .00 | 29.48 | 159.64 | 341.86 | 492.25 | 1069.37 | 1274.35 | 1491.81 |
| ELEVATION | .60 | 5.00 | 10.00 | 14.00 | 16.00 | 20.00 | 21.00 | 22.00 |

COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

(INCLUDING FLOW OVER DAM)

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| STORAGE | .00 | 29.48 | 131.30 | 145.96 | 159.64 | 177.75 | 201.14 | 226.40 | 246.61 | 275.32 |
| OUTFLOW | .00 | .00 | .00 | 106.00 | 302.89 | 549.00 | 952.00 | 1422.00 | 1811.00 | 2252.00 |
| ELEVATION | .60 | 5.00 | 9.15 | 9.60 | 10.00 | 10.50 | 11.10 | 11.70 | 12.15 | 12.75 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| STORAGE | 306.10 | 341.86 | 347.65 | 385.96 | 492.25 | 1069.37 | 1274.35 | 1491.81 |
| OUTFLOW | 2611.00 | 2990.60 | 3049.00 | 3696.00 | 5097.83 | 9411.17 | 10489.51 | 11567.84 |
| ELEVATION | 13.35 | 14.00 | 14.10 | 14.70 | 16.00 | 20.00 | 21.00 | 22.00 |

*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

```
          **************
          *            *
57 KK     *    Layton  *     _C
          *            *
          **************
                    this is the outflow channel dwonsteam of ROUTE 48

59 KO          OUTPUT CONTROL VARIABLES
                    IPRNT           4  PRINT CONTROL
                    IPLOT           0  PLOT CONTROL
                    QSCAL          0.  HYDROGRAPH PLOT SCALE
                    IPNCH           0  PUNCH COMPUTED HYDROGRAPH
                     IOUT          22  SAVE HYDROGRAPH ON THIS UNIT
                    ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                    ISAV2         380  LAST ORDINATE PUNCHED OR SAVED
                   TIMINT        .100  TIME INTERVAL IN HOURS


             HYDROGRAPH ROUTING DATA

60 RS          STORAGE ROUTING
                    NSTPS           2  NUMBER OF SUBREACHES
                     ITYP        FLOW  TYPE OF INITIAL CONDITION
                   RSVRIC       -1.00  INITIAL CONDITION
                        X         .00 WORKING R AND D COEFFICIENT

61 RC          NORMAL DEPTH CHANNEL
                     ANL        .070  LEFT OVERBANK N-VALUE
                    ANCH        .035  MAIN CHANNEL N-VALUE
                     ANR        .070  RIGHT OVERBANK N-VALUE
```

| | | |
|---|---|---|
| RLNTH | 5000. | REACH LENGTH |
| SEL | .0018 | ENERGY SLOPE |
| ELMAX | 13.0 | MAX. ELEV. FOR STORAGE/OUTFLOW CALCULATION |

CROSS-SECTION DATA

| | | --- LEFT OVERBANK --- | + | ------ MAIN CHANNEL ------- | + | --- RIGHT OVERBANK --- | | |
|---|---|---|---|---|---|---|---|---|
| 63 RY | ELEVATION | 20.00 | 10.00 | 5.00 | 1.80 | 1.80 | 5.00 | 10.00 | 20.00 |
| 62 RX | DISTANCE | .00 | 820.00 | 912.50 | 990.00 | 1010.00 | 1087.50 | 1180.00 | 2000.00 |

***

COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| STORAGE | .00 | 2.32 | 6.57 | 12.75 | 20.87 | 30.92 | 42.82 | 56.24 | 71.14 | 87.51 |
| OUTFLOW | .00 | 20.33 | 84.73 | 207.43 | 401.82 | 680.23 | 1105.58 | 1671.87 | 2341.11 | 3113.75 |
| ELEVATION | 1.80 | 2.39 | 2.98 | 3.57 | 4.16 | 4.75 | 5.34 | 5.93 | 6.52 | 7.11 |
| STORAGE | 105.36 | 124.69 | 145.49 | 167.76 | 191.54 | 219.75 | 254.50 | 295.80 | 343.64 | 398.01 |
| OUTFLOW | 3990.66 | 4973.04 | 6062.32 | 7260.12 | 8550.39 | 9843.29 | 11347.79 | 13056.37 | 14978.50 | 17128.13 |
| ELEVATION | 7.69 | 8.28 | 8.87 | 9.46 | 10.05 | 10.64 | 11.23 | 11.82 | 12.41 | 13.00 |

1

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

| | OPERATION | STATION | PEAK FLOW | TIME OF PEAK | AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR | 24-HOUR | 72-HOUR | BASIN AREA | MAXIMUM STAGE | TIME OF MAX STAGE |
|---|---|---|---|---|---|---|---|---|---|---|
| + | HYDROGRAPH AT | L_UP_4 | 3098. | 8.70 | 2548. | 1129. | 724. | .00 | | |
| + | ROUTED TO | IAYTON | 2829. | 9.90 | 2487. | 1127. | 725. | .00 | 13.72 | 9.90 |
| + | ROUTED TO | Layton | 2825. | 10.20 | 2483. | 1126. | 725. | .00 | 6.88 | 10.20 |

1

SUMMARY OF DAM OVERTOPPING/BREACH ANALYSIS FOR STATION IAYTON
(PEAKS SHOWN ARE FOR INTERNAL TIME STEP USED DURING BREACH FORMATION)

PLAN 1 .....

| | INITIAL VALUE | SPILLWAY CREST | TOP OF DAM |
|---|---|---|---|
| ELEVATION | 9.15 | 13.80 | 13.80 |
| STORAGE | 131. | 331. | 331. |
| OUTFLOW | 0. | 2874. | 2874. |

| RATIO OF PMF | MAXIMUM RESERVOIR W.S.ELEV | MAXIMUM DEPTH OVER DAM | MAXIMUM STORAGE AC-FT | MAXIMUM OUTFLOW CFS | DURATION OVER TOP HOURS | TIME OF MAX OUTFLOW HOURS | TIME OF FAILURE HOURS |
|---|---|---|---|---|---|---|---|
| 1.00 | 13.72 | .00 | 326. | 2829. | .00 | 9.90 | .00 |

*** NORMAL END OF HEC-1 ***

HEC-RAS Version 4.0 Beta
U.S. Army Corp of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```
X     X  XXXXXX    XXXX        XXXX       XX      XXXX
X     X  X        X    X      X   X     X  X    X
X     X  X        X           X   X    X    X   X
XXXXXXX  XXXX     X       XXX  XXXX     XXXXXX   XXXX
X     X  X        X           X  X      X    X       X
X     X  X        X    X      X   X     X    X       X
X     X  XXXXXX    XXXX       X    X    X    X   XXXXX
```

PROJECT DATA
Project Title: RT48_10_21_2011_Existing
Project File : RT48_10_21_2011_Existing.prj
Run Date and Time: 1/18/2012 10:32:40 AM

Project in English units

Project Description:
Water Surface Elevation for Existing Condition (Steady)

PLAN DATA

Plan Title: Plan 03
Plan File : Z:\WTR\WTR Projects\RT NJ 48 Layton Lake Dam\hec-ras\Layton_03_29_2011_steady_Exist_and_Proposed\RT48_10_21_2011_Existing.p03

Geometry Title: 48LAYFINRAT
Geometry File : Z:\WTR\WTR Projects\RT NJ 48 Layton Lake Dam\hec-ras\Layton_03_29_2011_steady_Exist_and_Proposed\RT48_10_21_2011_Existing.g05

Flow Title : Flow 07
Flow File : Z:\WTR\WTR Projects\RT NJ 48 Layton Lake Dam\hec-ras\Layton_03_29_2011_steady_Exist_and_Proposed\RT48_10_21_2011_Existing.f07

Plan Summary Information:
Number of: Cross Sections = 10 Multiple Openings = 0
Culverts = 0 Inline Structures = 0
Bridges = 0 Lateral Structures = 0

Computational Information
Water surface calculation tolerance = 0.01
Critical depth calculation tolerance = 0.01
Maximum number of iterations = 20
Maximum difference tolerance = 0.3
Flow tolerance factor = 0.001

Computation Options
Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance

Computational Flow Regime: Subcritical Flow

FLOW DATA

Flow Title: Flow 07
Flow File : Z:\WTR\WTR Projects\RT NJ 48 Layton Lake Dam\hec-ras\Layton_03_29_2011_steady_Exist_and_Proposed\RT48_10_21_2011_Existing.f07

Flow Data (cfs)

| River | Reach | RS | 100 YR EXISTING |
|---|---|---|---|
| GAME CK | GAME CK | 4560 | 2829 |

Boundary Conditions

| River | Reach | Profile | Upstream | Downstream |
|---|---|---|---|---|
| GAME CK | GAME CK | 100 YR EXISTING | | Normal S = 0.001 |

GEOMETRY DATA

Geometry Title: 48LAYFINRAT
Geometry File : Z:\WTR\WTR Projects\RT NJ 48 Layton Lake Dam\hec-ras\Layton_03_29_2011_steady_Exist_and_Proposed\RT48_10_21_2011_Existing.g05

CROSS SECTION

RIVER: GAME CK
REACH: GAME CK RS: 4560

INPUT
Description:
Station Elevation Data num= 18

| Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 15 | 350 | 12.6 | 800 | 13.5 | 880 | 13 | 930 | 10 |
| 980 | 5 | 1020 | 4 | 1030 | 3 | 1034 | .4 | 1066 | .4 |
| 1080 | .5 | 1081 | 3 | 1090 | 5 | 1180 | 10 | 1200 | 11 |
| 1270 | 15 | 1450 | 15 | 1850 | 20.3 | | | | |

Manning's n Values num= 3

| Sta | n Val | Sta | n Val | Sta | n Val |
|---|---|---|---|---|---|
| 0 | .07 | 1030 | .045 | 1081 | .07 |

| Bank Sta: Left | Right | Lengths: Left Channel | Right | Coeff Contr. | Expan. |
|---|---|---|---|---|---|
| 1030 | 1081 | 420 | 400 | 290 | .1 .3 |

CROSS SECTION OUTPUT Profile #100 YR EXISTING

| | | | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 8.68 | Element | 0.070 | 0.045 | 0.070 |
| Vel Head (ft) | 0.35 | Wt. n-Val. | 420.00 | 400.00 | 290.00 |
| W.S. Elev (ft) | 8.33 | Reach Len. (ft) | 256.66 | 397.01 | 138.54 |
| Crit W.S. (ft) | | Flow Area (sq ft) | 256.66 | 397.01 | 138.54 |
| E.G. Slope (ft/ft) | 0.001832 | Area (sq ft) | 493.07 | 2135.95 | 199.98 |
| Q Total (cfs) | 2829.00 | Flow (cfs) | 83.27 | 51.00 | 68.88 |
| Top Width (ft) | 203.15 | Top Width (ft) | | | |

100 yr Existing Condition

| | | | | | |
|---|---|---|---|---|---|
| Vel Total (ft/s) | 3.57 | Avg. Vel. (ft/s) | 1.92 | 5.38 | 1.44 |
| Max Chl Dpth (ft) | 7.93 | Hydr. Depth (ft) | 3.08 | 7.78 | 2.01 |
| Conv. Total (cfs) | 66087.0 | Conv. (cfs) | 11518.5 | 49896.9 | 4671.6 |
| Length Wtd. (ft) | 391.19 | Wetted Per. (ft) | 83.49 | 53.46 | 69.19 |
| Min Ch El (ft) | 0.40 | Shear (lb/sq ft) | 0.35 | 0.85 | 0.23 |
| Alpha | 1.78 | Stream Power (lb/ft s) | 0.68 | 4.57 | 0.33 |
| Frctn Loss (ft) | 0.88 | Cum Volume (acre-ft) | 21.07 | 63.37 | 27.93 |
| C & E Loss (ft) | 0.00 | Cum SA (acres) | 9.51 | 14.69 | 11.62 |

CROSS SECTION

RIVER: GAME CK
REACH: GAME CK RS: 4160

INPUT
Description:
Station Elevation Data num= 16

| Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 14.5 | 150 | 11.5 | 230 | 10 | 360 | 5 | 450 | 8.5 |
| 565 | 5 | 590 | 3 | 600 | .5 | 630 | .5 | 640 | 3 |
| 690 | 5 | 730 | 10 | 750 | 11 | 830 | 12 | 920 | 13 |
| 1100 | 17 | | | | | | | | |

Manning's n Values num= 3

| Sta | n Val | Sta | n Val | Sta | n Val |
|---|---|---|---|---|---|
| 0 | .07 | 590 | .045 | 640 | .07 |

| Bank Sta: Left | Right | Lengths: Left Channel | Right | Coeff Contr. | Expan. |
|---|---|---|---|---|---|
| 590 | 640 | 500 | 430 | 300 | .1 .3 |

CROSS SECTION OUTPUT Profile #100 YR EXISTING

| | | | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 7.79 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.40 | Wt. n-Val. | 0.070 | 0.045 | 0.070 |
| W.S. Elev (ft) | 7.40 | Reach Len. (ft) | 500.00 | 430.00 | 300.00 |
| Crit W.S. (ft) | | Flow Area (sq ft) | 328.33 | 319.95 | 192.97 |
| E.G. Slope (ft/ft) | 0.002820 | Area (sq ft) | 328.33 | 319.95 | 192.97 |
| Q Total (cfs) | 2829.00 | Flow (cfs) | 480.62 | 1918.15 | 430.23 |
| Top Width (ft) | 347.07 | Top Width (ft) | 227.88 | 50.00 | 69.19 |
| Vel Total (ft/s) | 3.36 | Avg. Vel. (ft/s) | 1.46 | 6.00 | 2.23 |
| Max Chl Dpth (ft) | 6.90 | Hydr. Depth (ft) | 1.44 | 6.40 | 2.79 |
| Conv. Total (cfs) | 53269.0 | Conv. (cfs) | 9049.9 | 36118.1 | 8101.1 |
| Length Wtd. (ft) | 411.15 | Wetted Per. (ft) | 228.09 | 50.62 | 69.38 |
| Min Ch El (ft) | 0.50 | Shear (lb/sq ft) | 0.25 | 1.11 | 0.49 |
| Alpha | 2.25 | Stream Power (lb/ft s) | 0.37 | 6.67 | 1.09 |
| Frctn Loss (ft) | 1.28 | Cum Volume (acre-ft) | 18.25 | 60.08 | 26.83 |
| C & E Loss (ft) | 0.05 | Cum SA (acres) | 8.01 | 14.23 | 11.16 |

Warning: Divided flow computed for this cross-section.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: GAME CK
REACH: GAME CK RS: 3730

INPUT
Description:
Station Elevation Data num= 16

| Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev |
|---|---|---|---|---|---|---|---|---|---|
| 300 | 12.8 | 340 | 10 | 365 | 5 | 400 | 5 | 430 | 5 |
| 500 | 3 | 540 | 2 | 541 | .5 | 555 | .5 | 570 | 2 |
| 700 | 4 | 705 | 5 | 830 | 10 | 920 | 11 | 1140 | 12 |
| 1250 | 15 | | | | | | | | |

Manning's n Values num= 3

| Sta | n Val | Sta | n Val | Sta | n Val |
|---|---|---|---|---|---|
| 300 | .07 | 540 | .045 | 570 | .07 |

| Bank Sta: Left | Right | Lengths: Left Channel | Right | Coeff Contr. | Expan. |
|---|---|---|---|---|---|
| 540 | 570 | 530 | 506 | 230 | .1 | .3 |

CROSS SECTION OUTPUT Profile #100 YR EXISTING

| | | | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 6.46 | Element | | | |
| Vel Head (ft) | 0.23 | Wt. n-Val. | 0.070 | 0.045 | 0.070 |
| W.S. Elev (ft) | 6.24 | Reach Len. (ft) | 530.00 | 506.00 | 230.00 |
| Crit W.S. (ft) | | Flow Area (sq ft) | 390.10 | 160.08 | 448.44 |
| E.G. Slope (ft/ft) | 0.003460 | Area (sq ft) | 390.10 | 160.08 | 448.44 |
| Q Total (cfs) | 2829.00 | Flow (cfs) | 811.71 | 931.35 | 1085.95 |
| Top Width (ft) | 377.08 | Top Width (ft) | 181.18 | 30.00 | 165.90 |
| Vel Total (ft/s) | 2.83 | Avg. Vel. (ft/s) | 2.08 | 5.82 | 2.42 |
| Max Chl Dpth (ft) | 5.74 | Hydr. Depth (ft) | 2.15 | 5.34 | 2.70 |
| Conv. Total (cfs) | 48093.8 | Conv. (cfs) | 13799.2 | 15833.1 | 18461.4 |
| Length Wtd. (ft) | 430.89 | Wetted Per. (ft) | 181.34 | 30.88 | 166.04 |
| Min Ch El (ft) | 0.50 | Shear (lb/sq ft) | 0.46 | 1.12 | 0.58 |
| Alpha | 1.82 | Stream Power (lb/ft s) | 0.97 | 6.52 | 1.41 |
| Frctn Loss (ft) | 0.60 | Cum Volume (acre-ft) | 14.13 | 57.71 | 24.62 |
| C & E Loss (ft) | 0.04 | Cum SA (acres) | 5.67 | 13.83 | 10.35 |

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: GAME CK
REACH: GAME CK RS: 3224

INPUT
Description:
Station Elevation Data num= 16

| Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev |
|---|---|---|---|---|---|---|---|---|---|
| 340 | 14 | 400 | 10 | 450 | 5 | 490 | 3 | 510 | 2 |
| 540 | .3 | 560 | .3 | 700 | 2.3 | 830 | 3 | 885 | 5 |
| 1020 | 10 | 1100 | 11 | 1170 | 12 | 1280 | 13 | 1350 | 14 |
| 1440 | 15 | | | | | | | | |

Manning's n Values num= 3

| Sta | n Val | Sta | n Val | Sta | n Val |
|---|---|---|---|---|---|
| 340 | .07 | 510 | .045 | 700 | .07 |

| Bank Sta: Left | Right | Lengths: Left Channel | Right | Coeff Contr. | Expan. |
|---|---|---|---|---|---|
| 510 | 700 | 360 | 580 | 670 | .1 | .3 |

CROSS SECTION OUTPUT Profile #100 YR EXISTING

| | | | | | |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 5.81 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.08 | Wt. n-Val. | 0.070 | 0.045 | 0.070 |
| W.S. Elev (ft) | 5.74 | Reach Len. (ft) | 360.00 | 580.00 | 670.00 |
| Crit W.S. (ft) | | Flow Area (sq ft) | 136.84 | 867.26 | 503.89 |
| E.G. Slope (ft/ft) | 0.000755 | Area (sq ft) | 136.84 | 867.26 | 503.89 |
| Q Total (cfs) | 2829.00 | Flow (cfs) | 127.93 | 2165.45 | 535.62 |
| Top Width (ft) | 462.22 | Top Width (ft) | 67.36 | 190.00 | 204.86 |
| Vel Total (ft/s) | 1.88 | Avg. Vel. (ft/s) | 0.93 | 2.50 | 1.06 |
| Max Chl Dpth (ft) | 5.44 | Hydr. Depth (ft) | 2.03 | 4.56 | 2.46 |
| Conv. Total (cfs) | 102924.5 | Conv. (cfs) | 4654.3 | 78783.3 | 19486.8 |
| Length Wtd. (ft) | 583.66 | Wetted Per. (ft) | 67.47 | 190.06 | 204.91 |
| Min Ch El (ft) | 0.30 | Shear (lb/sq ft) | 0.10 | 0.22 | 0.12 |
| Alpha | 1.43 | Stream Power (lb/ft s) | 0.09 | 0.54 | 0.12 |
| Frctn Loss (ft) | 0.36 | Cum Volume (acre-ft) | 10.92 | 51.75 | 22.11 |
| C & E Loss (ft) | 0.01 | Cum SA (acres) | 4.15 | 12.55 | 9.37 |

CROSS SECTION

RIVER: GAME CK
REACH: GAME CK RS: 2644

INPUT
Description:
Station Elevation Data num= 14

| Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev |
|---|---|---|---|---|---|---|---|---|---|
| 70 | 15 | 125 | 10 | 170 | 5 | 300 | 1 | 520 | 1 |
| 525 | .1 | 560 | .1 | 580 | 4 | 600 | 5 | 660 | 8 |
| 900 | 9 | 1200 | 10 | 1320 | 11 | 1760 | 15 | | |

Manning's n Values num= 3

| Sta | n Val | Sta | n Val | Sta | n Val |
|---|---|---|---|---|---|
| 70 | .07 | 170 | .045 | 580 | .07 |

| Bank Sta: Left | Right | Lengths: Left Channel | Right | Coeff Contr. | Expan. |
|---|---|---|---|---|---|
| 170 | 580 | 650 | 400 | 170 | .1 .3 |

CROSS SECTION OUTPUT Profile #100 YR EXISTING

| | | | | | |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 5.45 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.05 | Wt. n-Val. | 0.070 | 0.045 | 0.070 |
| W.S. Elev (ft) | 5.40 | Reach Len. (ft) | 650.00 | 400.00 | 170.00 |
| Crit W.S. (ft) | | Flow Area (sq ft) | 0.70 | 1554.71 | 19.46 |
| E.G. Slope (ft/ft) | 0.000512 | Area (sq ft) | 0.70 | 1554.71 | 19.46 |
| Q Total (cfs) | 2829.00 | Flow (cfs) | 0.11 | 2821.54 | 7.34 |
| Top Width (ft) | 441.46 | Top Width (ft) | 3.56 | 410.00 | 27.90 |
| Vel Total (ft/s) | 1.80 | Avg. Vel. (ft/s) | 0.16 | 1.81 | 0.38 |
| Max Chl Dpth (ft) | 5.30 | Hydr. Depth (ft) | 0.20 | 3.79 | 0.70 |
| Conv. Total (cfs) | 125060.7 | Conv. (cfs) | 5.0 | 124731.0 | 324.6 |
| Length Wtd. (ft) | 402.39 | Wetted Per. (ft) | 3.58 | 410.52 | 27.94 |
| Min Ch El (ft) | 0.10 | Shear (lb/sq ft) | 0.01 | 0.12 | 0.02 |
| Alpha | 1.02 | Stream Power (lb/ft s) | 0.00 | 0.22 | 0.01 |
| Frctn Loss (ft) | 0.33 | Cum Volume (acre-ft) | 10.35 | 35.62 | 18.08 |
| C & E Loss (ft) | 0.01 | Cum SA (acres) | 3.86 | 8.56 | 7.58 |

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: GAME CK
REACH: GAME CK RS: 2244

INPUT
Description:
Station Elevation Data num= 15

| Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev |
|---|---|---|---|---|---|---|---|---|---|
| 380 | 10 | 400 | 5 | 420 | 3 | 440 | 2 | 450 | 1.5 |
| 510 | 1 | 530 | .1 | 560 | .1 | 600 | 1 | 650 | 2 |
| 700 | 5 | 740 | 7 | 850 | 8.8 | 870 | 9 | 1200 | 10 |

Manning's n Values num= 3

| Sta | n Val | Sta | n Val | Sta | n Val |
|---|---|---|---|---|---|
| 380 | .07 | 450 | .045 | 650 | .07 |

| Bank Sta: Left | Right | Lengths: Left Channel | Right | Coeff Contr. | Expan. |
|---|---|---|---|---|---|
| 450 | 650 | 390 | 384 | 375 | .1 | .3 |

CROSS SECTION OUTPUT Profile #100 YR EXISTING

| | | | | | |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 5.11 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.15 | Wt. n-Val. | 0.070 | 0.045 | 0.070 |
| W.S. Elev (ft) | 4.95 | Reach Len. (ft) | 390.00 | 384.00 | 375.00 |
| Crit W.S. (ft) | | Flow Area (sq ft) | 100.09 | 804.31 | 72.60 |
| E.G. Slope (ft/ft) | 0.001521 | Area (sq ft) | 100.09 | 804.31 | 72.60 |
| Q Total (cfs) | 2829.00 | Flow (cfs) | 132.23 | 2618.96 | 77.81 |
| Top Width (ft) | 298.71 | Top Width (ft) | 49.52 | 200.00 | 49.19 |
| Vel Total (ft/s) | 2.90 | Avg. Vel. (ft/s) | 1.32 | 3.26 | 1.07 |
| Max Chl Dpth (ft) | 4.85 | Hydr. Depth (ft) | 2.02 | 4.02 | 1.48 |
| Conv. Total (cfs) | 72540.2 | Conv. (cfs) | 3390.5 | 67154.5 | 1995.2 |
| Length Wtd. (ft) | 384.78 | Wetted Per. (ft) | 49.65 | 200.04 | 49.28 |
| Min Ch El (ft) | 0.10 | Shear (lb/sq ft) | 0.19 | 0.38 | 0.14 |
| Alpha | 1.18 | Stream Power (lb/ft s) | 0.25 | 1.24 | 0.15 |
| Frctn Loss (ft) | 0.65 | Cum Volume (acre-ft) | 9.60 | 24.79 | 17.90 |
| C & E Loss (ft) | 0.00 | Cum SA (acres) | 3.47 | 5.76 | 7.43 |

CROSS SECTION

RIVER: GAME CK
REACH: GAME CK RS: 1860

INPUT
Description:
Station Elevation Data num= 13

| Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev |
|---|---|---|---|---|---|---|---|---|---|
| 100 | 10 | 240 | 5 | 280 | 2 | 450 | 1 | 520 | .1 |
| 570 | .1 | 580 | 1 | 600 | 2 | 620 | 5 | 710 | 6 |
| 800 | 7 | 940 | 7.5 | 1180 | 10 | | | | |

Manning's n Values num= 3

| Sta | n Val | Sta | n Val | Sta | n Val |
|---|---|---|---|---|---|
| 100 | .07 | 450 | .045 | 580 | .07 |

| Bank Sta: Left | Right | Lengths: Left Channel | Right | Coeff Contr. | Expan. |
|---|---|---|---|---|---|
| 450 | 580 | 355 | 330 | 230 | .1 | .3 |

CROSS SECTION OUTPUT Profile #100 YR EXISTING

| | | | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 4.45 | Element | | | |
| Vel Head (ft) | 0.15 | Wt. n-Val. | 0.070 | 0.045 | 0.070 |
| W.S. Elev (ft) | 4.30 | Reach Len. (ft) | 355.00 | 330.00 | 230.00 |
| Crit W.S. (ft) | | Flow Area (sq ft) | 512.23 | 510.63 | 73.80 |
| E.G. Slope (ft/ft) | 0.001905 | Area (sq ft) | 512.23 | 510.63 | 73.80 |
| Q Total (cfs) | 2829.00 | Flow (cfs) | 886.02 | 1831.72 | 111.26 |
| Top Width (ft) | 366.10 | Top Width (ft) | 200.73 | 130.00 | 35.37 |
| Vel Total (ft/s) | 2.58 | Avg. Vel. (ft/s) | 1.73 | 3.59 | 1.51 |
| Max Chl Dpth (ft) | 4.20 | Hydr. Depth (ft) | 2.55 | 3.93 | 2.09 |
| Conv. Total (cfs) | 64813.2 | Conv. (cfs) | 20298.9 | 41965.3 | 2549.0 |
| Length Wtd. (ft) | 317.00 | Wetted Per. (ft) | 200.82 | 130.05 | 35.56 |
| Min Ch El (ft) | 0.10 | Shear (lb/sq ft) | 0.30 | 0.47 | 0.25 |
| Alpha | 1.41 | Stream Power (lb/ft s) | 0.52 | 1.68 | 0.37 |
| Frctn Loss (ft) | 0.44 | Cum Volume (acre-ft) | 6.86 | 18.99 | 17.27 |
| C & E Loss (ft) | 0.02 | Cum SA (acres) | 2.35 | 4.30 | 7.07 |

CROSS SECTION

RIVER: GAME CK
REACH: GAME CK RS: 1530

INPUT
Description:
Station Elevation Data num= 15

| Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev |
|---|---|---|---|---|---|---|---|---|---|
| 380 | 10 | 400 | 5 | 430 | 1 | 440 | 0 | 540 | -.5 |
| 570 | -.5 | 600 | 0 | 670 | 1 | 840 | 2 | 870 | 4 |
| 890 | 5 | 925 | 6 | 960 | 7 | 1140 | 8 | 1280 | 10 |

Manning's n Values num= 3

| Sta | n Val | Sta | n Val | Sta | n Val |
|---|---|---|---|---|---|
| 380 | .07 | 440 | .045 | 600 | .07 |

| Bank Sta: Left | Right | Lengths: Left Channel | Right | Coeff Contr. | Expan. |
|---|---|---|---|---|---|
| 440 | 600 | 280 | 430 | 250 | .1 .3 |

CROSS SECTION OUTPUT Profile #100 YR EXISTING

| | | | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 3.99 | Element | | | |
| Vel Head (ft) | 0.09 | Wt. n-Val. | 0.070 | 0.045 | 0.070 |
| W.S. Elev (ft) | 3.90 | Reach Len. (ft) | 280.00 | 430.00 | 250.00 |
| Crit W.S. (ft) | | Flow Area (sq ft) | 65.48 | 671.19 | 672.56 |
| E.G. Slope (ft/ft) | 0.001077 | Area (sq ft) | 65.48 | 671.19 | 672.56 |
| Q Total (cfs) | 2829.00 | Flow (cfs) | 73.54 | 1891.53 | 863.93 |
| Top Width (ft) | 460.21 | Top Width (ft) | 31.74 | 160.00 | 268.47 |
| Vel Total (ft/s) | 2.01 | Avg. Vel. (ft/s) | 1.12 | 2.82 | 1.28 |
| Max Chl Dpth (ft) | 4.40 | Hydr. Depth (ft) | 2.06 | 4.19 | 2.51 |
| Conv. Total (cfs) | 86216.5 | Conv. (cfs) | 2241.2 | 57646.2 | 26329.1 |
| Length Wtd. (ft) | 352.60 | Wetted Per. (ft) | 31.98 | 160.01 | 268.54 |
| Min Ch El (ft) | -0.50 | Shear (lb/sq ft) | 0.14 | 0.28 | 0.17 |
| Alpha | 1.45 | Stream Power (lb/ft s) | 0.15 | 0.79 | 0.22 |
| Frctn Loss (ft) | 0.33 | Cum Volume (acre-ft) | 4.51 | 14.52 | 15.30 |
| C & E Loss (ft) | 0.01 | Cum SA (acres) | 1.40 | 3.20 | 6.26 |

CROSS SECTION

RIVER: GAME CK
REACH: GAME CK RS: 1100

INPUT
Description:
Station Elevation Data num= 11

| Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 11.7 | 300 | 10 | 400 | 1 | 650 | -1 | 655 | -1.5 |
| 700 | -1.5 | 730 | -1 | 965 | 5 | 1050 | 7.5 | 1200 | 8.5 |
| 1330 | 10 | | | | | | | | |

Manning's n Values num= 3

| Sta | n Val | Sta | n Val | Sta | n Val |
|---|---|---|---|---|---|
| 0 | .07 | 650 | .045 | 730 | .07 |

| Bank Sta: Left | Right | Lengths: Left Channel | Right | Coeff Contr. | Expan. |
|---|---|---|---|---|---|
| 650 | 730 | 100 | 800 | 960 | .1 | .3 |

CROSS SECTION OUTPUT Profile #100 YR EXISTING

| | | | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 3.65 | Element | | | |
| Vel Head (ft) | 0.06 | Wt. n-Val. | 0.070 | 0.045 | 0.070 |
| W.S. Elev (ft) | 3.58 | Reach Len. (ft) | 100.00 | 800.00 | 960.00 |
| Crit W.S. (ft) | | Flow Area (sq ft) | 933.01 | 397.95 | 411.45 |
| E.G. Slope (ft/ft) | 0.000837 | Area (sq ft) | 933.01 | 397.95 | 411.45 |
| Q Total (cfs) | 2829.00 | Flow (cfs) | 1282.08 | 1107.71 | 439.22 |
| Top Width (ft) | 538.24 | Top Width (ft) | 278.71 | 80.00 | 179.53 |
| Vel Total (ft/s) | 1.62 | Avg. Vel. (ft/s) | 1.37 | 2.78 | 1.07 |
| Max Chl Dpth (ft) | 5.08 | Hydr. Depth (ft) | 3.35 | 4.97 | 2.29 |
| Conv. Total (cfs) | 97768.5 | Conv. (cfs) | 44307.8 | 38281.6 | 15179.1 |
| Length Wtd. (ft) | 645.64 | Wetted Per. (ft) | 278.83 | 80.03 | 179.59 |
| Min Ch El (ft) | -1.50 | Shear (lb/sq ft) | 0.17 | 0.26 | 0.12 |
| Alpha | 1.54 | Stream Power (lb/ft s) | 0.24 | 0.72 | 0.13 |
| Frctn Loss (ft) | 0.59 | Cum Volume (acre-ft) | 1.30 | 9.24 | 12.19 |
| C & E Loss (ft) | 0.00 | Cum SA (acres) | 0.40 | 2.02 | 4.98 |

CROSS SECTION

RIVER: GAME CK
REACH: GAME CK RS: 300

INPUT
Description:
Station Elevation Data num= 14

| Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 12.8 | 150 | 10 | 160 | 5 | 205 | 5 | 215 | 1 |
| 280 | -1 | 350 | -1.5 | 419 | -1.5 | 420 | -1 | 550 | .6 |
| 670 | 1 | 715 | 5 | 800 | 7 | 1590 | 10 | | |

Manning's n Values num= 3

| Sta | n Val | Sta | n Val | Sta | n Val |
|---|---|---|---|---|---|
| 0 | .07 | 280 | .045 | 420 | .07 |

| Bank Sta: Left | Right | Lengths: Left Channel | Right | Coeff Contr. | Expan. |
|---|---|---|---|---|---|
| 280 | 420 | 0 | 0 | 0 | .1 | .3 |

CROSS SECTION OUTPUT Profile #100 YR EXISTING

100 yr Existing Condition

| | | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 3.05 | Wt. n-Val. | 0.070 | 0.045 | 0.070 |
| Vel Head (ft) | 0.08 | Reach Len. (ft) | | | |
| W.S. Elev (ft) | 2.97 | Flow Area (sq ft) | 198.07 | 608.39 | 694.99 |
| Crit W.S. (ft) | 0.75 | Area (sq ft) | 198.07 | 608.39 | 694.99 |
| E.G. Slope (ft/ft) | 0.001001 | Flow (cfs) | 265.30 | 1691.84 | 871.87 |
| Q Total (cfs) | 2829.00 | Top Width (ft) | 69.93 | 140.00 | 272.19 |
| Top Width (ft) | 482.12 | Avg. Vel. (ft/s) | 1.34 | 2.78 | 1.25 |
| Vel Total (ft/s) | 1.88 | Hydr. Depth (ft) | 2.83 | 4.35 | 2.55 |
| Max Chl Dpth (ft) | 4.47 | Conv. (cfs) | 8384.1 | 53467.1 | 27553.5 |
| Conv. Total (cfs) | 89404.7 | Wetted Per. (ft) | 70.34 | 140.12 | 272.29 |
| Length Wtd. (ft) | | Shear (lb/sq ft) | 0.18 | 0.27 | 0.16 |
| Min Ch El (ft) | -1.50 | Stream Power (lb/ft s) | 0.24 | 0.75 | 0.20 |
| Alpha | 1.49 | Cum Volume (acre-ft) | | | |
| Frctn Loss (ft) | | Cum SA (acres) | | | |
| C & E Loss (ft) | | | | | |

SUMMARY OF MANNING'S N VALUES

River:GAME CK

| Reach | River Sta. | n1 | n2 | n3 |
|---|---|---|---|---|
| GAME CK | 4560 | .07 | .045 | .07 |
| GAME CK | 4160 | .07 | .045 | .07 |
| GAME CK | 3730 | .07 | .045 | .07 |
| GAME CK | 3224 | .07 | .045 | .07 |
| GAME CK | 2644 | .07 | .045 | .07 |
| GAME CK | 2244 | .07 | .045 | .07 |
| GAME CK | 1860 | .07 | .045 | .07 |
| GAME CK | 1530 | .07 | .045 | .07 |
| GAME CK | 1100 | .07 | .045 | .07 |
| GAME CK | 300 | .07 | .045 | .07 |

SUMMARY OF REACH LENGTHS

River: GAME CK

| Reach | River Sta. | Left | Channel | Right |
|---|---|---|---|---|
| GAME CK | 4560 | 420 | 400 | 290 |
| GAME CK | 4160 | 500 | 430 | 300 |
| GAME CK | 3730 | 530 | 506 | 230 |
| GAME CK | 3224 | 360 | 580 | 670 |
| GAME CK | 2644 | 650 | 400 | 170 |
| GAME CK | 2244 | 390 | 384 | 375 |
| GAME CK | 1860 | 355 | 330 | 230 |
| GAME CK | 1530 | 280 | 430 | 250 |
| GAME CK | 1100 | 100 | 800 | 960 |
| GAME CK | 300 | 0 | 0 | 0 |

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: GAME CK

| Reach | River Sta. | Contr. | Expan. |
|---|---|---|---|
| GAME CK | 4560 | .1 | .3 |
| GAME CK | 4160 | .1 | .3 |
| GAME CK | 3730 | .1 | .3 |
| GAME CK | 3224 | .1 | .3 |
| GAME CK | 2644 | .1 | .3 |
| GAME CK | 2244 | .1 | .3 |
| GAME CK | 1860 | .1 | .3 |
| GAME CK | 1530 | .1 | .3 |
| GAME CK | 1100 | .1 | .3 |
| GAME CK | 300 | .1 | .3 |

Profile Output Table - Standard Table 1

| Reach | River Sta | Profile | Q Total | Min Ch El | W.S. Elev | Crit W.S. | E.G. Elev | E.G. Slope | Vel Chnl | Flow Area | Top Width | Froude # Chl |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | (cfs) | (ft) | (ft) | (ft) | (ft) | (ft/ft) | (ft/s) | (sq ft) | (ft) | |
| GAME CK | 4560 | 100 YR EXISTING | 2829.00 | 0.40 | 8.33 | | 8.68 | 0.001832 | 5.38 | 792.20 | 203.15 | 0.34 |
| GAME CK | 4160 | 100 YR EXISTING | 2829.00 | 0.50 | 7.40 | | 7.79 | 0.002820 | 6.00 | 841.24 | 347.07 | 0.42 |
| GAME CK | 3730 | 100 YR EXISTING | 2829.00 | 0.50 | 6.24 | | 6.46 | 0.003460 | 5.82 | 998.61 | 377.08 | 0.44 |
| GAME CK | 3224 | 100 YR EXISTING | 2829.00 | 0.30 | 5.74 | | 5.81 | 0.000755 | 2.50 | 1507.99 | 462.22 | 0.21 |
| GAME CK | 2644 | 100 YR EXISTING | 2829.00 | 0.10 | 5.40 | | 5.45 | 0.000512 | 1.81 | 1574.87 | 441.46 | 0.16 |
| GAME CK | 2244 | 100 YR EXISTING | 2829.00 | 0.10 | 4.95 | | 5.11 | 0.001521 | 3.26 | 977.00 | 298.71 | 0.29 |
| GAME CK | 1860 | 100 YR EXISTING | 2829.00 | 0.10 | 4.30 | | 4.45 | 0.001905 | 3.59 | 1096.67 | 366.10 | 0.32 |
| GAME CK | 1530 | 100 YR EXISTING | 2829.00 | -0.50 | 3.90 | | 3.99 | 0.001077 | 2.82 | 1409.23 | 460.21 | 0.24 |
| GAME CK | 1100 | 100 YR EXISTING | 2829.00 | -1.50 | 3.58 | | 3.65 | 0.000837 | 2.78 | 1742.41 | 538.24 | 0.22 |
| GAME CK | 300 | 100 YR EXISTING | 2829.00 | -1.50 | 2.97 | 0.75 | 3.05 | 0.001001 | 2.78 | 1501.45 | 482.12 | 0.24 |

ERRORS WARNINGS AND NOTES
Errors Warnings and Notes for Plan : Plan 02

River: GAME CK  Reach: GAME CK  RS: 4160  Profile: 100 YR EXISTING
Warning:Divided flow computed for this cross-section.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
River: GAME CK  Reach: GAME CK  RS: 3730  Profile: 100 YR EXISTING
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
River: GAME CK  Reach: GAME CK  RS: 2644  Profile: 100 YR EXISTING

Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

HEC-RAS Plan: Plan 02 River: GAME CK Reach: GAME CK Profile: 100 YR EXISTING

| Reach | River Sta | Profile | Q Total | Min Ch El | W.S. Elev | Crit W.S. | E.G. Elev | E.G. Slope | Vel Chnl | Flow Area | Top Width | Froude # Chl |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | (cfs) | (ft) | (ft) | (ft) | (ft) | (ft/ft) | (ft/s) | (sq ft) | (ft) | |
| GAME CK | 4560 | 100 YR EXISTING | 2829.00 | 0.40 | 8.33 | | 8.68 | 0.001832 | 5.38 | 792.20 | 203.15 | 0.34 |
| GAME CK | 4160 | 100 YR EXISTING | 2829.00 | 0.50 | 7.40 | | 7.79 | 0.002820 | 6.00 | 841.24 | 347.07 | 0.42 |
| GAME CK | 3730 | 100 YR EXISTING | 2829.00 | 0.50 | 6.24 | | 6.46 | 0.003460 | 5.82 | 998.61 | 377.08 | 0.44 |
| GAME CK | 3224 | 100 YR EXISTING | 2829.00 | 0.30 | 5.74 | | 5.81 | 0.000755 | 2.50 | 1507.99 | 462.22 | 0.21 |
| GAME CK | 2644 | 100 YR EXISTING | 2829.00 | 0.10 | 5.40 | | 5.45 | 0.000512 | 1.81 | 1574.87 | 441.46 | 0.16 |
| GAME CK | 2244 | 100 YR EXISTING | 2829.00 | 0.10 | 4.95 | | 5.11 | 0.001521 | 3.26 | 977.00 | 298.71 | 0.29 |
| GAME CK | 1860 | 100 YR EXISTING | 2829.00 | 0.10 | 4.30 | | 4.45 | 0.001905 | 3.59 | 1096.67 | 366.10 | 0.32 |
| GAME CK | 1530 | 100 YR EXISTING | 2829.00 | -0.50 | 3.90 | | 3.99 | 0.001077 | 2.82 | 1409.23 | 460.21 | 0.24 |
| GAME CK | 1100 | 100 YR EXISTING | 2829.00 | -1.50 | 3.58 | | 3.65 | 0.000837 | 2.78 | 1742.41 | 538.24 | 0.22 |
| GAME CK | 300 | 100 YR EXISTING | 2829.00 | -1.50 | 2.97 | 0.75 | 3.05 | 0.001001 | 2.78 | 1501.45 | 482.12 | 0.24 |

# *Appendix E – Proposed Conditions Dam & Spillway*

HEC-RAS Version 4.0 Beta
U.S. Army Corp of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```
X     X  XXXXXX    XXXX        XXXX       XX      XXXX
X     X  X        X    X       X   X     X  X    X
X     X  X        X            X   X     X    X   X
XXXXXXX  XXXX     X       XXX  XXXX      XXXXXX    XXXX
X     X  X        X            X  X      X    X        X
X     X  X        X    X       X   X     X    X        X
X     X  XXXXXX    XXXX        X    X    X    X   XXXXX
```

PROJECT DATA
Project Title: RT48_10_21_2011_Proposed
Project File : RT48_10_21_2011_Proposed.prj
Run Date and Time: 1/18/2012 10:37:43 AM

Project in English units

Project Description:
Water Surface Elevation for Proposed Condition (Steady)

PLAN DATA

Plan Title: Plan 03
Plan File : Z:\WTR\WTR Projects\RT NJ 48 Layton Lake Dam\hec-ras\Layton_03_29_2011_steady_Exist_and_Proposed\RT48_10_21_2011_Proposed.p03

Geometry Title: 48LAYFINRAT
Geometry File : Z:\WTR\WTR Projects\RT NJ 48 Layton Lake Dam\hec-ras\Layton_03_29_2011_steady_Exist_and_Proposed\RT48_10_21_2011_Proposed.g05

Flow Title : Flow 07
Flow File : Z:\WTR\WTR Projects\RT NJ 48 Layton Lake Dam\hec-ras\Layton_03_29_2011_steady_Exist_and_Proposed\RT48_10_21_2011_Proposed.f07

Plan Summary Information:

| | | | | | |
|---|---|---|---|---|---|
| Number of: | Cross Sections | = 10 | Multiple Openings | = | 0 |
| | Culverts | = 0 | Inline Structures | = | 0 |
| | Bridges | = 0 | Lateral Structures | = | 0 |

Computational Information

| | |
|---|---|
| Water surface calculation tolerance | = 0.01 |
| Critical depth calculation tolerance | = 0.01 |
| Maximum number of iterations | = 20 |
| Maximum difference tolerance | = 0.3 |
| Flow tolerance factor | = 0.001 |

Computation Options
Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance

Computational Flow Regime: Subcritical Flow

FLOW DATA

Flow Title: Flow 07
Flow File : Z:\WTR\WTR Projects\RT NJ 48 Layton Lake Dam\hec-ras\Layton_03_29_2011_steady_Exist_and_Proposed\RT48_10_21_2011_Proposed.f07

Flow Data (cfs)

| River | Reach | RS | 100 YR PROPOSED |
|---|---|---|---|
| GAME CK | GAME CK | 4560 | 2901 |

Boundary Conditions

| River | Reach | Profile | Upstream | Downstream |
|---|---|---|---|---|
| GAME CK | GAME CK | 100 YR PROPOSED | | Normal S = 0.001 |

GEOMETRY DATA

Geometry Title: 48LAYFINRAT
Geometry File : Z:\WTR\WTR Projects\RT NJ 48 Layton Lake Dam\hec-ras\Layton_03_29_2011_steady_Exist_and_Proposed\RT48_10_21_2011_Proposed.g05

CROSS SECTION

RIVER: GAME CK
REACH: GAME CK RS: 4560

INPUT
Description:
Station Elevation Data num= 18

| Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 15 | 350 | 12.6 | 800 | 13.5 | 880 | 13 | 930 | 10 |
| 980 | 5 | 1020 | 4 | 1030 | 3 | 1034 | .4 | 1066 | .4 |
| 1080 | .5 | 1081 | 3 | 1090 | 5 | 1180 | 10 | 1200 | 11 |
| 1270 | 15 | 1450 | 15 | 1850 | 20.3 | | | | |

Manning's n Values num= 3

| Sta | n Val | Sta | n Val | Sta | n Val |
|---|---|---|---|---|---|
| 0 | .07 | 1030 | .045 | 1081 | .07 |

| Bank Sta: Left | Right | Lengths: Left Channel | Right | Coeff Contr. | Expan. |
|---|---|---|---|---|---|
| 1030 | 1081 | 420 | 400 | 290 | .1 | .3 |

CROSS SECTION OUTPUT Profile #100 YR PROPOSED

| | | | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 8.75 | Element | | | |
| Vel Head (ft) | 0.36 | Wt. n-Val. | 0.070 | 0.045 | 0.070 |
| W.S. Elev (ft) | 8.39 | Reach Len. (ft) | 420.00 | 400.00 | 290.00 |
| Crit W.S. (ft) | | Flow Area (sq ft) | 261.68 | 400.07 | 142.70 |
| E.G. Slope (ft/ft) | 0.001862 | Area (sq ft) | 261.68 | 400.07 | 142.70 |
| Q Total (cfs) | 2901.00 | Flow (cfs) | 510.81 | 2180.60 | 209.59 |
| Top Width (ft) | 204.82 | Top Width (ft) | 83.87 | 51.00 | 69.96 |

100 yr Proposed Condition

| | | | | | |
|---|---|---|---|---|---|
| Vel Total (ft/s) | 3.61 | Avg. Vel. (ft/s) | 1.95 | 5.45 | 1.47 |
| Max Chl Dpth (ft) | 7.99 | Hydr. Depth (ft) | 3.12 | 7.84 | 2.04 |
| Conv. Total (cfs) | 67235.9 | Conv. (cfs) | 11839.0 | 50539.4 | 4857.6 |
| Length Wtd. (ft) | 391.12 | Wetted Per. (ft) | 84.10 | 53.46 | 70.27 |
| Min Ch El (ft) | 0.40 | Shear (lb/sq ft) | 0.36 | 0.87 | 0.24 |
| Alpha | 1.78 | Stream Power (lb/ft s) | 0.71 | 4.74 | 0.35 |
| Frctn Loss (ft) | 0.89 | Cum Volume (acre-ft) | 21.60 | 64.18 | 28.57 |
| C & E Loss (ft) | 0.00 | Cum SA (acres) | 9.60 | 14.69 | 11.71 |

CROSS SECTION

RIVER: GAME CK
REACH: GAME CK RS: 4160

INPUT
Description:
Station Elevation Data num= 16

| Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 14.5 | 150 | 11.5 | 230 | 10 | 360 | 5 | 450 | 8.5 |
| 565 | 5 | 590 | 3 | 600 | .5 | 630 | .5 | 640 | 3 |
| 690 | 5 | 730 | 10 | 750 | 11 | 830 | 12 | 920 | 13 |
| 1100 | 17 | | | | | | | | |

Manning's n Values num= 3

| Sta | n Val | Sta | n Val | Sta | n Val |
|---|---|---|---|---|---|
| 0 | .07 | 590 | .045 | 640 | .07 |

| Bank Sta: Left | Right | Lengths: Left Channel | Right | Coeff Contr. | Expan. |
|---|---|---|---|---|---|
| 590 | 640 | 500 | 430 | 300 | .1 .3 |

CROSS SECTION OUTPUT Profile #100 YR PROPOSED

| | | | | | |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 7.85 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.40 | Wt. n-Val. | 0.070 | 0.045 | 0.070 |
| W.S. Elev (ft) | 7.45 | Reach Len. (ft) | 500.00 | 430.00 | 300.00 |
| Crit W.S. (ft) | | Flow Area (sq ft) | 340.72 | 322.64 | 196.71 |
| E.G. Slope (ft/ft) | 0.002839 | Area (sq ft) | 340.72 | 322.64 | 196.71 |
| Q Total (cfs) | 2901.00 | Flow (cfs) | 505.77 | 1951.43 | 443.80 |
| Top Width (ft) | 352.06 | Top Width (ft) | 232.44 | 50.00 | 69.62 |
| Vel Total (ft/s) | 3.37 | Avg. Vel. (ft/s) | 1.48 | 6.05 | 2.26 |
| Max Chl Dpth (ft) | 6.95 | Hydr. Depth (ft) | 1.47 | 6.45 | 2.83 |
| Conv. Total (cfs) | 54448.6 | Conv. (cfs) | 9492.8 | 36626.2 | 8329.6 |
| Length Wtd. (ft) | 411.38 | Wetted Per. (ft) | 232.65 | 50.62 | 69.82 |
| Min Ch El (ft) | 0.50 | Shear (lb/sq ft) | 0.26 | 1.13 | 0.50 |
| Alpha | 2.27 | Stream Power (lb/ft s) | 0.39 | 6.83 | 1.13 |
| Frctn Loss (ft) | 1.28 | Cum Volume (acre-ft) | 18.69 | 60.86 | 27.44 |
| C & E Loss (ft) | 0.05 | Cum SA (acres) | 8.07 | 14.23 | 11.24 |

Warning: Divided flow computed for this cross-section.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: GAME CK
REACH: GAME CK RS: 3730

INPUT
Description:
Station Elevation Data num= 16

| Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev |
|---|---|---|---|---|---|---|---|---|---|
| 300 | 12.8 | 340 | 10 | 365 | 5 | 400 | 5 | 430 | 5 |
| 500 | 3 | 540 | 2 | 541 | .5 | 555 | .5 | 570 | 2 |
| 700 | 4 | 705 | 5 | 830 | 10 | 920 | 11 | 1140 | 12 |
| 1250 | 15 | | | | | | | | |

Manning's n Values num= 3

| Sta | n Val | Sta | n Val | Sta | n Val |
|---|---|---|---|---|---|
| 300 | .07 | 540 | .045 | 570 | .07 |

| Bank Sta: Left | Right | Lengths: Left Channel | Right | Coeff Contr. | Expan. |
|---|---|---|---|---|---|
| 540 | 570 | 530 | 506 | 230 | .1 | .3 |

CROSS SECTION OUTPUT Profile #100 YR PROPOSED

| | | | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 6.52 | Element | | | |
| Vel Head (ft) | 0.23 | Wt. n-Val. | 0.070 | 0.045 | 0.070 |
| W.S. Elev (ft) | 6.29 | Reach Len. (ft) | 530.00 | 506.00 | 230.00 |
| Crit W.S. (ft) | | Flow Area (sq ft) | 400.37 | 161.78 | 457.87 |
| E.G. Slope (ft/ft) | 0.003433 | Area (sq ft) | 400.37 | 161.78 | 457.87 |
| Q Total (cfs) | 2901.00 | Flow (cfs) | 843.37 | 944.12 | 1113.51 |
| Top Width (ft) | 378.78 | Top Width (ft) | 181.46 | 30.00 | 167.31 |
| Vel Total (ft/s) | 2.84 | Avg. Vel. (ft/s) | 2.11 | 5.84 | 2.43 |
| Max Chl Dpth (ft) | 5.79 | Hydr. Depth (ft) | 2.21 | 5.39 | 2.74 |
| Conv. Total (cfs) | 49514.1 | Conv. (cfs) | 14394.6 | 16114.2 | 19005.3 |
| Length Wtd. (ft) | 430.70 | Wetted Per. (ft) | 181.63 | 30.88 | 167.45 |
| Min Ch El (ft) | 0.50 | Shear (lb/sq ft) | 0.47 | 1.12 | 0.59 |
| Alpha | 1.81 | Stream Power (lb/ft s) | 1.00 | 6.55 | 1.43 |
| Frctn Loss (ft) | 0.60 | Cum Volume (acre-ft) | 14.44 | 58.47 | 25.19 |
| C & E Loss (ft) | 0.04 | Cum SA (acres) | 5.70 | 13.83 | 10.43 |

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: GAME CK
REACH: GAME CK RS: 3224

INPUT
Description:
Station Elevation Data num= 16

| Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev |
|---|---|---|---|---|---|---|---|---|---|
| 340 | 14 | 400 | 10 | 450 | 5 | 490 | 3 | 510 | 2 |
| 540 | .3 | 560 | .3 | 700 | 2.3 | 830 | 3 | 885 | 5 |
| 1020 | 10 | 1100 | 11 | 1170 | 12 | 1280 | 13 | 1350 | 14 |
| 1440 | 15 | | | | | | | | |

Manning's n Values num= 3

| Sta | n Val | Sta | n Val | Sta | n Val |
|---|---|---|---|---|---|
| 340 | .07 | 510 | .045 | 700 | .07 |

| Bank Sta: Left | Right | Lengths: Left Channel | Right | Coeff Contr. | Expan. |
|---|---|---|---|---|---|
| 510 | 700 | 360 | 580 | 670 | .1 | .3 |

CROSS SECTION OUTPUT Profile #100 YR PROPOSED

| | | | | | |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 5.87 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.08 | Wt. n-Val. | 0.070 | 0.045 | 0.070 |
| W.S. Elev (ft) | 5.79 | Reach Len. (ft) | 360.00 | 580.00 | 670.00 |
| Crit W.S. (ft) | | Flow Area (sq ft) | 140.66 | 877.99 | 515.50 |
| E.G. Slope (ft/ft) | 0.000758 | Area (sq ft) | 140.66 | 877.99 | 515.50 |
| Q Total (cfs) | 2901.00 | Flow (cfs) | 133.37 | 2213.28 | 554.35 |
| Top Width (ft) | 464.31 | Top Width (ft) | 67.92 | 190.00 | 206.38 |
| Vel Total (ft/s) | 1.89 | Avg. Vel. (ft/s) | 0.95 | 2.52 | 1.08 |
| Max Chl Dpth (ft) | 5.49 | Hydr. Depth (ft) | 2.07 | 4.62 | 2.50 |
| Conv. Total (cfs) | 105400.5 | Conv. (cfs) | 4845.7 | 80414.0 | 20140.9 |
| Length Wtd. (ft) | 583.66 | Wetted Per. (ft) | 68.03 | 190.06 | 206.44 |
| Min Ch El (ft) | 0.30 | Shear (lb/sq ft) | 0.10 | 0.22 | 0.12 |
| Alpha | 1.43 | Stream Power (lb/ft s) | 0.09 | 0.55 | 0.13 |
| Frctn Loss (ft) | 0.36 | Cum Volume (acre-ft) | 11.15 | 52.43 | 22.62 |
| C & E Loss (ft) | 0.01 | Cum SA (acres) | 4.18 | 12.55 | 9.44 |

CROSS SECTION

RIVER: GAME CK
REACH: GAME CK RS: 2644

INPUT
Description:
Station Elevation Data num= 14

| Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev |
|---|---|---|---|---|---|---|---|---|---|
| 70 | 15 | 125 | 10 | 170 | 5 | 300 | 1 | 520 | 1 |
| 525 | .1 | 560 | .1 | 580 | 4 | 600 | 5 | 660 | 8 |
| 900 | 9 | 1200 | 10 | 1320 | 11 | 1760 | 15 | | |

Manning's n Values num= 3

| Sta | n Val | Sta | n Val | Sta | n Val |
|---|---|---|---|---|---|
| 70 | .07 | 170 | .045 | 580 | .07 |

| Bank Sta: Left | Right | Lengths: Left Channel | Right | Coeff Contr. | Expan. |
|---|---|---|---|---|---|
| 170 | 580 | 650 | 400 | 170 | .1 | .3 |

CROSS SECTION OUTPUT Profile #100 YR PROPOSED

| | | | | | |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 5.50 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.05 | Wt. n-Val. | 0.070 | 0.045 | 0.070 |
| W.S. Elev (ft) | 5.45 | Reach Len. (ft) | 650.00 | 400.00 | 170.00 |
| Crit W.S. (ft) | | Flow Area (sq ft) | 0.92 | 1577.68 | 21.06 |
| E.G. Slope (ft/ft) | 0.000512 | Area (sq ft) | 0.92 | 1577.68 | 21.06 |
| Q Total (cfs) | 2901.00 | Flow (cfs) | 0.16 | 2892.68 | 8.16 |
| Top Width (ft) | 443.08 | Top Width (ft) | 4.06 | 410.00 | 29.02 |
| Vel Total (ft/s) | 1.81 | Avg. Vel. (ft/s) | 0.18 | 1.83 | 0.39 |
| Max Chl Dpth (ft) | 5.35 | Hydr. Depth (ft) | 0.23 | 3.85 | 0.73 |
| Conv. Total (cfs) | 128185.2 | Conv. (cfs) | 7.2 | 127817.4 | 360.6 |
| Length Wtd. (ft) | 402.36 | Wetted Per. (ft) | 4.08 | 410.52 | 29.06 |
| Min Ch El (ft) | 0.10 | Shear (lb/sq ft) | 0.01 | 0.12 | 0.02 |
| Alpha | 1.02 | Stream Power (lb/ft s) | 0.00 | 0.23 | 0.01 |
| Frctn Loss (ft) | 0.33 | Cum Volume (acre-ft) | 10.56 | 36.08 | 18.49 |
| C & E Loss (ft) | 0.01 | Cum SA (acres) | 3.88 | 8.56 | 7.63 |

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: GAME CK
REACH: GAME CK RS: 2244

INPUT
Description:
Station Elevation Data num= 15

| Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev |
|---|---|---|---|---|---|---|---|---|---|
| 380 | 10 | 400 | 5 | 420 | 3 | 440 | 2 | 450 | 1.5 |
| 510 | 1 | 530 | .1 | 560 | .1 | 600 | 1 | 650 | 2 |
| 700 | 5 | 740 | 7 | 850 | 8.8 | 870 | 9 | 1200 | 10 |

Manning's n Values num= 3

| Sta | n Val | Sta | n Val | Sta | n Val |
|---|---|---|---|---|---|
| 380 | .07 | 450 | .045 | 650 | .07 |

| Bank Sta: Left | Right | Lengths: Left Channel | Right | Coeff Contr. | Expan. |
|---|---|---|---|---|---|
| 450 | 650 | 390 | 384 | 375 | .1 | .3 |

CROSS SECTION OUTPUT Profile #100 YR PROPOSED

| | | | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 5.16 | Element | 0.070 | 0.045 | 0.070 |
| Vel Head (ft) | 0.16 | Wt. n-Val. | 390.00 | 384.00 | 375.00 |
| W.S. Elev (ft) | 5.00 | Reach Len. (ft) | 102.73 | 814.93 | 75.23 |
| Crit W.S. (ft) | | Flow Area (sq ft) | 102.73 | 814.93 | 75.23 |
| E.G. Slope (ft/ft) | 0.001527 | Area (sq ft) | 137.42 | 2681.84 | 81.73 |
| Q Total (cfs) | 2901.00 | Flow (cfs) | 50.02 | 200.00 | 50.09 |
| Top Width (ft) | 300.11 | Top Width (ft) | 1.34 | 3.29 | 1.09 |
| Vel Total (ft/s) | 2.92 | Avg. Vel. (ft/s) | 2.05 | 4.07 | 1.50 |
| Max Chl Dpth (ft) | 4.90 | Hydr. Depth (ft) | 3517.2 | 68639.3 | 2091.9 |
| Conv. Total (cfs) | 74248.4 | Conv. (cfs) | 50.16 | 200.04 | 50.18 |
| Length Wtd. (ft) | 384.78 | Wetted Per. (ft) | 0.20 | 0.39 | 0.14 |
| Min Ch El (ft) | 0.10 | Shear (lb/sq ft) | 0.26 | 1.28 | 0.16 |
| Alpha | 1.19 | Stream Power (lb/ft s) | 9.79 | 25.10 | 18.31 |
| Frctn Loss (ft) | 0.65 | Cum Volume (acre-ft) | 3.48 | 5.76 | 7.48 |
| C & E Loss (ft) | 0.00 | Cum SA (acres) | | | |

CROSS SECTION

RIVER: GAME CK
REACH: GAME CK RS: 1860

INPUT
Description:
Station Elevation Data num= 13

| Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev |
|---|---|---|---|---|---|---|---|---|---|
| 100 | 10 | 240 | 5 | 280 | 2 | 450 | 1 | 520 | .1 |
| 570 | .1 | 580 | 1 | 600 | 2 | 620 | 5 | 710 | 6 |
| 800 | 7 | 940 | 7.5 | 1180 | 10 | | | | |

Manning's n Values num= 3

| Sta | n Val | Sta | n Val | Sta | n Val |
|---|---|---|---|---|---|
| 100 | .07 | 450 | .045 | 580 | .07 |

| Bank Sta: Left | Right | Lengths: Left Channel | Right | Coeff Contr. | Expan. |
|---|---|---|---|---|---|
| 450 | 580 | 355 | 330 | 230 | .1 | .3 |

CROSS SECTION OUTPUT Profile #100 YR PROPOSED

| | | | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 4.51 | Element | | | |
| Vel Head (ft) | 0.15 | Wt. n-Val. | 0.070 | 0.045 | 0.070 |
| W.S. Elev (ft) | 4.36 | Reach Len. (ft) | 355.00 | 330.00 | 230.00 |
| Crit W.S. (ft) | | Flow Area (sq ft) | 522.89 | 517.52 | 75.69 |
| E.G. Slope (ft/ft) | 0.001902 | Area (sq ft) | 522.89 | 517.52 | 75.69 |
| Q Total (cfs) | 2901.00 | Flow (cfs) | 914.12 | 1871.70 | 115.18 |
| Top Width (ft) | 367.16 | Top Width (ft) | 201.44 | 130.00 | 35.72 |
| Vel Total (ft/s) | 2.60 | Avg. Vel. (ft/s) | 1.75 | 3.62 | 1.52 |
| Max Chl Dpth (ft) | 4.26 | Hydr. Depth (ft) | 2.60 | 3.98 | 2.12 |
| Conv. Total (cfs) | 66512.3 | Conv. (cfs) | 20958.4 | 42913.2 | 2640.7 |
| Length Wtd. (ft) | 316.89 | Wetted Per. (ft) | 201.53 | 130.05 | 35.92 |
| Min Ch El (ft) | 0.10 | Shear (lb/sq ft) | 0.31 | 0.47 | 0.25 |
| Alpha | 1.41 | Stream Power (lb/ft s) | 0.54 | 1.71 | 0.38 |
| Frctn Loss (ft) | 0.44 | Cum Volume (acre-ft) | 6.99 | 19.23 | 17.66 |
| C & E Loss (ft) | 0.02 | Cum SA (acres) | 2.35 | 4.30 | 7.11 |

CROSS SECTION

RIVER: GAME CK
REACH: GAME CK RS: 1530

INPUT
Description:
Station Elevation Data num= 15

| Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev |
|---|---|---|---|---|---|---|---|---|---|
| 380 | 10 | 400 | 5 | 430 | 1 | 440 | 0 | 540 | -.5 |
| 570 | -.5 | 600 | 0 | 670 | 1 | 840 | 2 | 870 | 4 |
| 890 | 5 | 925 | 6 | 960 | 7 | 1140 | 8 | 1280 | 10 |

Manning's n Values num= 3

| Sta | n Val | Sta | n Val | Sta | n Val |
|---|---|---|---|---|---|
| 380 | .07 | 440 | .045 | 600 | .07 |

| Bank Sta: Left | Right | Lengths: Left Channel | Right | Coeff Contr. | Expan. |
|---|---|---|---|---|---|
| 440 | 600 | 280 | 430 | 250 | .1 .3 |

CROSS SECTION OUTPUT Profile #100 YR PROPOSED

| | | | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 4.04 | Element | | | |
| Vel Head (ft) | 0.09 | Wt. n-Val. | 0.070 | 0.045 | 0.070 |
| W.S. Elev (ft) | 3.95 | Reach Len. (ft) | 280.00 | 430.00 | 250.00 |
| Crit W.S. (ft) | | Flow Area (sq ft) | 67.21 | 679.87 | 687.14 |
| E.G. Slope (ft/ft) | 0.001076 | Area (sq ft) | 67.21 | 679.87 | 687.14 |
| Q Total (cfs) | 2901.00 | Flow (cfs) | 76.13 | 1931.67 | 893.20 |
| Top Width (ft) | 461.43 | Top Width (ft) | 32.14 | 160.00 | 269.28 |
| Vel Total (ft/s) | 2.02 | Avg. Vel. (ft/s) | 1.13 | 2.84 | 1.30 |
| Max Chl Dpth (ft) | 4.45 | Hydr. Depth (ft) | 2.09 | 4.25 | 2.55 |
| Conv. Total (cfs) | 88447.5 | Conv. (cfs) | 2321.0 | 58893.9 | 27232.5 |
| Length Wtd. (ft) | 352.18 | Wetted Per. (ft) | 32.39 | 160.01 | 269.36 |
| Min Ch El (ft) | -0.50 | Shear (lb/sq ft) | 0.14 | 0.29 | 0.17 |
| Alpha | 1.45 | Stream Power (lb/ft s) | 0.16 | 0.81 | 0.22 |
| Frctn Loss (ft) | 0.33 | Cum Volume (acre-ft) | 4.58 | 14.69 | 15.64 |
| C & E Loss (ft) | 0.01 | Cum SA (acres) | 1.40 | 3.20 | 6.30 |

CROSS SECTION

RIVER: GAME CK
REACH: GAME CK RS: 1100

INPUT
Description:
Station Elevation Data num= 11

| Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 11.7 | 300 | 10 | 400 | 1 | 650 | -1 | 655 | -1.5 |
| 700 | -1.5 | 730 | -1 | 965 | 5 | 1050 | 7.5 | 1200 | 8.5 |
| 1330 | 10 | | | | | | | | |

Manning's n Values num= 3

| Sta | n Val | Sta | n Val | Sta | n Val |
|---|---|---|---|---|---|
| 0 | .07 | 650 | .045 | 730 | .07 |

| Bank Sta: Left | Right | Lengths: Left Channel | Right | Coeff Contr. | Expan. |
|---|---|---|---|---|---|
| 650 | 730 | 100 | 800 | 960 | .1 | .3 |

CROSS SECTION OUTPUT Profile #100 YR PROPOSED

| | | | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 3.70 | Element | | | |
| Vel Head (ft) | 0.06 | Wt. n-Val. | 0.070 | 0.045 | 0.070 |
| W.S. Elev (ft) | 3.64 | Reach Len. (ft) | 100.00 | 800.00 | 960.00 |
| Crit W.S. (ft) | | Flow Area (sq ft) | 948.20 | 402.30 | 421.28 |
| E.G. Slope (ft/ft) | 0.000840 | Area (sq ft) | 948.20 | 402.30 | 421.28 |
| Q Total (cfs) | 2901.00 | Flow (cfs) | 1317.23 | 1129.78 | 453.99 |
| Top Width (ft) | 540.97 | Top Width (ft) | 279.31 | 80.00 | 181.66 |
| Vel Total (ft/s) | 1.64 | Avg. Vel. (ft/s) | 1.39 | 2.81 | 1.08 |
| Max Chl Dpth (ft) | 5.14 | Hydr. Depth (ft) | 3.39 | 5.03 | 2.32 |
| Conv. Total (cfs) | 100097.5 | Conv. (cfs) | 45450.5 | 38982.5 | 15664.6 |
| Length Wtd. (ft) | 645.47 | Wetted Per. (ft) | 279.44 | 80.03 | 181.72 |
| Min Ch El (ft) | -1.50 | Shear (lb/sq ft) | 0.18 | 0.26 | 0.12 |
| Alpha | 1.54 | Stream Power (lb/ft s) | 0.25 | 0.74 | 0.13 |
| Frctn Loss (ft) | 0.59 | Cum Volume (acre-ft) | 1.32 | 9.35 | 12.46 |
| C & E Loss (ft) | 0.00 | Cum SA (acres) | 0.40 | 2.02 | 5.01 |

CROSS SECTION

RIVER: GAME CK
REACH: GAME CK RS: 300

INPUT
Description:
Station Elevation Data num= 14

| Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 12.8 | 150 | 10 | 160 | 5 | 205 | 5 | 215 | 1 |
| 280 | -1 | 350 | -1.5 | 419 | -1.5 | 420 | -1 | 550 | .6 |
| 670 | 1 | 715 | 5 | 800 | 7 | 1590 | 10 | | |

Manning's n Values num= 3

| Sta | n Val | Sta | n Val | Sta | n Val |
|---|---|---|---|---|---|
| 0 | .07 | 280 | .045 | 420 | .07 |

| Bank Sta: Left | Right | Lengths: Left Channel | Right | Coeff Contr. | Expan. |
|---|---|---|---|---|---|
| 280 | 420 | 0 | 0 | 0 | .1 | .3 |

CROSS SECTION OUTPUT Profile #100 YR PROPOSED

100 yr Proposed Condition

| | | Element | Left OB | Channel | Right OB |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 3.11 | Wt. n-Val. | 0.070 | 0.045 | 0.070 |
| Vel Head (ft) | 0.08 | Reach Len. (ft) | | | |
| W.S. Elev (ft) | 3.03 | Flow Area (sq ft) | 201.82 | 615.88 | 709.57 |
| Crit W.S. (ft) | 0.79 | Area (sq ft) | 201.82 | 615.88 | 709.57 |
| E.G. Slope (ft/ft) | 0.001001 | Flow (cfs) | 273.31 | 1726.55 | 901.15 |
| Q Total (cfs) | 2901.00 | Top Width (ft) | 70.06 | 140.00 | 272.79 |
| Top Width (ft) | 482.86 | Avg. Vel. (ft/s) | 1.35 | 2.80 | 1.27 |
| Vel Total (ft/s) | 1.90 | Hydr. Depth (ft) | 2.88 | 4.40 | 2.60 |
| Max Chl Dpth (ft) | 4.53 | Conv. (cfs) | 8638.1 | 54568.4 | 28481.2 |
| Conv. Total (cfs) | 91687.7 | Wetted Per. (ft) | 70.49 | 140.12 | 272.89 |
| Length Wtd. (ft) | | Shear (lb/sq ft) | 0.18 | 0.27 | 0.16 |
| Min Ch El (ft) | -1.50 | Stream Power (lb/ft s) | 0.24 | 0.77 | 0.21 |
| Alpha | 1.48 | Cum Volume (acre-ft) | | | |
| Frctn Loss (ft) | | Cum SA (acres) | | | |
| C & E Loss (ft) | | | | | |

SUMMARY OF MANNING'S N VALUES

River:GAME CK

| Reach | River Sta. | n1 | n2 | n3 |
|---|---|---|---|---|
| GAME CK | 4560 | .07 | .045 | .07 |
| GAME CK | 4160 | .07 | .045 | .07 |
| GAME CK | 3730 | .07 | .045 | .07 |
| GAME CK | 3224 | .07 | .045 | .07 |
| GAME CK | 2644 | .07 | .045 | .07 |
| GAME CK | 2244 | .07 | .045 | .07 |
| GAME CK | 1860 | .07 | .045 | .07 |
| GAME CK | 1530 | .07 | .045 | .07 |
| GAME CK | 1100 | .07 | .045 | .07 |
| GAME CK | 300 | .07 | .045 | .07 |

SUMMARY OF REACH LENGTHS

River: GAME CK

| Reach | River Sta. | Left | Channel | Right |
|---|---|---|---|---|
| GAME CK | 4560 | 420 | 400 | 290 |
| GAME CK | 4160 | 500 | 430 | 300 |
| GAME CK | 3730 | 530 | 506 | 230 |
| GAME CK | 3224 | 360 | 580 | 670 |
| GAME CK | 2644 | 650 | 400 | 170 |
| GAME CK | 2244 | 390 | 384 | 375 |
| GAME CK | 1860 | 355 | 330 | 230 |
| GAME CK | 1530 | 280 | 430 | 250 |
| GAME CK | 1100 | 100 | 800 | 960 |
| GAME CK | 300 | 0 | 0 | 0 |

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: GAME CK

| Reach | River Sta. | Contr. | Expan. |
|---|---|---|---|
| GAME CK | 4560 | .1 | .3 |
| GAME CK | 4160 | .1 | .3 |
| GAME CK | 3730 | .1 | .3 |
| GAME CK | 3224 | .1 | .3 |
| GAME CK | 2644 | .1 | .3 |
| GAME CK | 2244 | .1 | .3 |
| GAME CK | 1860 | .1 | .3 |
| GAME CK | 1530 | .1 | .3 |
| GAME CK | 1100 | .1 | .3 |
| GAME CK | 300 | .1 | .3 |

Profile Output Table - Standard Table 1

| Reach | River Sta | Profile | Q Total | Min Ch El | W.S. Elev | Crit W.S. | E.G. Elev | E.G. Slope | Vel Chnl | Flow Area | Top Width | Froude # Chl |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | (cfs) | (ft) | (ft) | (ft) | (ft) | (ft/ft) | (ft/s) | (sq ft) | (ft) | |
| GAME CK | 4560 | 100 YR PROPOSED | 2901.00 | 0.40 | 8.39 | | 8.75 | 0.001862 | 5.45 | 804.44 | 204.82 | 0.34 |
| GAME CK | 4160 | 100 YR PROPOSED | 2901.00 | 0.50 | 7.45 | | 7.85 | 0.002839 | 6.05 | 860.07 | 352.06 | 0.42 |
| GAME CK | 3730 | 100 YR PROPOSED | 2901.00 | 0.50 | 6.29 | | 6.52 | 0.003433 | 5.84 | 1020.02 | 378.78 | 0.44 |
| GAME CK | 3224 | 100 YR PROPOSED | 2901.00 | 0.30 | 5.79 | | 5.87 | 0.000758 | 2.52 | 1534.14 | 464.31 | 0.21 |
| GAME CK | 2644 | 100 YR PROPOSED | 2901.00 | 0.10 | 5.45 | | 5.50 | 0.000512 | 1.83 | 1599.65 | 443.08 | 0.16 |
| GAME CK | 2244 | 100 YR PROPOSED | 2901.00 | 0.10 | 5.00 | | 5.16 | 0.001527 | 3.29 | 992.90 | 300.11 | 0.29 |
| GAME CK | 1860 | 100 YR PROPOSED | 2901.00 | 0.10 | 4.36 | | 4.51 | 0.001902 | 3.62 | 1116.10 | 367.16 | 0.32 |
| GAME CK | 1530 | 100 YR PROPOSED | 2901.00 | -0.50 | 3.95 | | 4.04 | 0.001076 | 2.84 | 1434.22 | 461.43 | 0.24 |
| GAME CK | 1100 | 100 YR PROPOSED | 2901.00 | -1.50 | 3.64 | | 3.70 | 0.000840 | 2.81 | 1771.78 | 540.97 | 0.22 |
| GAME CK | 300 | 100 YR PROPOSED | 2901.00 | -1.50 | 3.03 | 0.79 | 3.11 | 0.001001 | 2.80 | 1527.26 | 482.86 | 0.24 |

ERRORS WARNINGS AND NOTES
Errors Warnings and Notes for Plan : Plan 02

River: GAME CK  Reach: GAME CK  RS: 4160  Profile: 100 YR PROPOSED
  Warning:Divided flow computed for this cross-section.
  Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
River: GAME CK  Reach: GAME CK  RS: 3730  Profile: 100 YR PROPOSED
  Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
River: GAME CK  Reach: GAME CK  RS: 2644  Profile: 100 YR PROPOSED

100 yr Proposed Condition

Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

HEC-RAS Plan: Plan 02 River: GAME CK Reach: GAME CK Profile: 100 YR PROPOSED

| Reach | River Sta | Profile | Q Total | Min Ch El | W.S. Elev | Crit W.S. | E.G. Elev | E.G. Slope | Vel Chnl | Flow Area | Top Width | Froude # Chl |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | (cfs) | (ft) | (ft) | (ft) | (ft) | (ft/ft) | (ft/s) | (sq ft) | (ft) | |
| GAME CK | 4560 | 100 YR PROPOSED | 2901.00 | 0.40 | 8.39 | | 8.75 | 0.001862 | 5.45 | 804.44 | 204.82 | 0.34 |
| GAME CK | 4160 | 100 YR PROPOSED | 2901.00 | 0.50 | 7.45 | | 7.85 | 0.002839 | 6.05 | 860.07 | 352.06 | 0.42 |
| GAME CK | 3730 | 100 YR PROPOSED | 2901.00 | 0.50 | 6.29 | | 6.52 | 0.003433 | 5.84 | 1020.02 | 378.78 | 0.44 |
| GAME CK | 3224 | 100 YR PROPOSED | 2901.00 | 0.30 | 5.79 | | 5.87 | 0.000758 | 2.52 | 1534.14 | 464.31 | 0.21 |
| GAME CK | 2644 | 100 YR PROPOSED | 2901.00 | 0.10 | 5.45 | | 5.50 | 0.000512 | 1.83 | 1599.65 | 443.08 | 0.16 |
| GAME CK | 2244 | 100 YR PROPOSED | 2901.00 | 0.10 | 5.00 | | 5.16 | 0.001527 | 3.29 | 992.90 | 300.11 | 0.29 |
| GAME CK | 1860 | 100 YR PROPOSED | 2901.00 | 0.10 | 4.36 | | 4.51 | 0.001902 | 3.62 | 1116.10 | 367.16 | 0.32 |
| GAME CK | 1530 | 100 YR PROPOSED | 2901.00 | -0.50 | 3.95 | | 4.04 | 0.001076 | 2.84 | 1434.22 | 461.43 | 0.24 |
| GAME CK | 1100 | 100 YR PROPOSED | 2901.00 | -1.50 | 3.64 | | 3.70 | 0.000840 | 2.81 | 1771.78 | 540.97 | 0.22 |
| GAME CK | 300 | 100 YR PROPOSED | 2901.00 | -1.50 | 3.03 | 0.79 | 3.11 | 0.001001 | 2.80 | 1527.26 | 482.86 | 0.24 |

100 yr Proposed Condition

```
1*****************************************
 *                                       *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
 *               JUN   1998              *
 *            VERSION 4.1                *
 *                                       *
 *  RUN DATE   24OCT11  TIME  12:01:00   *
 *                                       *
 *****************************************
```

```
*****************************************
*                                       *
*    U.S. ARMY CORPS OF ENGINEERS       *
*    HYDROLOGIC ENGINEERING CENTER      *
*          609 SECOND STREET            *
*       DAVIS, CALIFORNIA 95616         *
*           (916) 756-1104              *
*                                       *
*****************************************
```

```
X     X  XXXXXXX   XXXXX          X
X     X  X        X     X        XX
X     X  X        X              X
XXXXXXX  XXXX     X        XXXXX  X
X     X  X        X              X
X     X  X        X     X        X
X     X  XXXXXXX   XXXXX         XXX
```

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL  LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1 HEC-1 INPUT PAGE 1

```
LINE          ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

   1          ID  HEC-1
   2          ID  LAYTON LAKE DAM ROUTE 48 M.P. 3.06
   3          ID  CARNEYS POINT TOWNSHIP, SALEM COUNTY NJ
   4          ID
              *DIAGRAM
   5          IT       6 01JAN94       0     380
   6          IO       4

   7          KK  L_UP_48 ** inflow to Layton Lake
   8          KM   INFLOW IN LAYTON LAKE
   9          KO       0       0     0.0       0      22
  10          QI       0       1       1       1       1       2       2       2       3       4
  11          QI       4       5       6       7       8      09      11      12      14      16
  12          QI      18      20      22      25      27      30      33      36      40      44
  13          QI      48      52      57      62      67      73      79      85      92     100
  14          QI     107     116     125     134     144     155     166     178     191     204
  15          QI     219     234     251     269     289     311     336     366     405     453
  16          QI     512     580     660     751     855    0969    1094    1226    1365    1507
  17          QI    1653    1800    1946    2089    2255    2354    2476    2589    2691    2781
  18          QI    2859    2925    2981    3027    3062    3084    3095    3098    3094    3084
  19          QI    3069    3051    3029    3044    2978    2950    2922    2893    2863    2833
  20          QI    2802    2771    2740    2708    2675    2642    2608    2574    2539    2506
  21          QI    2472    2440    2407    2376    2344    2313    2282    2251    2220    2190
```

100 yr Proposed Condition

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 22 | QI | 2159 | 2128 | 2097 | 2066 | 2035 | 2004 | 1974 | 1945 | 1916 | 1887 |
| 23 | QI | 1859 | 1832 | 1805 | 1779 | 1753 | 1728 | 1703 | 1678 | 1654 | 1630 |
| 24 | QI | 1606 | 1583 | 1560 | 1538 | 1516 | 1494 | 1473 | 1451 | 1430 | 1409 |
| 25 | QI | 1388 | 1367 | 1347 | 1327 | 1308 | 1289 | 1270 | 1252 | 1234 | 1217 |
| 26 | QI | 1200 | 1183 | 1167 | 1151 | 1135 | 1119 | 1104 | 1088 | 1073 | 1058 |
| 27 | QI | 1043 | 1029 | 1015 | 1001 | 0988 | 0974 | 0961 | 0948 | 0935 | 922 |
| 28 | QI | 909 | 896 | 883 | 870 | 857 | 845 | 832 | 819 | 806 | 793 |
| 29 | QI | 780 | 767 | 783 | 739 | 725 | 711 | 697 | 683 | 669 | 655 |
| 30 | QI | 640 | 625 | 611 | 596 | 581 | 567 | 553 | 539 | 525 | 552 |
| 31 | QI | 499 | 487 | 475 | 463 | 451 | 439 | 428 | 416 | 405 | 394 |
| 32 | QI | 384 | 373 | 363 | 353 | 344 | 335 | 326 | 317 | 309 | 301 |
| 33 | QI | 293 | 285 | 277 | 269 | 261 | 254 | 247 | 240 | 234 | 229 |
| 34 | QI | 223 | 218 | 212 | 206 | 200 | 194 | 188 | 182 | 177 | 172 |
| 35 | QI | 167 | 162 | 158 | 154 | 150 | 146 | 143 | 139 | 136 | 132 |
| 36 | QI | 128 | 125 | 121 | 118 | 115 | 113 | 110 | 108 | 105 | 103 |
| 37 | QI | 101 | 099 | 096 | 094 | 092 | 90 | 89 | 87 | 85 | 82 |
| 38 | QI | 80 | 78 | 76 | 74 | 73 | 71 | 69 | 68 | 66 | 65 |
| 39 | QI | 63 | 62 | 60 | 59 | 58 | 57 | 55 | 54 | 53 | 52 |
| 40 | QI | 51 | 49 | 48 | 46 | 44 | 42 | 40 | 38 | 37 | 36 |
| 41 | QI | 35 | 33 | 32 | 32 | 31 | 30 | 29 | 27 | 24 | 24 |
| 42 | QI | 23 | 22 | 20 | 19 | 19 | 18 | 17 | 16 | 16 | 15 |
| 43 | QI | 15 | 14 | 14 | 13 | 13 | 12 | 12 | 11 | 11 | 10 |
| 44 | QI | 11 | 10 | 9 | 9 | 9 | 9 | 8 | 8 | 8 | 7 |
| 45 | QI | 7 | 7 | 7 | 7 | 6 | 6 | 6 | 6 | 6 | 5 |
| 46 | QI | 5 | 5 | 5 | 5 | 5 | 4 | 4 | 4 | 4 | 4 |
| 47 | QI | 4 | 4 | 4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |



```
          LINE      ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

            48      KK  IAYTON
            49      KM   LAYTON LAKE
            50      KO       0       0     0.0       0      22
                    * RESERVOIR STORAGE
            51      RS       1     ELEV    9.15     0.0
            52      SA     0.2    18.0    35.0    57.0    95.0    200.    210.    225.
            53      SE    0.60     5.0     10.     14.     16.     20.    21.0    22.0
            54      SQ       0   105.9   610.9  1338.7    1766    2231    2663    3379    3718  4136.4
            55      SE    9.15    9.60   10.60   11.60   12.10   12.60   13.10   14.10   14.60   15.10
            56      ST   14.68     100     0.0     1.5

            57      KK  Layton_C
            58      KM   this is the outflow channel dwonsteam of ROUTE 48
            59      KO       0       0     0.0       0      22
            60      RS       2    FLOW      -1       0
            61      RC    0.07   0.035    0.07    5000   .0018      13
            62      RX       0     820   912.5     990    1010  1087.5    1180    2000
            63      RY      20      10       5     1.8     1.8       5      10      20
            64      ZZ
1
                SCHEMATIC DIAGRAM OF STREAM NETWORK

 INPUT
  LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

    NO.     (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

 *** HEC1 ERROR 4 *** NO HYDROGRAPHS AVAILABLE TO ROUTE
                 V
                 V
     48      IAYTON
```

```
              V
              V
   57      Layton

 (***) RUNOFF ALSO COMPUTED AT THIS LOCATION

        1 ERRORS IN STREAM SYSTEM
1*****************************************
 *                                       *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
 *               JUN   1998              *
 *             VERSION 4.1               *
 *                                       *
 *  RUN DATE   24OCT11  TIME  12:01:00   *
 *                                       *
 *****************************************
```

```
*****************************************
*                                       *
*    U.S. ARMY CORPS OF ENGINEERS       *
*    HYDROLOGIC ENGINEERING CENTER      *
*          609 SECOND STREET            *
*       DAVIS, CALIFORNIA 95616         *
*           (916) 756-1104              *
*                                       *
*****************************************
```

```
                        HEC-1
                        LAYTON LAKE DAM ROUTE 48 M.P. 3.06
                        CARNEYS POINT TOWNSHIP, SALEM COUNTY NJ


   6 IO          OUTPUT CONTROL VARIABLES
                       IPRNT          4  PRINT CONTROL
                       IPLOT          0  PLOT CONTROL
                       QSCAL         0.  HYDROGRAPH PLOT SCALE

     IT          HYDROGRAPH TIME DATA
                        NMIN          6  MINUTES IN COMPUTATION INTERVAL
                       IDATE     1JAN94  STARTING DATE
                       ITIME       0000  STARTING TIME
                          NQ        380  NUMBER OF HYDROGRAPH ORDINATES
                      NDDATE     2JAN94  ENDING DATE
                      NDTIME       1354  ENDING TIME
                      ICENT         19  CENTURY MARK

                    COMPUTATION INTERVAL      .10 HOURS
                        TOTAL TIME BASE    37.90 HOURS

            ENGLISH UNITS
                 DRAINAGE AREA          SQUARE MILES
                 PRECIPITATION DEPTH    INCHES
                 LENGTH, ELEVATION      FEET
                 FLOW                   CUBIC FEET PER SECOND
                 STORAGE VOLUME         ACRE-FEET
                 SURFACE AREA           ACRES
                 TEMPERATURE            DEGREES FAHRENHEIT


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


              **************
              *            *
   7 KK       *   L_UP_4   *      8 ** inflow to Layton Lake
              *            *
```

```
          **************
                    INFLOW IN LAYTON LAKE

 9 KO          OUTPUT CONTROL VARIABLES
                     IPRNT           4  PRINT CONTROL
                     IPLOT           0  PLOT CONTROL
                     QSCAL          0.  HYDROGRAPH PLOT SCALE
                     IPNCH           0  PUNCH COMPUTED HYDROGRAPH
                      IOUT          22  SAVE HYDROGRAPH ON THIS UNIT
                     ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                     ISAV2         380  LAST ORDINATE PUNCHED OR SAVED
                    TIMINT        .100  TIME INTERVAL IN HOURS


             SUBBASIN RUNOFF DATA

 0 BA          SUBBASIN CHARACTERISTICS
                     TAREA         .00  SUBBASIN AREA
                                                
```

```
56 ST          TOP OF DAM
                    TOPEL       14.68  ELEVATION AT TOP OF DAM
                   DAMWID      100.00  DAM WIDTH
                     COQD         .00  WEIR COEFFICIENT
                     EXPD        1.50  EXPONENT OF HEAD

                                   ***

                          COMPUTED STORAGE-ELEVATION DATA

      STORAGE         .00     29.48    159.64    341.86    492.25   1069.37   1274.35   1491.81
    ELEVATION         .60      5.00     10.00     14.00     16.00     20.00     21.00     22.00

                     COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

                                (INCLUDING FLOW OVER DAM)

      STORAGE         .00     29.48    131.30    145.96    159.64    181.52    222.06    244.31    267.95    293.02
      OUTFLOW         .00      .00       .00    105.90    307.90    610.90   1338.70   1766.00   2231.00   2663.00
    ELEVATION         .60      5.00      9.15      9.60     10.00     10.60     11.60     12.10     12.60     13.10

      STORAGE      341.86    347.65    379.14    415.13    492.25   1069.37   1274.35   1491.81
      OUTFLOW     3307.40   3379.00   3718.00   4136.40   4889.52   8236.72   9073.52   9910.32
    ELEVATION       14.00     14.10     14.60     15.10     16.00     20.00     21.00     22.00


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


          **************
          *            *
57 KK     *    Layton  *     _C
          *            *
          **************
                    this is the outflow channel dwonsteam of ROUTE 48

59 KO          OUTPUT CONTROL VARIABLES
                    IPRNT           4  PRINT CONTROL
                    IPLOT           0  PLOT CONTROL
                    QSCAL          0.  HYDROGRAPH PLOT SCALE
                    IPNCH           0  PUNCH COMPUTED HYDROGRAPH
                     IOUT          22  SAVE HYDROGRAPH ON THIS UNIT
                    ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                    ISAV2         380  LAST ORDINATE PUNCHED OR SAVED
                   TIMINT        .100  TIME INTERVAL IN HOURS


             HYDROGRAPH ROUTING DATA

60 RS          STORAGE ROUTING
                    NSTPS           2  NUMBER OF SUBREACHES
                     ITYP        FLOW  TYPE OF INITIAL CONDITION
                   RSVRIC       -1.00  INITIAL CONDITION
                        X         .00 WORKING R AND D COEFFICIENT

61 RC          NORMAL DEPTH CHANNEL
                     ANL        .070  LEFT OVERBANK N-VALUE
                    ANCH        .035  MAIN CHANNEL N-VALUE
                     ANR        .070  RIGHT OVERBANK N-VALUE
```

| | | |
|---|---|---|
| RLNTH | 5000. | REACH LENGTH |
| SEL | .0018 | ENERGY SLOPE |
| ELMAX | 13.0 | MAX. ELEV. FOR STORAGE/OUTFLOW CALCULATION |

CROSS-SECTION DATA

| | | --- LEFT OVERBANK --- | + | ------ MAIN CHANNEL ------- | + | --- RIGHT OVERBANK --- | | |
|---|---|---|---|---|---|---|---|---|
| 63 RY | ELEVATION | 20.00 | 10.00 | 5.00 | 1.80 | 1.80 | 5.00 | 10.00 | 20.00 |
| 62 RX | DISTANCE | .00 | 820.00 | 912.50 | 990.00 | 1010.00 | 1087.50 | 1180.00 | 2000.00 |

***

COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| STORAGE | .00 | 2.32 | 6.57 | 12.75 | 20.87 | 30.92 | 42.82 | 56.24 | 71.14 | 87.51 |
| OUTFLOW | .00 | 20.33 | 84.73 | 207.43 | 401.82 | 680.23 | 1105.58 | 1671.87 | 2341.11 | 3113.75 |
| ELEVATION | 1.80 | 2.39 | 2.98 | 3.57 | 4.16 | 4.75 | 5.34 | 5.93 | 6.52 | 7.11 |
| STORAGE | 105.36 | 124.69 | 145.49 | 167.76 | 191.54 | 219.75 | 254.50 | 295.80 | 343.64 | 398.01 |
| OUTFLOW | 3990.66 | 4973.04 | 6062.32 | 7260.12 | 8550.39 | 9843.29 | 11347.79 | 13056.37 | 14978.50 | 17128.13 |
| ELEVATION | 7.69 | 8.28 | 8.87 | 9.46 | 10.05 | 10.64 | 11.23 | 11.82 | 12.41 | 13.00 |

1

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

| | OPERATION | STATION | PEAK FLOW | TIME OF PEAK | AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR | 24-HOUR | 72-HOUR | BASIN AREA | MAXIMUM STAGE | TIME OF MAX STAGE |
|---|---|---|---|---|---|---|---|---|---|---|
| + | HYDROGRAPH AT | L_UP_4 | 3098. | 8.70 | 2548. | 1129. | 724. | .00 | | |
| + | ROUTED TO | IAYTON | 2901. | 9.70 | 2495. | 1127. | 725. | .00 | 13.43 | 9.70 |
| + | ROUTED TO | Layton | 2895. | 9.90 | 2490. | 1127. | 725. | .00 | 6.94 | 9.90 |

1

SUMMARY OF DAM OVERTOPPING/BREACH ANALYSIS FOR STATION IAYTON
(PEAKS SHOWN ARE FOR INTERNAL TIME STEP USED DURING BREACH FORMATION)

PLAN 1 .....

| | INITIAL VALUE | SPILLWAY CREST | TOP OF DAM |
|---|---|---|---|
| ELEVATION | 9.15 | 14.68 | 14.68 |
| STORAGE | 131. | 385. | 385. |
| OUTFLOW | 0. | 3785. | 3785. |

| RATIO OF PMF | MAXIMUM RESERVOIR W.S.ELEV | MAXIMUM DEPTH OVER DAM | MAXIMUM STORAGE AC-FT | MAXIMUM OUTFLOW CFS | DURATION OVER TOP HOURS | TIME OF MAX OUTFLOW HOURS | TIME OF FAILURE HOURS |
|---|---|---|---|---|---|---|---|
| 1.00 | 13.43 | .00 | 310. | 2901. | .00 | 9.70 | .00 |

*** NORMAL END OF HEC-1 ***

# *Appendix F – Meetings & Correspondence*

State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION
Natural and Historic Resources
Office of Engineering & Construction

JON S. CORZINE
*Governor*

MARK N. MAURIELLO
*Acting Commissioner*

JUN 25 2009

Richard Dunne, P.E.
State of New Jersey
Department of Transportation
P.O. Box 600
Trenton, NJ 08625

RECEIVED
JUN 29 2009
McCormick Taylor, Inc.

Re: Layton Lake Dam
File No. 30-15

Dear Mr. Dunne:

This is in reference the report entitled "Spillway Design Report Layton Lake Dam NJDEP File No. 30-15 NJ Route 48, M.P. 3.06 Carneys Point Township Salem County, New Jersey", prepared by McCormick Taylor, Inc. and dated May 2009.

Based upon review of this report, it has been determined that the hazard classification for the Layton Lake Dam will remain significant hazard (Class II). Based upon the incremental dam failure analysis, it has been determined that the spillway design flood (SDF) for Layton Lake Dam may be reduced to the 100 year flood. Peak inflow to the dam for the 100 year flood is 3098 cfs.

This reduction to the 100-year SCS Type III storm for the Layton Lake Dam is permitted under the New Jersey Dam Safety Standards (N.J.A.C. 7:20-1.9(b)) based upon quantitative and relative impact analysis which shows that failure of the dam concurrent with the selected SDF would not result in additional damages beyond the damages which occur as a result of the flood without the failure of the dam.

Dredging within the lakebed area and/or changes in land use downstream of the dam within the inundation area may render the reduction unacceptable in the future. Future formal dam safety inspections (required once every 10 years) must reevaluate the dam, lakebed and watershed areas with respect to this reduction to assure that the reduction is still warranted. If changes in the land use render the reduction unwarranted, it will be the responsibility of the dam owner to modify their dam to provide additional spillway capacity.

Prior to approval of plans and specifications for the rehabilitation of the dam incorporating the reduced SDF, the owner of the dam must provide written acknowledgement of this responsibility. Please refer to the enclosed Sample Spillway Design Flood (SDF) Reduction - Owner Responsibility Acceptance for details on what is required.

Please be advised that as a significant hazard dam, an Emergency Action Plan must be developed for the Layton Lake Dam. The existing EAP for this dam is outdated. Therefore, an updated and revised EAP must be submitted to this office by September 15, 2009.

NJDOT should proceed with the recommended investigations and designs necessary to address the deficiencies identified at the structure. A permit application for rehabilitation necessary to address the deficiencies must be submitted to this office by March 31, 2010.

Should you have any further questions, please contact John Ritchey at (609)984-0859.

Sincerely,

John H. Moyle, P.E., Manager
Bureau of Dam Safety and Flood Control

Enclosure
C: Eric Ditchey, P.E., McCormick Taylor, Inc.

McCormick Taylor
Engineers & Planners Since 1946

*Issued: June 10, 2010*

**MEETING REPORT**

**PROJECT:** NJ Route 48, Milepost 3.06 - Layton Lake Dam

**SUBJECT:** Scoping Meeting

**PLACE:** New Jersey Department of Transportation
E&O Building
1035 Parkway Avenue
Trenton, New Jersey 08625

**DATE/TIME:** June 04, 2010: 10:00 a.m.

| ATTENDEES: | REPRESENTING/POSITION: |
|---|---|
| Willie Colquitt | NJDOT – DPD |
| Okey Ilonzo | NJDOT – DPD, Drainage |
| Nader Mortaja | NJDOT – DPD, Drainage |
| Dave Adhout | NJDOT – Drainage |
| Chiman Antala | NJDOT – Value Solutions |
| Al Virgilio | NJDOT – Value Solutions |
| Stan Pierzhanowski | NJDOT – Value Solutions |
| Bruce Hawkinson | NJDOT – Environmental |
| Amanda Bolis | NJDOT – Environmental |
| Kim Sharp | NJDOT – Construction Management |
| Gregory Spiritosanto | NJDOT – Access Design |
| Mujahid Khan | NJDOT – Structural Evaluation |
| Kiong Chan | NJDOT – Drainage Management |
| Mike Kasbekar | NJDOT – Project Management |
| Jayant Dalal | NJDOT – Bridge Design |
| James Lepri | NJDOT – Utility Coordination |
| Scott Oplinger | NJDOT – Region South Maintenance |
| Nabil M. Hourani | McCormick Taylor, Inc. |
| Eric J. Ditchey | McCormick Taylor, Inc. |
| Timothy R. McGuire | McCormick Taylor, Inc. |

**PURPOSE:** The purpose of this meeting was to present alternatives to mitigate the non-compliance of a "Significant Hazard" dam with current dam safety regulations.

**NOTES BY:** Timothy R. McGuire

700 East Gate Drive • Suite 201 • Mt. Laurel, NJ 08054 • Phone: 856-793-0800 • Fax: 856-793-0819
www.mccormicktaylor.com

**DISCUSSION:**

1. NJDOT's DPD representative welcomed everyone and reminded all of the purpose of the meeting. Mr. Colquitt briefed attendees about the project and presented its location.

2. Eric Ditchey of McCormick Taylor (MT) presented the Problem Statement delivered by the NJDOT, and MT findings on the existing condition and operation of the Layton Lake Dam. While MT's regular inspection in 2004 found the dam safe, upgrades and repairs were identified as necessary. Detailed analysis of the dam, authorized by NJDOT under a mandate from NJDEP – Bureau of Dam Safety and Flood Control, included petrographic testing of the concrete structures. This testing (including core samples) revealed the presence of Alkali-Silica Reactivity (ASR) throughout the bridge abutments, wing-walls, and spillway structures. Hydrologic calculations of Layton Lake's 7.7 square mile drainage area (using the Delmarva Unit Hydrograph, a new Dam Safety requirement for South Jersey) indicated that the existing spillway does not have the capacity to pass the recommended spillway design storm (SDS), and that the NJ Route 48 low point overtops by about 0.3 feet of water during the SDS.

3. The existing Layton Lake Dam is about 13 feet high and 500 feet in length. The spillway is a concrete ogee type in a semi-circular configuration with an effective length of about 90 feet. Two 48-inch diameter sluice gates are located near the eastern limit of the spillway. The gates are operated (by landowners, the closest house on the east side, according to Mr. Hawkinson) with hand cranks accessed from a concrete walkway. The bridge under NJ Route 48 has a span of about 32 feet and a rise of about 11 feet.

4. For development of alternatives, the Spillway Design Report for Layton Lake Dam from May 2009 (issued by MT) — recommended a decrease in the SDS from ½ Probable Maximum Flood (PMF, 17 inches in 72 hours) to the 100 year storm event (7-8 inches in 24 hours). When asked why this reduction was allowed, it was explained that no additional protection to downstream structures was provided beyond the 100-year storm event. Okey Ilonzo asked if there was a record of the ½-PMF in New Jersey. It was explained that while there is not a record of the ½-PMF in New Jersey, and no record of the existing facility over-topping, for safety reasons a dam should be designed beyond what will be seen. A design to pass the 100-year storm would be considered sufficient for Dam Safety.

5. Alternative 1, at $5.7 million, consists of the construction of a new bridge with a 40-foot span and construction of a new 150-foot long ogee spillway. No change in roadway profile is proposed for Alternative 1. Access impacts are not expected, and right-of-way (ROW) impacts will be temporary. Test pits are suggested to assess utility impacts (present in the project area are New Jersey American Water, PSE&G, Verizon-New Jersey, Inc., and Comcast Cable; two run overhead and two run under the bridge). Alternative 1 will pass the SDS with the required one-foot of freeboard.

6. Alternative 2, at $6 million, consists of construction of a new bridge with a span of 40 feet, a new 90-foot long ogee spillway (same size as existing, an anticipated preference of adjacent landowners), and elevation of the roadway profile by 1.1 feet. Access impacts and ROW impacts will be temporary. Test pits are recommended to assess utility impacts. Alternative 2 will convey the SDS with the required one-foot of freeboard. Costs of addressing design exceptions are included in the price of Alternative 2, as are costs of utility relocation.

7. The new spillway would be maintained by the NJDOT with a maintenance easement. The sluice gate control would remain with the land owner.

8. No surface runoff/erosion problems have been reported. While the embankment has full exposure on the upstream side, and partial exposure on the downstream side, the condition appears fine. However, under any alternative, trees must be removed both upstream and downstream, and riprap applied on the upstream side for protection against wave action.

9. It was noted that the most recent bridge sufficiency rating was 97, which led to the questioning of bridge replacement. MT reiterated that ASR was affecting the concrete throughout the structures and that, while a time limit could not be established, this would eventually cause the structures to crumble in place. Pressure injection may buy a little time, but could not stop the decay of the concrete. Adding walls inside the abutments would reduce the already insufficient clearance to pass water from the design storm. Condition of the bridge aside, it is not up to hydraulic standards, so it must be replaced as part of this dam project.

10. Since the existing bridge has two lanes and two full shoulders, it is anticipated that replacement can occur without a detour.

11. Federal participation is anticipated.

12. At the conclusion of the discussion, Alternative 2 was selected. Documentation of price justification was requested. MT indicated that documentation would be provided.

The foregoing constitutes our understanding of the issues discussed. Kindly advise at once of any error or omission. Please address all comments to Tim McGuire at (856) 793-0800 or via e-mail at trmcguire@mtmail.biz.

cc: (w/attachment): All Meeting Attendees

**NJ ROUTE 48, LAYTON LAKE DAM**
**SCOPING MEETING**
*Friday May 4, 2010*
*New Jersey Department of Transportation*
*1035 Parkway Avenue*
*Trenton, NJ 08625*

| NAME | REPRESENTING | PHONE NUMBER | |
|---|---|---|---|
| WILLIE J. COLQUITT | NJDOT / DPD | 609-530-3524 | |
| Chiman Antala | DOT - Value Solutions | 609-530-2455 | |
| Al Virgilio | DOT - Value Solutions | 609 53- -5594 | |
| STAN PIERZHANOWSKI | " " | 609-530-3809 | |
| Bruce Hawkinson | NJDOT / Environmental | 609-530-4272 | |
| David Abbott | NJDOT / Drainage | 609-530-2283 | |
| OKey ILonzo | NJDOT / DPD | 609-530-5269 | |
| Amanda Bolis | NJDOT / ENVIRONMENTAL BEPR | 609-530-4683 | |
| KIM Sharp | DOT/Construction Mang | 609-530-2781 | |
| GREGORY SPIRITOSANTO | ACCESS DESIGN | 609-530-3778 | |
| MUJAHID KHAN | STR. EVAL. | 5-2877 | |
| Kiong Chan | Drainage Management | 609-530 5354 | |
| Mike Kasbekar | NJDOT / PROJECT MGMT. | 609-530-6627 | |

**NJ ROUTE 48, LAYTON LAKE DAM**
**SCOPING MEETING**
*Friday May 4, 2010*
*New Jersey Department of Transportation*
*1035 Parkway Avenue*
*Trenton, NJ 08625*

| NAME | REPRESENTING | PHONE NUMBER | |
|---|---|---|---|
| Jayant Dalal | NJ DOT BRIDGE DESIGN | 609-530-2567 | |
| JAMES LEPRI | NJDOT UTILITY COORDINATION | 609-530-5560 | |
| Nader Morkos | NJDOT-DPD Drainage | (609) 530-2077 | |
| Scott Oplinger | NJDOT Region South Maint | 856-486-6629 | |
| Tim McGuire | NT | 856-793-0800 | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

McCormick Taylor
Engineers & Planners Since 1946

*Issued: March 2, 2011*

**MEETING REPORT**

| | |
|---|---|
| **PROJECT:** | NJ Route 48, M.P. 3.06<br>Layton Lake Dam Improvements<br>Carneys Point Township<br>Salem County, NJ |
| **SUBJECT:** | Officials Briefing |
| **PLACE:** | CARNEYS POINT TOWNSHIP MUNICIPAL BUILDING |
| **DATE/TIME:** | February 17, 2011, 11:00 am |

| **ATTENDEES:** | **REPRESENTING** |
|---|---|
| Willie Colquitt | NJDOT - BPD |
| Mike Kasbekar | NJDOT – BPM |
| Kimberley Nance | NJDOT – OCR |
| Wayne D. Pelura | Carneys Point Township Mayor |
| Joe Racite | Carneys Point Township Deputy Mayor |
| Gene Gilbert | Carneys Point Township Public Works Superintendent |
| William Burris | Carneys Point Township Engineer |
| Nabil Hourani | McCormick Taylor, Inc. (MT) |
| Eric Ditchey | MT |

**NOTES BY:** Eric Ditchey

**PURPOSE:** The purpose of the meeting was to discuss the Initially Preferred Alternative (IPA) for the rehabilitation of Layton Lake Dam.

1. Willie Colquitt opened the meeting. He had everyone introduce themselves, and then he gave an overview of the project.

2. Eric Ditchey presented the hazard classification and spillway design flood for the dam; and the preferred alternative consisting of a new bridge with a 40 foot span, new concrete spillway with a 90 foot weir length, new low level outlet gate, and a raised road way profile by approximately 1 foot. The proposed alternative meets all of NJDEP Dam Safety regulations. Also presented was the proposed construction staging which will not require a detour, one lane of traffic in each direction will be maintained at all times by shifting traffic onto the shoulders and constructing the bridge in two stages. The proposed typical roadway section will be identical to the existing.

3. In response to a question, Nabil Hourani presented the proposed roadway drainage and confirmed that new inlets will be constructed where Layton Lake Drive intersects Route 48. He also explained that the profile of Layton Lake Drive will be raised to meet Route 48 at the intersection.

4. The Township asked for clarification regarding ownership of the lake and the need for easements. MT explained all of the proposed work would be confined to the NJDOT right-of-way except for the new spillway. A temporary construction easement will be required for construction of the spillway. The lake is privately owned by a homeowner association. MT asked for a contact name and number for the homeowner association (Bill Schockel 856-299-4183).

5. Mr. Colquitt asked if the Township would issue a Resolution of Support for the project and the Township responded affirmatively.

The foregoing constitutes our understanding of the issues discussed. Kindly advise at once of any error or omission.

cc: All Meeting Attendees

McCormick Taylor
Engineers & Planners Since 1946

*Issued: March 16, 2011*

## MEETING REPORT

| | |
|---|---|
| **PROJECT:** | NJ Route 48, M.P. 3.06<br>Layton Lake Dam Improvements<br>Carneys Point Township<br>Salem County, NJ |
| **SUBJECT:** | Lake Corporation Briefing |
| **PLACE:** | CARNEYS POINT TOWNSHIP MUNICIPAL BUILDING |
| **DATE/TIME:** | March 14, 2011, 7:30 pm |

| **ATTENDEES:** | **REPRESENTING** |
|---|---|
| Willie Colquitt | NJDOT - BPD |
| Kimberley Nance | NJDOT – OCR |
| Bill Schockel | Layton Lake Inc., President |
| Eric Ditchey | McCormick Taylor, Inc. (MT) |

**NOTES BY:** Eric Ditchey

**PURPOSE:** The purpose of the meeting was to discuss the Initially Preferred Alternative (IPA) for the rehabilitation of Layton Lake Dam.

1. Kimberley Nance opened the meeting. She had everyone introduce themselves, then turned the meeting over to Willie Colquitt. He gave an overview of the project and explained where the project was in NJDOT's pipeline process.

2. Eric Ditchey presented the hazard classification (Class II – Significant Hazard) and spillway design flood (100-year; or 1 percent annual chance) for the dam; and the preferred alternative consisting of a new bridge with a 40 foot span, new concrete spillway with a 90 foot weir length, new low level outlet gate, and a raised road way profile by approximately 1 foot. He also presented the other alternative considered consisting of a new bridge with a 40 foot span, new concrete spillway with a 150 foot weir length, new low level outlet gate, and no change to the road way profile. The second alternative was eliminated from further consideration due to the size of the proposed spillway.

3. The proposed alternative meets all of NJDEP Dam Safety regulations. The proposed alternative addresses the identified deficiencies of inadequate spillway

capacity and concrete cracking (ASR/AAR). Also presented was the proposed construction staging which will not require a detour, one lane of traffic in each direction will be maintained at all times by shifting traffic onto the shoulders and constructing the bridge in two stages. The proposed typical roadway section will be identical to the existing.

4. The lake level will also be maintained during construction by installing a temporary cofferdam and by-pass piping to convey base flow through the construction site.

5. The proposed roadway drainage consists of new inlets constructed where Layton Lake Drive intersects Route 48 and a basin on the south side of Route 48. The profile of Layton Lake Drive will be raised to meet Route 48 at the intersection.

6. MT explained all of the proposed work would be confined to the NJDOT right-of-way except for the new spillway. A temporary construction easement will be required for construction of the spillway. Typically ownership of the spillway and operation of the sluice gate gets turned over to the lake owner; NJDOT maintains responsibility to inspect, maintain, and repair the dam including the spillway. An agreement between NJDOT and the lake owner would be prepared during final design defining these roles and responsibilities.

7. Mr. and Mrs. live on the corner of Route 48 and Layton Lake Drive. They would like to realign their driveway so that they enter directly from Route 48. This would be handled during final design with approvals from the Access Department within NJDOT.

8. Mr. Colquitt asked if Layton Lake Inc would issue a Letter of Support for the project and the Corporation responded affirmatively.

The foregoing constitutes our understanding of the issues discussed. Kindly advise at once of any error or omission.

cc: All Meeting Attendees

0823

RECEIVED
APR 20 2011
HISTORIC PRESERVATION OFFICE

# State of New Jersey

DEPARTMENT OF TRANSPORTATION
P.O. Box 600
Trenton, New Jersey 08625-0600

CHRIS CHRISTIE
*Governor*

KIM GUADAGNO
*Lt. Governor*

JAMES S. SIMPSON
*Commissioner*

11-0924-2 4-5 MH.
HPO-F2011-203

Route 48 (Harding Highway) over
Laytons Lake Dam
(Structures No. 1706-152 and
1706-199)
***Eligibillty and Effect***
Carneys Point Township
Salem County
NJDOT # 1706501
HPO 11-0924-1 MH

April 19, 2011

Mr. Daniel D. Saunders
Deputy State Historic Preservation Officer
Mail Code 501-04B
State of New Jersey
Department of Environmental Protection - Historic Preservation Office
PO Box 420
Trenton, NJ 08625-0420

ATTN: Michelle Hughes – Vehicular Transportation Unit

Dear Mr. Saunders:

On March 24, 2011, the Department of Transportation (DOT) initiated the Section 106 process per 36CFR800.3 by proposing participants of a public involvement plan per 36CFR800.2 and by establishing an agreed upon Area of Potential Effects per 36CFR800.3. In your April 15, 2011 response to the Area of Potential Effect (APE) correspondence, you requested that information be provided for Block 235/Lot 12 (3 Lakeside lane). That information was e-mailed to Michelle Hughes of your staff on April 15, 2011. Upon review and via a follow-up telephone call, Ms. Hughes indicated that the property was not of sufficient age for evaluation, and the original APE was found acceptable.

The enclosed report by McCormick Taylor, Inc. entitled **NJ Route 48 (Harding Highway), Laytons Lake Dam Improvements, Carneys Point Township, Salem County, NJ** (March 2011) identifies historic properties per 36CFR800.4 within the Area of Potential Effect and assesses the effects of the proposed undertaking per 36CFR800.3 and .5.

***SUMMARY:*** *The New Jersey Department of Transportation seeks your concurrence with our recommendation that there are no historic properties affected by the above referenced project.*



LANDSCAPE & URBAN DES. Fax:609-530-5526 Oct 27 2011 05:45 P.01

11-0924-45
HPO-F2011-203

The New Jersey Department of Transportation proposes replacement of the dam and spillway (St. No. 1706-199) and the 1972 bridge (St. No. 1706-152) at Laytons Lake in Carneys Point, Salem County. The project also includes roadway safety and drainage improvements. The project includes re-aligning and raising the roadway by 2.41 feet, and constructing a new 40 foot span bridge and ogee spillway in a semi-circular shape with an effective length of 90 feet. New storm drainage pipes and a water-quality basin will be constructed. The basin will be on the southern side of Rt. 48 within extant right-of-way and will have a pipe to an open ditch leading to Game Creek to the east.

Although Laytons Lake was created in the mid-eighteenth century to power a mill, the components of the power source (dam, impoundment, and spillway [raceway]) have been modified over the years. In 1916, the roadway and earthfill dam were realigned to straighten a prominent bend along the roadway's tangent to the lake. Much of the current configuration of the dam and spillway is the result of the bridge replacement work in the 1970s when the pre-1916 paths of the spillway and Game Creek channel were shifted to the west, and the dam and roadway shifted further to the north or upstream. Because of the change in the complex's configuration, the power source no longer retains its integrity.

Pre-contact archeological resources have been identified in the area of the project; however, testing within the APE for the basin failed to encounter any significant subsurface resources. As a result, the project will have no effect on significant subsurface resources.

Two above-ground resources had been identified during prior cultural resources work. This report and survey updated the survey forms and evaluated the properties known as

1. Erhardt Property (762 Harding Highway; Block 249/Lot 8)
2. Thorpe Property (772 Harding Highway; Block 249/Lot 10)

Both properties were part of a tract of land deeded to John Wilder in the 1740s. A mill was constructed on the property in 1740 or 1741 and had various owners. The mill was demolished during the early 20th century. What remains are two farm properties dating from the 18th century with buildings dating from the mid-19th century into the 20th century.

As a result of the survey, these properties were determined not eligible for listing in the National Register of Historic Places. The project will have No Effect on these properties.

As currently planned, project activities will have No Effect on any significant archeological and architectural resources listed on or eligible for the National Register of Historic Places, and no further work is recommended.

Please indicate your opinion regarding the proposed project on the line provided below within 30 days.

All cultural resources work was conducted in compliance with the requirements of Section 106 of the National Historic Preservation Act of 1966 (as amended), implemented by the regulations described in 36CFR800, and in accordance with the provisions of the Programmatic Agreement executed in November 1996. At this time the draft report is being submitted to parties with an interest in the regional history to afford an opportunity to comment on the findings.

**To the parties listed below**, under Section 106 of the Federal Historic Preservation Act, the Federal Agency, in this case the Federal Highway Administration (FHWA), is required to notify consulting parties and parties who may have an interest in regional history of pending transportation projects in which significant cultural resources may be affected. (A summary of the Section 106 process is enclosed; the Advisory Council on Historic Preservation has prepared this summary.)



LANDSCAPE & URBAN DES. Fax:609-530-5526 Oct 27 2011 03:44 P.02

11-0924;4,5
HPO-F2011-203

As a participant as specified under 36CFR800.2, your review of and comment on the enclosed draft cultural resource survey is requested. **If you disagree with the findings and conclusions within this letter, please respond to the NJDOT with your comments in 15 days.** Comments can be sent to or emailed to me at the following addresses:


*Mail*: Janet A. Fittipaldi
The New Jersey Department of Transportation
PO Box 600
Trenton, NJ 08625

*E-mail*: Janet.Fittipaldi@dot.state.nj.us

*Telephone*: (609) 530-5462


The New Jersey Department of Transportation appreciates your interest in maintaining a safe and reliable transportation system while recognizing New Jersey's irreplaceable historic resources. However, if we do not hear from you, we will assume that you have no interest in the subject matter; therefore, we will not provide you with, or notify you of, any additional information developed during the Section 106 process for this project.

Very truly yours,

Janet A. Fittipaldi
Executive Manager
Bureau of Landscape Architecture and Environmental Solutions
Capital Program Support

enclosures

Kew:APERtlaytonslake

cc: Kostas Svarnas — *FHWA Area Engineer* — w/o enclosures
Director — *Salem County Cultural and Heritage Commission*, 94 Market Street Second Floor - Rm. 213 Salem, NJ 08079
President — *Salem County Historical Society*, 79-83 Market Street Salem, NJ 08079
President — *Archaeological Society of New Jersey*, c/o Richard Veit, Ph.D, Monmouth University, West Long Branch, NJ 07764-1898

✓ I concur with your finding that there are no historic properties affected within the project's area of potential effects. Consequently, pursuant to 36 CFR 800.4(d)(1), no further Section 106 consultation is required unless additional resources are discovered during project implementation pursuant to 36 CFR 800.13.

_____ My opinion differs from the above for the following reasons:

Signed: _____ Date: 6/30/11
Daniel D. Saunders
Deputy State Historic Preservation Officer



LANDSCAPE & URBAN DES. Fax:609-530-5526 Oct 27 2011 03:44 P.03

McCormick Taylor
Engineers & Planners Since 1946

*Issued: December 12, 2011*

**MEETING REPORT**

| | |
|---|---|
| **PROJECT:** | NJ Route 48, M.P. 3.06<br>Layton Lake Dam Improvements<br>Carneys Point Township<br>Salem County, NJ |
| **SUBJECT:** | Public Information Center |
| **PLACE:** | CARNEYS POINT TOWNSHIP MUNICIPAL BUILDING |
| **DATE/TIME:** | December 08, 2011, 4:00 pm |

| **ATTENDEES:** | **REPRESENTING** |
|---|---|
| Willie Colquitt | NJDOT - BPD |
| Mike Kasbekar | NJDOT – BPM |
| Kimberley Nance | NJDOT – OCR |
| Meredith Hammond | NJDOT – OCR |
| Bill Schockel | Resident, President of Homeowners Association |
| Laura Smith | Resident |
| Charles Erhardt | Resident |
| Andrew Merendino | Resident |
| Lucinda Lewis | Resident |
| G. Philip Lewis | Resident |
| Sean Christie | Resident |
| Nabil Hourani | McCormick Taylor, Inc. (MT) |
| Timothy McGuire | MT |

**NOTES BY:** Timothy McGuire

**PURPOSE:** The purpose of the meeting was to present the proposed NJ Route 48 Layton Lake Dam project, and to provide a forum for affected parties (local residents, etc.) to express any concerns about the design and/or construction process.

1. A primary concern for most attendees was the previously proposed relocation of NJ Route 48. All were pleased to find that this had been removed from the design and that NJ Route 48 would remain in its current location.

2. The most common secondary concern for most attendees was the maintenance of a natural and pleasing appearance of the lake and associated surroundings (for maintenance of aesthetics, property values, recreation, etc.). Concern expressed about the proposed steel sheeting on both the upstream and downstream slopes of the dam was relieved when Mr. Hourani informed that the sheeting would be driven to be flush with the surface and would not be

visible. Residents requested aesthetic treatments be used during placement of rails and concrete. Mr. Kasbekar suggested that "weathered" steel could be used for rails and decorative concrete formliners could be applied to the spillway walls and bridge parapets. Residents were informed that the lake may be lowered up to six inches during construction of the spillway for contractor safety. No objections were raised.

3. In response to a question, Mr. Hourani presented the proposed roadway drainage and confirmed that new inlets will be constructed where Layton Lake Drive intersects NJ Route 48. He also explained that the profile of Layton Lake Drive will be raised to meet NJ Route 48 at the intersection. He also explained the drainage repairs proposed for the properties downstream and west of the dam, in response to concerns expressed by those residents.

4. In response to a concern expressed regarding the potential for closure of Route 48 during construction, Mr. Hourani and Mr. Colquitt affirmed that two lanes would be maintained throughout construction with no proposed detours.

5. Attendees requested clarification regarding ownership of the dam and the associated liabilities, need for easements, etc. Mr. Hourani explained all of the proposed work would be confined to the NJDOT right-of-way except for the new spillway, and that a temporary construction easement will be required for construction of the spillway. Mr. Kasbekar explained that while the spillway belongs to NJDOT, the property of the dam and the lake is privately owned by the Association. For this reason, and for proximity (residents are on location), the Association will remain responsible for operation of the new and improved sluice gate. Mr. Hourani indicated that an Operation Manual and an Emergency Action Plan will be provided. It was suggested that this new spillway would provide for a safer dam, which would reduce the burden of liability for the Association.

6. Mr. Colquitt asked if the Association would be open to issuing a Resolution of Support for the project in future stages of planning and the residents responded affirmatively.

The foregoing constitutes our understanding of the issues discussed. Kindly advise at once of any error or omission.

cc: W. Colquitt – NJDOT
M. Kasbekar – NJDOT
K. Nance – NJDOT
R. Bird – NJDOT
File

# NJDOT ATTENDANCE RECORD
## PUBLIC INFORMATION CENTER
## PLEASE PRINT

PIC

**PROJECT:** Rt. 48 Layton Lake Dam **DATE:** 12/8/11

**MEETING LOCATION:** Carneys Point Municipal Bldg

| Name | Phone Number | Mailing Address/Affiliation | Email Address |
|---|---|---|---|
| Nabil Hourani | 8567930800 | MTA | nmhourani@mtmail.biz |
| Mike Kasbekar | 609-530-6627 | NJDOT | mike.kasbekar@dot.state.nj.us |
| Tim McGuire | 856-793-0800 | | TRMCGUIRE@MTMAIL.BIZ |
| Charles Erhardt | 856-351-2603 | Layton's Lake Inc 762 Harding Hwy, Carneys Point NJ 08069 | cerhardt@salemcc.edu |
| Andrew Merendino | 6092029066 | 758 HARDING HWY CARNEYS POINT NJ | |
| Bill Schocket | 857-299-4183 | 27 OAK Lane Carneys Point NJ | WSCHOCKET@COMCAST.NET |
| LAURA SMYTH | 856-299-4533 | 27 OAK LANE CARNEYS PT, NJ | SAME |
| Meredith Hammond | 530 455 5 | NJ DOT | |
| Lucinda Lewis | 856-299-2678 | 2 Layton's Lake Dr. 08069 | cinda@laytonslakeinc.com |
| G. Phillip Lewis | 856-769-3322 | 105 Stockington Rd. Logan 08098 | gplewis@yourcountylawyer.com |
| Sean Christie | 610-547-7245 | 10 Layton's Lake Dr. Carney Point | seamus88@comcast.net |
| Kimberly Nance | 609-530-6542 | NJDOT/OCR | |
| WILLIE I COVETT | 609-530-3524 | NJDOT/PM | |

# *Appendix G – Proposed Plans – (Bound Separately)*

| STATE | FEDERAL PROJECT NO. |
|---|---|
| N.J. | - |

| UTILITIES |
|---|
| ATLANTIC CITY ELECTRIC COMPANY, INC. (ELECTRIC) |
| COMCAST CABLE COMMUNICATIONS MANAGEMENT, LLC (CABLE TV) |
| VERIZON - NEW JERSEY, INC. (TELEPHONE) |
| CARNEY'S POINT TOWNSHIP SEWER AUTHORITY (SEWER) |
| NEW JERSEY AMERICAN WATER COMPANY (WATER) |
| PUBLIC SERVICE ELECTRIC AND GAS COMPANY - GAS (GAS) |

# *State of New Jersey*
# *Department of Transportation*

***PLANS OF***

# LAYTON LAKE DAM
# DRAINAGE IMPROVEMENTS

# CONTRACT NO.

**TOWNSHIP OF CARNEYS POINT** **SALEM COUNTY**

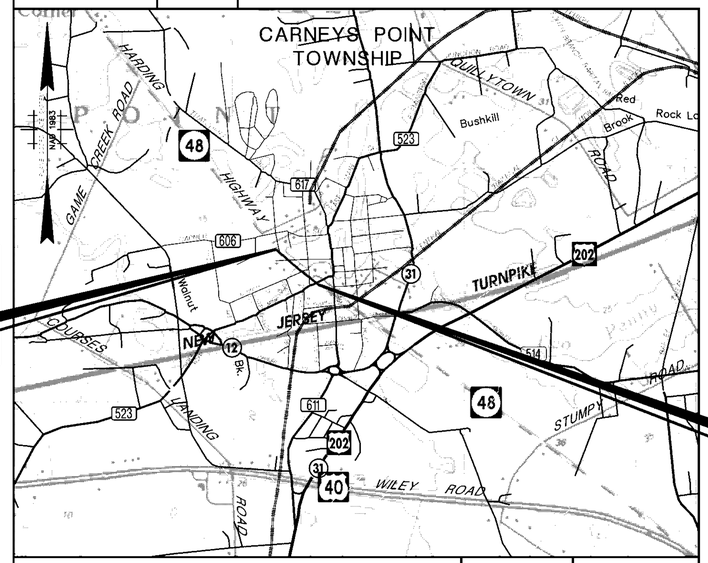
**SCALES AS INDICATED** **NOVEMBER 2011**

| INDEX OF SHEETS | |
|---|---|
| SHEET NO. | DESCRIPTION |
| 1 | KEY |
| 2-3 | TYPICAL SECTIONS |
| 4 | PLAN SHEET INDEX |
| 5-8 | CONSTRUCTION PLANS |
| 9-11 | PROFILES |
| 12-16 | TRAFFIC CONTROL AND STAGING PLANS |
| 17-19 | CROSS SECTIONS |
| 20-27 | BRIDGE PLANS |
| | |
| | |

| DESIGN TRAFFIC DATA ROUTE 48 (M.P. 2.90-3.21) | |
|---|---|
| A.D.T. (2011) - 2 WAY | 4900 |
| A.D.T. (2031) - 2 WAY | 5400 |
| D.H.V. (2031) - 2 WAY | 420 |
| D | 59% |
| T | 3% |
| V | 55 M.P.H. |

PROJECT CATEGORY | NON-NHS

C.S. 1002




BEGIN PROJECT
ROUTE 48
℄ STA. 30+50.00

BEGIN FEDERAL PROJECT
NO. ----
ROUTE 48
℄ STA. 30+50.00
M.P. 2.90

END PROJECT
ROUTE 48
℄ STA. 47+00.00

END FEDERAL PROJECT
NO. ----
ROUTE 48
℄ STA. 47+00.00
M.P. 3.21

TYPE OF HIGHWAY- URBAN MINOR ARTERIAL - ROUTE 48

ROW SECTION

ROUTE 48(0000) SECTION 0

## KEY MAP

1000′ 0 1000′

| BRIDGES IN THIS CONTRACT | |
|---|---|
| 1 | BRIDGE NO. 1706-152 ROUTE 48 OVER TWO PENNY RUN |

MID-POINT OF PROJECT
LONGITUDE: 75°25′42″W
LATTIUDE: 39°41′29″N

*STANDARD ROADWAY CONSTRUCTION/TRAFFIC CONTROL/ BRIDGE CONSTRUCTION DETAILS BOOKLET, AUGUST 2007, AND STANDARD ELECTRICAL DETAILS BOOKLET, 2007, ARE APPLICABLE TO THIS PROJECT EXCEPT FOR THOSE DETAILS CONTAINED HEREIN.*

"CHANGES MADE TO THESE PLANS SINCE SIGNATURE BY THE CONSULTANT MAY BE DETERMINED BY COMPARISON OF THE PLANS FILED AT THE DEPARTMENT WITH THOSE FILED AT THE OFFICE OF THE CONSULTANT."

McCormick Taylor, Inc.

CERTIFICATION OF AUTHORIZATION NO. 24GA28044300

NABIL N HOURANI

NEW JERSEY PROFESSIONAL ENGINEER LICENSE NO. 24GE3888900

LENGTH OF PROJECT ROUTE 48 = 1,650 LIN. FT. OR 0.31 MILES
TOTAL LENGTH OF PROJECT = 1,650 LIN. FT. OR 0.31 MILES

Submitted by _____ Date _____
Director, Division of Project Management

Approved by _____ Date _____
State Transportation Engineer

*2007 STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION TO GOVERN*



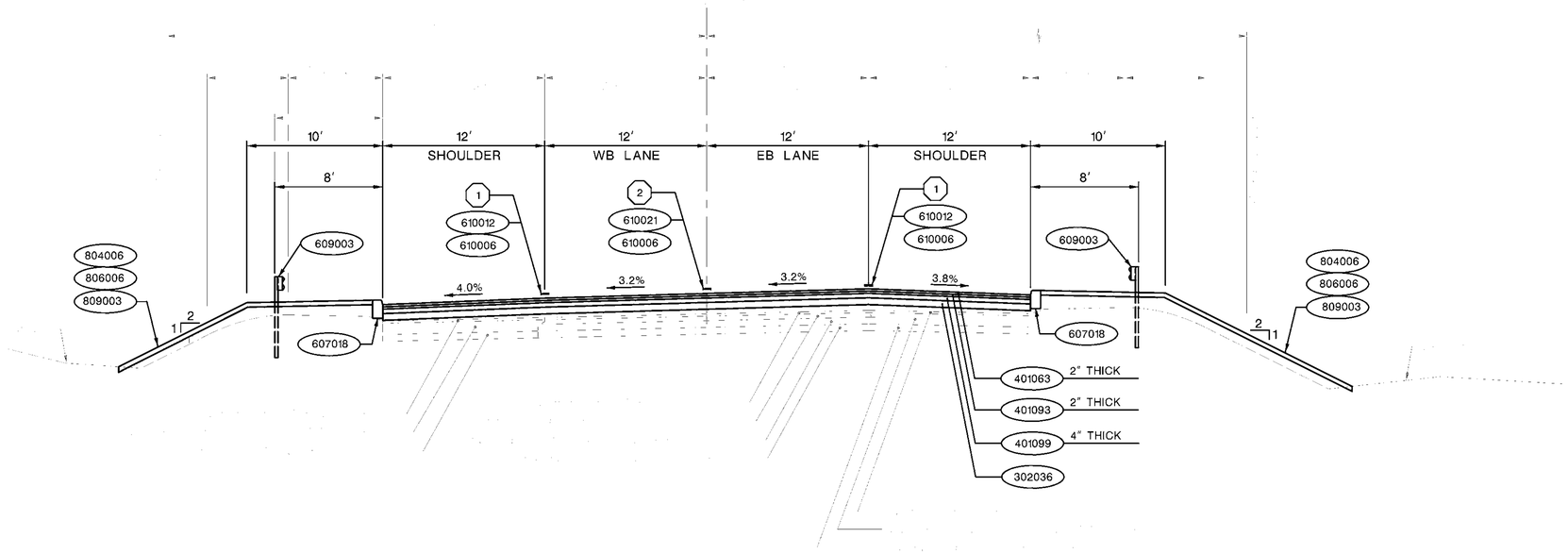
McCormick Taylor
Engineers & Planners
Since 1946

FILE NAME: Z:\WTRProjects\5227-09 (Rt 48 Layton Lake Dam)\CADD\KeyMap\KEYSHEET.dgn
PEN TABLE: Z:\WTRProjects\5227-09 (Rt 48 Layton Lake Dam)\CADD\KeyMap\Route48_KeyMap.tbl
REV. DATE: 1/19/2012
SCALE: 4000/0000 / IN.

REVISION DATE:
SCALE: 1"=5'
AUTHOR:

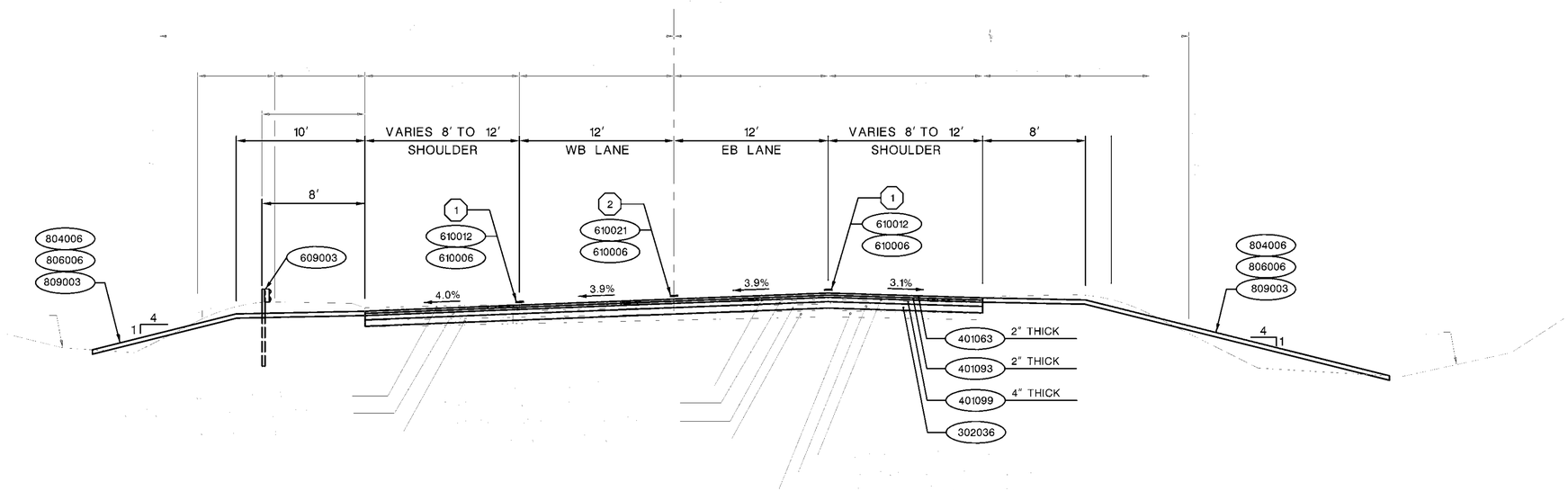
McCORMICK TAYLOR, INC.
SHEET TITLE: TYPICAL SECTIONS 01
FILE NAME: X:\295 Final Design\Preliminary Design\TypSections\TS01.dgn

| STATE | FEDERAL PROJECT NO. |
|---|---|
| N.J. | X |




## SUPERELEVATED SECTION

STA. 36+31.13 TO STA. 40+74.60




## SUPERELEVATED SECTION

STA. 31+31.60 TO STA. 36+31.13

## PROPOSED MATERIALS

| ITEM NO. | DESCRIPTION |
|---|---|
| 203041P | GEOTEXTILE, ROADWAY STABILIZATION |
| 302036P | DENSE-GRADED AGGREGATE BASE COURSE, 6" THICK |
| 401009P | HMA MILLING, 3" OR LESS |
| 401063M | HOT MIX ASPHALT 12.5H76 SURFACE COURSE |
| 401093M | HOT MIX ASPHALT 19H76 INTERMEDIATE COURSE |
| 401099M | HOT MIX ASPHALT 25M64 BASE COURSE |
| 607018P | 9" X 16" CONCRETE VERTICAL CURB |
| 608004P | NONVEGETATIVE SURFACE, POROUS HOT MIX ASPHALT |
| 609003M | BEAM GUIDE RAIL |
| 609021M | RUB RAIL |
| 609075M | REMOVAL OF BEAM GUIDE RAIL |
| 610006M | TRAFFIC STRIPES, LONG LIFE, EPOXY RESIN 6" |
| 610012M | RPM, MONO-DIRECTIONAL, WHITE LENS |
| 610021M | RPM, BI-DIRECTIONAL, AMBER LENS |
| 804006P | TOPSOILING, 4" THICK |
| 806006P | FERTILIZING AND SEEDING, TYPE A-3 |
| 809003M | STRAW MULCHING |
| | |
| | |
| | |
| | |

0 5 10 ft.

SCALE: 1"=5'

TS-1 / TS-2

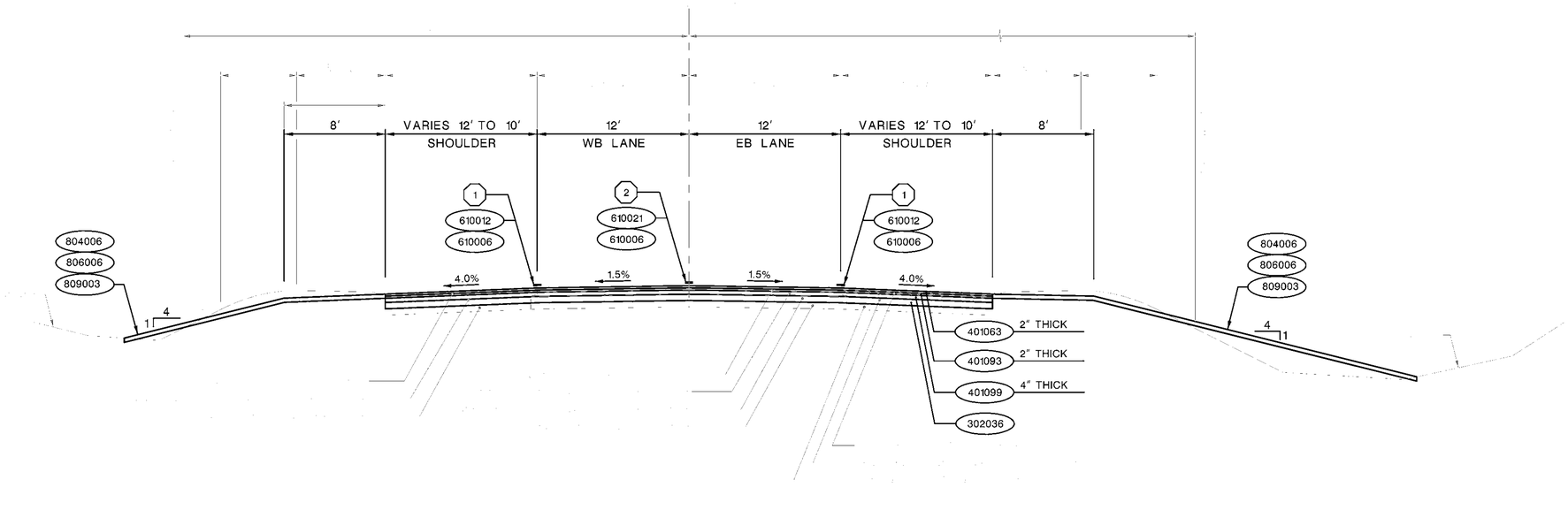
NEW JERSEY DEPARTMENT OF TRANSPORTATION

# TYPICAL SECTIONS

## ROUTE 48
## LAYTON LAKE DAM
## DRAINAGE IMPROVEMENTS

McCormick Taylor, Inc.
CERTIFICATION OF AUTHORIZATION NO. 24GA28044300
DATE:
NABIL M. HOURANI
NEW JERSEY PROFESSIONAL ENGINEER LICENSE NO. 24GE3888900

| STATE | FEDERAL PROJECT NO. |
|---|---|
| N.J. | X |




## NORMAL SECTION

STA. 40+74.60 TO STA. 47+00.00

## PROPOSED MATERIALS

| ITEM NO. | DESCRIPTION |
|---|---|
| 203041P | GEOTEXTILE, ROADWAY STABILIZATION |
| 302036P | DENSE-GRADED AGGREGATE BASE COURSE, 6" THICK |
| 401009P | HMA MILLING, 3" OR LESS |
| 401063M | HOT MIX ASPHALT 12.5H76 SURFACE COURSE |
| 401093M | HOT MIX ASPHALT 19H76 INTERMEDIATE COURSE |
| 401099M | HOT MIX ASPHALT 25M64 BASE COURSE |
| 607018P | 9" X 16" CONCRETE VERTICAL CURB |
| 608004P | NONVEGETATIVE SURFACE, POROUS HOT MIX ASPHALT |
| 609003M | BEAM GUIDE RAIL |
| 609021M | RUB RAIL |
| 609075M | REMOVAL OF BEAM GUIDE RAIL |
| 610006M | TRAFFIC STRIPES, LONG LIFE, EPOXY RESIN 6" |
| 610012M | RPM, MONO-DIRECTIONAL, WHITE LENS |
| 610021M | RPM, BI-DIRECTIONAL, AMBER LENS |
| 804006P | TOPSOILING, 4" THICK |
| 806006P | FERTILIZING AND SEEDING, TYPE A-3 |
| 809003M | STRAW MULCHING |
| | |
| | |
| | |
| | |

REVISION DATE:
SCALE:1"=5'
AUTHOR:

McCORMICK TAYLOR, INC.
SHEET TITLE: TYPICAL SECTIONS 01
FILE NAME:X:\29\Final Design\Preliminary Design\TypSections\TS-01.dgn

TS-2
TS-2

NEW JERSEY DEPARTMENT OF TRANSPORTATION

# TYPICAL SECTIONS

**ROUTE 48**
**LAYTON LAKE DAM**
**DRAINAGE IMPROVEMENTS**

McCormick Taylor, Inc.
CERTIFICATION OF AUTHORIZATION NO. 24GA28044300
DATE:
NABIL M. HOURANI
NEW JERSEY PROFESSIONAL ENGINEER LICENSE NO. 24GE3888900

| STATE | FEDERAL PROJECT NO. |
|---|---|
| N.J. | * |

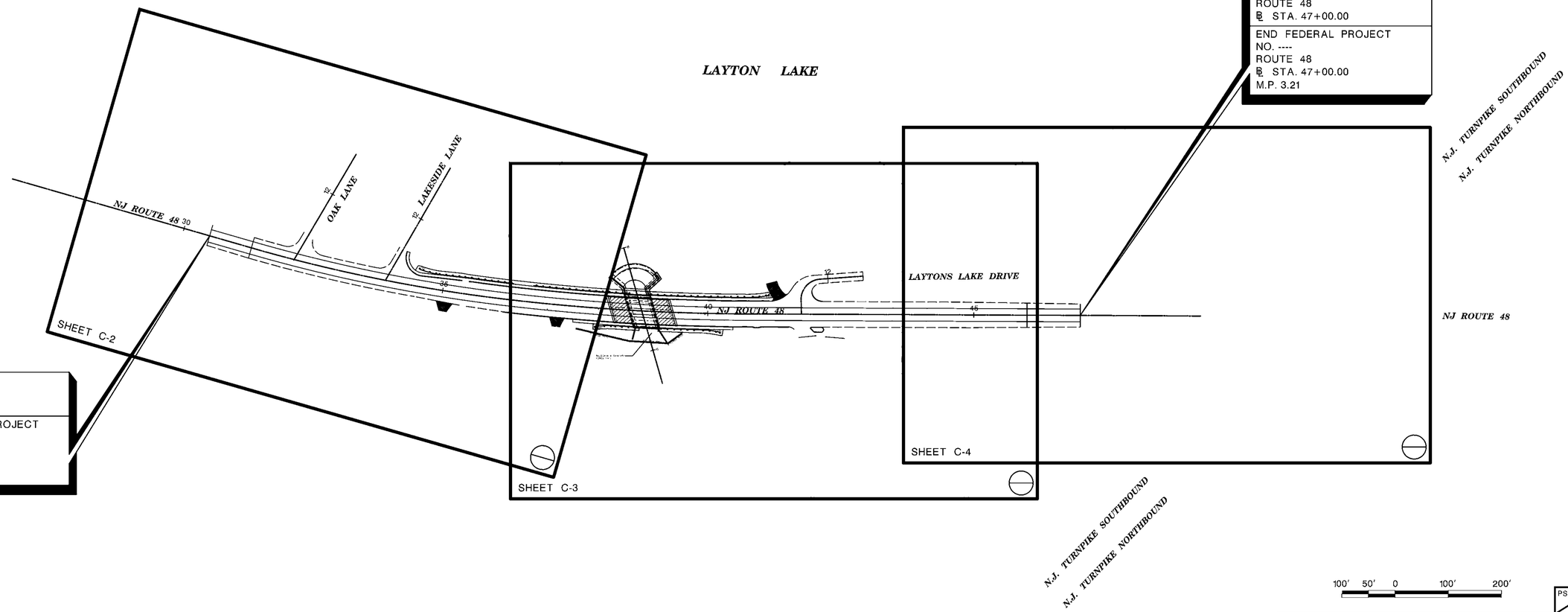
TOWNSHIP OF CARNEYS POINT

SALEM COUNTY

NAD 1983

McCormick Taylor
Engineers & Planners
Since 1946

FILE NAME: Z:\WTR\Projects\5227-09 (Rt 48 Layton Lake Dam)\CADD\PS\PS1-1.dgn
PEN TABLE: Z:\WTR\Projects\5227-09 (Rt 48 Layton Lake Dam)\CADD\PS\Route48_PSI.tbl
REV. DATE: 1/19/2012
SCALE: 1:00.0000 ' / IN.




BEGIN PROJECT
ROUTE 48
℄ STA. 30+50.00

BEGIN FEDERAL PROJECT
NO. ----
ROUTE 48
℄ STA. 30+50.00
M.P. 2.90

END PROJECT
ROUTE 48
℄ STA. 47+00.00

END FEDERAL PROJECT
NO. ----
ROUTE 48
℄ STA. 47+00.00
M.P. 3.21

100' 50' 0 100' 200'

PSI-1
PSI-1

NEW JERSEY DEPARTMENT OF TRANSPORTATION

# PLAN SHEET INDEX

## ROUTE 48
## LAYTON LAKE DAM
## DRAINAGE IMPROVEMENTS

McCormick Taylor, Inc.
CERTIFICATION OF AUTHORIZATION NO. 24GA28044300

NABIL M. HOURANI
NEW JERSEY PROFESSIONAL ENGINEER LICENSE NO. 24GE3888900

# NEW JERSEY DEPARTMENT OF TRANSPORTATION STANDARD LEGEND

McCormick Taylor
Engineers & Planners
Since 1946

FILE NAME: Z:\WTR\Projects\5227-09 (Rt 48 Layton Lake Dam)\CADD\LegendLegend.dgn
PEN TABLE: Z:\WTR\Projects\5227-09 (Rt 48 Layton Lake Dam)\CADD\Construction\Construction.tbl
REV. DATE: 1/19/2012
SCALE: 30.0000 ft / IN.

## Linear Features

| Existing | PROPOSED | |
|---|---|---|
| W | W | Water Main (Size) |
| G | G | Gas Main (Size) |
| T | T | Telephone Conduit |
| E | E | Electric Conduit (Highway or Utility) |
| CTV | CTV | Cable TV |
| FO | FO | Fiber Optic |
| (Size & Type) → (Over 30" - Draw to Size) | (SIZE & TYPE) → | Sanitary Sewers or Storm Drains |
| | | Pavements (Concrete or Bituminous) |
| | | Shoulders |
| | | Curbs |
| (F) (C) | (C) (F) | Slopes (Cut & Fill) |
| 5+00 ℄ | ℄ 10+00 | Base Line |
| | | Twp., City, County Lines |
| Existing R.O.W. Line | PROPOSED R.O.W. LINE | Right of Way Lines (Access Permitted) |
| Existing R.O.W. & No Access Line | PROP. R.O.W. & NO ACCESS LINE | Right of Way Lines (No Access) |
| | | Easements |
| ℄ | | Property Line |
| x x x x | | Fence (Size & Type) |
| | | Reset Fence |
| | | Beam Guide Rail |
| | | Reset Beam Guide Rail |
| | | Noise Walls |
| | | Wetland Limit Line |
| | | Silt Fence |
| Ditch | DITCH | Ditches |
| | | Railroad Tracks |
| | | Tree Line |

## Topographical Features

| Existing | PROPOSED | |
|---|---|---|
| | | Inlets (Label Type) |
| "ES" | "ES" | Inlets (Type ES) |
| | | Manholes (Label Type or Utility) |
| | | Reset (Inlets or Manholes) |
| | | Reconstructed (Inlets or Manholes) |
| | | Cast Iron Extension (Frame or Ring) (Inlet or Manhole) |
| | | New Manhole Casting, Square Frame, Circular Cover |
| | | R.C. End Section or C.M. Headwall |
| | | Headwalls |
| | | Headwalls & Aprons |
| W | | Water Gate Valves |
| | | Reset Water Gate Valves |
| G | | Gas Gate Valves |
| | | Reset Gas Gate Valves |
| Hyd. | | Hydrants |
| | | Reset Hydrants |
| | | Utility Pole (Type & Number) |
| | TEMP | Temporary Utility Pole |
| | | Traffic Signal |
| J.B. | J.B. | Junction Box |
| Ⓕ | Ⓕ | Fiber Optic Junction Box |
| J.B. & Light | J.B. | Junction Box Foundation |
| | | Signs |
| | | Vertical Panels |
| Monitor Well | Monitor Well | Monitoring Wells |

## Topographical Features

| Existing | PROPOSED | |
|---|---|---|
| | | Guide Rail End Terminals |
| | | Beam Guide Rail Anchorages |
| Mon. | | Monuments |
| | | ROW Monument (ROW Control Points) |
| | TEST PIT NUMBER | Test Pit |
| Boring Number | BORING NUMBER | Borings (Boring Number) |
| | | Decidous Tree (Size, Kind) |
| | | Evergreens |
| | | Bush |
| | | Hedges |
| | | Swamp |

## Double Reference Codes

EDQ - ESTIMATE AND DISTRIBUTION OF QUANTITIES - ROADWAY
TS - TYPICAL SECTIONS
PSI - PLAN SHEET INDEX
C - CONSTRUCTION PLANS
EP - ENVIRONMENTAL PLANS & SOIL EROSION & SEDIMENT CONTROL PLANS
D - DRAINAGE PLANS
P - PROFILES
T - TIES
G - GRADES
TC - TRAFFIC CONTROL AND STAGING PLANS
E - ELECTRICAL PLANS
TSP - TRAFFIC SIGNAL PLANS
HL - HIGHWAY LIGHTING PLANS
ITS - INTELLIGENT TRANSPORTATION SYSTEM PLANS
SL - SIGN LOCATION PLANS
TSS - TRAFFIC SIGNING AND STRIPING PLANS
STD - SIGN TEXT DETAILS
MS - METHOD OF CROSS SECTIONS
L - LANDSCAPE PLANS
X - CROSS SECTIONS
DTL - CONSTRUCTION DETAILS
EQB - ESTIMATE OF QUANTITIES - BRIDGE
B - BRIDGE PLANS

## Miscellaneous Symbols

- Items With No Alternate
- Alternate Items OR — For Alternate Pipe Items (C) = Concrete (M) = Metal
- Milling
- Building to be Demolished
- Removal of Pavement
- Building to be Removed & Paid for Under Clearing Site
- PARCEL — Demolition No. & Parcel No. of Building to be Demolished
- PROFILE + % LEVEL LINE - %
- High Point
- Low Point
- B.M. — Bench Mark
- Flared Guide Rail Terminal (FRT)
- Tangent Guide Rail Terminal (TRT)
- Articulated Concrete Blocks

Proposed Bridge
Bridge Approach Slabs and Transition Slabs

## ABBREVIATIONS USED IN THIS CONTRACT

| | |
|---|---|
| AH., BK. | AHEAD, BACK |
| BGR | BEAM GUIDE RAIL |
| ℄, B.L. | BASELINE |
| B.M. | BENCH MARK |
| B.T. | BELL TELEPHONE |
| BIT., BITUM. | BITUMINOUS |
| BLDG. | BUILDING |
| ℄, C.L. | CENTERLINE |
| C.I.P. | CAST IRON PIPE |
| C.M.P. | CORRUGATED METAL PIPE |
| CONC. | CONCRETE |
| CT | CURB TRANSITION |
| CULV. | CULVERT |
| C.V.C. | CONCRETE VERTICAL CURB |
| D, DIA. | DIAMETER |
| D.C. | DROP CURB |
| DE | DITCH EXCAVATION |
| DEP., DP | DEPRESSED CURB |
| DH | DRILL HOLE |
| D.I.P. | DUCTILE IRON SEWER PIPE |
| DWY | DRIVEWAY |
| E.B., W.B., N.B., S.B. | EASTBOUND, WESTBOUND NORTHBOUND, SOUTHBOUND |
| EL., ELEV. | ELEVATION |
| EXIST., EX. | EXISTING |
| GR. | GRATE |
| HT. | HEIGHT |
| H.W. | HEADWALL |
| HYD. | HYDRANT |
| INV. | INVERT |
| IP | IRON PIN |
| J.B. | JUNCTION BOX |
| J.C. | JUNCTION CHAMBER |
| LT., RT. | LEFT, RIGHT |
| L.O.P. | LIMIT OF PAVEMENT (PAVING) |
| L.O.M. | LIMIT OF MILLING |
| L.O.M. & R. | LIMIT OF MILLING & RESURFACING |
| M.B. | MAILBOX |
| M.P. | MILE POST |
| MAX. | MAXIMUM |
| MIN. | MINIMUM |
| N.J.A.W. | NEW JERSEY AMERICAN WATER COMPANY |
| NO. | NUMBER |
| N.T.S. | NOT TO SCALE |
| PAV'T. | PAVEMENT |
| PC, P.C. | POINT OF CURVATURE |
| PERF. | PERFORATED |
| P.G.L. | PROFILE GRADE LINE |
| ℄, P.L. | PROPERTY LINE, PROFILE LINE |
| PK | PARKER KAYLON MASONRY NAIL |
| POC, P.O.C. | POINT ON CURVE |
| POL, P.O.L. | POINT ON LINE |
| POT, P.O.T. | POINT ON TANGENT |
| PRC, P.R.C. | POINT OF REVERSE CURVE |
| PROP. | PROPOSED |
| PT, P.T. | POINT OF TANGENCY |
| PVC, P.V.C. | POLYVINYL CHLORIDE SEWER PIPE, POINT OF VERTICAL CURVATURE |
| PVI, P.V.I. | POINT OF VERTICAL INTERSECTION |
| PVT, P.V.T. | POINT OF VERTICAL TANGENCY, PAVEMENT |
| R | RADIUS |
| RBGR | REMOVAL OF BEAM GUIDE RAIL |
| RCEP | REINFORCED CONCRETE ELLIPTICAL PIPE |
| RCP, R.C.P. | REINFORCED CONCRETE PIPE |
| RMC, R.M.C. | RIGID METALLIC CONDUIT |
| RNMC, R.N.M.C. | RIGID NON-METALLIC CONDUIT |
| ROW, R.O.W. | RIGHT OF WAY |
| R.R. | RAILROAD |
| RTE., RT. | ROUTE |
| SAN. | SANITARY |
| S.C. | CONCRETE SLOPING CURB |
| SDWK. | SIDEWALK |
| S.H.D. | STATE HIGHWAY DEPARTMENT |
| SHLD. | SHOULDER |
| ℄, S.L. | SURVEY LINE |
| S.O.D. | SUBBASE OUTLET DRAIN |
| STY. | STORY |
| T | TANGENT |
| TBA | TO BE ABANDONED |
| TBR | TO BE REMOVED |
| TEL. | TELEPHONE |
| TEMP. | TEMPORARY |
| THK., TH. | THICK |
| TYP. | TYPICAL |
| U.D. | UNDERDRAIN |
| UP, U.P. | UTILITY POLE |
| VAR. | VARIABLE, VARIES |
| W.C.V.C. | WHITE CONCRETE VERTICAL CURB |
| WM | WATER METER |
| W.Q.T.S. | WATER QUALITY TREATMENT STRUCTURE |
| X-SECT | CROSS SECTION |

## GENERAL NOTES:

1. CONTRACTOR IS TO VERIFY THE LOCATION OF ALL UTILITIES ABOVE AND UNDERGROUND PRIOR TO CONSTRUCTION. ANY ANTICIPATED CONFLICTS MUST BE REPORTED TO THE RESIDENT ENGINEER IMMEDIATELY FOR RESOLUTION. THE EXISTING ABOVE AND UNDERGROUND UTILITIES SHOWN ARE DIAGRAMMATIC ONLY.
2. THE CONTRACTOR IS TO CONTACT THE NEW JERSEY DEPARTMENT OF TRANSPORTATION DESIGN SERVICES GEODETIC CONTROL SURVEY - 609-530-5641, AT LEAST TWO (2) WEEKS PRIOR TO CONSTRUCTION FOR COORDINATION OF THE MONUMENT PRESERVATION. PROTECT ALL EXISTING MONUMENTS DURING CONSTRUCTION ACTIVITIES.
3. EXISTING SIGNS AFFECTED BY CONSTRUCTION ACTIVITIES ARE TO BE RELOCATED AS DIRECTED BY THE RESIDENT ENGINEER. THERE WILL BE NO SEPARATE PAYMENT FOR RELOCATING EXISTING SIGNS OR FOR EXISTING SIGNS DAMAGED BY CONSTRUCTION ACTIVITIES.
4. THE CONTRACTOR MUST USE EQUIPMENT THAT WILL NOT INTERFERE WITH THE OVERHEAD UTILITY LINES WHILE PERFORMING CONSTRUCTION OPERATIONS. NO ADDITIONAL PAYMENT WILL BE MADE BY THE STATE TO COMPENSATE THE CONTRACTOR FOR USE OF THIS EQUIPMENT TO AVOID INTERFERENCE WITH THE OVERHEAD UTILITY LINES. THE CONTRACTOR MUST CONTACT THE VARIOUS UTITLITY OWNERS BEFORE COMMENCING CONSTRUCTION TO DETERMINE HOW CLOSE THE EQUIPMENT CAN BE OPERATED NEAR OR UNDER UTILITY LINES.
5. ANY TREES NOT SPECIFIED FOR REMOVAL WHICH ARE DAMAGED OR DESTROYED BY THE CONTRACTOR'S OPERATIONS SHALL BE REPLACED IN KIND AT NO COST TO THE STATE.
6. ALL EXISTING PIPES, INLETS, AND/OR OTHER DRAINAGE FEATURES THAT CONFLICT WITH THE PROPOSED DRAINAGE SYSTEM DESIGN AND EXISTING PIPES, INLETS, AND/OR OTHER ITEMS LABELED AS "TO BE REMOVED" (T.B.R.) SHALL BE REMOVED AND PAID FOR UNDER ITEM "CLEARING SITE".

N.J. Plane Coordinate System

**North Arrow To Be Used On Standard Construction Sheets Where Bearings Refer To N. J. Plane Coordinate System**

**N.T.S.**

C-1 / C-4

NEW JERSEY DEPARTMENT OF TRANSPORTATION

# CONSTRUCTION PLANS

## ROUTE 48
## LAYTON LAKE DAM
## DRAINAGE IMPROVEMENTS

McCORMICK TAYLOR, INC.
CERTIFICATION OF AUTHORIZATION NO. 24GA28044300

NABIL M. HOURANI
NEW JERSEY PROFESSIONAL ENGINEER LICENSE NO. 24GE3888900

5
27

| STATE | FEDERAL PROJECT NO. |
|---|---|
| N.J. | * |

TOWNSHIP OF CARNEYS POINT

SALEM COUNTY

NAD 1983

BEGIN PROJECT
ROUTE 48
℄ STA. 30+50.00

BEGIN FEDERAL PROJECT
NO. ----
ROUTE 48
℄ STA. 30+50.00
M.P. 2.90

**LAYTON LAKE**

**OAK LANE**

OAK LANE ℄

N66°34'37.44"E

**LAKESIDE LANE**

LAKESIDE LANE ℄

N66°07'14.68"E

PC STA. 31+51.60

PCC STA. 36+31.13

MATCH LINE B.L. STA. 37+65

PLAN SHEET NO. C-3

**ROUTE 48**

NJ ROUTE 48 ℄

S37°52'01.30"E

R=3000.00'

INLET TYPE 'E'
[, 'LT.]
T.G. 17.50
INV. 12.55 (EX. 15" RCP)

RECONSTRUCT INLET TYPE 'B'
[+, 'LT.]
TG. 16.15

RESET INLET TYPE 'B'
[, 'LT.]
TG. 15.55

INLET TYPE 'B'
[, 'LT.]
T.G. 15.13
INV. 12.50

WATER QUALITY STRUCTURE
[, 'LT.]
RIM 16.12
INV. 8.60 (IN)
INV. 8.60 (OUT)

INLET TYPE 'B1'
[, 'RT.]
T.G. 16.03
INV. 9.25 (24" RCP IN)
INV. 11.00 (18" RCP IN)
INV. 8.65 (18" RCP OUT)
INV. 9.40 (24" RCP OUT)

INLET TYPE 'B'
[, 'LT.]
T.G. 14.95
INV. 11.60 (IN)
INV. 11.35 (OUT)

+12.05
EL. 15.84

INLET TYPE 'ES'
[, 'LT.]
T.G. 18.60
INV. 12.09 (EX. 15" RCP IN)
INV. 12.09 (18" RCP OUT)

INLET TYPE 'ES'
[, 'LT.]
T.G. 17.63
INV. 11.50 (15" RCP IN)
INV. 11.40 (18" RCP IN)
INV. 11.42 (EX. 18" RCP IN)
INV. 11.40 (OUT)

HEADWALL
[+, 'RT.]
THW. 15.00
INV. 11.75

INLET TYPE 'ES'
[, 'LT.]
T.G. 16.75
INV. 10.85 (IN)
INV. 10.35 (OUT)

INLET TYPE 'B'
[, 'RT.]
T.G. 15.98
INV. 9.40

MANHOLE
[, 'RT.]
RIM 15.30
INV. 9.10 (24" RCP IN)
INV. 8.55 (18" RCP IN)
INV. 8.55 (OUT)

30' 20' 10' 0 30' 60'

C-2
C-4

NEW JERSEY DEPARTMENT OF TRANSPORTATION

# CONSTRUCTION PLANS

## ROUTE 48
## LAYTON LAKE DAM
## DRAINAGE IMPROVEMENTS

McCormick Taylor, Inc.
CERTIFICATION OF AUTHORIZATION NO. 24GA28044300

NABIL M. HOURANI
NEW JERSEY PROFESSIONAL ENGINEER LICENSE NO. 24GE3888900

6
27

McCormick Taylor
Engineers & Planners
Since 1946

FILE NAME: Z:\WTR\Projects\5227-09 (Rt 48 Layton Lake Dam)\CADD\Construction\C-2.dgn
PEN TABLE: Z:\WTR\Projects\5227-09 (Rt 48 Layton Lake Dam)\CADD\Construction\Construction.tbl
REV. DATE: 2/10/2012
SCALE: 30.0000 ' /IN.

| STATE | FEDERAL PROJECT NO. |
|---|---|
| N.J. | * |

TOWNSHIP OF CARNEYS POINT

SALEM COUNTY

NAD 1983

LAYTON LAKE

WATER QUALITY STRUCTURE
[, ' LT.]
RIM 15.38
INV. 8.25 (IN)
INV. 8.25 (OUT)

INLET TYPE 'B'
[, ' LT.]
T.G. 14.04
INV. 9.80

INLET TYPE 'B'
[, ' LT.]
T.G. 14.29
INV. 11.30

INLET TYPE 'B'
[, ' LT.]
T.G. 13.96
INV. 9.60

INLET TYPE 'E'
[, ' LT.]
T.G. 12.80
INV. 10.05

INLET TYPE 'E'
[, ' LT.]
T.G. 13.75
INV. 10.85

INLET TYPE 'B'
[, ' LT.]
T.G. 14.88
INV. 10.35

INLET TYPE 'E'
[, ' LT.]
T.G. 15.70
INV. 10.60

INLET TYPE 'ES'
[, ' LT.]
T.G. 23.39
INV. 20.10

LAYTONS LAKE DRIVE

LAYTONS LAKE DRIVE

S57°59'04.38"E

PT STA. 40+74.60

TEMPORARY CONSTRUCTION EASEMENT LINE

MATCH LINE B.L. STA. 37+50

PLAN SHEET NO. C-2

+01.93
EL. 15.98

+31.86
EL. 14.83

R=4042.44'

NJ ROUTE 48

NJ ROUTE 48

PC STA. 11+27.10

PT STA. 11+84.89

S53°41'34.49"E

MATCH LINE B.L. STA. 45+50

PLAN SHEET NO. C-4

T.B.R.

PLUG

15" RCP

18" RCP

24" RCP

6" FORCE MAIN

MANHOLE
[, ' RT.]
RIM 15.33
INV. 8.20 (15" RCP IN)
INV. 8.80 (24" RCP IN)
INV. 8.20 (OUT)

INV. 8.00

RELOCATE 6" SANITARY FORCE MAIN

S20°07'56.50"W

INLET TYPE 'ES'
[, ' LT.]
T.G. 15.00
INV. 9.50 (IN)
INV. 9.00 (OUT)

INLET TYPE 'B'
[, ' LT.]
T.G. 14.95
INV.(a) 9.30 (IN)
INV.(b) 8.60 (IN)
INV. 8.60 (OUT)

INLET TYPE 'B'
[, ' LT.]
T.G. 15.27
INV. 8.30 (24" RCP IN)
INV. 9.00 (24" RCP OUT)
INV. 8.30 (15" RCP OUT)

INLET TYPE 'B'
[, ' LT.]
T.G. 15.36
INV.(a) 10.00 (IN)
INV.(b) 12.40 (IN)
INV. 10.00 (OUT)

INLET TYPE 'ES'
[, ' LT.]
T.G. 23.39
INV. 19.70

30' 20' 10' 0 30' 60'

C-3
C-4

NEW JERSEY DEPARTMENT OF TRANSPORTATION

# CONSTRUCTION PLANS

## ROUTE 48
## LAYTON LAKE DAM
## DRAINAGE IMPROVEMENTS

McCormick Taylor, Inc.
CERTIFICATION OF AUTHORIZATION NO. 24GA28044300

NABIL M. HOURANI
NEW JERSEY PROFESSIONAL ENGINEER LICENSE NO. 24GE3888900

7
27

McCormick Taylor
Engineers & Planners
Since 1946

FILE NAME: Z:\WTR\Projects\5227-09 (Rt 48 ayton Lake Dam)\CADD\Construction\C-3.dgn
PEN TABLE: Z:\WTR\Projects\5227-09 (Rt 48 ayton Lake Dam)\CADD\Construction\Construction.tbl
REV. DATE: 2/10/2012
SCALE: 30.0000 ' IN.

McCormick Taylor
Engineers & Planners
Since 1946

FILE NAME: ZiWTRProjects\5227-09 (Rt 48 ayton Lake Dam)\CADD\Construction\C-4.dgn
PEN TABLE: ZiWTRProjects\5227-09 (Rt 48 ayton Lake Dam)\CADD\Construction\Construction.tbl
REV. DATE: 1/19/2012
SCALE: 30.0000 ' / IN.

| STATE | FEDERAL PROJECT NO. |
|---|---|
| N.J. | * |

TOWNSHIP OF CARNEYS POINT

SALEM COUNTY

NAD 1983

N.J. State Plane Coordinate System

LAYTONS LAKE DRIVE

MATCH LINE B.L. STA. 45+50

PLAN SHEET NO. C-3

ROUTE 48

NJ ROUTE 48 ℄

S53°41'34.49"E

46 47 48 49

20' 24' 20'

12' 12' 9.5'

12' 10'

END PROJECT
ROUTE 48
℄ STA. 47+00.00

END FEDERAL PROJECT
NO. ----
ROUTE 48
℄ STA. 47+00.00
M.P. 3.21

N.J. TURNPIKE SOUTHBOUND

N.J. TURNPIKE NORTHBOUND

30' 20' 10' 0 30' 60'

C-4
C-4

NEW JERSEY DEPARTMENT OF TRANSPORTATION

# CONSTRUCTION PLANS

## ROUTE 48
## LAYTON LAKE DAM
## DRAINAGE IMPROVEMENTS

McCormick Taylor, Inc.
CERTIFICATION OF AUTHORIZATION NO. 24GA28044300

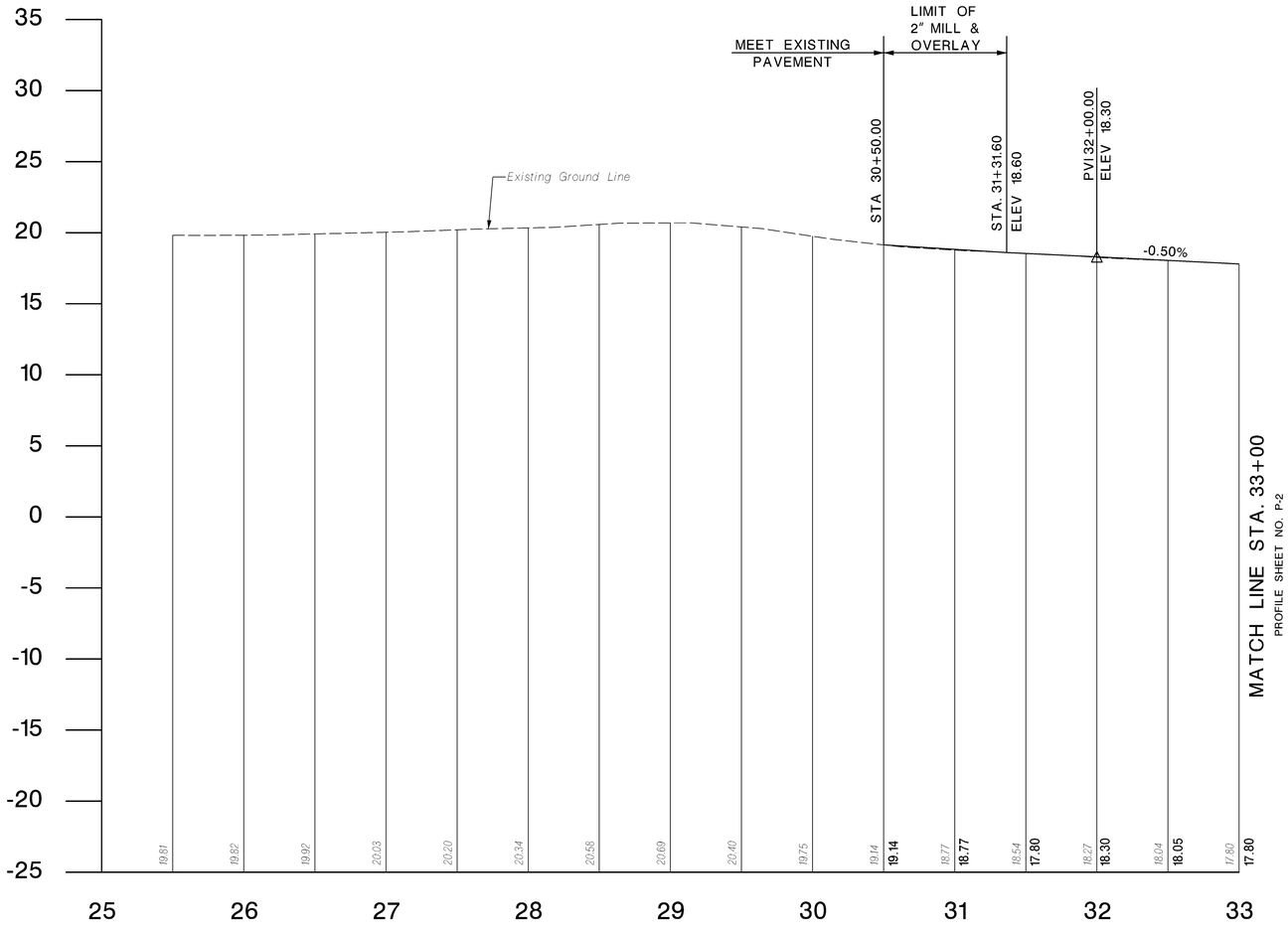
NABIL M. HOURANI
NEW JERSEY PROFESSIONAL ENGINEER LICENSE NO. 24GE3888900

| STATE | FEDERAL PROJECT NO. |
|---|---|
| N.J. | * |

McCormick Taylor
Engineers & Planners
Since 1946

FILE NAME: Z:\WTR\Projects\S227-09 (Rt 48 Layton Lake Dam)\CADD\Profiles\Profiles_REVISED 9-2011_2D.dgn
PEN TABLE: Z:\WTR\Projects\S227-09 (Rt 48 Layton Lake Dam)\CADD\Profiles\Rte48 Profile.tbl
REV. DATE: 1/19/2012
SCALE: 50.0000 ' / IN.

50' 0 50' 100'
5' 0 5' 10'




# ROUTE 48

DESIGN SPEED = 55 MPH

NOTE:
E=DIFFERENCE BETWEEN THE P.V.I. ELEVATION AND THE VERTICAL CURVE ELEVATION AT THE P.V.I. STATION.

P-1 / P-3

NEW JERSEY DEPARTMENT OF TRANSPORTATION

## PROFILES

**ROUTE 48**
**LAYTON LAKE DAM**
**DRAINAGE IMPROVEMENTS**

McCormick Taylor, Inc.
CERTIFICATION OF AUTHORIZATION NO. 24GA28044300

NABIL M. HOURANI
NEW JERSEY PROFESSIONAL ENGINEER LICENSE NO. 24GE3888900

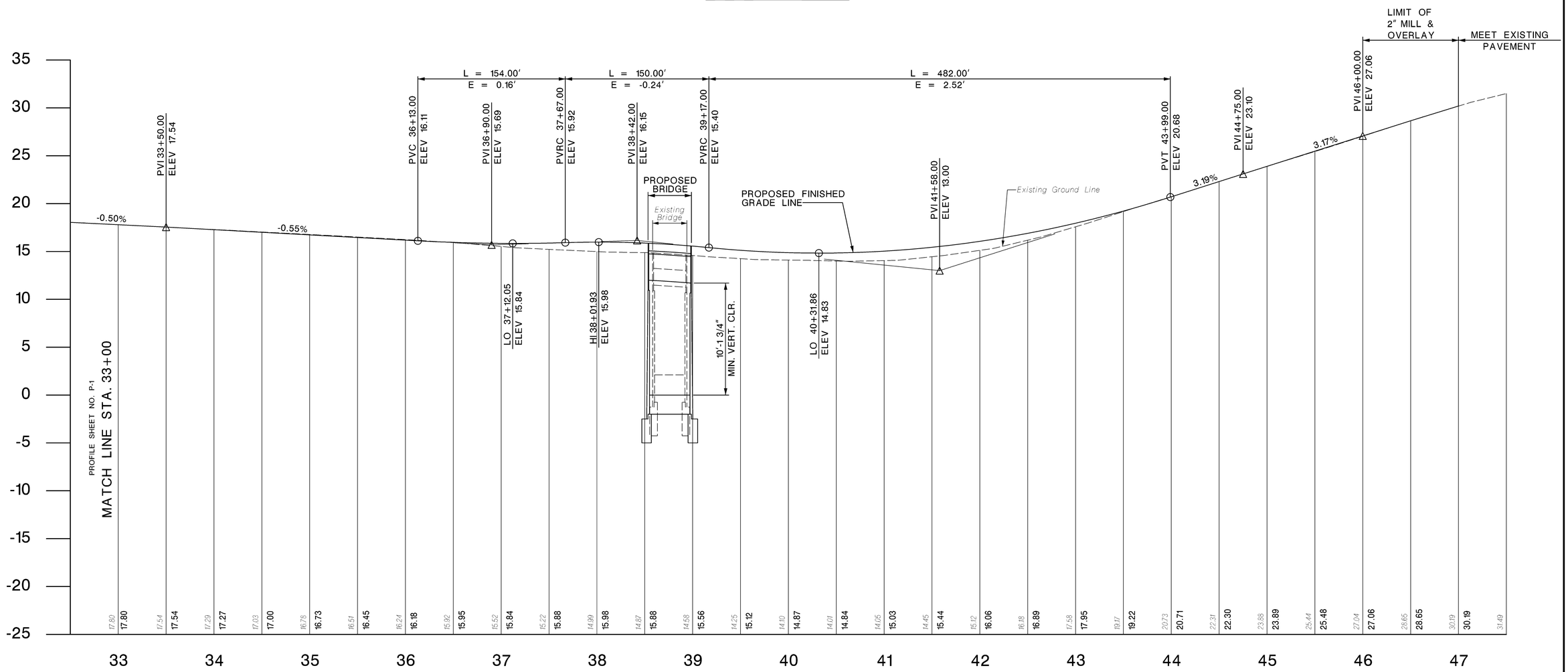
9
27

McCormick Taylor
Engineers & Planners
Since 1946

FILE NAME: Z:\WTR\Projects\S227-09 (Rt 48 Layton Lake Dam)\CADD\Profiles\Profiles_REVISED 9-2011_2D.dgn
PEN TABLE: Z:\WTR\Projects\S227-09 (Rt 48 Layton Lake Dam)\CADD\Profiles\Rte48 Profile.tbl
REV. DATE: 1/19/2012
SCALE: 50.0000 ' / IN.

| STATE | FEDERAL PROJECT NO. |
|---|---|
| N.J. | * |

50' 0 50' 100'
5' 0 5' 10'




# ROUTE 48

DESIGN SPEED = 55 MPH

NOTE:
E=DIFFERENCE BETWEEN THE P.V.I. ELEVATION AND THE VERTICAL CURVE ELEVATION AT THE P.V.I. STATION.

P-2 / P-3

NEW JERSEY DEPARTMENT OF TRANSPORTATION

## PROFILES

**ROUTE 48**
**LAYTON LAKE DAM**
**DRAINAGE IMPROVEMENTS**

McCormick Taylor, Inc.
CERTIFICATION OF AUTHORIZATION NO. 24GA28044300

NABIL M. HOURANI
NEW JERSEY PROFESSIONAL ENGINEER LICENSE NO. 24GE3888900

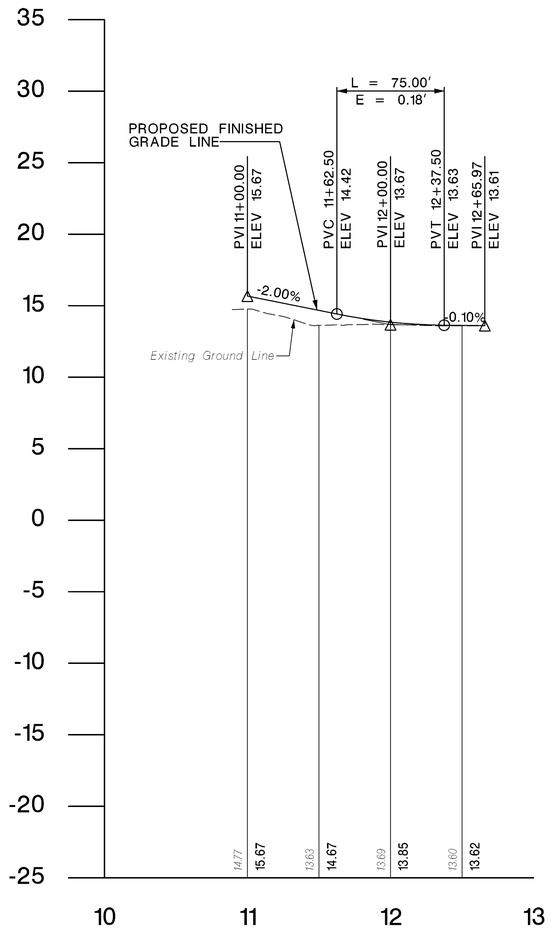
FILE NAME: Z:\WTR\Projects\S227-09 (Rt 48 Layton Lake Dam)\CADD\Profiles\Profiles_REVISED 9-2011_2D.dgn
PEN TABLE: Z:\WTR\Projects\S227-09 (Rt 48 Layton Lake Dam)\CADD\Profiles\Rte48 Profile.tbl
REV. DATE: 1/19/2012
SCALE: 50.0000 ' / IN.

McCormick Taylor
Engineers & Planners
Since 1946

50′ 0 50′ 100′

5′ 0 5′ 10′

| STATE | FEDERAL PROJECT NO. |
|---|---|
| N.J. | * |




# LAYTONS LAKE DRIVE

DESIGN SPEED = 25 MPH

NOTE:
E=DIFFERENCE BETWEEN THE P.V.I. ELEVATION AND THE VERTICAL CURVE ELEVATION AT THE P.V.I. STATION.

P-3
P-3

NEW JERSEY DEPARTMENT OF TRANSPORTATION

## PROFILES

**ROUTE 48**
**LAYTON LAKE DAM**
**DRAINAGE IMPROVEMENTS**

McCormick Taylor, Inc.
CERTIFICATION OF AUTHORIZATION NO. 24GA28044300

NABIL M. HOURANI
NEW JERSEY PROFESSIONAL ENGINEER LICENSE NO. 24GE3888900

11
27

| STATE | FEDERAL PROJECT NO. |
|---|---|
| N.J. | * |

McCormick Taylor
Engineers & Planners
Since 1946

FILE NAME: $FILE$
PEN TABLE: $PENTBL$
REV. DATE: $DATE$
SCALE: $SCALE$

## LEGEND

- TYPE III BREAKAWAY BARRICADES
- TYPE III BREAKAWAY BARRICADES WITH SIGN (LIGHT STOCK SIGN)
- CONSTRUCTION SIGNS
- DRUMS
- CONE
- PRECAST CONCRETE CURB CONSTRUCTION BARRIER,TYPE 4
- DIRECTION OF TRAFFIC FLOW
- TRAFFIC DIRECTOR, FLAGGER
- TRAILER MOUNTED ARROW BOARD SHOWING CAUTION MODE
- ILLUMINATED FLASHING ARROW MOUNTED ON TOWING VEHICLE SHOWING ARROW PATTERN (Left, Right, Both)
  LEFT RIGHT BOTH
- TRAFFIC CONTROL TRUCK WITH MOUNTED CRASH CUSHION AND ARROW BOARD SHOWING CAUTION MODE
- TRAFFIC CONTROL TRUCK WITH MOUNTED CRASH CUSHION AND ARROW BOARD SHOWING ARROW PATTERN (Left, Right, Both)
  LEFT RIGHT BOTH
- TEMPORARY CRASH CUSHION, INERTIAL BARRIER SYSTEM, 14 MODULES, 60 MPH DESIGN
- WORK AREA
- BUFFER ZONE
- TEMPORARY PAVEMENT
- PAINT STRIPING TRUCK OR OTHER OPERATING VEHICLE

## GENERAL NOTES:

1. ADVANCE WARNING SIGNS DISTANCES, AND TAPER LENGTHS MAY BE EXTENDED, AT DIRECTION OF THE DEPARTMENT, TO ADJUST FOR REDUCED VISIBILITY DUE TO HORIZONTAL AND VERTICAL CURVATURE OF THE ROADWAY.

2. THE APPROXIMATE LOCATIONS OF THE ILLUMINATED FLASHING ARROW BOARDS ARE SHOWN ON THE TRAFFIC CONTROL PLANS. THESE LOCATIONS MAY BE MODIFIED AS APPROVED BY RE TO ADJUST FOR VISIBILITY DUE TO HORIZONTAL OR VERTICAL CURVATURE OF THE ROADWAY OR TO POSITION AT A SAFER LOCATION. ILLUMINATED FLASHING ARROW BOARDS ARE TO BE USED FOR TEMPORARY LANE CLOSINGS AND AT LOCATIONS SHOWN ON THE TRAFFIC CONTROL PLANS.

3. PRIOR TO ANY ROAD CONSTRUCTION, TRAFFIC CONTROL SIGNS AND DEVICES SHALL BE IN PLACE.

4. RAMPS AND/OR SIDE STREETS ENTERING THE ROADWAY AFTER THE FIRST ADVANCE WARNING SIGN SHALL BE PROVIDED WITH AT LEAST ONE W20-IF SIGN (ROAD WORK AHEAD) AS A MINIMUM.

5. ALL EXISTING ROAD SIGNS, PAVEMENT MARKINGS AND/OR PLOWABLE PAVEMENT REFLECTORS WHICH CONFLICT WITH THE PROPOSED TRAFFIC CONTROL PLAN SHALL BE COVERED, REMOVED OR RELOCATED AS DIRECTED BY THE RE.

6. CONFLICTING OR NON-OPERATING SIGNAL INDICATIONS ON EITHER THE EXISTING, TEMPORARY,OR PROPOSED TRAFFIC SIGNAL SYSTEMS SHALL BE BAGGED OR COVERED.

7. MAINTENANCE AND PROTECTION OF TRAFFIC SHALL BE IN ACCORDANCE WITH THE MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES - PART VI "STANDARDS AND GUIDES FOR TRAFFIC CONTROL FOR STREET AND HIGHWAY CONSTRUCTION, MAINTENANCE, UTILITY, AND INCIDENT MANAGEMENT OPERATIONS", UNLESS OTHERWISE NOTED IN THE PLANS AND SPECIFICATIONS.

8. CONSTRUCTION SIGN W99-2 (GIVE US A BRAKE) SHALL BE LOCATED 200 FEET IN ADVANCE OF PROJECT LIMITS.

9. A W1-6 (ARROW) SIGN MOUNTED ON A BREAKAWAY BARRICADE AND CENTERED ON THE CLOSED WIDTH SHALL BE LOCATED 100 FEET BEYOND EACH INTERSECTION OR MAIN ACCESS POINT WITHIN THE AREA OF A LANE OR SHOULDER CLOSURE.

10. CONSTRUCTION SIGNS R11-4 (ROAD CLOSED TO THRU TRAFFIC) SHALL BE PLACED AT THE INTERSECTING STREETS WHICH ARE CLOSED TO TRAFFIC BECAUSE OF CONSTRUCTION.

11. CONSTRUCTION SIGNS W8-9A (SYMBOL FOR UNEVEN PAVEMENT) AND W8-14A (GROOVED PAVEMENT) SHALL BE USED WHEN SUCH PAVEMENT CONDITIONS EXIST. THE PLACEMENT OF THESE SIGNS SHALL BE AS DIRECTED BY THE RE.

12. MOVING WORK AREAS IN A LANE CLOSURE REQUIRE A TRAILER MOUNTED ILLUMINATED FLASHING ARROW TO REMAIN AT THE END OF THE TAPER, THE TRAFFIC CONTROL TRUCK WITH MOUNTED CRASH CUSHION THAT SHALL MOVE WITH THE WORK AREAS TO KEEP A 70 FEET MIN. AND 150 FEET MAX. BUFFER IN ADVANCE OF EACH WORK AREA.

13. THE CONTRACTOR SHALL SUBMIT A PLAN FOR THE SAFE ACCESS OF CONSTRUCTION VEHICLES THROUGHOUT THE WORK SITE WHERE SPACE CONSTRAINTS PREVENT THE USE OF LANE CLOSURES. THE PLAN SHALL BE SUBMITTED TO THE RE IN ACCORDANCE WITH THE STANDARD SPECIFICATIONS.

14. TRAFFIC SAFETY SERVICES SHALL BE USED IN ACCORDANCE WITH THE STANDARD SPECIFICATIONS FOR TRAFFIC CONTROL.

15. ALL EXCAVATED AREAS WITHIN OR ADJACENT TO THE ROADWAY SHALL BE BACKFILLED AND PLACED ON AT LEAST 6H : 1V SLOPE BEFORE THE END OF EACH WORK DAY. OTHER EXCAVATED AREA WITHIN THE CLEAR ZONE SHALL BE BACKFILLED.

16. WHERE REQUIRED, THE CONTRACTOR SHALL MAKE PROVISIONS FOR MAINTAINING PEDESTRIAN CROSSING LOCATIONS AND TYPE AS DIRECTED BY THE RE.

17. BITUMINOUS CONCRETE PLACED DURING THE VARIOUS CONSTRUCTION STAGES SHALL BE TRANSITIONED ON A MINIMUM 20H : 1V SLOPE TO MEET THE ADJACENT EXISTING GRADE AT THE LONGITUDINAL AND TRANSVERSE LIMITS OF THE STAGE CONSTRUCTION AREAS UNLESS OTHERWISE NOTED ON THE STAGE CONSTRUCTION PLANS.

18. THE PLACEMENT AND OR RELOCATION OF PRECAST CONCRETE CURB, CONSTRUCTION BARRIER SHALL BE DONE DURING APPROVED OFF-PEAK HOURS WHEN TRAFFIC MAY BE REDUCED TO ONE LANE IN EACH DIRECTION.

19. CONSTRUCTION ZONE SPEED LIMIT WILL BE DETERMINED BY THE TRAFFIC SIGNAL & SAFETY ENGINEERING, REGIONAL TRAFFIC ENGINEER - WORK ZONE, AT THE TIME OF OR DURING CONSTRUCTION, AS REQUESTED BY THE R.E..

20. THE SPEED LIMIT, R2-1 (BLACK ON WHITE) WITH ADDED WORK ZONE PLATE (BLACK ON ORANGE) SIGNS SHALL BE LOCATED THROUGH WORK AREAS AS DIRECTED BY THE TRAFFIC SIGNAL & SAFETY ENGINEERING REGIONAL TRAFFIC ENGINEER - WORK ZONE.

21. THE REDUCED SPEED AHEAD SIGN, W3-5(S) (BLACK ON ORANGE) SHALL BE LOCATED IN ADVANCE OF SPEED LIMIT R2-1 SIGNS WHICH REDUCE THE NORMAL POSTED SPEED LIMIT THROUGH THE CONSTRUCTION ZONE.

22. TRAFFIC FINES DOUBLED IN WORK AREA R(NJ)5-17(S) , 4 FEET BY 2.5 FEET SIGN SHALL BE LOCATED 500 FEET AFTER THE FIRST ADVANCE WARNING SIGN, (W20 SERIES) AT EACH WORK AREA LOCATED WITHIN URBAN AREAS. THIS SIGN SHALL ALSO BE USED ON PROJECTS REQUIRING MOVING OPERATIONS IN WHICH CASE THE SIGN SHALL BE MOUNTED ON A SLOW MOVING CONSTRUCTION VEHICLE.

23. THE FINAL HMA SURFACE PAVEMENT SHALL NOT BE CONSTRUCTED UNTIL THE FINAL STAGE OF THE PROJECT UNLESS OTHERWWISE DIRECTED BY THE RE OR INDICATED ON THE PLANS. MANHOLES AND INLETS SHALL BE SET TO FINISHED GRADE AND TEMPORARY PAVEMENT RAMPS ARE TO BE CONSTRUCTED AROUND THEM WITH A MINIMUM 20H : 1V SLOPE IN ALL DIRECTIONS USING HOT MIX ASPHALT PAVEMENT. THIS TEMPORARY MATERIAL WILL BE REMOVED IMMEDIATELY PRIOR TO PLACING THE SURFACE COURSE.

24. TRAFFIC CONTROL DEVICES FOR LANE CLOSURES INCLUDING SIGNS, CONES, BARRICADES, ETC. SHALL BE PLACED AS SHOWN ON PLANS. SIGNS SHALL NOT BE PLACED WITHOUT ACTUAL LANE CLOSURES AND SHALL BE IMMEDIATELY REMOVED UPON REMOVAL OF THE CLOSURES.

25. CONES MAY BE SUBSTITUTED FOR DRUMS AND INSTALLED UPON THE APPROVAL OF THE RE.

26. TRAFFIC IMPACT NOTICES AND CHANGES

A. TERMS:
WHEN THE FOLLOWING TERMS ARE USED, THE INTENT AND MEANING SHALL BE AS FOLLOWS:

i. IMPACTS TO NORMAL TRAFFIC FLOW - WORK THAT REQUIRES A PORTION OF THE PAVED ROADWAY BEING BLOCKED OR CLOSED WITH SAFETY DEVICES OR VEHICLES, INCLUDING, BUT NOT LIMITED TO, FULL OR PARTIAL LANE CLOSURES, FULL OR PARTIAL RAMP CLOSURES, SHOULDER CLOSURES, MOVING OPERATIONS SUCH AS TRAFFIC STRIPING OR SWEEPING, LANE SHIFTS, OR ALTERNATING TRAFFIC. THIS APPLIES EVEN WHEN DETOURS ARE PROVIDED.

ii. TEMPORARY LANE CLOSURES - WORK DESCRIBED UNDER "IMPACTS TO NORMAL TRAFFIC FLOW" WHICH IS ROUTINELY SET UP AND REMOVED ON A DAILY BASIS.

iii. PERMANENT LANE CLOSURES - WORK DESCRIBED UNDER "IMPACTS TO NORMAL TRAFFIC FLOW" WHICH REMAINS IN PLACE CONTINUOUSLY FOR 24 HOURS OR MORE.

B. ADVANCE NOTICES

FOR THE INITIAL START OF WORK THAT REQUIRES "IMPACTS TO NORMAL TRAFFIC FLOW", THE CONTRACTOR SHALL NOTIFY THE RE IN WRITING, ON THE ADVANCE FORM TO-103 PROVIDED BY THE DEPARTMENT, OF THE PROPOSED DATE. THE NOTICE SHALL BE SUBMITTED AT LEAST TWENTY-EIGHT (28) CALENDAR DAYS, BUT NOT MORE THAN SIXTY (60) CALENDAR DAYS, BEFORE THE PROPOSED DATE. START OF WORK THAT IMPACTS NORMAL TRAFFIC FLOW WILL NOT BE PERMITTED PRIOR TO THE DATE STATED IN THE NOTICE. THE CONTRACTOR SHALL CONFIRM, IN WRITING TO THE RESIDENT ENGINEER (RE), THE PROPOSED DATE SEVEN (7) (AND/OR FOURTEEN) CALENDAR DAYS BEFORE STARTING THE ESTABLISHMENT OF THE TRAFFIC CONTROL MEASURES FOR THE TRAFFIC IMPACT. THE CONTRACTOR SHALL IMMEDIATELY NOTIFY THE RE IF THE PROPOSED ESTABLISHMENT CAN NOT BE COMPLETED ON THE PROPOSED DATE.

FOR A "PERMANENT LANE CLOSURE", THE CONTRACTOR SHALL NOTIFY THE RE IN WRITING, ON ADVANCE FORM TO-103, OF THE PROPOSED DATE A NEW TRAFFIC PATTERN WILL BE ESTABLISHED. THE NOTICE SHALL BE SUBMITTED AT LEAST TWENTY-EIGHT CALENDAR DAYS, BUT NOT MORE THAN SIXTY CALENDAR DAYS, IN ADVANCE OF THE PROPOSED DATE. START OF A NEW TRAFFIC PATTERN WILL NOT BE PERMITTED PRIOR TO THE DATE STATED IN THE NOTICE. THE CONTRACTOR SHALL CONFIRM, IN WRITING TO THE RE, THE PROPOSED DATE OF THE NEW TRAFFIC PATTERN SEVEN (AND/OR FOURTEEN) DAYS BEFORE STARTING TRAFFIC CONTROL MEASURES FOR THE ESTABLISHMENT OF THE NEW PATTERN. THE CONTRACTOR SHALL IMMEDIATELY NOTIFY THE RE IF THE PROPOSED ESTABLISHMENT CAN NOT BE COMPLETED ON THE PROPOSED DATE.

STARTING THE ESTABLISHMENT OF A NEW PERMANENT TRAFFIC PATTERN SHALL BEGIN NO EARLIER THAN 11:00 PM FRIDAY AND SHALL BE COMPLETED AND READY FOR OPERATIONS BY 6:00 PM THE FOLLOWING SUNDAY. THE ESTABLISHMENT SHALL BE COMPLETED IN ACCORDANCE WITH THE LANE CLOSURE HOURS SPECIFIED IN THE CONTRACT.

ADVANCE NOTICES SENT PRIOR TO THE PRE-CONSTRUCTION MEETING SHALL BE ADDRESSED TO THE CONTACT PERSON AS SPECIFIED IN SUBSECTION 101.04 OF THE SPECIAL PROVISIONS.

C. PROGRESS NOTICES

ALL "IMPACTS TO NORMAL TRAFFIC FLOW" SCHEDULED FOR THE SEVEN DAY PERIOD STARTING ON THE FOLLOWING MONDAY SHALL BE SUBMITTED TO THE RE BY 9:00 AM OF EACH FRIDAY ON WEEKLY FORM TO-101 PROVIDED BY THE DEPARTMENT.

EACH DAY OF "TEMPORARY LANE CLOSURES" SHALL BE SUBMITTED TO THE RE BY 9:00 AM THE DAY IN ADVANCE OF THE START OF THOSE OPERATIONS ON DAILY FORM TO-102 PROVIDED BY THE DEPARTMENT.

"TEMPORARY LANE CLOSURES" FOR WEEKENDS SHALL BE SUBMITTED TO THE RE BY 9:00 AM ON THE MMEDIATELY PRECEDING FRIDAY ON THE DAILY FORM TO-102 PROVIDED BY THE DEPARTMENT.

D. CHANGES TO THE SCHEDULED CLOSURES
REQUEST FOR A CHANGE TO THE TRAFFIC CONTROL REQUIREMENTS IN THE CONTRACT DOCUMENTS SHALL BE SUBMITTED IN WRITING TO THE RE AS FOLLOWS:

CHANGES TO THE SCHEDULED HOURS FOR "TEMPORARY LANE CLOSURES" SHALL BE SUBMITTED TO THE R.E. AT LEAST EIGHT CALENDAR DAYS IN ADVANCE OF WHEN THE CHANGE IS PROPOSED TO START.

OTHER PROPOSED CHANGES TO "TEMPORARY LANE CLOSURES" AND ALL CHANGES TO "PERMANENT LANE CLOSURES" SHALL BE SUBMITTED TO THE RE AS SPECIFIED IN THE SPECIFICATIONS.

30′ 20′ 10′ 0 30′ 60′

TCP-1
TCP-5

NEW JERSEY DEPARTMENT OF TRANSPORTATION

# TRAFFIC CONTROL PLANS

## ROUTE 48
## LAYTON LAKE DAM
## DRAINAGE IMPROVEMENTS

McCormick Taylor, Inc.
CERTIFICATION OF AUTHORIZATION NO. 24GA28044300

NABIL M. HOURANI
NEW JERSEY PROFESSIONAL ENGINEER LICENSE NO. 24GE3888900

12
27

McCormick Taylor
Engineers & Planners
Since 1946
FILE NAME: Z:\WTRP\projects\5227-09 (Rt 48 Layton Lake Dam)\CADD\Traffic Control\TCP_PLAN_STAGE1.dgn
PEN TABLE: Z:\WTRP\projects\5227-09 (Rt 48 Layton Lake Dam)\CADD\Traffic Control\TCP_Pen.tbl
REV. DATE: 1/02/2012
SCALE: 99.9999 = 1IN.

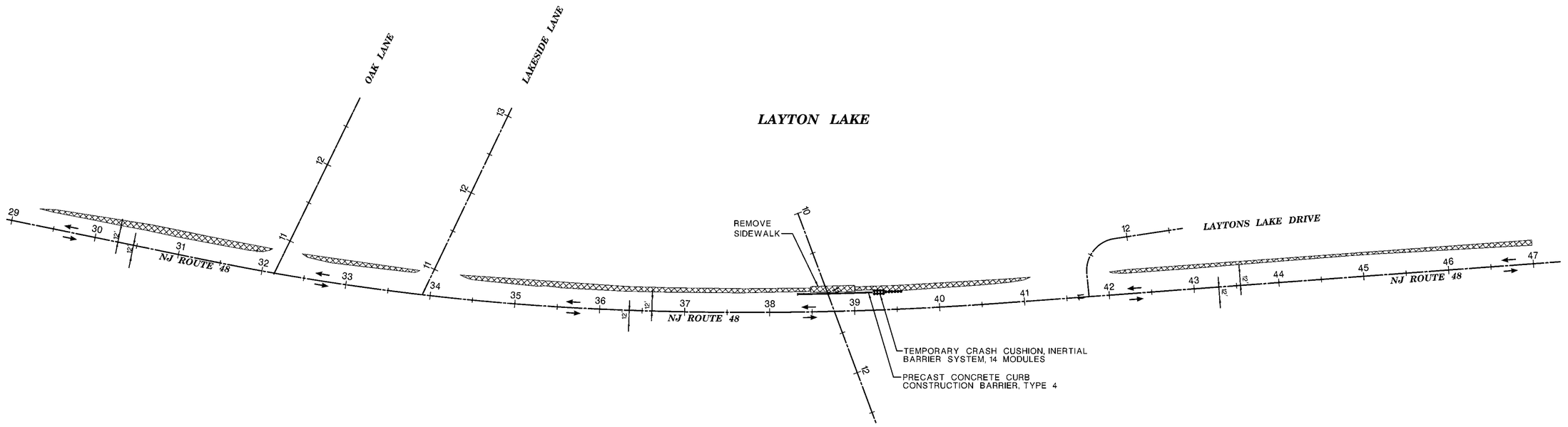
| STATE | FEDERAL PROJECT NO. |
|---|---|
| N.J. | * |

TOWNSHIP OF CARNEYS POINT

SALEM COUNTY

## STAGE 1 SEQUENCE

1. REMOVE SIDEWALK ON LEFT SIDE OF BRIDGE.
2. INSTALL TEMPORARY PAVEMENT ON LEFT SIDE OF ROUTE 48.




# STAGE 1

30′ 20′ 10′ 0 30′ 60′

TCP-2 / TCP-5

NEW JERSEY DEPARTMENT OF TRANSPORTATION

## TRAFFIC CONTROL PLANS

### ROUTE 48
### LAYTON LAKE DAM
### DRAINAGE IMPROVEMENTS

McCormick Taylor, Inc.
CERTIFICATION OF AUTHORIZATION NO. 24GA28044300

NABIL M. HOURANI
NEW JERSEY PROFESSIONAL ENGINEER LICENSE NO. 24GE3888900

13
27

McCormick Taylor
Engineers & Planners
Since 1946
FILE NAME: Z:\MTRP\projects\5227-09 (Rt 48 Layton Lake Dam)\CADD\Traffic Control\TCP_PLAN_STAGE2.dgn
PEN TABLE: Z:\MTRP\projects\5227-09 (Rt 48 Layton Lake Dam)\CADD\Traffic Control\TCP_Plan.tbl
REV. DATE: 1/20/2012
SCALE: 60.0000 ' / IN.

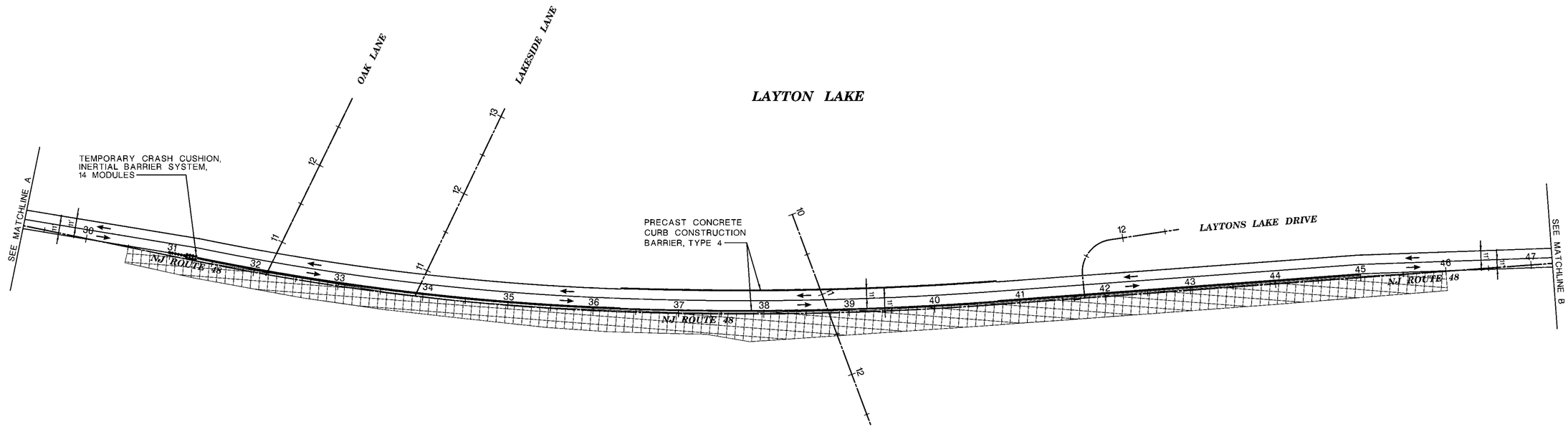
| STATE | FEDERAL PROJECT NO. |
|---|---|
| N.J. | * |

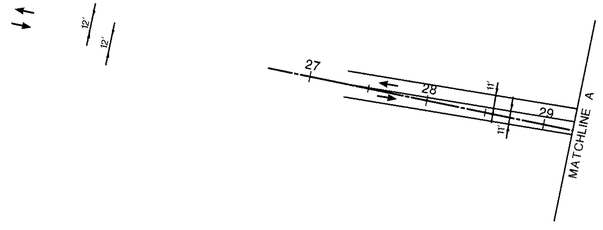
TOWNSHIP OF CARNEYS POINT

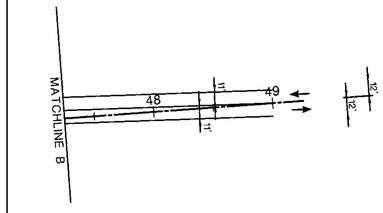
SALEM COUNTY

## STAGE 2 SEQUENCE

1. SHIFT TRAFFIC TO THE LEFT SIDE OF ROUTE 48 UTILIZING THE TEMPORARY PAVEMENT.
2. DEMOLISH RIGHT SIDE OF ROUTE 48 BRIDGE OVER LAYTON LAKE.
3. CONSTRUCT RIGHT SIDE OF ROUTE 48 BRIDGE AND PAVEMENT WITH THE EXCEPTION OF THE BRIDGE SIDEWALK.
4. INSTALL TEMPORARY PAVEMENT ON RIGHT SIDE OF ROUTE 48.




# STAGE 2

30' 20' 10' 0 30' 60'

TCP-3 / TCP-5

NEW JERSEY DEPARTMENT OF TRANSPORTATION

## TRAFFIC CONTROL PLANS

### ROUTE 48
### LAYTON LAKE DAM
### DRAINAGE IMPROVEMENTS

McCormick Taylor, Inc.
CERTIFICATION OF AUTHORIZATION NO. 24GA28044300

NABIL M. HOURANI
NEW JERSEY PROFESSIONAL ENGINEER LICENSE NO. 24GE3888900

14
27

McCormick Taylor
Engineers & Planners
Since 1946

FILE NAME: Z:\WTRP\projects\5227-09 (Rt 48 Layton Lake Dam)\CADD\Traffic Control\TCP PLAN, STAGE3.dgn
PEN TABLE: Z:\WTRP\projects\5227-09 (Rt 48 Layton Lake Dam)\CADD\Traffic Control\TCP_Plan.tbl
REV. DATE: 1/20/2012
SCALE: 60.0000 ' / IN.

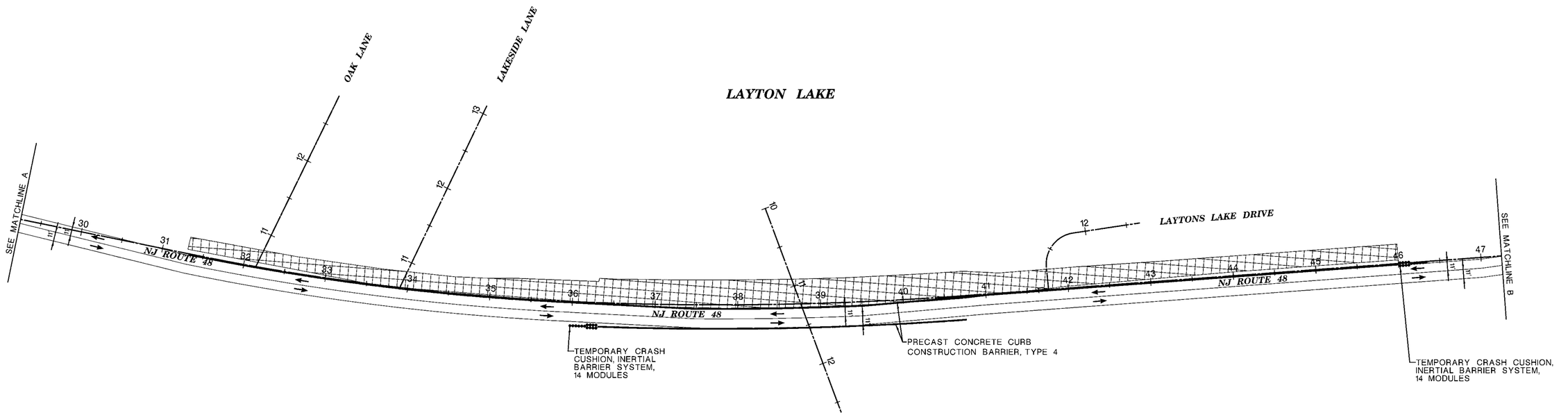
| STATE | FEDERAL PROJECT NO. |
|---|---|
| N.J. | * |

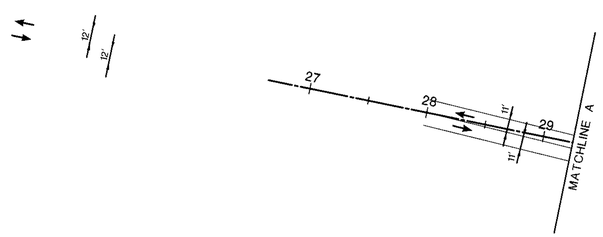
TOWNSHIP OF CARNEYS POINT

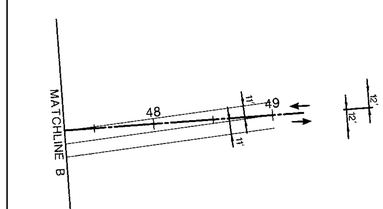
SALEM COUNTY

## STAGE 3 SEQUENCE

1. SHIFT TRAFFIC TO THE RIGHT SIDE OF NEWLY CONSTRUCTED ROUTE 48.
2. DEMOLISH REMAINING SECTION ROUTE 48 BRIDGE OVER LAYTON LAKE.
3. CONSTRUCT LEFT SIDE OF ROUTE 48 BRIDGE AND PAVEMENT.




# STAGE 3

30' 20' 10' 0 30' 60'

TCP-4
TCP-5

NEW JERSEY DEPARTMENT OF TRANSPORTATION

## TRAFFIC CONTROL PLANS

### ROUTE 48
### LAYTON LAKE DAM
### DRAINAGE IMPROVEMENTS

McCormick Taylor, Inc.
CERTIFICATION OF AUTHORIZATION NO. 24GA28044300

NABIL M. HOURANI
NEW JERSEY PROFESSIONAL ENGINEER LICENSE NO. 24GE3888900

15
27

McCormick Taylor
Engineers & Planners
Since 1946
FILE NAME: Z:\MTRP\Projects\5227-09 (Rt 48 Layton Lake Dam)\CADD\Traffic Control\TCP_PLAN_STAGE4.dgn
PEN TABLE: Z:\MTRP\Projects\5227-09 (Rt 48 Layton Lake Dam)\CADD\Traffic Control\TCP_Plan.tbl
REV. DATE: 1/20/2012
SCALE: 60.0000 ' / IN.

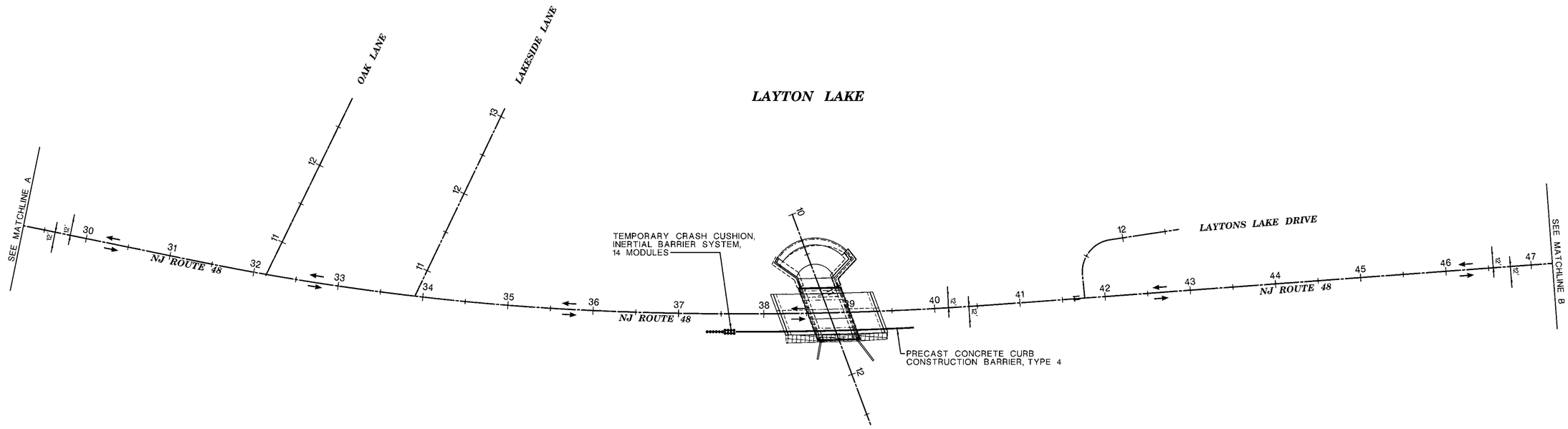
| STATE | FEDERAL PROJECT NO. |
|---|---|
| N.J. | * |

TOWNSHIP OF CARNEYS POINT

SALEM COUNTY

## STAGE 4 SEQUENCE

1. CONSTRUCT THE RIGHT SIDE OF THE ROUTE 48 BRIDGE SIDEWALK.
2. REMOVE TEMPORARY PAVEMENT ON RIGHT SIDE OF ROUTE 48.




# STAGE 4

30' 20' 10' 0 30' 60'

TCP-5
TCP-5

NEW JERSEY DEPARTMENT OF TRANSPORTATION

## TRAFFIC CONTROL PLANS

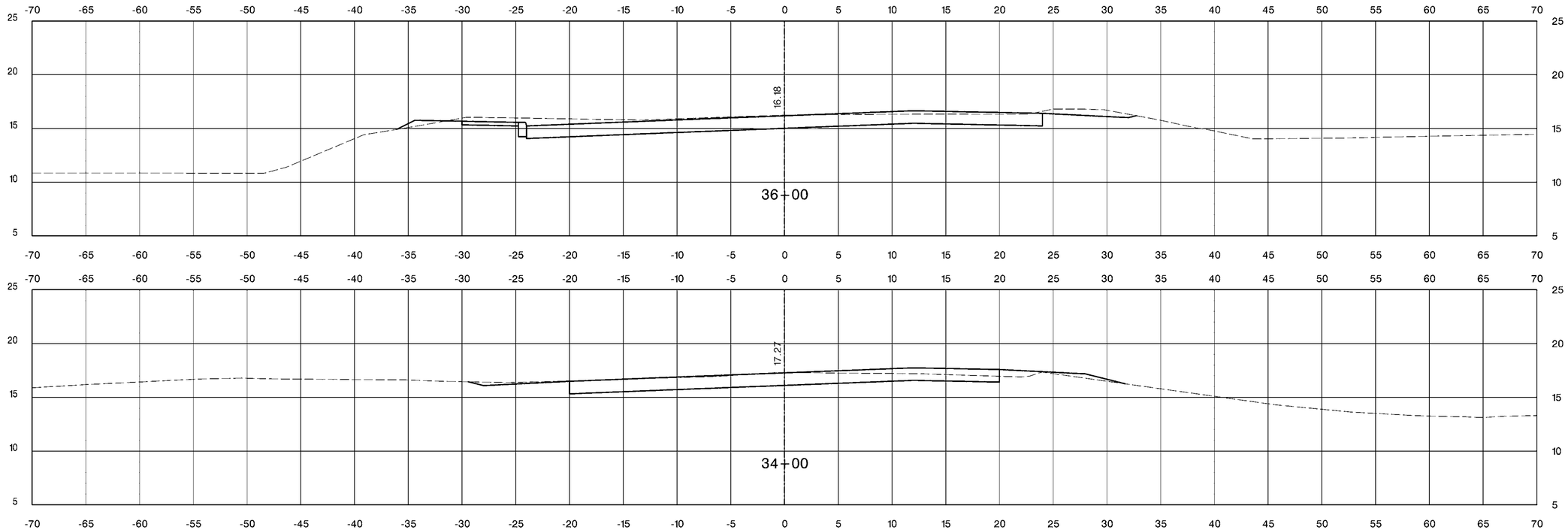
### ROUTE 48
### LAYTON LAKE DAM
### DRAINAGE IMPROVEMENTS

McCormick Taylor, Inc.
CERTIFICATION OF AUTHORIZATION NO. 24GA28044300

NABIL M. HOURANI
NEW JERSEY PROFESSIONAL ENGINEER LICENSE NO. 24GE3888900

16
27

| STATE | FEDERAL PROJECT NO. |
|---|---|
| N.J. | X |




## NOTES

ALL CROSS-SECTIONS ARE RADIAL OR T RIGHT ANGLES TO THE BASELINES EXCEPT WHERE OTHER METHODS ARE INDICATED.

EXCAVATION AND EMBANKMENT QUANTITIES SHOWN ON THE CROSS-SECTIONS ARE MEASURED BETWEEN THE DASHED LINES REPRESENTING THE SUURFACE OF THE EXISTING GROUND AND THE SOLID LINES REPRESENTING THE LIMITS OF EXCAVATION OR EMBANKMENT. WHERE TOPSOIL IS PROPOSED, THE SOLID LINES INDICATE THE BOTTOM OF PROPOSED TOPSOIL.

THE PROPOSED GRADES SHOWN ON THE CROSS-SECTOIONS ARE FOR ESTIMATING QUANTITIES.

ROUTE 48 ℄ STA. 34+00.00 and 36+00.00 X-1 / X-3

NEW JERSEY DEPARTMENT OF TRANSPORTATION

# CRITICAL CROSS SECTIONS

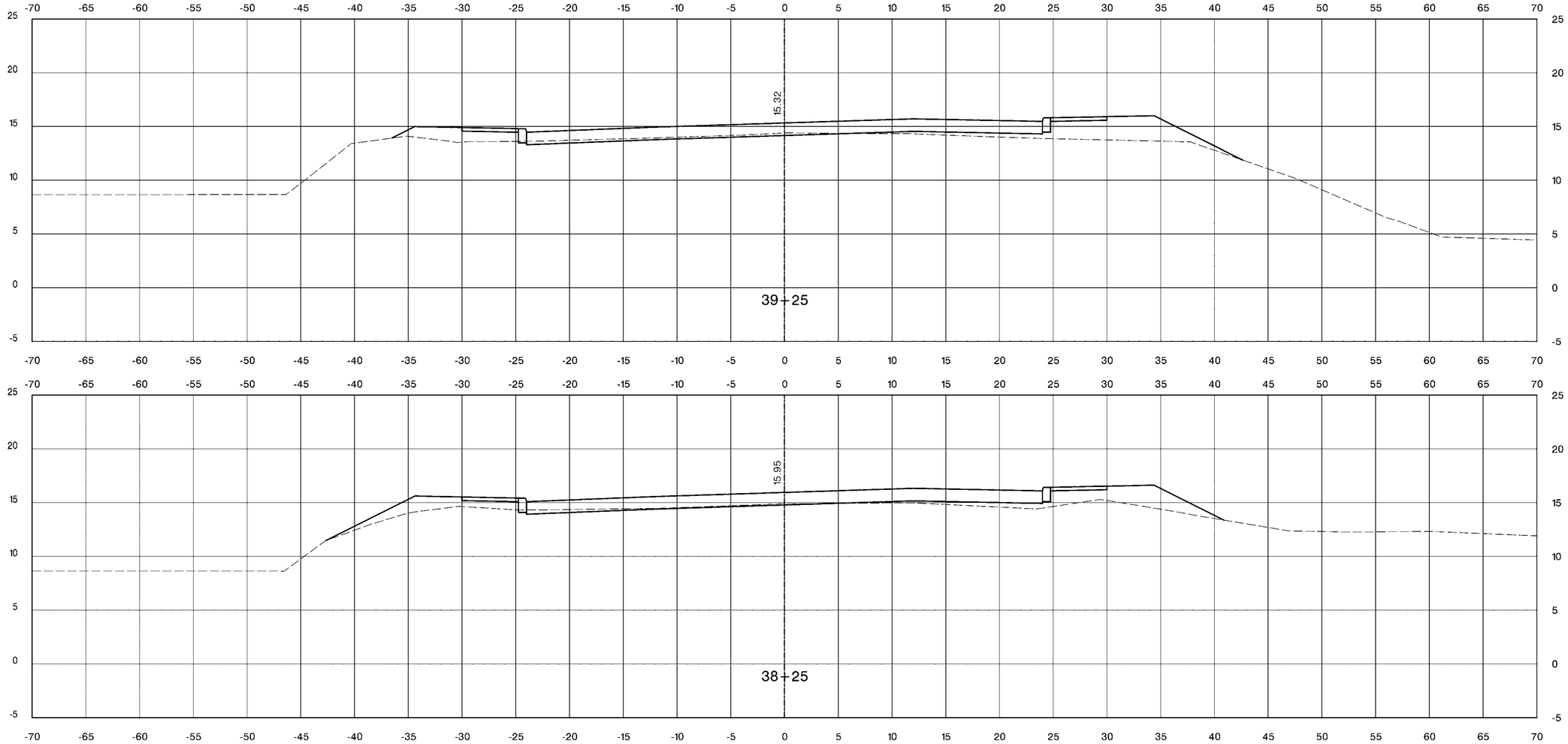
## ROUTE 48
## LAYTON LAKE DAM
## DRAINAGE IMPROVEMENTS

McCormick Taylor, Inc.
CERTIFICATION OF AUTHORIZATION NO. 24GA28044300
DATE:
NABIL M. HOURANI
NEW JERSEY PROFESSIONAL ENGINEER LICENSE NO. 24GE3888900

17
27

REVISION DATE:
SCALE:1"=5'
AUTHOR:
McCORMICK TAYLOR, INC.
SHEET TITLE: TYPICAL SECTIONS 01
FILE NAME:X:\295 Final Design\Preliminary\Design\TypSections\TS01.dgn

| STATE | FEDERAL PROJECT NO. |
|---|---|
| N.J. | X |




ROUTE 48 ℄ STA. 38+25.00 AND 39+25.00 X-2 / X-3

NEW JERSEY DEPARTMENT OF TRANSPORTATION

# CRITICAL CROSS SECTIONS

## ROUTE 48
## LAYTON LAKE DAM
## DRAINAGE IMPROVEMENTS

McCormick Taylor, Inc.

CERTIFICATION OF AUTHORIZATION NO. 24GA28044300

DATE:

NABIL M. HOURANI

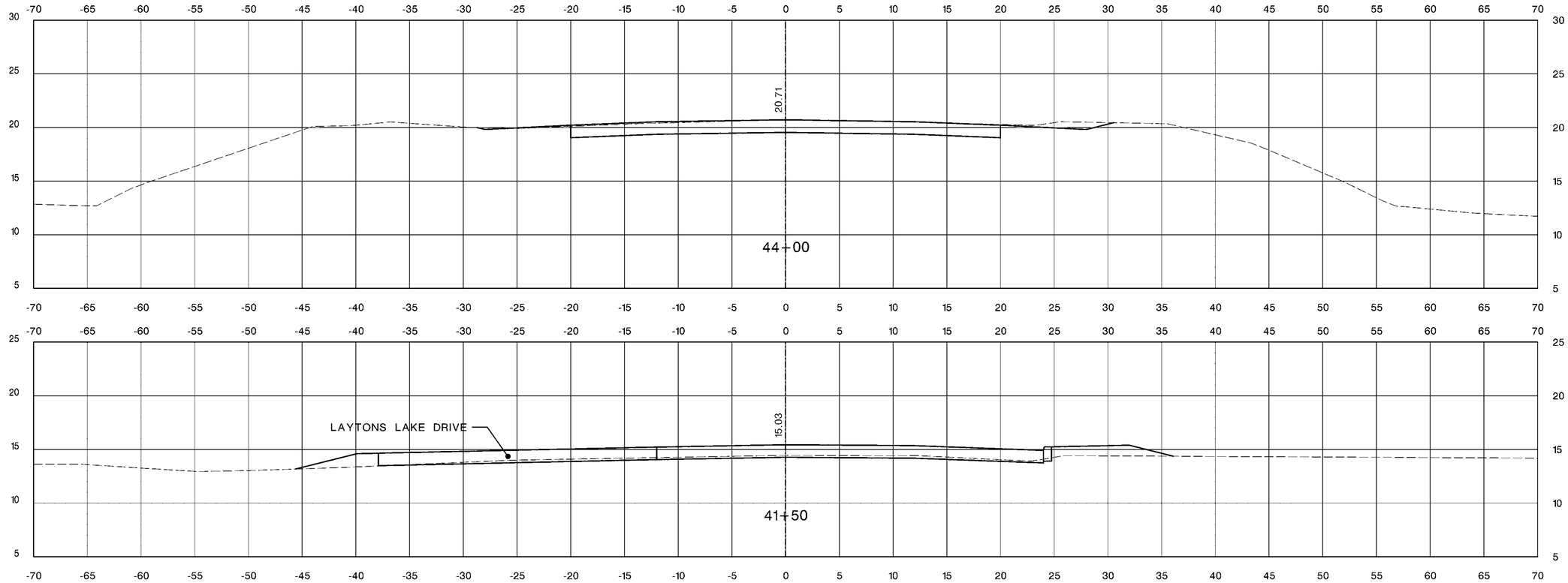
NEW JERSEY PROFESSIONAL ENGINEER LICENSE NO. 24GE3888900

18
27

REVISION DATE:
SCALE: 1"=5'
AUTHOR:

McCORMICK TAYLOR, INC.
SHEET TITLE: TYPICAL SECTIONS 01
FILE NAME: X:\295 Final Design\Preliminary\Design\TypSections\TS01.dgn

| STATE | FEDERAL PROJECT NO. |
|---|---|
| N.J. | X |




REVISION DATE:
SCALE:1"=5'
AUTHOR:

McCORMICK TAYLOR,INC.
SHEET TITLE: TYPICAL SECTIONS 01
FILE NAME:X:\295 Final Design\Preliminary\Design\TypSections\TS-01.dgn

ROUTE 48 ℄ STA. 41+50.00 AND 44+00.00 | X-3 / X-3

NEW JERSEY DEPARTMENT OF TRANSPORTATION

# CRITICAL CROSS SECTIONS

## ROUTE 48
## LAYTON LAKE DAM
## DRAINAGE IMPROVEMENTS

McCormick Taylor, Inc.

CERTIFICATION OF AUTHORIZATION NO. 24GA28044300

DATE:

NABIL M. HOURANI

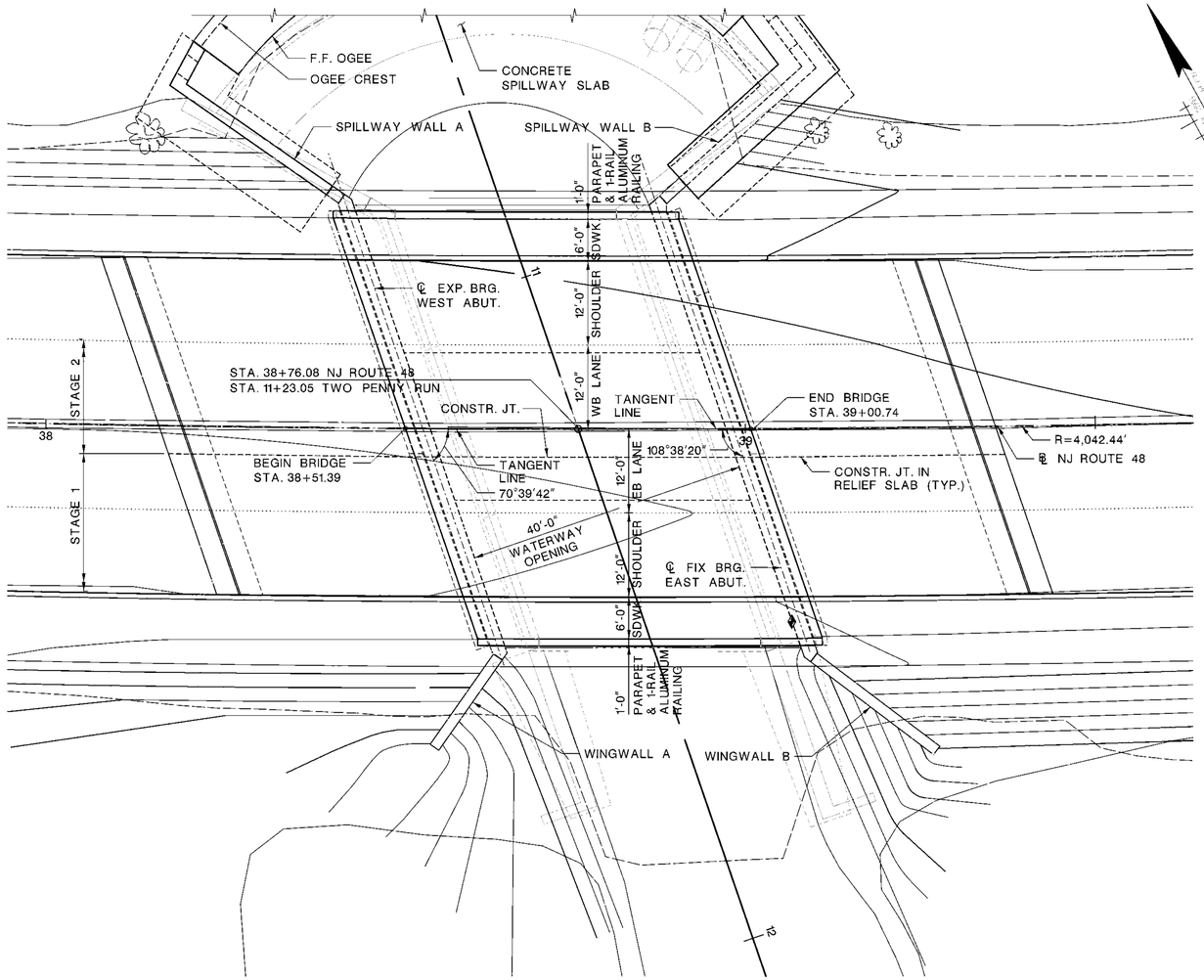
NEW JERSEY PROFESSIONAL ENGINEER LICENSE NO. 24GE3888900

19
27

| STATE | FEDERAL PROJECT NO. | SHEET | TOTAL SHEETS |
|---|---|---|---|
| N. J. | | | |

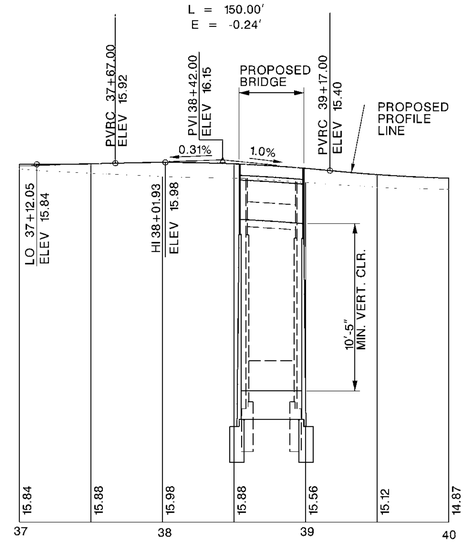
STRUCTURE NO. 1706-152

STRUCTURE NAME
ROUTE 48 OVER TWO PENNY RUN



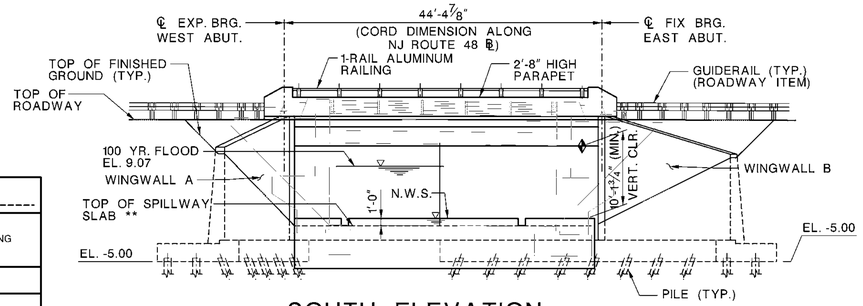

## PLAN

SCALE: 1"= 10'-0"




## ROUTE 48 PROFILE

NOT TO SCALE




## SOUTH ELEVATION

SCALE: 1"= 10'-0"

* INDICATES APPROXIMATE ESTIMATED BOTTOM OF FOOTING ELEVATION. THE ACTUAL BOTTOM OF FOOTING ELEVATION WILL BE DETERMINED UPON APPROVAL OF GEOTECHNICAL SOIL EXPLORATION REPORT.

** ELEVATION VARIES FROM 0.40 TO 0.60

### GENERAL NOTES

1. DESIGN SPECIFICATIONS
   2010 AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, WITH CURRENT INTERIMS, AS MODIFIED BY SECTION 3 OF THE NJDOT DESIGN MANUAL FOR BRIDGES AND STRUCTURES.

2. CONSTRUCTION SPECIFICATIONS
   2007 NJDOT STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION WITH CURRENT SUPPLEMENTAL SPECIFICATIONS, AS MODIFIED BY THE SPECIAL PROVISIONS.

3. LIVE LOAD
   AASHTO LRFD HL-93 VEHICULAR LIVE LOADING OR NJDOT PERMIT VEHICLE, WHICHEVER GOVERNS.

4. CONCRETE COMPRESSIVE STRESSES
   (a) DESIGN COMPRESSIVE STRENGTH (f'c)
   CLASS A.....4,000 psi
   CLASS B.....3,000 psi
   CLASS P-2.....6,000 psi
   (b) CLASS MIX DESIGN STRENGTH (IN ACCORDANCE WITH TABLE 903.03.06-3 OF THE NJDOT STANDARD SPECIFICATIONS)
   CLASS A.....4,600 psi
   CLASS B.....3,700 psi
   CLASS P-2.....6,500 psi

5. REINFORCEMENT STEEL
   ASTM A615 (GRADE 60)

6. SUPERSTRUCTURE
   (a) DEAD LOAD INCLUDES A 25 LBS./SQ. FT. PROVISION FOR A FUTURE 2 INCH THICK CONCRETE OVERLAY PROTECTIVE SYSTEM ON THE BRIDGE DECK.

7. SEISMIC DESIGN NOTES
   SEISMIC DESIGN CATEGORY = TO BE DETERMINED.
   SITE CLASS DEFINITION = TO BE DETERMINED.

8. FOUNDATION DESIGN CRITERIA
   FOUNDATION TYPE WILL BE DETERMINED DURING THE GEOTECHNICAL SOIL EXPLORATION AND ANALYSIS.

8. ESTIMATED COST $2,088,561 BASED ON 2011 PRICE.

| HYDRAULIC AND HYDROLOGIC DATA | |
|---|---|
| DRAINAGE AREA (SQ. MI) | XX |
| DESIGN DISCHARGE (C.F.S.) | XX |
| DESIGN WATER SURFACE ELEVATION (FT) | XX |
| ENERGY LINE ELEVATION (FT) | XX |
| FREQUENCY | 100 YR. |

LEGEND

| | | | |
|---|---|---|---|
| ABUT. | ABUTMENT | FIX. | FIXED |
| APPROX. | APPROXIMATE | F.R.P. | FIBERGLASS REINFORCED PLASTIC |
| ℄ | BASELINE | MIN. | MINIMUM |
| BRG. | BEARING | N.W.S. | NORMAL WATER SURFACE |
| ℄ | CENTERLINE | SDWK. | SIDEWALK |
| ◆ | MINIMUM VERTICAL CLEARANCE | STA. | STATION |
| EB | EASTBOUND | TYP. | TYPICAL |
| EL. | ELEVATION | WB | WESTBOUND |
| EXP. | EXPANSION | | RELIEF SLAB |

| CONTROL SECTION | ---------- | JOB NO. ---------- | |
|---|---|---|---|
| DES. BY | A. TURBIN | CHK. BY | C. H. CHUNG |
| DWN. BY | L.W. LAING | | |
| EST. BY | | CHK. BY | |
| SPEC'S. BY | | | |

IN CHARGE OF ----------

FILE NAME: $FILE$
PEN. TABLE: $PENTBL$
REV. DATE: $DATE$
SCALE: $SCALE$

NEW JERSEY DEPARTMENT OF TRANSPORTATION
BUREAU OF STRUCTURAL ENGINEERING

# GENERAL PLAN AND ELEVATION

ROUTE 48 LAYTON LAKE DAM
DRAINAGE IIMPROVEMENTS
CONTRACT NO:

CARNEYS POINT TOWNSHIP — SALEM COUNTY

McCORMICK TAYLOR, INC.
CERT. OF AUTHORIZ. NO. 24GA28044300
DATE:
CHANG H. CHUNG, P.E.
N.J. LIC. NO. 24GE04311400

| REVISION | BY | C'K'D | DATE |
|---|---|---|---|
| | | | |
| | | | |
| | | | |

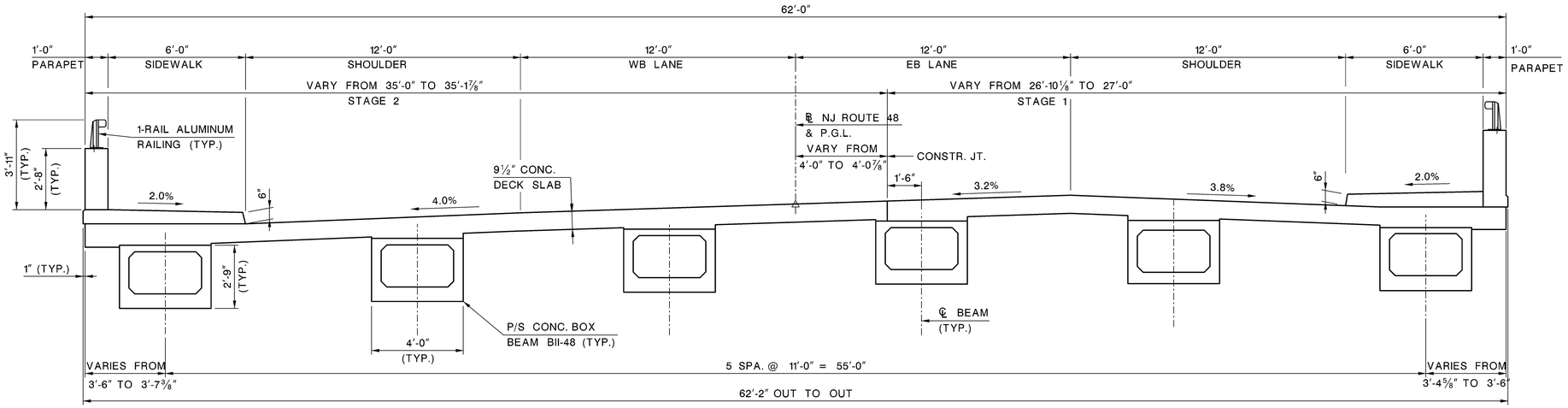
BRIDGE SHEET NO. B-1 OF B-XX

20
27

| STATE | FEDERAL PROJECT NO. | SHEET | TOTAL SHEETS |
|---|---|---|---|
| N. J. | | | |

STRUCTURE NO. 1706-152

STRUCTURE NAME
ROUTE 48 OVER TWO PENNY RUN




## TYPYCAL SECTION

SCALE: ⅜" = 1'-0"

LEGEND

| | |
|---|---|
| ABUT. | ABUTMENT |
| ALT. | ALTERNATE |
| B | BOTTOM |
| BRG. | BEARING |
| ℄ | CENTERLINE |
| CONC. | CONCRETE |
| CONSTR. | CONSTRUCTION |
| EQ. | EQUAL |
| EXIST. | EXISTING |
| EXP. | EXPANSION |
| FIX. | FIXED |
| JT(S). | JOINT(S) |
| MAX. | MAXIMUM |
| MIN. | MINIMUM |
| SPA. | SPACING |
| T | TOP |
| TYP. | TYPICAL |

FILE NAME: $FILE$
PEN TABLE: $PENTBL$
REV DATE: $DATE$
SCALE: $SCALE$

| CONTROL SECTION | | JOB NO. | |
|---|---|---|---|
| DES. BY | | CHK. BY | |
| DWN. BY | | | |
| EST. BY | | CHK. BY | |
| SPEC'S. BY | | | |

IN CHARGE OF _____

1' 0 2' 4'
⅜" = 1' - 0"

| REVISION | BY | C'K'D | DATE |
|---|---|---|---|
| | | | |
| | | | |
| | | | |

NEW JERSEY DEPARTMENT OF TRANSPORTATION
BUREAU OF STRUCTURAL ENGINEERING

# TYPICAL SECTION

ROUTE 48 LAYTON LAKE DAM
DRAINAGE IIMPROVEMENTS
CONTRACT NO:

CARNEYS POINT TOWNSHIP — SALEM COUNTY

McCORMICK TAYLOR, INC.
CERT. OF AUTHORIZ. NO. 24GA28044300
DATE:
CHANG H. CHUNG, P.E.
N.J. LIC. NO. 24GE04311400

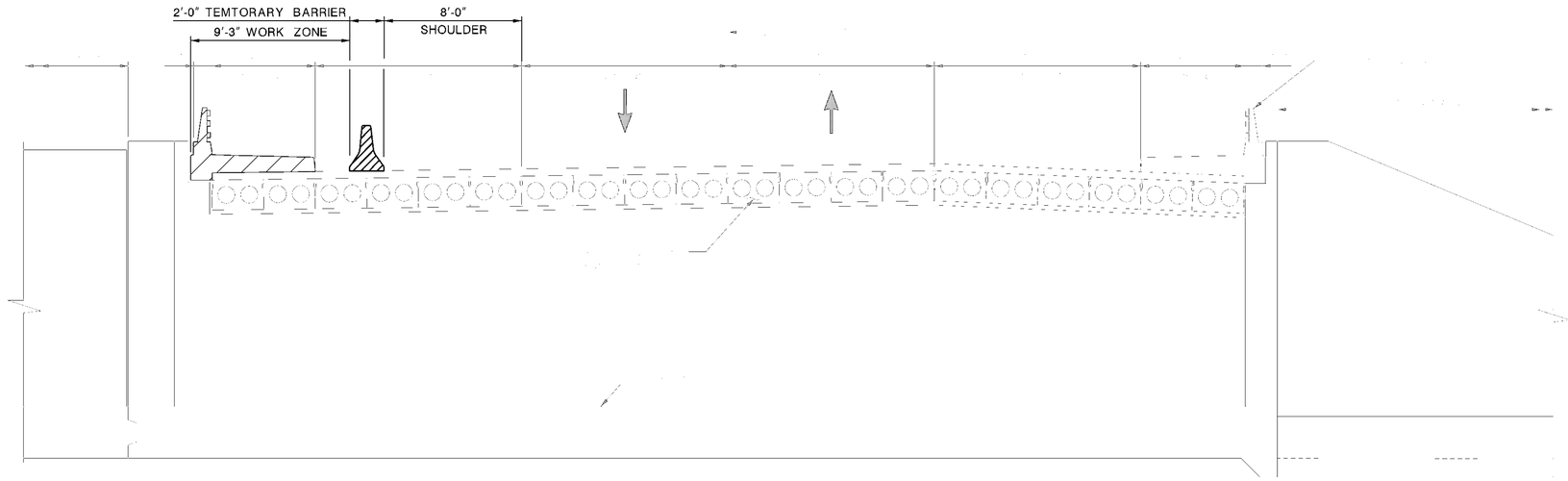
BRIDGE SHEET NO. B-2 OF B-XX

21
27

| STATE | FEDERAL PROJECT NO. | SHEET | TOTAL SHEETS |
|---|---|---|---|
| N. J. | | | |

STRUCTURE NO. 1706-152

STRUCTURE NAME
ROUTE 48 OVER TWO PENNY RUN




## STAGE 1 - DEMOLITION

SCALE: ¼" = 1'-0"

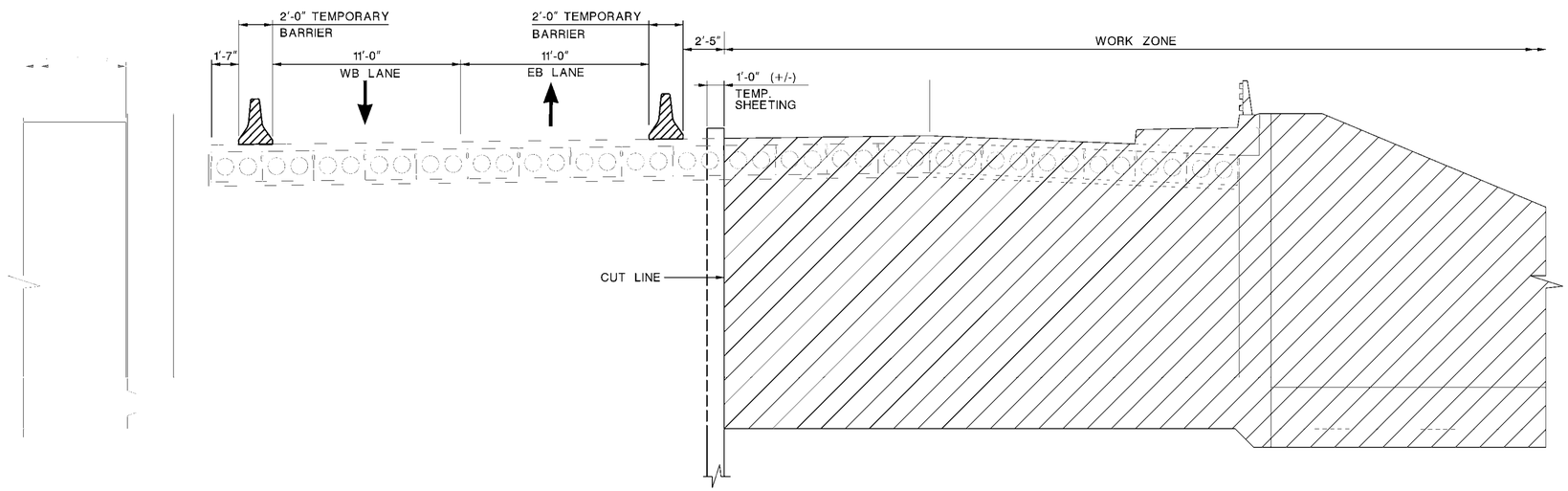
## STAGING NOTES:

STAGE 1 - DEMOLITION

1. SET UP MAINTENANCE AND PROTECTION OF TRAFFIC PATTERN FOR STAGE 1 CONSTRUCTION IN ACCORDANCE WITH TRAFFIC CONTROL PLANS.
2. REMOVE EXISTING SIDEWALK AND PARAPET.

LEGEND

| | |
|---|---|
| ABUT. | ABUTMENT |
| ALT. | ALTERNATE |
| B | BOTTOM |
| BRG. | BEARING |
| ℄ | CENTERLINE |
| CONC. | CONCRETE |
| CONSTR. | CONSTRUCTION |
| EQ. | EQUAL |
| EXIST. | EXISTING |
| EXP. | EXPANSION |
| FIX. | FIXED |
| JT(S). | JOINT(S) |
| MAX. | MAXIMUM |
| MIN. | MINIMUM |
| SPA. | SPACING |
| T | TOP |
| TYP. | TYPICAL |
| | DENOTES DEMOLITION |




## STAGE 2 - DEMOLITION

SCALE: ¼" = 1'-0"

STAGE 2 - DEMOLITION

1. INSTALL DIVERSION PIPES IN ACCORDANCE WITH STREAM DIVERSION PLAN.
2. INSTALL TEMPORARY COFFERDAM AND DIRVERT WATER FROM THE CONSTRUCTION AREA.
3. SET UP MAINTENANCE AND PROTECTION OF TRAFFIC PATTERN FOR STAGE 2 CONSTRUCTION IN ACCORDANCE WITH TRAFFIC CONTROL PLANS.
4. INSTALL TEMPORARY SHEETING.
5. REMOVE SOUTH HALF OF THE EXISTING BRIDGE, APPROACH SLABS.

| CONTROL SECTION | | JOB NO. |
|---|---|---|
| DES. BY | | CHK. BY |
| DWN. BY | | CHK. BY |
| EST. BY | | |
| SPEC'S. BY | | |

IN CHARGE OF

FILE NAME: $FILE$
PEN. TABLE: $PENTBL$
REV. DATE: $DATE$
SCALE: $SCALE$

1' 0 4' 8'
¼" = 1' - 0"

| REVISION | BY | C'K'D | DATE |
|---|---|---|---|
| | | | |
| | | | |
| | | | |

NEW JERSEY DEPARTMENT OF TRANSPORTATION
BUREAU OF STRUCTURAL ENGINEERING

# STAGING PLAN - 1

ROUTE 48 LAYTON LAKE DAM
DRAINAGE IIMPROVEMENTS
CONTRACT NO:

CARNEYS POINT TOWNSHIP — SALEM COUNTY

McCORMICK TAYLOR, INC.
CERT. OF AUTHORIZ. NO. 24GA28044300
DATE:
CHANG H. CHUNG, P.E.
N.J. LIC. NO. 24GE04311400

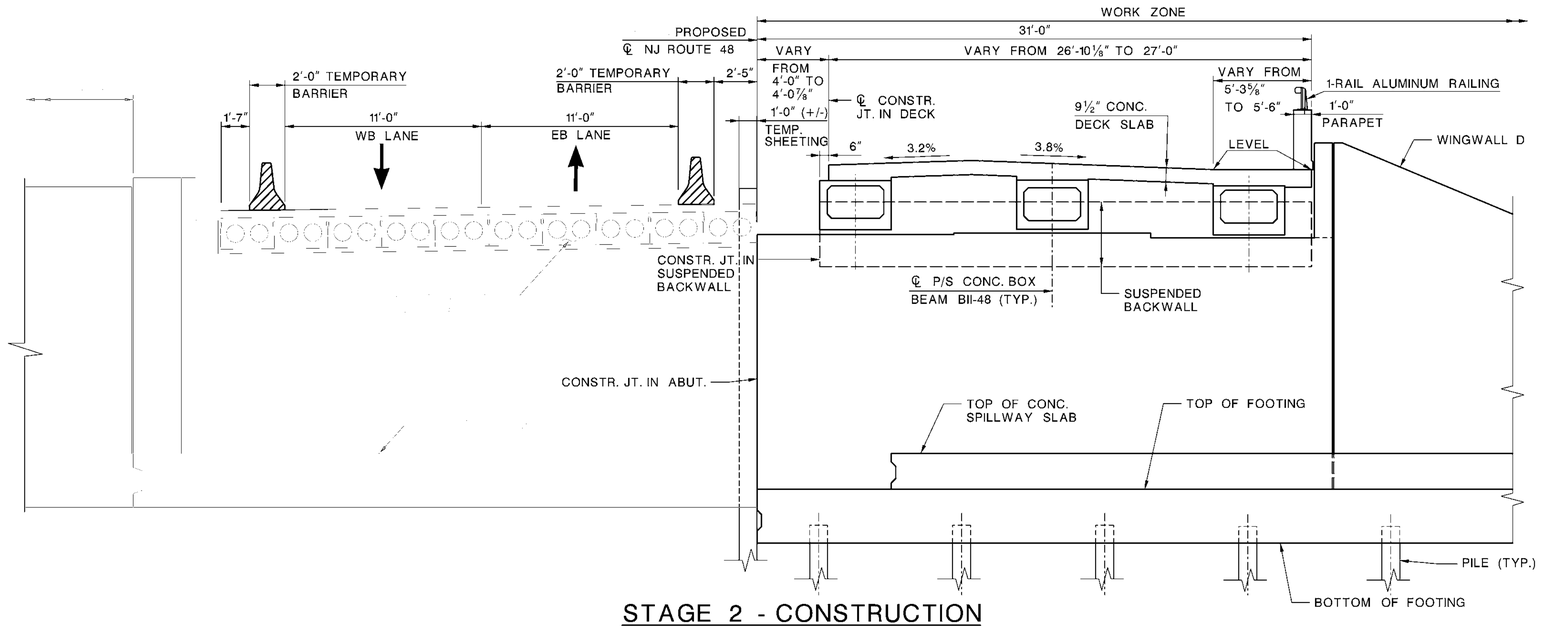
BRIDGE SHEET NO. B-3 OF B-XX

22
27

| STATE | FEDERAL PROJECT NO. | SHEET | TOTAL SHEETS |
|---|---|---|---|
| N. J. | | | |

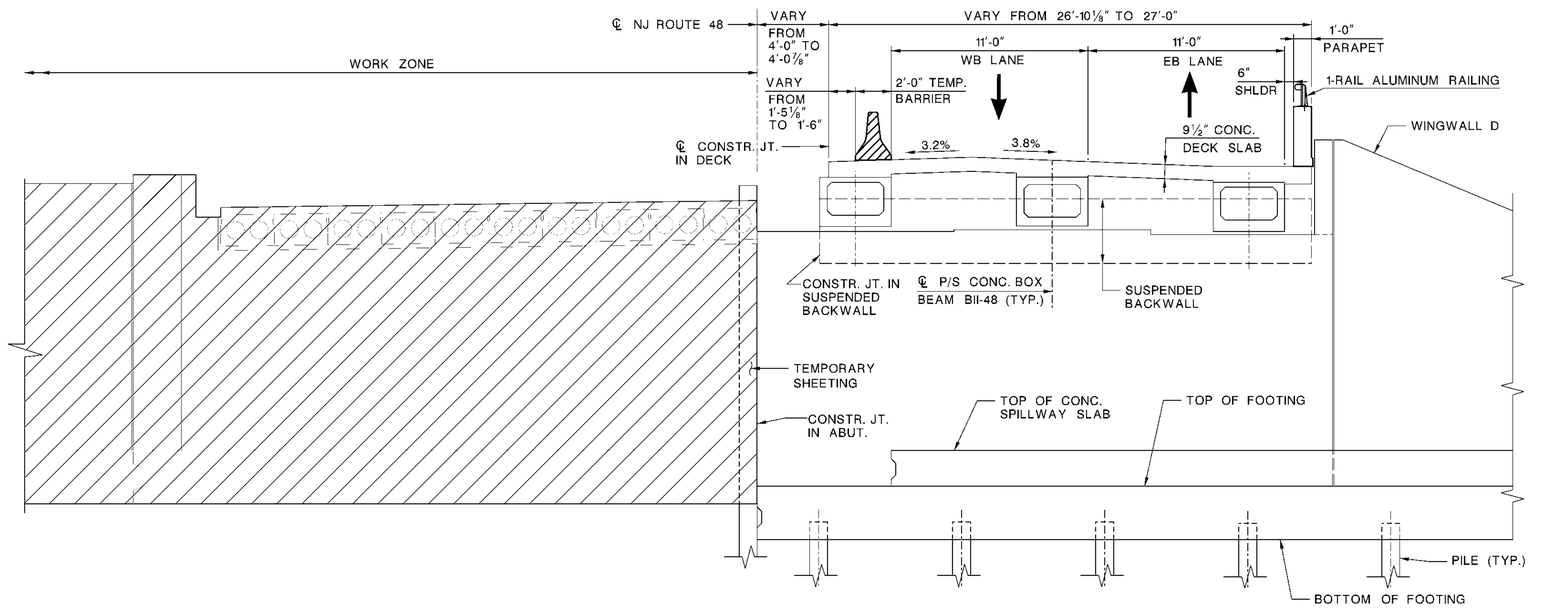
STRUCTURE NO. 1706-152

STRUCTURE NAME
ROUTE 48 OVER TWO PENNY RUN




## STAGE 2 - CONSTRUCTION

SCALE: ¼" = 1'-0"




## STAGE 3 - DEMOLITION

SCALE: ¼" = 1'-0"

## STAGING NOTES:

STAGE 2 - CONSTRUCTION

1. CONSTRUCT SOUTH HALF OF THE NEW FOUNDATIONS, SUBSTRUCTURE UNITS AND PORTION OF THE SPILLWAY SLAB.
2. ERECT BEAMS AND CONSTRUCT DIAPHRAGMS, SUSPENDED BACKWALLS, DECK, PARAPET, ALUMINUM RAILING, RELIEF SLABS, ETC.

LEGEND

| | |
|---|---|
| ABUT. | ABUTMENT |
| ALT. | ALTERNATE |
| B | BOTTOM |
| BRG. | BEARING |
| ℄ | CENTERLINE |
| CONC. | CONCRETE |
| CONSTR. | CONSTRUCTION |
| EQ. | EQUAL |
| EXIST. | EXISTING |
| EXP. | EXPANSION |
| FIX. | FIXED |
| JT(S). | JOINT(S) |
| MAX. | MAXIMUM |
| MIN. | MINIMUM |
| SPA. | SPACING |
| T | TOP |
| TYP. | TYPICAL |
| ▨ | DENOTES DEMOLITION |

STAGE 3 - DEMOLITION

1. COORDINATE UTILITY RELOCATION WITH FACILITY OWNERS AND RELOCATION PLAN PRIOR TO START WORK.
2. SET UP MAINTENANCE AND PROTECTION OF TRAFFIC PATTERN FOR STAGE 3 CONSTRUCTION IN ACCORDANCE WITH TRAFFIC CONTROL PLANS.
3. INSTALL/MODIFY TEMPORARY SHEETING AT BACK FACE OF THE NEW ABUTMENT TO RETAIN NEW ROADWAY.
4. REMOVE REMAINING PORTION OF EXISTING BRIDGE, APPROACH SLABS AND SPILLWAY.

| CONTROL SECTION | _____ | JOB NO. _____ | |
|---|---|---|---|
| DES. BY | | CHK. BY | |
| DWN. BY | | | |
| EST. BY | | CHK. BY | |
| SPEC'S. BY | | | |
| IN CHARGE OF _____ | | | |

FILE NAME: $FILE$
PEN TABLE: $PENTBL$
REV. DATE: $DATE$
SCALE: $SCALE$

1' 0 4' 8'
¼" = 1' - 0"

| REVISION | BY | C'K'D | DATE |
|---|---|---|---|
| | | | |

NEW JERSEY DEPARTMENT OF TRANSPORTATION
BUREAU OF STRUCTURAL ENGINEERING

# STAGING PLAN - 2

ROUTE 48 LAYTON LAKE DAM
DRAINAGE IIMPROVEMENTS
CONTRACT NO:

CARNEYS POINT TOWNSHIP — SALEM COUNTY

McCORMICK TAYLOR, INC.
CERT. OF AUTHORIZ. NO. 24GA28044300
DATE:
CHANG H. CHUNG, P.E.
N.J. LIC. NO. 24GE04311400

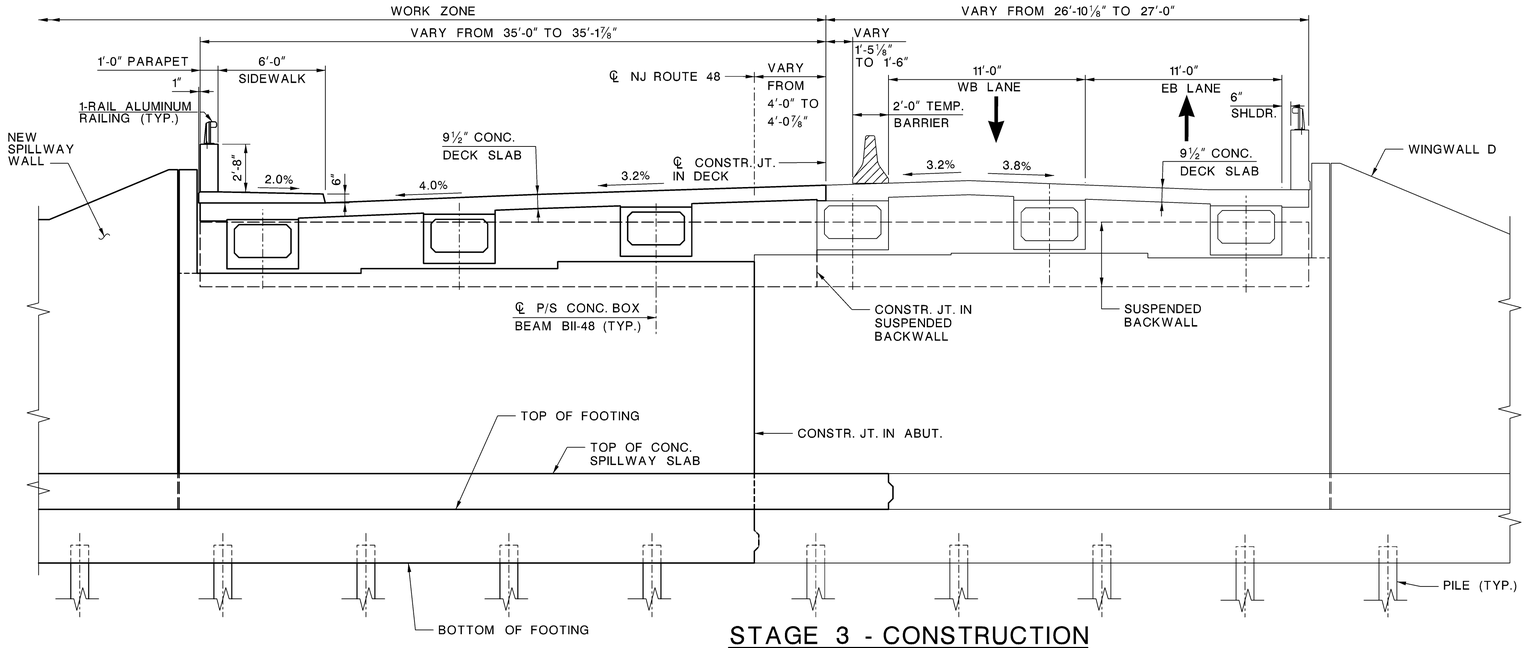
BRIDGE SHEET NO. B-4 OF B-XX

23
27

| STATE | FEDERAL PROJECT NO. | SHEET | TOTAL SHEETS |
|---|---|---|---|
| N. J. | | | |

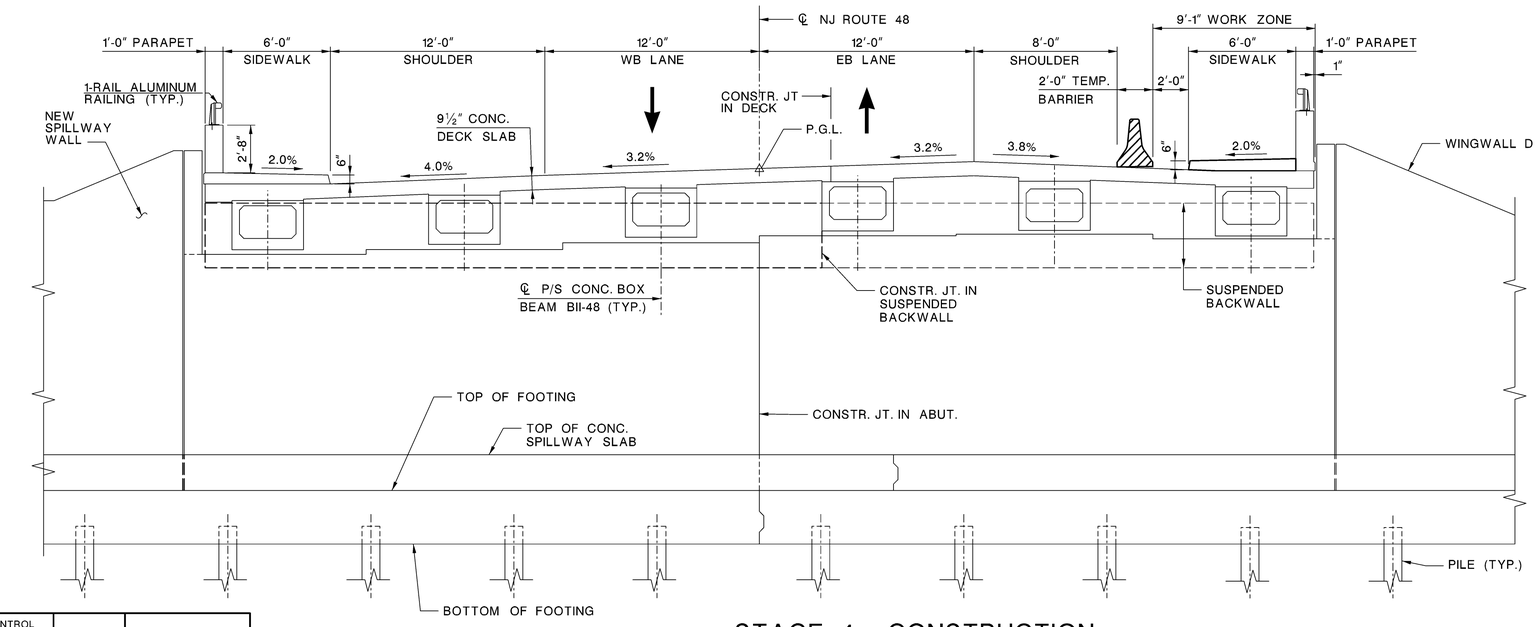
STRUCTURE NO. 1706-152

STRUCTURE NAME
ROUTE 48 OVER TWO PENNY RUN




## STAGE 3 - CONSTRUCTION

SCALE: ¼" = 1'-0"




## STAGE 4 - CONSTRUCTION

SCALE: ¼" = 1'-0"

## STAGING NOTES:

STAGE 3 - CONSTRUCTION

1. CONSTRUCT NORTH HALF OF THE NEW FOUNDATIONS, SUBSTRUCTURE UNITS AND REMAINING PORTION OF THE SPILLWAY.
2. ERECT BEAMS AND CONSTRUCT DECK, DIAPHRAGMS, SUSPENDED BACKWALLS, RELIEF SLABS, SIDEWALK, PARAPET, ALUMINUM RAILING , ETC.

LEGEND

| | |
|---|---|
| ABUT. | ABUTMENT |
| ALT. | ALTERNATE |
| B | BOTTOM |
| BRG. | BEARING |
| ℄ | CENTERLINE |
| CONC. | CONCRETE |
| CONSTR. | CONSTRUCTION |
| EQ. | EQUAL |
| EXIST. | EXISTING |
| EXP. | EXPANSION |
| FIX. | FIXED |
| JT(S). | JOINT(S) |
| MAX. | MAXIMUM |
| MIN. | MINIMUM |
| SPA. | SPACING |
| T | TOP |
| TYP. | TYPICAL |

STAGE 4 - CONSTRUCTION

1. SET UP MAINTENANCE AND PROTECTION OF TRAFFIC PATTERN FOR STAGE 4 CONSTRUCTION IN ACCORDANCE WITH TRAFFIC CONTROL PLANS.
2. CONSTRUCT SOUTH SIDEWALK.

| CONTROL SECTION | | JOB NO. |
|---|---|---|
| DES. BY | | CHK. BY |
| DWN. BY | | CHK. BY |
| EST. BY | | CHK. BY |
| SPEC'S. BY | | |

IN CHARGE OF

FILE NAME: $FILE$
PEN TABLE: $PENTBL$
REV DATE: $DATE$
SCALE: $SCALE$

1' 0 4' 8'
¼" = 1' - 0"

| REVISION | BY | C'K'D | DATE |
|---|---|---|---|
| | | | |
| | | | |
| | | | |

NEW JERSEY DEPARTMENT OF TRANSPORTATION
BUREAU OF STRUCTURAL ENGINEERING

# STAGING PLAN - 3

ROUTE 48 LAYTON LAKE DAM
DRAINAGE IIMPROVEMENTS
CONTRACT NO:

CARNEYS POINT TOWNSHIP — SALEM COUNTY

McCORMICK TAYLOR, INC.
CERT. OF AUTHORIZ. NO. 24GA28044000
DATE:
CHANG H. CHUNG, P.E.
N.J. LIC. NO. 24GE04311400

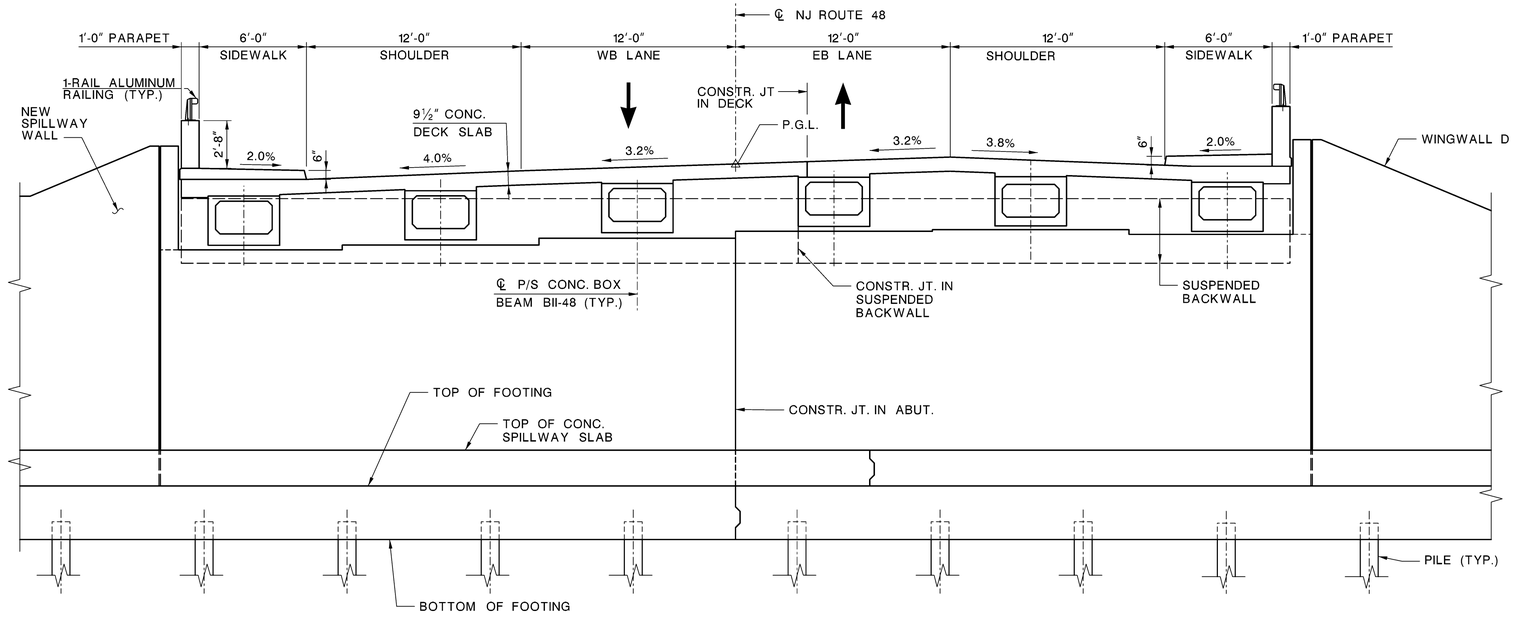
BRIDGE SHEET NO. B-5 OF B-XX

24
27

| STATE | FEDERAL PROJECT NO. | SHEET | TOTAL SHEETS |
|---|---|---|---|
| N. J. | | | |

STRUCTURE NO. 1706-152

STRUCTURE NAME
ROUTE 48 OVER TWO PENNY RUN




## FINAL STAGE

SCALE: ¼" = 1'-0"

LEGEND

| | |
|---|---|
| ABUT. | ABUTMENT |
| ALT. | ALTERNATE |
| B | BOTTOM |
| BRG. | BEARING |
| ℄ | CENTERLINE |
| CONC. | CONCRETE |
| CONSTR. | CONSTRUCTION |
| EQ. | EQUAL |
| EXIST. | EXISTING |
| EXP. | EXPANSION |
| FIX. | FIXED |
| JT(S). | JOINT(S) |
| MAX. | MAXIMUM |
| MIN. | MINIMUM |
| SPA. | SPACING |
| T | TOP |
| TYP. | TYPICAL |

| | | | |
|---|---|---|---|
| CONTROL SECTION | _____ | JOB NO. _____ | |
| DES. BY | | CHK. BY | |
| DWN. BY | | | |
| EST. BY | | CHK. BY | |
| SPEC'S. BY | | | |
| IN CHARGE OF _____ | | | |

FILE NAME: $FILE$
PEN. TABLE: $PENTBL$
REV. DATE: $DATE$
SCALE: $SCALE$

1' 0 4' 8'
¼" = 1' - 0"

| REVISION | BY | C'K'D | DATE |
|---|---|---|---|
| | | | |
| | | | |
| | | | |

NEW JERSEY DEPARTMENT OF TRANSPORTATION
BUREAU OF STRUCTURAL ENGINEERING

# STAGING PLAN - 4

ROUTE 48 LAYTON LAKE DAM
DRAINAGE IIMPROVEMENTS
CONTRACT NO:

CARNEYS POINT TOWNSHIP — SALEM COUNTY

McCORMICK TAYLOR, INC.
CERT. OF AUTHORIZ. NO. 24GA28044300
DATE:
CHANG H. CHUNG, P.E.
N.J. LIC. NO. 24GE04311400

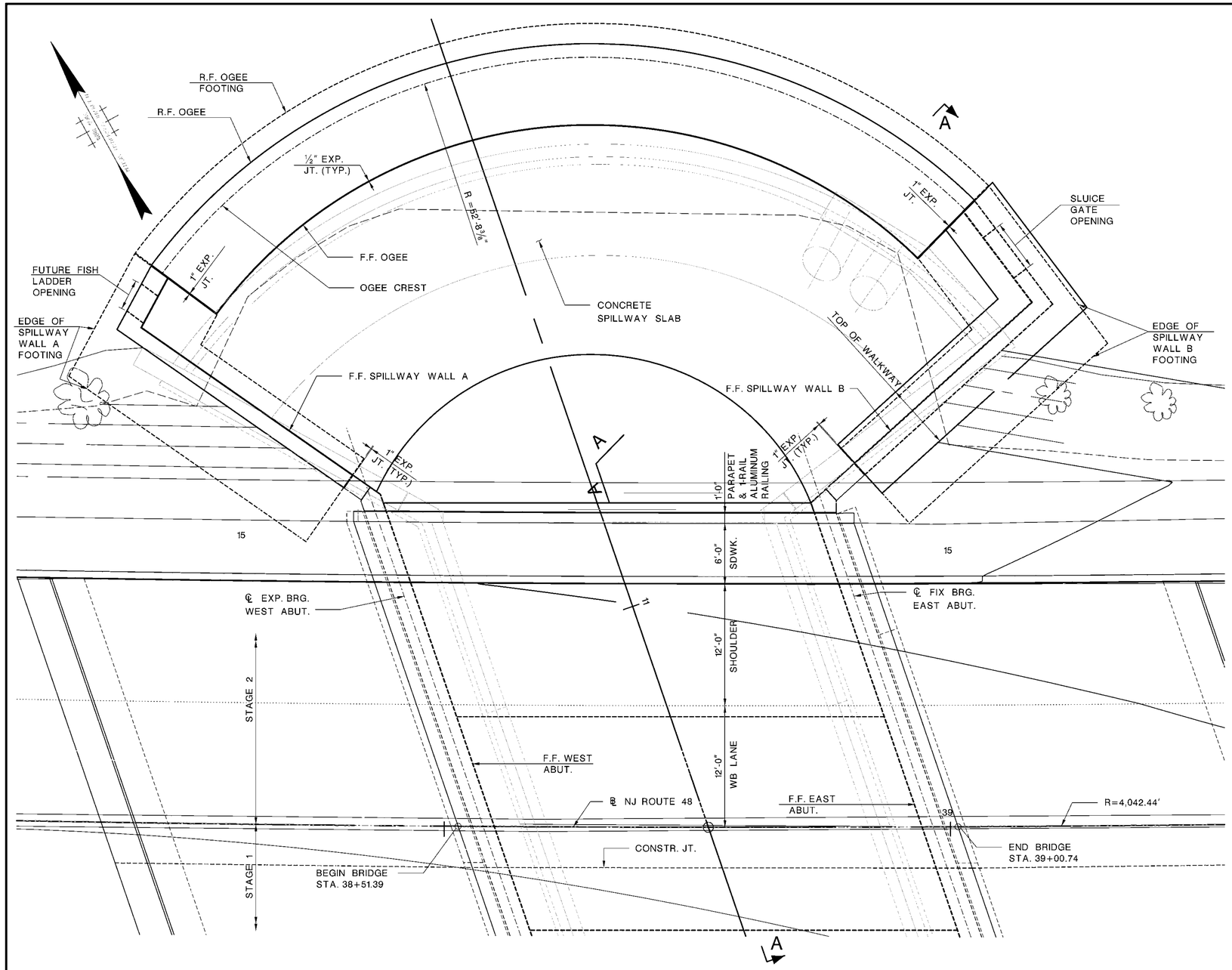
BRIDGE SHEET NO. B-6 OF B-XX

25
27

| STATE | FEDERAL PROJECT NO. | SHEET | TOTAL SHEETS |
|---|---|---|---|
| N. J. | | | |

STRUCTURE NO. 1706-152

STRUCTURE NAME
ROUTE 48 OVER TWO PENNY RUN




## PLAN

SCALE: 1"= 5'-0"

LEGEND

| | | | |
|---|---|---|---|
| ABUT. | ABUTMENT | F.F. | FRONT FACE |
| APPROX. | APPROXIMATE | FIX. | FIXED |
| ℄ | BASELINE | F.R.P. | FIBERGLASS REINFORCED PLASTIC |
| BRG. | BEARING | JT. | JOINT |
| ℄ | CENTERLINE | MIN. | MINIMUM |
| ◊ | MINIMUM VERTICAL CLEARANCE | R.F. | REAR FACE |
| | | SDWK. | SIDEWALK |
| EB | EASTBOUND | STA. | STATION |
| EL. | ELEVATION | TYP. | TYPICAL |
| EXP. | EXPANSION | WB | WESTBOUND |

## GENERAL NOTES

1. DESIGN SPECIFICATIONS
   2010 AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, WITH CURRENT INTERIMS, AS MODIFIED BY SECTION 3 OF THE NJDOT DESIGN MANUAL FOR BRIDGES AND STRUCTURES.

2. CONSTRUCTION SPECIFICATIONS
   2007 NJDOT STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION WITH CURRENT SUPPLEMENTAL SPECIFICATIONS, AS MODIFIED BY THE SPECIAL PROVISIONS.

3. CONCRETE COMPRESSIVE STRESSES
   (a) DESIGN COMPRESSIVE STRENGTH (f'c)
   CLASS B.....3,000 psi

   (b) CLASS MIX DESIGN STRENGTH (IN ACCORDANCE WITH TABLE 903.03.06-3 OF THE NJDOT STANDARD SPECIFICATIONS)
   CLASS B.....3,700 psi

4. REINFORCEMENT STEEL
   ASTM A615 (GRADE 60)

5. SEISMIC DESIGN NOTES
   SEISMIC DESIGN CATEGORY = TO BE DETERMINED.
   SITE CLASS DEFINITION = TO BE DETERMINED.

6. FOUNDATION DESIGN CRITERIA
   FOUNDATION TYPE WILL BE DETERMINED DURING THE GEOTECHNICAL SOIL EXPLORATION AND ANALYSIS.

7. FOR SECTIONS A-A, SEE SHEET B-8.

1'0 8' 16'
⅛" = 1'-0"

5' 0 5' 10'
1" = 5'-0"

| REVISION | BY | C'K'D | DATE |
|---|---|---|---|
| | | | |
| | | | |
| | | | |

| CONTROL SECTION | | JOB NO. | |
|---|---|---|---|
| DES. BY | A. TURBIN | CHK. BY | C. H. CHUNG |
| DWN. BY | R. BERMUDEZ | | |
| EST. BY | | CHK. BY | |
| SPEC'S. BY | | | |

IN CHARGE OF

FILE NAME: $FILE$
PEN. TABLE: $PENTBL$
REV. DATE: $DATE$
SCALE: $SCALE$

NEW JERSEY DEPARTMENT OF TRANSPORTATION
BUREAU OF STRUCTURAL ENGINEERING

# OGEE PLAN

ROUTE 48 LAYTON LAKE DAM
DRAINAGE IIMPROVEMENTS
CONTRACT NO:

CARNEYS POINT TOWNSHIP — SALEM COUNTY

McCORMICK TAYLOR, INC.
CERT. OF AUTHORIZ. NO. 24GA28044300
DATE:
CHANG H. CHUNG, P.E.
N.J. LIC. NO. 24GE04311400

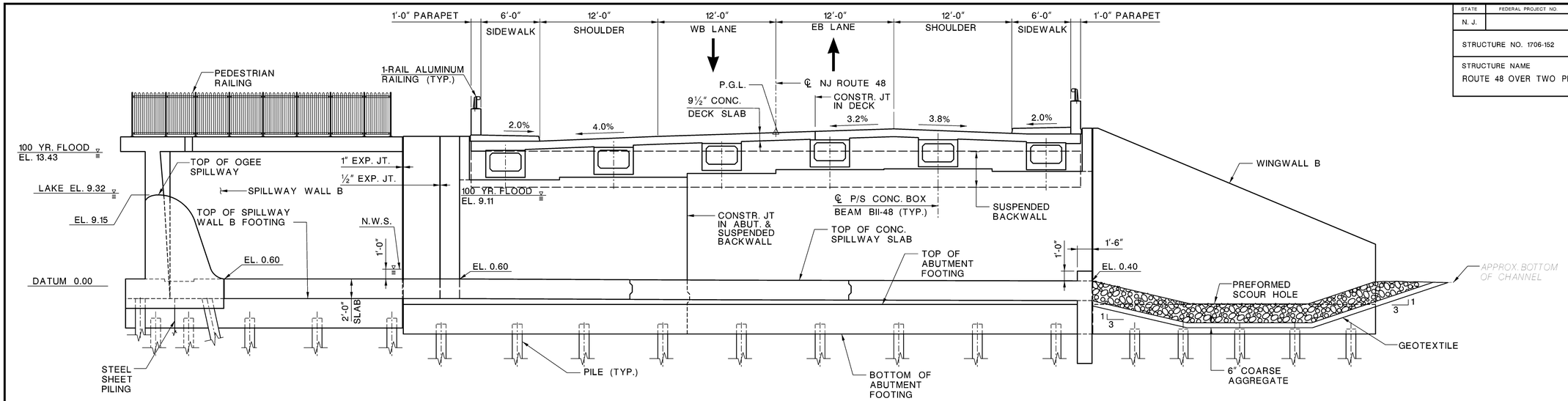
BRIDGE SHEET NO. B-7 OF B-XX

26
27

| STATE | FEDERAL PROJECT NO. | SHEET | TOTAL SHEETS |
|---|---|---|---|
| N. J. | | | |

STRUCTURE NO. 1706-152

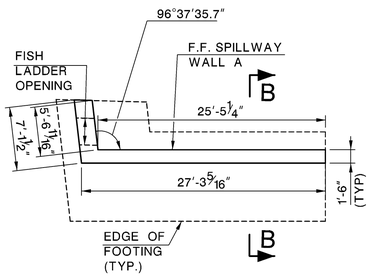
STRUCTURE NAME
ROUTE 48 OVER TWO PENNY RUN




## SECTION A-A

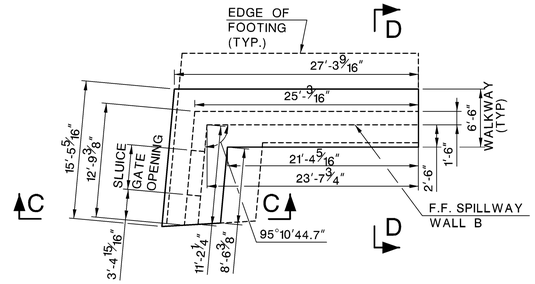
(LOOKING DOWN STATION)

SCALE: 3/16" = 1'-0"



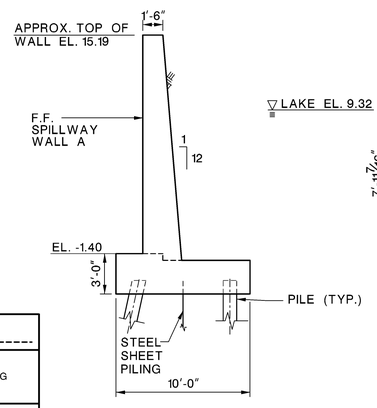

## SPILLWAY WALL A PLAN

SCALE: ⅛" = 1'-0"



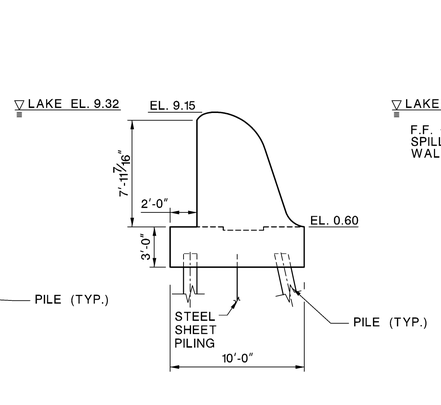

## SPILLWAY WALL B PLAN

SCALE: ⅛" = 1'-0"



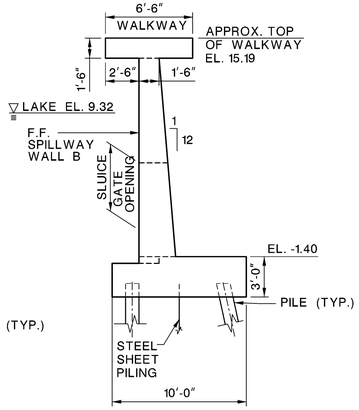

## SECTION B-B

SCALE: 3/16" = 1'-0"



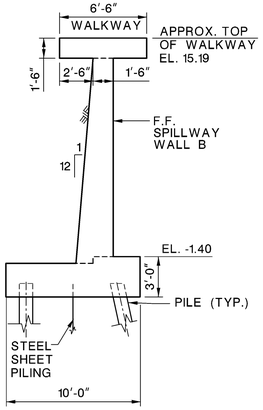

## TYPICAL OGEE SECTION

SCALE: 3/16" = 1'-0"




## SECTION C-C

SCALE: 3/16" = 1'-0"




## SECTION D-D

SCALE: 3/16" = 1'-0"

1' 0 5' 10'

3/16" = 1'-0"

LEGEND

| | |
|---|---|
| ABUT. | ABUTMENT |
| BRG. | BEARING |
| ℄ | CENTERLINE |
| CONC. | CONCRETE |
| CONSTR. | CONSTRUCTION |
| EXIST. | EXISTING |
| JT(S). | JOINT(S) |
| N.W.S. | NORMAL WATER SURFACE |
| MAX. | MAXIMUM |
| MIN. | MINIMUM |
| TYP. | TYPICAL |

| CONTROL SECTION | | JOB NO. | |
|---|---|---|---|
| DES. BY | A. TURBIN | CHK. BY | C. H. CHUNG |
| DWN. BY | R. BERMUDEZ | | |
| EST. BY | | CHK. BY | |
| SPEC'S BY | | | |

IN CHARGE OF

FILE NAME: $FILE$
PEN TABLE: $PENTBL$
REV. DATE: $DATE$
SCALE: $SCALE$

| REVISION | BY | C'K'D | DATE |
|---|---|---|---|
| | | | |
| | | | |
| | | | |

NEW JERSEY DEPARTMENT OF TRANSPORTATION
BUREAU OF STRUCTURAL ENGINEERING

# SPILLWAY SECTIONS

ROUTE 48 LAYTON LAKE DAM
DRAINAGE IIMPROVEMENTS
CONTRACT NO:

CARNEYS POINT TOWNSHIP SALEM COUNTY

McCORMICK TAYLOR, INC.
CERT. OF AUTHORIZ. NO. 24GA28044300
DATE:
CHANG H. CHUNG, P.E.
N.J. LIC. NO. 24GE04311400

BRIDGE SHEET NO. B-8 OF B-XX

27
27

# *Appendix H – Geotechnical Report*

# SUBSURFACE EXPLORATION AND GEOTECHNICAL EVALUATION REPORT

LAYTONS LAKE DAM
NEW JERSEY ROUTE 48, MP 3.06

CARNEY'S POINT TOWNSHIP
SALEM COUNTY, NEW JERSEY

*Prepared by:*

**KMA Consulting Engineers, Inc.**

*Prepared for:*

**New Jersey Department of Transportation**

**July, 2011**

John Dogbey, P.E.
NJ PE License No. 40322

# TABLE OF CONTENTS

**1. INTRODUCTION ..... 3**
**2. PROJECT DESCRIPTION ..... 3**
**3. FIELD EXPLORATION AND LABORATORY TESTING ..... 4**
3.1. FIELD EXPLORATION ..... 4
3.2. LABORATORY TESTING ..... 5
**4. SUBSURFACE CONDITIONS ..... 6**
4.1 PUBLISHED GEOLOGIC DATA ..... 6
4.2 SOILS ENCOUNTERED ..... 6
4.3 GROUNDWATER CONDITIONS ..... 7
**5. SEISMIC (SITE CLASS & LIQUIFACTION POTENTIAL) ANALYSES ..... 8**
**6. FOUNDATION ANALYSES ..... 8**
6.1 SPREAD FOOTING ANALYSIS ..... 10
6.2. PILE ANALYSIS ..... 10
6.4 RESULTS OF THE PILE ANALYSIS ..... 12
**7. RECOMMENDATIONS ..... 14**
**8. BASIS FOR RECOMMENDATIONS ..... 15**

## LIST OF TABLES

TABLE 3. 1: LABORATORY TESTING ..... 5

TABLE 6. 1: SOIL PROFILE IN B-1 ..... 9
TABLE 6. 2: SPREAD FOOTING ANALYSIS ..... 10
TABLE 6. 3: ASSUMED LOADS ON SINGLE PILES ..... 11
TABLE 6. 4: PROPERTIES OF H-PILE ..... 11
TABLE 6. 5: PROPERTIES OF THE STEEL/CONCRETE COMPOSITE PILE . 11
TABLE 6. 6: RESISTANCE, SOFTWARE USED AND FACTORS ..... 12
TABLE 6. 7: VERTICAL RESISTANCES (DRIVEN/ALLPILE) ..... 13
TABLE 6. 8: VERTICAL SETTLEMENTS (ALLPILE) ..... 14
TABLE 6. 9: LATERAL ANALYSES (L-PILE) ..... 14

## APPENDICES

APPENDIX A: SITE LOCATION
- APPENDIX A-1: SITE LOCATION MAP
- APPENDIX A-2: BORING LOCATION PLAN

APPENDIX B: BORING LOGS
APPENDIX C: LABORATORY TESTS RESULTS
APPENDIX D: SITE CLASS ANALYSIS
APPENDIX E: LIQUIFACTION POTENTIAL ANALYSIS
APPENDIX F: VERTICAL RESISTANCE ANALYSES RESULTS
- APPENDIX F-1: H-PILE DOWNWARD (DRIVEN)
- APPENDIX F-2: H-PILE 25- FOOT LONG (ALLPILE)
- APPENDIX F-3: H-PILE 50- FOOT LONG (ALLPILE)
- APPENDIX F-4: H-PILE 60- FOOT LONG (ALLPILE)
- APPENDIX F-5: H-PILE 75- FOOT LONG (ALLPILE)
- APPENDIX F-6: STEEL PIPE PILE DOWNWARD (DRIVEN)
- APPENDIX F-7: STEEL PIPE 25-FOOT LONG PILE (ALLPILE)
- APPENDIX F-8: STEEL PIPE 50-FOOT LONG PILE (ALLPILE)
- APPENDIX F-9: STEEL PIPE 60-FOOT LONG PILE (ALLPILE)
- APPENDIX F-10: STEEL PIPE 75-FOOT LONG PILE (ALLPILE)

APPENDIX G: LATERAL ANALYSES RESULTS (L-PILE)
- APPENDIX G-1: H-PILE 25- FOOT LONG
- APPENDIX G-2: H-PILE 50- FOOT LONG
- APPENDIX G-3: H-PILE 60- FOOT LONG
- APPENDIX G-4: H-PILE 75- FOOT LONG
- APPENDIX G-5: STEEL PIPE 25-FOOT LONG PILE
- APPENDIX G-6: STEEL PIPE 50-FOOT LONG PILE
- APPENDIX G-7: STEEL PIPE 60-FOOT LONG PILE
- APPENDIX G-8: STEEL PIPE 75-FOOT LONG PILE

## 1. INTRODUCTION

Laytons Lake Dam is located at milepost 3.06 of NJ Route 48 in Carney's Point Township, Salem County, NJ (see Appendix A-1: Site Location Map). The dam embankment carries NJ Route 48 in a west to east direction over Two Penny Run. New Jersey Department of Transportation (NJDOT) owns NJ Route 48 and maintains the dam and spillway of Layton Lake. The lake is used for recreational activities. The dam is classified as "Significant Hazard" and does not conform to current dam safety regulations. As a result, New Jersey Department of Environmental Protection – Bureau of Dam Safety and Flood Control (NJDEP-BDSFC) mandated that New Jersey Department of Transportation (NJDOT) perform a detailed study of the dam.

McCormick Taylor, Inc. performed an analysis of the dam and submitted a "Spillway Design Report" in 2009 to NJDEP-BDSFC. This is a preliminary geotechnical investigation. This investigation and report is part of the study mandated by the NJDEP-BDSFC.

## 2. PROJECT DESCRIPTION

Information provided by McCormick Taylor Inc. shows that the dam is about 13 feet high and 500 feet in length. The spillway is a semi-circular concrete ogee with an effective length of about 90 feet. Two 48-inch diameter sluice gates are located near the eastern limit of the spillway. Laytons Lake Dam was also determined to be affected by Alkali-Silica Reactivity (ASR). ASR is caused by a reaction between the alkaline cement pore solution in the concrete and reactive forms of silica in the aggregate. It can cause expansion and cracking of the concrete resulting in structural problems and possible failure.

The proposed project will involve raising the roadway by about 1.1 feet, re-aligning the roadway and constructing a new bridge with a span of 40 feet. A new semi-circular ogee spillway having an effective length of 90 feet will also be constructed.

This report provides preliminary subsurface soil and groundwater conditions and pertinent geotechnical data for the development of preliminary design concept of the project.

The work was conducted for the New Jersey Department of Transportation (NJDOT).

## 3. FIELD EXPLORATION AND LABORATORY TESTING

As stated earlier, the purpose for the investigation was to obtain subsurface soil and ground water data necessary for developing initial design for the proposed bridge, spillway and dam. The investigation involved the drilling of two borings, collection of soil samples, and conducting laboratory tests on selected samples.

### 3.1. FIELD EXPLORATION

The field test for the geotechnical investigation consisted of drilling one borehole (B-1) on the north shoulder of Route 48 west side of the bridge; the second boring (B-2) was also on the northerly shoulder but to the east side of the bridge. Refer to Appendix A-2 for boring locations. The borings were drilled to an approximate depth of 100 feet below existing ground surface. The drilling was performed on March 17 and 18, 2011. CME 45 drill rig mounted on a truck was used.

The borings were advanced by means of rotary drilling method. Bentonite mud was used as the drilling fluid.

Soil samples were obtained using the split-spoon sampler. The split-spoon was driven in accordance with the requirements of the standard penetration test (SPT). This involves driving a 2-inch outside diameter split spoon using a 140 lb automatic hammer free-falling 30 inches. The numbers of hammer blows required to drive the 24-inch long spoon in 6-inch increments (four increments in all) were recorded. The number of blows required to penetrate the middle two increments (6 to 18 inches) is defined as the standard penetration resistance (N). Standard

Penetration Test (SPT) readings were obtained continuously in the upper 12 feet and at 5 ft intervals thereafter. The soil samples recovered from the SPT split-spoons were visually classified in accordance to the "Burmister Soil Classification System."

The boring location and elevation of the existing grade were determined using the GPS surveying method. The survey was performed by the Surveying Department of KMA Consulting Engineers, Inc. The boring logs are presented in Appendix B.

## 3.2. LABORATORY TESTING

All soil samples obtained were sent to the offices of KMA Consulting Engineers, Inc. Field data was reviewed and a number of samples were selected for laboratory testing. The selected samples were submitted to a certified soils testing laboratory, Temple University Soil Laboratory, for testing.

The selected samples taken to the laboratory were subjected to sieve and hydrometer analyses, Atterberg limits test, natural moisture content, consolidation, and unconfined compressive strength tests. The tests were conducted in accordance to the American Society of Testing Materials (ASTM) procedures which are summarized in Table 3.1.

**Table 3. 1: Laboratory Testing**

| Laboratory Analysis | ASTM Standard | Soil Properties Tested |
|---|---|---|
| Sieve Analysis | D422 | Soil grain size distribution |
| Hydrometer analysis | D4221 | Silt and clay sizes |
| Atterberg Limits | D4318 | Soil plasticity |
| Natural Moisture Content | D2216 | Soil moisture content |
| Unconfined Compression test | D2166 | Soil unconfined compressive strength |
| Consolidation | D2435 | Soil magnitude and rate of consolidation |

A summary of the test results, including graphic presentation of gradation test curves, Atterberg limits chart, unconfined compression test plots, and one-dimension consolidation results are presented in Appendix C.

## 4. SUBSURFACE CONDITIONS

Published geologic data was studied to provide valuable information on the types and mode of formation of the soils in the general vicinity of the project. This information helps in evaluating the subsurface conditions encountered in the borings.

### 4.1 PUBLISHED GEOLOGIC DATA

The project site is located in Salem County, New Jersey. The surface soil in this area, according to the Web Soil Survey, consists of Downer-Galestown (DopB) complex. The soil profile consists mainly of Loamy Sand (0-16 inches), Sandy Loam (16 to 36 inches) and Loamy Sand (36-48 inches).

The surficial geological material in the project area consists mainly of Cape May Formation (Qcm2 and Qcm3) which is a late Pleistocene. Qcm2 consists of sand, pebble gravel, minor silt, clay , peat and cobble gravel; with colors varying from very pale brown to yellow, reddish yellow, white, olive yellow and gray. Qcm3 consists of sand, pebble gravel, minor silt, clay, and peat; with colors varying from yellow, to reddish yellow, white, and gray.

The surficial geologic information was taken from the "New Jersey Geological CD Series CD 06-1". Soil survey data was based on information from "Web Soil Survey 2.0" published by the United States Department of Agriculture of Natural Resources Conservative (NRCS).

### 4.2 SOILS ENCOUNTERED

The soils encountered in the boring are in general agreement with the published geologic data. The detail of the subsurface soil conditions are on the boring logs

presented in Appendix B of this report. The various soil layers encountered with their relevant properties are summarized in the ensuing paragraphs.

At the existing grade in both boreholes a 2-inch thick asphalt concrete (AC) layer was encountered. Below the asphalt in both boreholes is fill. The fill consists primarily of brown/ yellowish brown sand with trace of gravel. We believe the fill is part of the dam's embankment. The fill extends to an approximate depth of 8 feet in B-1 and 7 feet in B-2. Standard penetration test resistance (N-values) varies from over 13 blows per foot (bpf) to 30 bpf.

Directly below the fill in both borings and extending to an approximate depth of 19 feet lays a light/dark gray sand layer with trace of gravel. N-values vary between 7 and 35 bpf with an average N-value of approximately 10 bpf in B-1 and 19 bpf in B-2.

Below 19 feet, dark to a light gray clay, silty clay, clayey silt and sandy clay layers exist to a depth of 80 feet in B-1 and 70 feet in B-2. The N-value for this layer varies between 10 and 20 bpf with an average value of 12 bpf. The average total unit weight is approximately 119 pounds per cubic foot (pcf). The undrained shear strength ($c_u$) for the clay layer was determined in laboratory unconfined compression test to be 573 pounds per square foot (psf) for the sample from B-1. Two unconfined compression tests were performed on a single undisturbed sample form B-2. The undrained shear strengths obtained are 216 and 676 psf.

Underneath clayey soil layers and extending to the end of each boring is very dense sand. The N-values are higher than 50 bpf.

## 4.3 GROUNDWATER CONDITIONS

Stabilized groundwater surface was measured at a depth of 7 feet and 5 feet below existing grade in borehole B-1 and B-2, respectively.

## 5. SEISMIC (SITE CLASS & LIQUIFACTION POTENTIAL) ANALYSES

Site class for structural design was evaluated based on the uncorrected standard penetration N-values as specified in AASHTO LFRD Bridge Design Specifications Section 3.10.3.1. The site class analysis is based on soil data up to 100 feet below existing grade. The analysis indicates a site class of E. The results are presented in Appendix D of this report.

Liquefaction potential analysis was performed as specified in AASHTO LFRD Bridge Design Specifications Section A10.1. The simplified empirical method was used. The earthquake event used was the one with 2% probability of exceedance in 50 years. For the site, this results in peak horizontal ground acceleration (PHGA) of 10% of gravitational acceleration (g). Magnitude 7.5 earthquake was used as the basis for the analysis.

A factor of safety of 2 is regarded as a reasonable margin of safety against liquefaction. On the basis of this criterion none of soil layers appear to have the potential to experience liquefaction during an earthquake having the magnitude assumed for the analysis. The results are presented in Appendix E.

## 6. FOUNDATION ANALYSES

The proposed project includes raising the roadway by about 1.1 feet, re-aligning the roadway, a new bridge with a span of 40 feet, and a new ogee spillway in a semi-circular shape with an effective length of 90 feet. No information on the spillway, the bridge layout or work-loads is currently available.

The soil profile used in the analysis is shown in Table 6.1. Overall, the soil profiles in the two boreholes (B-1 and B-2) are practically similar. However, the dense sand layer (with

SPT blow counts exceeding 50) in B-1 starts at depth of 80 feet while it starts at depth of 55 feet in B-2. In addition, a clay layer exists from 19 feet to 60 feet underlain by a silty

clay layer from 60 to 72 feet in B-1. While in Borehole B-2 the clay layer extends from 19 feet to 55 feet. To be conservative, B-1 was used for foundation analysis.

**Table 6. 1: Soil Profile in B-1**

| Depth (ft.) | Soil Type | Effective Unit Weight (pcf) | Phi $\varphi$ ($^0$) | Cohesion C (psf) | k (lb/in$^3$) | $\varepsilon_{50}$ | Type |
|---|---|---|---|---|---|---|---|
| 0 | Sand/Gravel | 121.4 | 36.4 | 0 | 107.7 | - | 4 |
| 5 | Sand/Gravel (W) | 59 | 36.4 | 0 | 67.2 | - | 4 |
| 8 | Sand/Gravel (W) | 52.5 | 33 | 0 | 32.5 | - | 4 |
| 14 | Sand (W) | 49.7 | 31.8 | 0 | 24.5 | - | 4 |
| 19 | Soft Clay (W) | 56.6 | 0 | 573 | 272 | 0.92 | 1 |
| 60 | Clayey Silt (W) | 73.9 | 35.3 | 1970 | 1451.8 | 0.43 | 3 |
| 72 | Sand (W) | 57.7 | 35.6 | 0 | 56 | - | 4 |
| 80 | Sand (W) | 67.7 | 40 | 0 | 156.8 | - | 4 |
| (W) indicates profile under water table | | | | | | | |

Soil properties used in the analyses are:

1. Effective Unit weight of the soil - this is the total unit weight of the soil less the unit weight of water (62.4 pcf).
2. Phi ($\varphi$) - effective angle of internal friction.
3. Cohesion(C) - unconfined compressive strength.
4. k - modulus of subgrade reaction.
5. $\varepsilon_{50}$ - strain corresponding to one half the maximum principal stress difference.
6. Type - coded information depending on the soil type used in generating the piles response to lateral loading.

Spread-footing and pile foundations are the alternate foundation types considered.

## 6.1 SPREAD FOOTING ANALYSIS

One of the foundation alternatives is spread footing. The footing dimensions used is 15 feet wide by 70 feet long; 70 feet is approximately equal to the width of the existing bridge.

The nominal bearing resistance is 6.7 ksf. The bearing resistance factor recommended by AASHTO LRFD (2010) is 0.45. The resulting factored bearing resistance is approximately 3 ksf. The factored bearing resistance induces a settlement of 5.8 inches. The bearing pressure which would induce one-inch settlement is approximately 0.5 ksf. Our analysis indicates that the clay layer is under-consolidated and AASHTO LRFD (2010) states that normally consolidated and under-consolidated soils are not suitable for spread footing support.

Table 6.2 summarizes the results of the spread footing analysis.

**Table 6. 2: Spread Footing Analysis**

| Footing Dimensions | | Nominal Bearing Resistance (ksf) | Factored Bearing Resistance (ksf) | Allowable Gross Load (kips) | Corresponding Settlement (in) |
|---|---|---|---|---|---|
| B (ft) | L (ft) | | | | |
| 15 | 70 | 6.7 | 3.0 | 3181 | 5.8 |

## 6.2. PILE ANALYSIS

Since at this stage there is no information concerning loads and pile arrangements, the pile analysis is performed only on single piles. Steel pipe piles filled with concrete and steel H-piles are considered. For this preliminary analysis, we assumed vertical and horizontal loads of 100 kips and 25 kips, respectively. The estimates of the expected loads are summarized in Table 6.3.

**Table 6. 3: Assumed Loads on Single Piles**

| Vertical Load (kips) | Horizontal Load (kips) |
|---|---|
| 100 | 25 |

These estimates provide a general idea about the magnitude of the expected forces. They are subject to revision by the project structural engineers.

H-Pile (14x117) and steel pipe pile filled with concrete (16-inch outside diameter with 0.5-inch thick wall) have been analyzed. The relevant structural properties of the piles are provided in Table 6.4 and 6.5.

**Table 6. 4: Properties of H-Pile**

| Width (in) | Area ($in^2$) | Weight/Ft (lb) | Moment of Inertia ($in^4$) | Elastic Modulus (ksi) |
|---|---|---|---|---|
| 14.9 | 34.4 | 120 | 1220 | 29000 |

The resistances evaluated include vertical downward resistance, vertical upward resistance (uplift) and lateral resistance.

**Table 6. 5: Properties of the Steel/Concrete Composite Pile**

| Diameter (in) | Wall Thickness (in) | Area ($in^2$) | Weight/Ft (lb) | Moment of Inertia ($in^4$) | Elastic Modulus (ksi) |
|---|---|---|---|---|---|
| 16 | 0.5 | 42.6 | 266 | 4113 | 29000 |

The computer softwares used to analyze the piles are:

1. DRIVEN - This is an FHWA software.
2. L-PILE – By Ensoft, Inc. This is based on FHWA COM624P computer software.
3. ALLPILE – By CivilTech. The lateral resistance analysis portion is based on FHWA COM624 program.

Table 6.6 below summarizes the resistances evaluated, the appropriate resistance factors and the basis for the factors.

**Table 6. 6: Resistance, Software Used and Factors**

| Resistance | Software Used | Resistance Factor | Comments |
|---|---|---|---|
| Vertical Downward | DRIVEN | 0.45 | Nordlund/Thurman Method |
| Vertical Upward (Uplift) | ALLPILE | 0.35 | Nordlund Method |
| Lateral – Single Pile | L-PILE | 1.0 | Nominal resistance causes 1.0" deflection |

## 6.4 RESULTS OF THE PILE ANALYSIS

The H-Pile was initially analyzed for a depth of 25 feet. The nominal and the factored vertical (downward) resistances are 67 and 30 kips, respectively. These are considered unacceptable (i.e. lower than the assumed working load on the pile). The nominal and the factored vertical uplift loads are, respectively 33 and 12 kips. The pile was further analyzed for lengths of 50, 60 and 75 feet. Results showed that the nominal and factored downward vertical loads for the 50-foot pile are 170 and 76 kips, respectively. The corresponding values for the 60-foot pile are 211 and 95 kips and those for the 70-foot pile are 478 and 215 kips, respectively.

The H-piles were analyzed for resistance under horizontal loading. Results showed that all H-Piles had a head deflection less than 0.4 inches, under the applied load of 25 kips. The horizontal load that causes 1-inch deflection for the 50-foot long pile is 48 kips. A horizontal load of 49 kips causes one-inch deflection for both the 60-foot and 75-foot long H-Piles.

The steel pipe pile was also analyzed for depths of 25, 50, 60 and 75 feet. The nominal and the factored vertical (downward) resistance for the 25-foot pile are 47 and 21 kips, respectively; these are considered too low. The nominal and

factored vertical uplift resistances are 31 and 11 kips, respectively. The 50 and 60-foot long piles also have relatively low nominal and factored vertical downward and upward resistances as shown in Table 6.7. The factored vertical resistances of the 25, 50 and 60-foot long piles are less than the assumed 100 kips working load. The 75-foot long steel pipe pile resulted in nominal and factored vertical downward resistances of 452 and 203 kips, respectively.

The steel pipe piles were also analyzed for resistance under horizontal loading. Results showed that all steel pipe piles had a head deflection less than 0.2 inches, under the applied load of 25 kips. The horizontal loads that cause 1-inch deflection for the 50-foot, 60-foot and 75-foot steel pipe piles are 76, 77 and 78 kips, respectively.

Settlement appears not to be a major concern for both pile types. The results of the vertical resistance analyses are summarized in Table 6.7 and that of the settlement analyses are in Table 6.8. Detailed results are shown in Appendix F. The results of the lateral analyses are summarized in Table 6.9. Detailed results of the lateral analyses are shown in Appendix G.

**Table 6. 7: Vertical Resistances (DRIVEN/ALLPILE)**

| Pile Type | | H-Pile (14x117) | | | | | | Steel/Concrete Composite Pile (16 in. diameter) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Length (ft) | | | | | | | | | | | |
| | | 50 | | 60 | | 75 | | 50 | | 60 | | 75 | |
| Vertical Downward Loads (kips) | Nominal | 170 | Nominal | 211 | Nominal | 478 | Nominal | 107 | Nominal | 139 | Nominal | 452 |
| | Factored | 76 | Factored | 95 | Factored | 215 | Factored | 48 | Factored | 63 | Factored | 203 |
| Vertical Upward Loads (kips) | Nominal | 106 | Nominal | 135 | Nominal | 274 | Nominal | 96 | Nominal | 121 | Nominal | 244 |
| | Factored | 37 | Factored | 47 | Factored | 96 | Factored | 33 | Factored | 42 | Factored | 85 |
| Note: Vertical Downward Loads were determined using DRIVEN<br>Upward Loads were determined using ALLPILE | | | | | | | | | | | | | |

**Table 6. 8: Vertical Settlements (ALLPILE)**

| | H-Pile (14x117) | | | Steel/Concrete Composite Pile (16 in. diameter) | | |
|---|---|---|---|---|---|---|
| | Length (ft) | | | | | |
| | 50 | 60 | 75 | 50 | 60 | 75 |
| Settlement (in) at 100 Kips Vertical Load | 0.0351 | 0.0391 | 0.047 | Failure in Bearing | 0.0332 | 0.0389 |

**Table 6. 9: Lateral Analyses (L-Pile)**

| Pile Type | | | H-Pile (14x117) | | | | | | Steel/Concrete Composite Pile (16 in. diameter) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Length (ft) | | | | | | | | | | | |
| | | | 50 | | 60 | | 75 | | 50 | | 60 | | 75 | |
| | | | Horizontal Pile Deflection (in) | | | | | | | | | | | |
| Vertical Load (kips) | Horizontal Load (kips) | Moment (kip-ft) | Pile Head | Pile Tip | Pile Head | Pile Tip | Pile Head | Pile Tip | Pile Head | Pile Tip | Pile Head | Pile Tip | Pile Head | Pile Tip |
| 100 | 25 | 0 | 0.378 | 1.0E-03 | 0.372 | -9.3E-05 | 0.375 | -5.2E-08 | 0.199 | 5.7E-03 | 0.195 | 4.0E-03 | 0.197 | 9.5E-07 |
| Loads to induce 1 inch Horizontal Deflection | | | | | | | | | | | | | | |
| Horizontal Load (kips) | | | 48 | | 49 | | 49 | | 76 | | 77 | | 78 | |

## 7. RECOMMENDATIONS

As a result of the relatively large settlement cause by the factored resistance and the relatively low bearing pressure which induces one inch of settlement, we do not recommend spread footing foundation. In addition, the scour potential of the stream bed has not been assessed. In order to evaluate this condition borings need to be performed in the lake to assess the soil deposits at the bottom of the lake. These deposits may also be liquefiable when subjected to shaking during an earthquake.

Based on the results of our analyses, H-pile driven to an approximate depth of 75 feet below existing ground surface will perform satisfactorily under the assumed loads on a single pile. Likewise the 16-inch diameter steel pipe pile, with 0.5-inch thick wall filled with concrete, driven to a depth of 75 feet below existing grade.

It is recommended that additional borings be drilled at the site to provide a more detailed information concerning the subsurface conditions. At least two of the recommended borings should be performed in the lake close to the location of the proposed spill-way.

These borings will help in identifying any liquefiable deposits at the bottom of the lake, provide relevant data for seepage analysis and, if applicable, help estimate the magnitude of scour which may occur at the abutments.

## 8. BASIS FOR RECOMMENDATIONS

This report has been prepared to serve as a basis for design and preparation of plans and specifications for the foundation for the proposed Laytons Lake Dam Improvement Project. The opinions, conclusions, and recommendations contained in this report are based upon our professional judgment and generally accepted principles of geotechnical engineering. Inherent to these is the assumption that the earthwork, foundation construction and other relevant aspects of the construction will be performed under the direct supervision of a geotechnical engineer licensed in the State of New Jersey.

These analyses and recommendations are, of necessity, based on the information available at the time of the actual writing of the report and on the site conditions, surface and subsurface, that existed at the time the exploratory borings were drilled. Further assumption has been made that the limited exploratory boring, in relation both to lateral extent of the site and to depth, are representative of conditions at the site.

The nature and extent of variations in the vicinity of the boring may not become evident until construction. If variations from the anticipated conditions are encountered, it may be necessary to revise the recommendations in this report. We cannot accept responsibility for designs based on recommendations in this report unless we are engaged to make site visits during construction to:

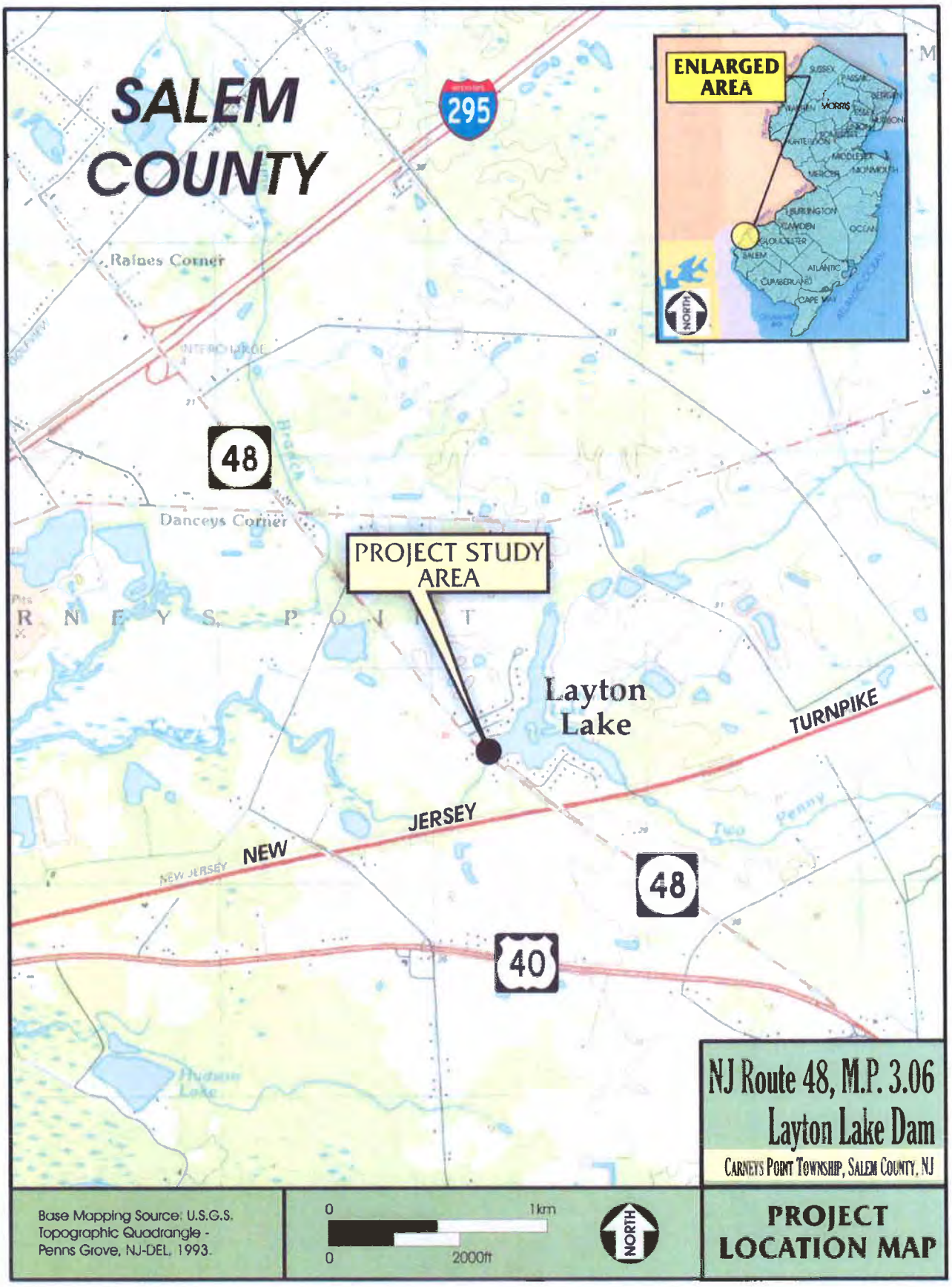
a) Check that the subsurface conditions exposed during construction are in general agreement with our design assumptions and

b) Ascertain that, in general, the work is being performed in compliance with the contract documents.

Our professional services have been performed in accordance with generally accepted engineering principles and practices; no other warranty, expressed or implied, is made. KMA Consulting Engineers, Inc. assumes no responsibility for interpretations made by others on information presented in this report.

# APPENDIX A: SITE LOCATION

# APPENDIX A-1: SITE LOCATION MAP



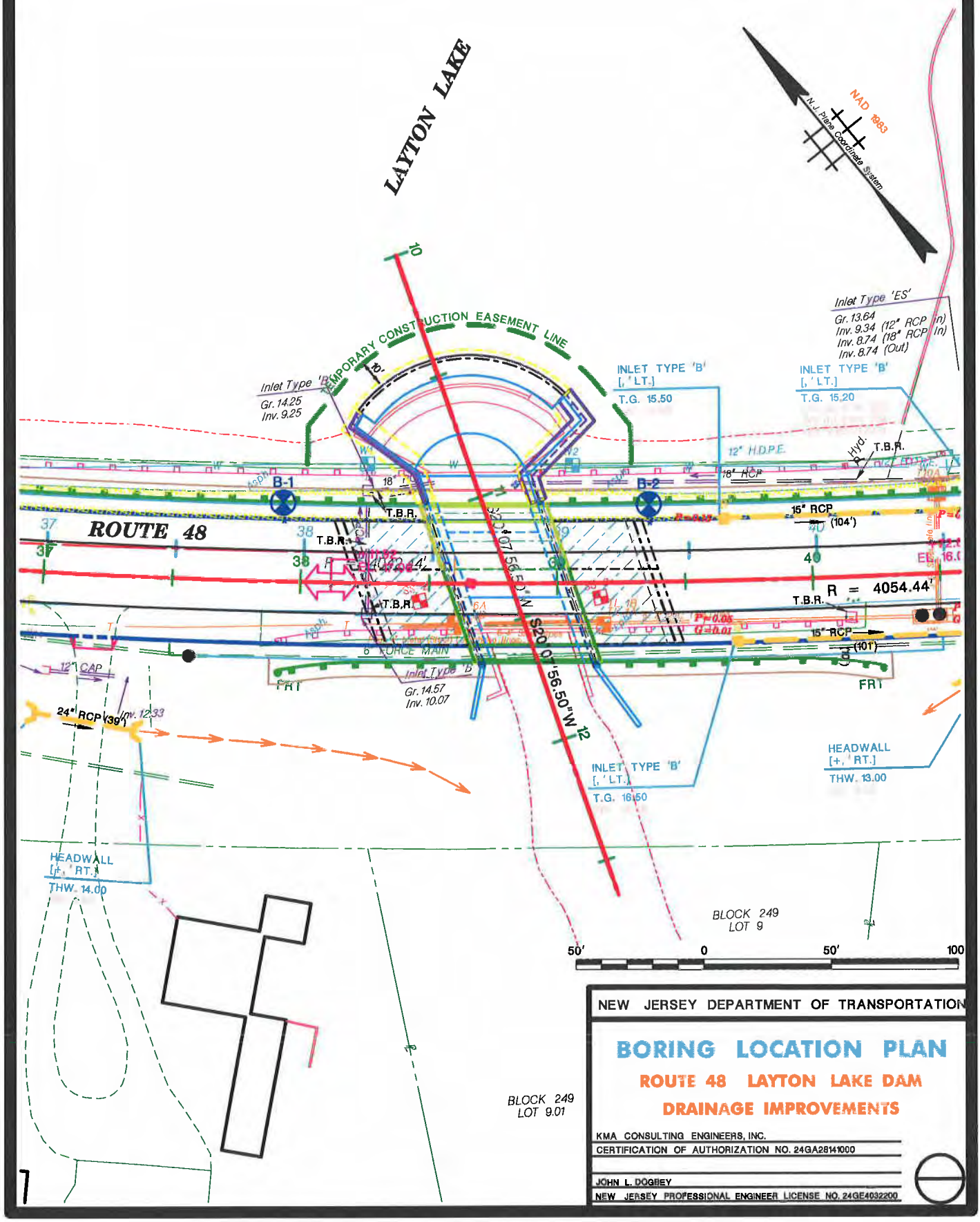

McCormick Taylor
Engineers & Planners Since 1946

FIGURE 1

# APPENDIX A-2: BORING LOCATION PLAN

TOWNSHIP OF CARNEYS POINT

COUNTY OF SALEM




NEW JERSEY DEPARTMENT OF TRANSPORTATION

# BORING LOCATION PLAN

## ROUTE 48 LAYTON LAKE DAM DRAINAGE IMPROVEMENTS

KMA CONSULTING ENGINEERS, INC.
CERTIFICATION OF AUTHORIZATION NO. 24GA28141000

JOHN L. DOGGREY
NEW JERSEY PROFESSIONAL ENGINEER LICENSE NO. 24GE4032200

# APPENDIX B: BORING LOGS

FORM SO-2

# KMA CONSULTING ENGINEERS, INC.

ROUTE: NJ 48 LOCAL NAME: NJ 48 BORING NO. B-1

SECTION: 1706 EAST: 230822.491 NORTH: 313918.077

STATION: 37+92.60 OFFSET: 30.70' LT REFERENCE LINE: Center Line of Route 48 GROUND ELEVATION: 14.43

BORINGS BY: Soil Borings, Inc. DATE STARTED: 3-17-11

INSPECTOR: Prathima Alla / Charbel Khoury DATE COMPLETED: 3-17-11

ELEVATION G.W.T.
0 Hr. 7 ft Date: 3-17-11
24 Hr. _____ ft. P.P. Installed Date: Date:

| DEPTH (ft.) | SAMPLE NO. | DEPTH (ft.) | | BLOWS ON SPOON 0-6" | 6-12" | 12-18" | 18-24" | REC. (in.) | SOIL DESCRIPTION & STRATIGRAPHY | |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | S-1 | 0 | 2.0 | - | 6 | 12 | 10 | 14" | 1" Thick asphalt over 1" thick granular base<br>Brown mf SAND, little f Gravel (Fill) | 0.1 |
| | S-2 | 2 | 4.0 | 12 | 16 | 14 | 8 | 16" | Dark brown mf SAND, trace f Gravel (Fill) | 3 |
| 5 | S-3 | 4 | 6.0 | 7 | 10 | 11 | 14 | 15" | Light yellowish brown cf SAND, trace f Gravel (Fill) | 4 |
| | S-4 | 6 | 8.0 | 18 | 13 | 12 | 13 | 17" | | |
| | S-5 | 8 | 10.0 | 7 | 7 | 6 | 6 | 19" | Light gray cf SAND, trace Silt, trace f Gravel | 8 |
| 10 | | | | | | | | | | |
| | S-6 | 13 | 15.0 | 1 | 3 | 4 | 7 | 17" | | |
| 15 | | | | | | | | | Dark gray mf SAND, thin layer of dark brown Peat at 14' | 14 |
| | S-7 | 18 | 20.0 | 3 | 4 | 4 | 6 | 15" | | |
| 20 | | | | | | | | | Dark gray CLAY, some mf Sand, micaceous | 19 |
| | S-8 | 23 | 25.0 | 5 | 6 | 4 | 7 | 24" | | |
| 25 | S-9 | 25 | 27.0 | STUBE | | | | 24" | | |
| | S-10 | 27 | 29.0 | 4 | 5 | 7 | 7 | 24" | | |
| 30 | | | | | | | | | | |
| | S-11 | 33 | 35.0 | 5 | 6 | 6 | 8 | 24" | | |
| 35 | | | | | | | | | | |

| | |
|---|---|
| Nominal I.D. of Drive Pipe | |
| Nominal I.D. of Split Barrel Sampler | 1.375" |
| Weight of Hammer on Drive Pipe | |
| Weight of Hammer on Split Barrel Sampler | 140 lb |
| Drop of Hammer on Drive Pipe | |
| Drop of Hammer on Split Barrel Sampler | 30" |

Core Size _____ - _____

Soil descriptions represent a field identification after D.M. Burmister unless otherwise noted.

The subsurface information shown hereon was obtained for State design and estimate purposes. It is made available to authorized users only that they may have access to the same information available to the State. It is presented in good faith, but is not intended as a substitute for investigations, interpretation or judgment of such authorized users.

Approximate Change in Strata _____

Inferred Change in Strata — — — —

FORM SO-2

# KMA CONSULTING ENGINEERS, INC.

ROUTE: NJ 48 LOCAL NAME: NJ 48 BORING NO. B-1

SECTION: 1706 EAST: 230822.491 NORTH: 313918.077

STATION: 37+92.60 OFFSET: 30.70' LT REFERENCE LINE: Center Line of Route 48 GROUND ELEVATION: 14.43

BORINGS BY: Soil Borings, Inc. DATE STARTED: 3-17-11

INSPECTOR: Prathima Alla / Charbel Khoury DATE COMPLETED: 3-17-11

ELEVATION G.W.T.
0 Hr. 7 ft Date: 3-17-11
24 Hr. _____ ft. P.P. Installed Date: Date:

| DEPTH (ft.) | SAMPLE NO. | DEPTH (ft.) | | BLOWS ON SPOON 0-6" | 6-12" | 12-18" | 18-24" | REC. (in.) | SOIL DESCRIPTION & STRATIGRAPHY | |
|---|---|---|---|---|---|---|---|---|---|---|
| 35 | | | | | | | | | | |
| | S-12 | 38 | 40.0 | 5 | 5 | 8 | 10 | 24" | | |
| 40 | | | | | | | | | | |
| | S-13 | 43 | 45.0 | 6 | 7 | 13 | 12 | 24" | | |
| | | | | | | | | | Light grayish brown silty CLAY, little f Sand, micaceous | 44.5 |
| 45 | | | | | | | | | | |
| | S-14 | 48 | 50.0 | 5 | 4 | 7 | 6 | 24" | | |
| | | | | | | | | | Dark gray clayey SILT,little f Sand, micaceous | 49.5 |
| 50 | | | | | | | | | | |
| | S-15 | 53 | 55.0 | 3 | 4 | 6 | 8 | 24" | | |
| 55 | | | | | | | | | | |
| | S-16 | 58 | 60.0 | 5 | 5 | 6 | 13 | 24" | | |
| 60 | | | | | | | | | | |
| | S-17 | 63 | 65.0 | 8 | 15 | 17 | 18 | 24" | | |
| 65 | | | | | | | | | | |
| | | | | | | | | | Dark gray silty CLAY, pieces of Shale. | 67 |
| | S-18 | 68 | 70.0 | 9 | 18 | 26 | 34 | 24" | | |
| 70 | | | | | | | | | | |

| | |
|---|---|
| Nominal I.D. of Drive Pipe | |
| Nominal I.D. of Split Barrel Sampler | 1.375" |
| Weight of Hammer on Drive Pipe | |
| Weight of Hammer on Split Barrel Sampler | 140 lb |
| Drop of Hammer on Drive Pipe | |
| Drop of Hammer on Split Barrel Sampler | 30" |

Core Size _____

Soil descriptions represent a field identification after D.M. Burmister unless otherwise noted.

The subsurface information shown hereon was obtained for State design and estimate purposes. It is made available to authorized users only that they may have access to the same information available to the State. It is presented in good faith, but is not intended as a substitute for investigations, interpretation or judgment of such authorized users.

Approximate Change in Strata _____

Inferred Change in Strata — — — —

FORM SO-2

# KMA CONSULTING ENGINEERS, INC.

ROUTE: NJ 48 LOCAL NAME: NJ 48 BORING NO. B-1

SECTION: 1706 EAST: 230822.491 NORTH: 313918.077

STATION: 37+92.60 OFFSET: 30.70' LT REFERENCE LINE: Center Line of Route 48 GROUND ELEVATION: 14.43

BORINGS BY: Soil Borings, Inc. DATE STARTED: 3-17-11

INSPECTOR: Prathima Alla / Charbel Khoury DATE COMPLETED: 3-17-11

ELEVATION G.W.T.
0 Hr. 7 ft Date: 3-17-11
24 Hr. _____ ft. P.P. Installed Date: Date:

| DEPTH (ft.) | SAMPLE NO. | | DEPTH (ft.) | BLOWS ON SPOON 0-6" | 6-12" | 12-18" | 18-24" | REC. (in.) | SOIL DESCRIPTION & STRATIGRAPHY | |
|---|---|---|---|---|---|---|---|---|---|---|
| 70 | | | | | | | | | | |
| | S-19 | 73 | 75.0 | 8 | 7 | 7 | 5 | 24" | | |
| 75 | | | | | | | | | | |
| | S-20 | 78 | 80.0 | 6 | 7 | 17 | 50 | 24" | | |
| | | | | | | | | | Pale gray mf SAND, trace Silt,thin layers of black organic matter at 87' . | 79.5 |
| 80 | | | | | | | | | | |
| | S-21 | 83 | 85.0 | 50/6" | | | | 6" | | |
| 85 | | | | | | | | | | |
| | S-22 | 88 | 90.0 | 50/4" | | | | 4" | | |
| 90 | | | | | | | | | | |
| | S-23 | 93 | 95.0 | 50/5" | | | | 5" | | |
| 95 | | | | | | | | | | |
| | S-24 | 98 | 100.0 | 45 | 22 | 29 | 32 | 14" | | |
| 100 | | | | | | | | | End of Boring @ 100' | 100 |
| 105 | | | | | | | | | | |

| | |
|---|---|
| Nominal I.D. of Drive Pipe | |
| Nominal I.D. of Split Barrel Sampler | 1.375" |
| Weight of Hammer on Drive Pipe | |
| Weight of Hammer on Split Barrel Sampler | 140 lb |
| Drop of Hammer on Drive Pipe | |
| Drop of Hammer on Split Barrel Sampler | 30" |

Core Size _____

Soil descriptions represent a field identification after D.M. Burmister unless otherwise noted.

The subsurface information shown hereon was obtained for State design and estimate purposes. It is made available to authorized users only that they may have access to the same information available to the State. It is presented in good faith, but is not intended as a substitute for investigations, interpretation or judgment of such authorized users.

Approximate Change in Strata _____

Inferred Change in Strata — — — —

FORM SO-2

# KMA CONSULTING ENGINEERS, INC.

ROUTE: NJ 48 LOCAL NAME: NJ 48 BORING NO. B-2

SECTION: 1706 EAST:230932.324 NORTH: 313827.401

STATION: 39+36.50 OFFSET: 30.40' LT REFERENCE LINE: Center Line of Route 48 GROUND ELEVATION: 13.61

BORINGS BY: Soil Borings, Inc. DATE STARTED: 3-18-11

INSPECTOR: Prathima Alla / Charbel Khoury DATE COMPLETED: 3-18-11

ELEVATION G.W.T.
0 Hr. 5 ft Date: 3-18-11
24 Hr. Date:
ft. P.P. Installed Date:

| DEPTH (ft.) | SAMPLE NO. | DEPTH (ft.) | | BLOWS ON SPOON 0-6" | 6-12" | 12-18" | 18-24" | REC. (in.) | SOIL DESCRIPTION & STRATIGRAPHY | |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | S-1 | 0 | 2.0 | - | 5 | 8 | 10 | 11" | 1" Thick asphalt over 1" thick granular base<br>Light yellowish brown cf SAND, trace Gravel (Fill) | 0.1 |
| | S-2 | 2 | 4.0 | 11 | 10 | 9 | 6 | 17" | | |
| | S-3 | 4 | 6.0 | 10 | 7 | 8 | 12 | 14" | | |
| 5 | S-4 | 6 | 8.0 | 9 | 12 | 10 | 11 | 17" | | |
| | S-5 | 8 | 10.0 | 5 | 9 | 8 | 7 | 20" | Grayish brown cf SAND, trace f Gravel | 7 |
| 10 | | | | | | | | | Light yellowish brown cf SAND , trace f Gravel | 9 |
| | S-6 | 13 | 15.0 | 17 | 21 | 14 | 14 | 10" | Light gray cf SAND, little f Gravel, trace Silt, | 11 |
| 15 | S-7 | 18 | 20.0 | 2 | 2 | 4 | 5 | 18" | Dark gray CLAY,some f Sand, micaceous | 18.4 |
| 20 | S-8 | 23 | 25.0 | 4 | 4 | 5 | 5 | 15" | | |
| 25 | S-9 | 28 | 30.0 | 4 | 5 | 6 | 7 | 24" | | |
| 30 | S-10 | 30 | 32.0 | STUBE | | | | 24" | | |
| | S-11 | 32 | 34.0 | 8 | 9 | 7 | 7 | 24" | Dark gray silty CLAY, trace f Sand | 32 |
| 35 | | | | | | | | | | |

| | |
|---|---|
| Nominal I.D. of Drive Pipe | |
| Nominal I.D. of Split Barrel Sampler | 1.375" |
| Weight of Hammer on Drive Pipe | |
| Weight of Hammer on Split Barrel Sampler | 140 lb |
| Drop of Hammer on Drive Pipe | |
| Drop of Hammer on Split Barrel Sampler | 30" |

Core Size -

Soil descriptions represent a field identification after D.M. Burmister unless otherwise noted.

The subsurface information shown hereon was obtained for State design and estimate purposes. It is made available to authorized users only that they may have access to the same information available to the State. It is presented in good faith, but is not intended as a substitute for investigations, interpretation or judgment of such authorized users.

Approximate Change in Strata
Inferred Change in Strata

FORM SO-2

# KMA CONSULTING ENGINEERS, INC.

ROUTE: NJ 48 LOCAL NAME: NJ 48 BORING NO. B-2

SECTION: 1706 EAST: 230932.324 NORTH: 313827.401

STATION: 39+36.50 OFFSET: 30.40' LT REFERENCE LINE: Center Line of Route 48 GROUND ELEVATION: 13.61

BORINGS BY: Soil Borings, Inc. DATE STARTED: 3-18-11

INSPECTOR: Prathima Alla / Charbel Khoury DATE COMPLETED: 3-18-11

ELEVATION G.W.T.
0 Hr. 5 ft Date: 3-18-11
24 Hr. _____ ft. P.P. Installed Date: Date:

| DEPTH (ft.) | SAMPLE NO. | DEPTH (ft.) | BLOWS ON SPOON 0-6" | 6-12" | 12-18" | 18-24" | REC. (in.) | SOIL DESCRIPTION & STRATIGRAPHY | |
|---|---|---|---|---|---|---|---|---|---|
| 35 | | | | | | | | | |
| | S-12 | 38 40.0 | 3 | 7 | 7 | 9 | 24" | | |
| 40 | | | | | | | | | |
| | S-13 | 43 45.0 | 4 | 7 | 7 | 9 | 24" | | |
| 45 | | | | | | | | | |
| | S-14 | 48 50.0 | 5 | 7 | 7 | 10 | 24" | | |
| 50 | | | | | | | | | |
| | S-15 | 53 55.0 | 5 | 8 | 10 | 12 | 24" | | 54.7 |
| 55 | | | | | | | | Light green mf SAND, trace Silt,glauconitic | |
| | S-16 | 58 60.0 | 17 | 50/4" | | | 10" | | |
| 60 | | | | | | | | Light green mf SAND, some Clay, glauconitic | 61 |
| | S-17 | 63 65.0 | 16 | 16 | 17 | 25 | 24" | Light grayish green sandy CLAY, glauconitic | 64 |
| 65 | | | | | | | | | |
| | S-18 | 68 70.0 | 10 | 12 | 50/5" | | 17" | | 69.8 |
| 70 | | | | | | | | | |

| | |
|---|---|
| Nominal I.D. of Drive Pipe | |
| Nominal I.D. of Split Barrel Sampler | 1.375" |
| Weight of Hammer on Drive Pipe | |
| Weight of Hammer on Split Barrel Sampler | 140 lb |
| Drop of Hammer on Drive Pipe | |
| Drop of Hammer on Split Barrel Sampler | 30" |

Core Size _____

Soil descriptions represent a field identification after D.M. Burmister unless otherwise noted.

The subsurface information shown hereon was obtained for State design and estimate purposes. It is made available to authorized users only that they may have access to the same information available to the State. It is presented in good faith, but is not intended as a substitute for investigations, interpretation or judgment of such authorized users.

Approximate Change in Strata _____
Inferred Change in Strata — — — —

FORM SO-2

# KMA CONSULTING ENGINEERS, INC.

ROUTE: NJ 48 LOCAL NAME: NJ 48 BORING NO. B-2

SECTION: 1706 EAST: 230932.324 NORTH: 313827.401

STATION: 39+36.50 OFFSET: 30.40' LT REFERENCE LINE: Center Line of Route 48 GROUND ELEVATION: 13.61

BORINGS BY: Soil Borings, Inc. DATE STARTED: 3-18-11 ELEVATION G.W.T. 0 Hr. 5 ft Date: 3-18-11

INSPECTOR: Prathima Alla / Charbel Khoury DATE COMPLETED: 3-18-11 24 Hr. ft. P.P. Installed Date: Date:

| DEPTH (ft.) | SAMPLE NO. | DEPTH (ft.) | | BLOWS ON SPOON 0-6" | 6-12" | 12-18" | 18-24" | REC. (in.) | SOIL DESCRIPTION & STRATIGRAPHY |
|---|---|---|---|---|---|---|---|---|---|
| 70 | | | | | | | | | Pale gray mf SAND, trace Silt |
| | S-19 | 73 | 75.0 | 37 | 50/3" | | | 9" | |
| 75 | | | | | | | | | |
| | S-20 | 78 | 80.0 | 25 | 50/5" | | | 6" | |
| 80 | | | | | | | | | |
| | S-21 | 83 | 85.0 | 50/5" | | | | 5" | |
| 85 | | | | | | | | | |
| | S-22 | 88 | 90.0 | 50/5" | | | | 5" | |
| 90 | | | | | | | | | |
| | S-23 | 93 | 95.0 | 38 | 50/2" | | | 8" | |
| 95 | | | | | | | | | |
| | S-24 | 98 | 100.0 | 50/5" | | | | 5" | End of Boring at 98.4'. 98.4 |
| 100 | | | | | | | | | |
| 105 | | | | | | | | | |

| | |
|---|---|
| Nominal I.D. of Drive Pipe | |
| Nominal I.D. of Split Barrel Sampler | 1.375" |
| Weight of Hammer on Drive Pipe | |
| Weight of Hammer on Split Barrel Sampler | 140 lb |
| Drop of Hammer on Drive Pipe | |
| Drop of Hammer on Split Barrel Sampler | 30" |

Core Size _____

Soil descriptions represent a field identification after D.M. Burmister unless otherwise noted.

The subsurface information shown hereon was obtained for State design and estimate purposes. It is made available to authorized users only that they may have access to the same information available to the State. It is presented in good faith, but is not intended as a substitute for investigations, interpretation or judgment of such authorized users.

Approximate Change in Strata _____

Inferred Change in Strata — — — —

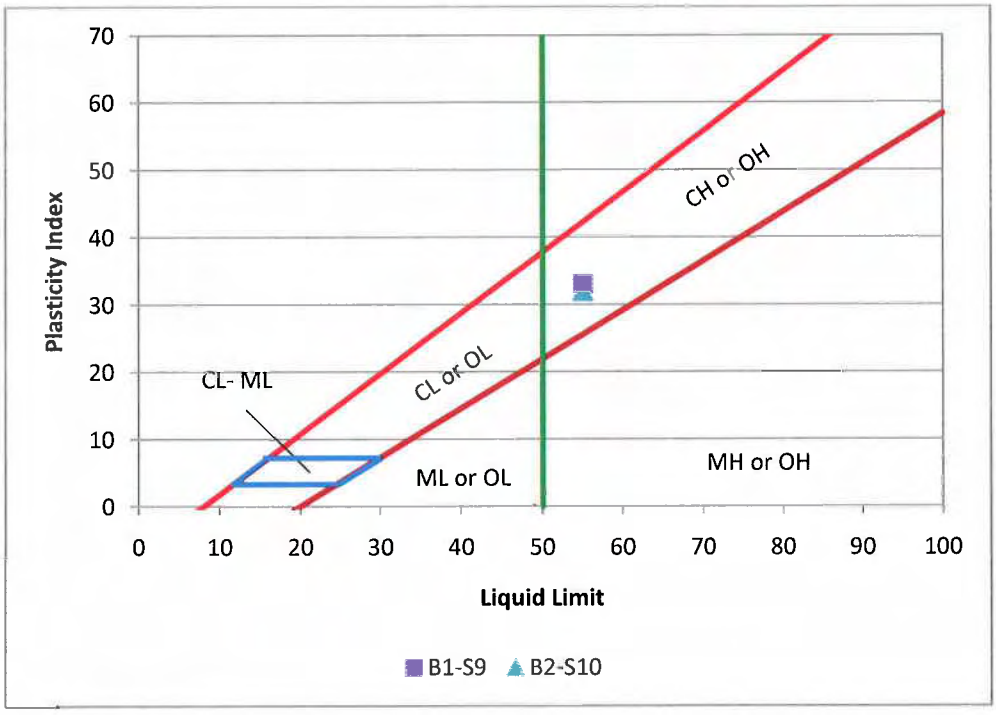
# APPENDIX C: LABORATORY TEST RESULTS

## Summary Results

**Client :** KMA Consulting Enginers, Inc.
**Project:** Laytons Lake
**Project #:** 1121
**Tested by:** Khoury
**Tested at:** Temple University
**Date :** 4/10/2011

| Boring | Sample | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | No. | Depth | LL | PL | PI | M.C.* | S.G.** | Cu | Cc | USCS Classification |
| B-1 | S5 | 8'-14' | -- | -- | -- | 18.23 | -- | 3.4 | 0.95 | Poorly Graded Sand (SP) |
| | S9 (SH) | 25'-27' | 55 | 22 | 33 | 40.32 | 2.64 | -- | -- | Fat Clay (CH) |
| | S21/S23 | 80'-100' | -- | -- | -- | 22.05 | -- | 5 | 1.25 | Poorly Graded Sand with Silt (SP-SM) |
| B2 | S6 | 13'-15' | -- | -- | -- | 17.97 | -- | 5 | 0.89 | Poorly Graded Sand with Silt (SP-SM) |
| | S10 (SH) | 30'-32' | 55 | 23 | 32 | 39.12 | 2.65 | -- | -- | Fat Clay (CH) |
| | S19/S21/S23 | 70'-100' | -- | -- | -- | 21.38 | -- | 3.56 | 1.25 | Poorly Graded Sand with Silt (SP-SM) |

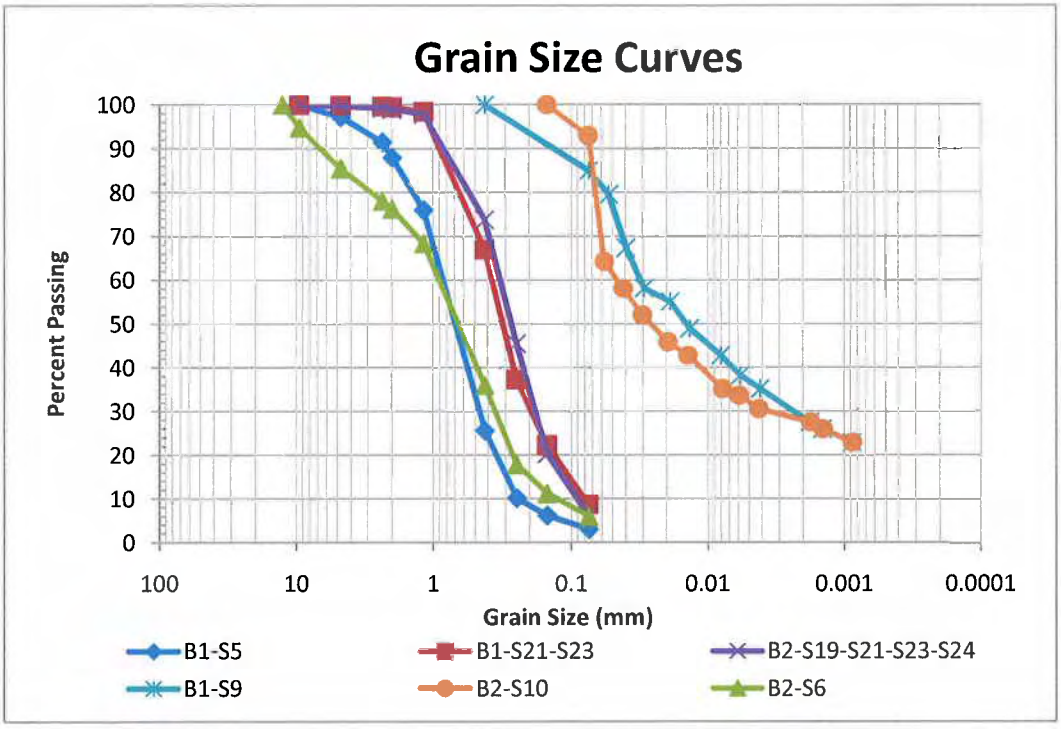
Notes:
M.C.* - denotes moisture content
S.G.** - denotes specific gravity



## Grain Size Results

**Client :** KMA Consulting Enginers, Inc.
**Project:** Laytons Lake
**Project No.:** 1121
**Tested by :** Khoury
**Tested at :** Temple University
**Date :** 4/10/2011

| Boring | Sample | | % Gravel | | | % Sand | | | % Fines |
|---|---|---|---|---|---|---|---|---|---|
| | No. | Depth | Coarse | Medium | Fine | Coarse | Medium | Fine | |
| B-1 | S5 | 8'-14' | 0 | 0 | 3 | 9 | 62 | 23 | 3 |
| | S9 (SH) | 25'-27' | 0 | 0 | 0 | 0 | 0 | 25 | 85 |
| | S21/S23 | 80'-100' | 0 | 0 | 0 | 0.5 | 32 | 58 | 9 |
| B2 | S6 | 13'-15' | 0 | 0 | 14 | 9 | 40 | 30 | 6 |
| | S10 (SH) | 30'-32' | 0 | 0 | 0 | 0 | 0 | 7 | 93 |
| | S19/S21/S23 | 70'-100' | 0 | 0 | 0 | 1 | 25 | 68 | 6 |



# UCT DATA:

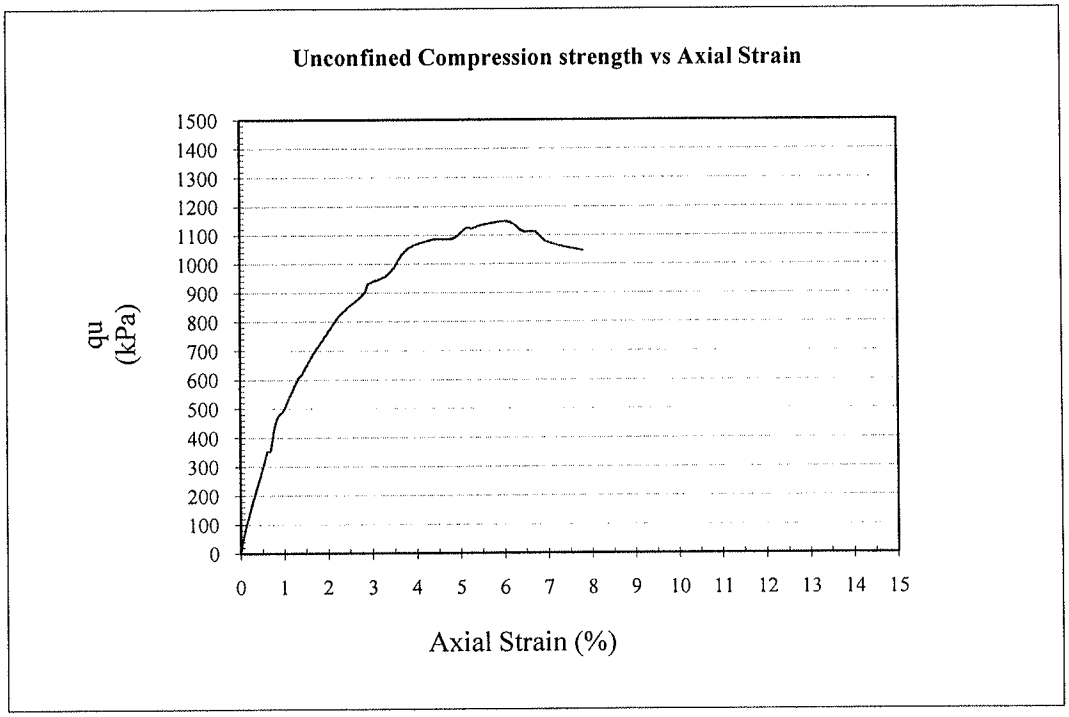
| | |
|---|---|
| **Project:** | KMA |
| **Boring No:** | B1-S9 |
| **Sample depth:** | 25' 4"-25' 10" |
| **Tested By:** | Khoury |
| **Date:** | 4/15/2011 |
| **Shear Rate:** | 1 % /min |

**Initial Conditions**

| | |
|---|---|
| **Diameter (inch)** | 2.837 |
| **Height (inch)** | 5.630 |
| **Wet weight (g)** | 1102.1 |
| **Sample Area (in^2)** | 6.320 |
| **Water Content (%)** | 40.32 |
| **$\gamma$ (pcf)** | 117.75 |
| **$\gamma_d$ (pcf)** | 83.92 |

**Maximum $q_u$ =** **1146.6 psf**

**Undrained shear strength $c_u = q_u/2$=** **573.31 psf**



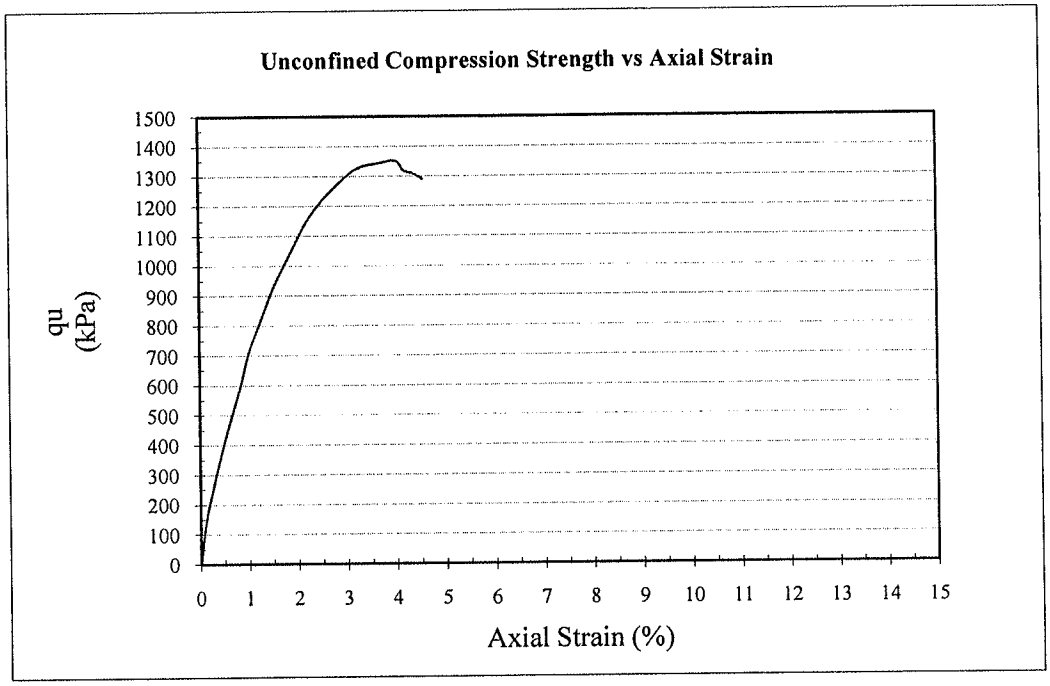
# UCT DATA:

| | |
|---|---|
| **Project:** | KMA |
| **Boring No:** | B2-S10 |
| **Sample depth:** | 31' 6"-32" |
| **Tested By:** | Khoury |
| **Date:** | 4/15/2011 |
| **Shear Rate:** | 1 % /min |

| **Initial Conditions** | |
|---|---|
| **Diameter (inch)** | 2.839 |
| **Height (inch)** | 5.660 |
| **Wet weight (g)** | 1093.6 |
| **Sample Area (in^2)** | 6.329 |
| **Water Content (%)** | 37.48 |
| **$\gamma$ (pcf)** | 116.06 |
| **$\gamma_d$ (pcf)** | 84.41 |

**Maximum $q_u$ =** **1351.7 psf**

**Undrained shear strength $c_u = q_u/2$=** **675.86 psf**



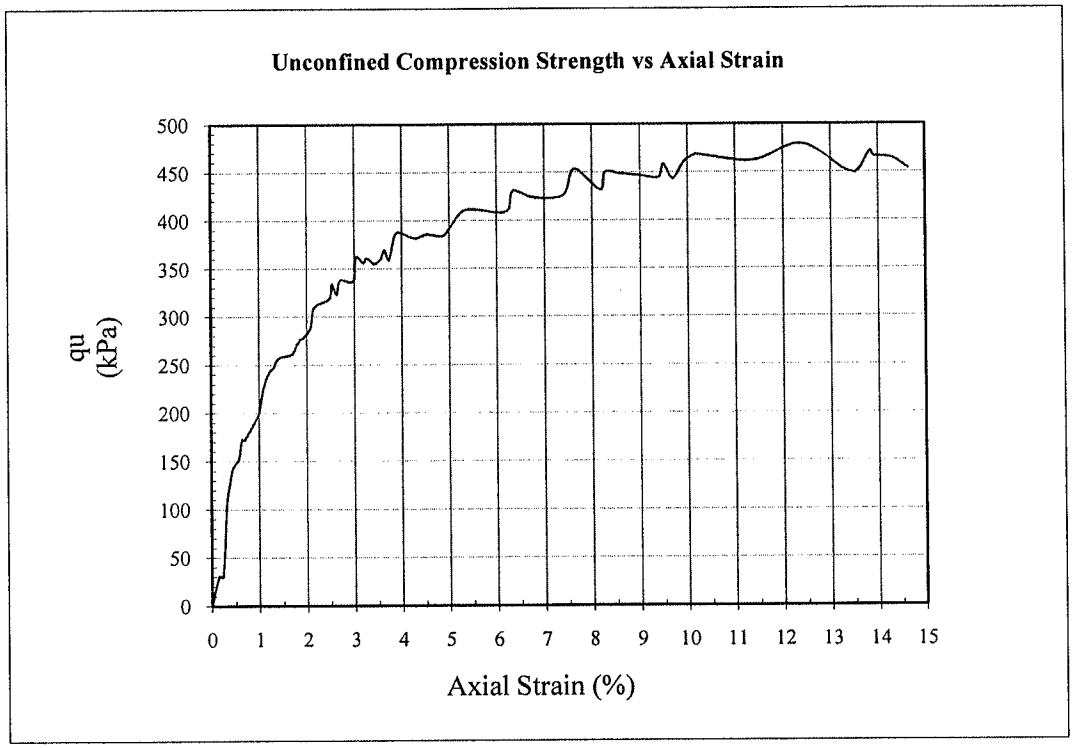
# UCT DATA:

| | |
|---|---|
| **Project:** | KMA |
| **Boring No:** | B2-S10 |
| **Sample depth:** | 30'-30'6" |
| **Tested By:** | Khoury |
| **Date:** | 4/15/2011 |
| **Shear Rate:** | 1 % /min |

| **Initial Conditions** | |
|---|---|
| **Diameter (inch)** | 2.837 |
| **Height (inch)** | 5.650 |
| **Wet weight (g)** | 1163.3 |
| **Sample Area (in^2)** | 6.320 |
| **Water Content (%)** | 40.75 |
| **$\gamma$ (pcf)** | 123.85 |
| **$\gamma_d$ (pcf)** | 87.99 |

**Maximum $q_u$ =** **430.7 psf**

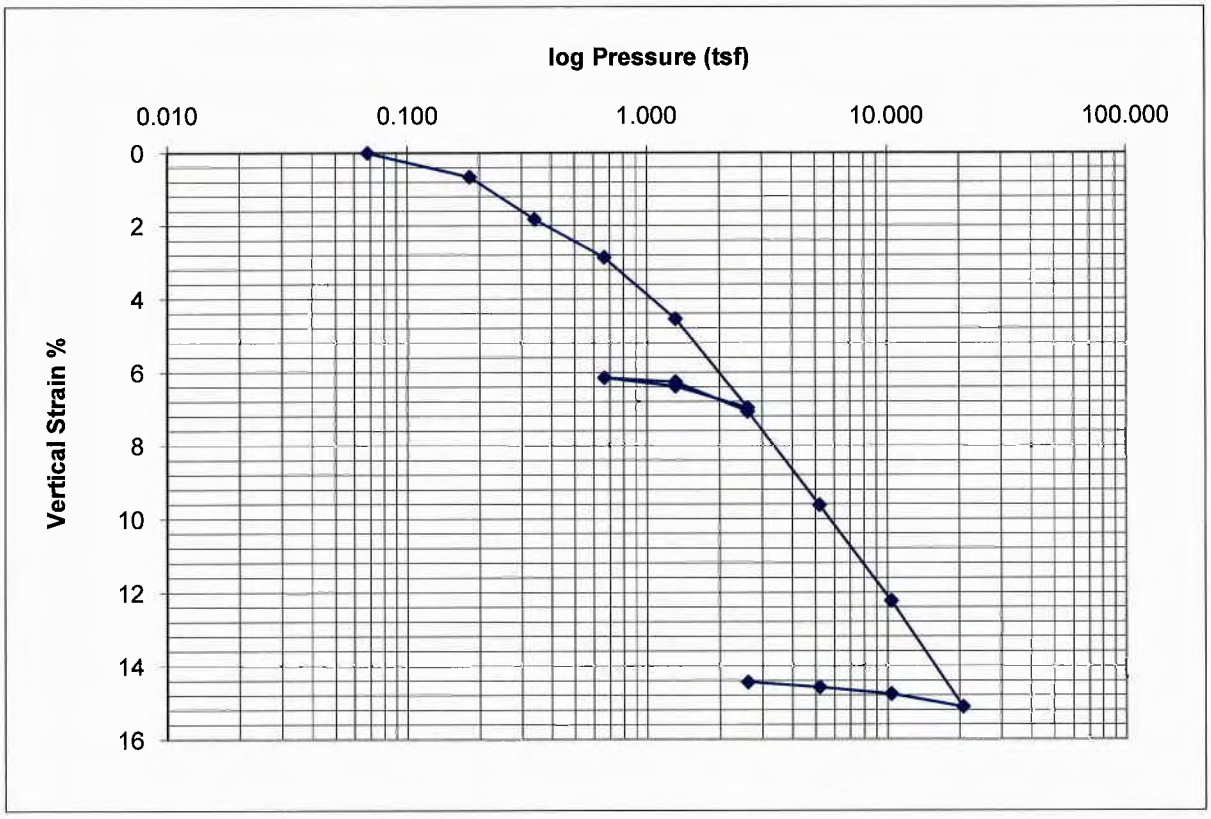
**Undrained shear strength $c_u = q_u/2$=** **215.35 psf**



# Consolidation Test Report

**Client :** KMA Consulting Enginers, Inc.
**Project:** Laytons Lake
**Project #:** 1121

**Tested by:** Khoury
**Tested at:** Temple University
**Date :** 4/10/2011

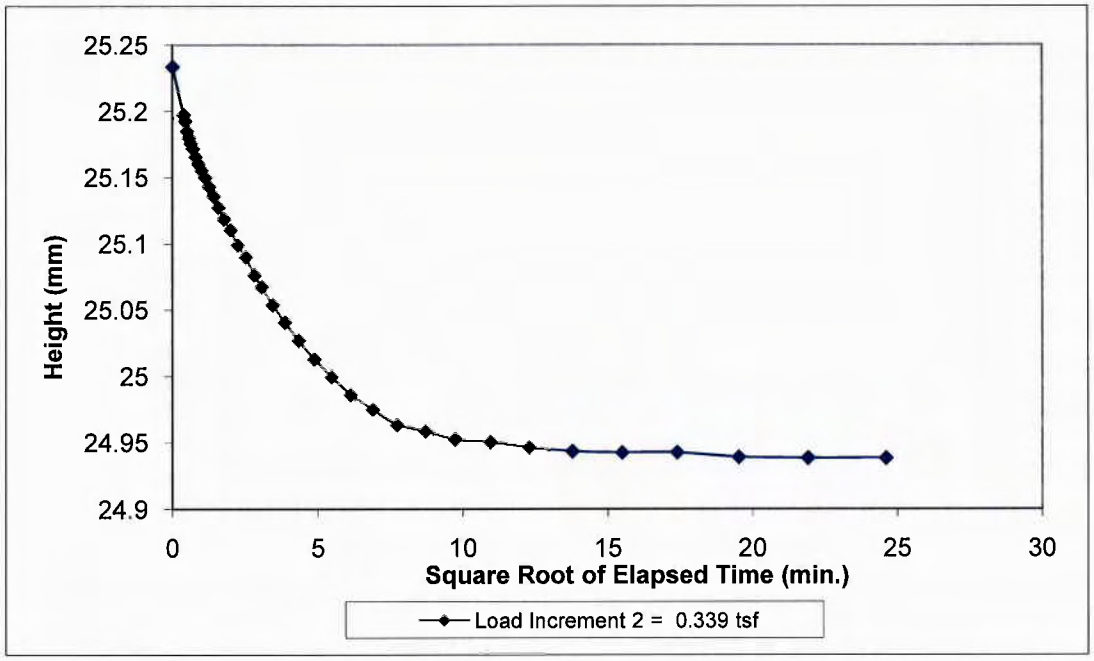


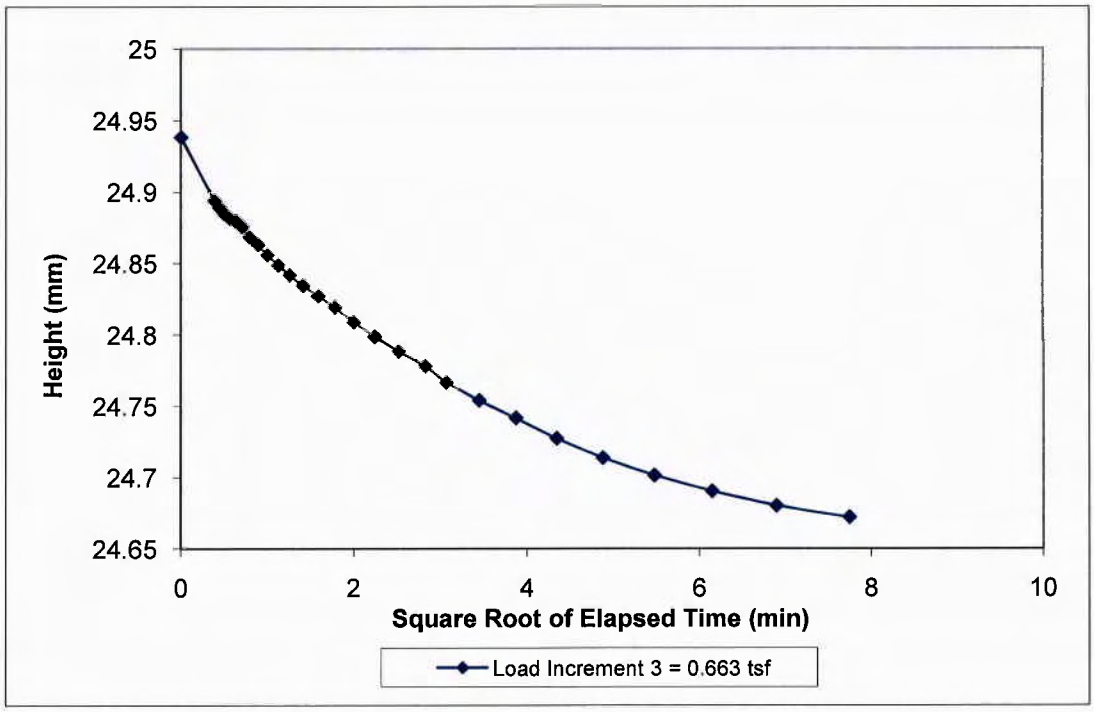

| Borehole # | Sample # | Depth (ft) | LL | PI | Initial dry unit weight (pcf) | M.C. % | Initial Void Ratio | Pc (tsf) | Cs | Cc | Method |
|---|---|---|---|---|---|---|---|---|---|---|---|
| B2 | S10 | 30'-32' | 55 | 32 | 98.23 | 26 | 0.716 | 0.84 | 0.020 | 0.157 | ASTM D2435 |

# Change in Sample Height vs. Time

**Client :** KMA Consulting Enginers, Inc.
**Project:** Laytons Lake
**Project #:** 1121

**Tested by:** Khoury
**Tested at:** Temple University
**Date :** 4/10/2011

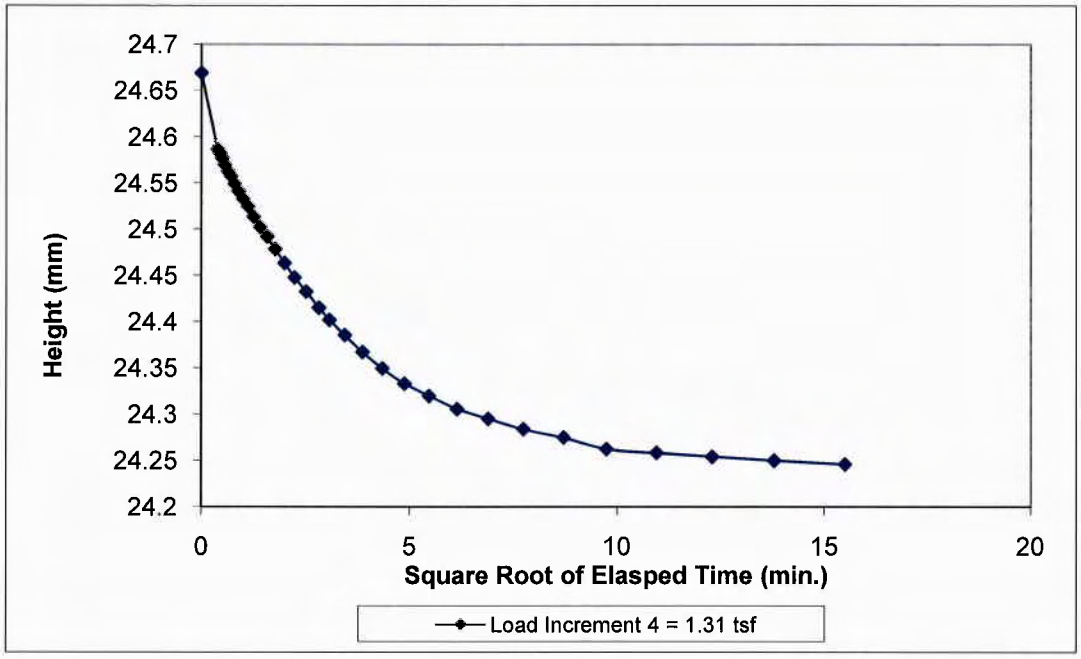


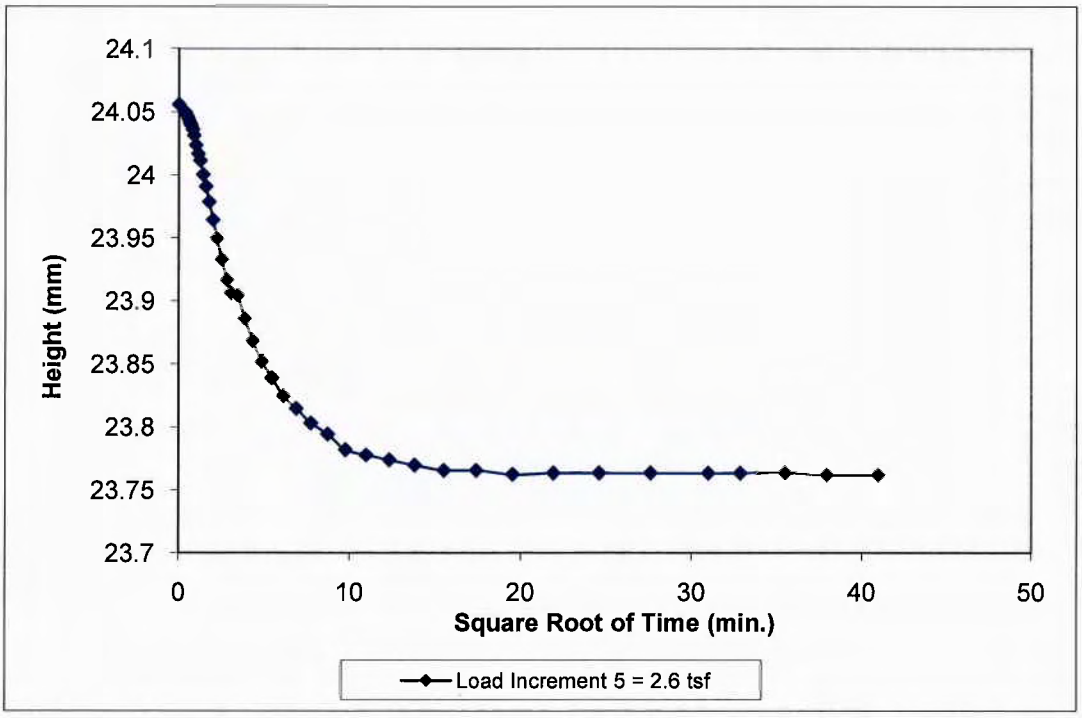



# Change in Sample Height vs. Time

**Client :** KMA Consulting Enginers, Inc.
**Project:** Laytons Lake
**Project #:** 1121

**Tested by:** Khoury
**Tested at:** Temple University
**Date :** 4/10/2011

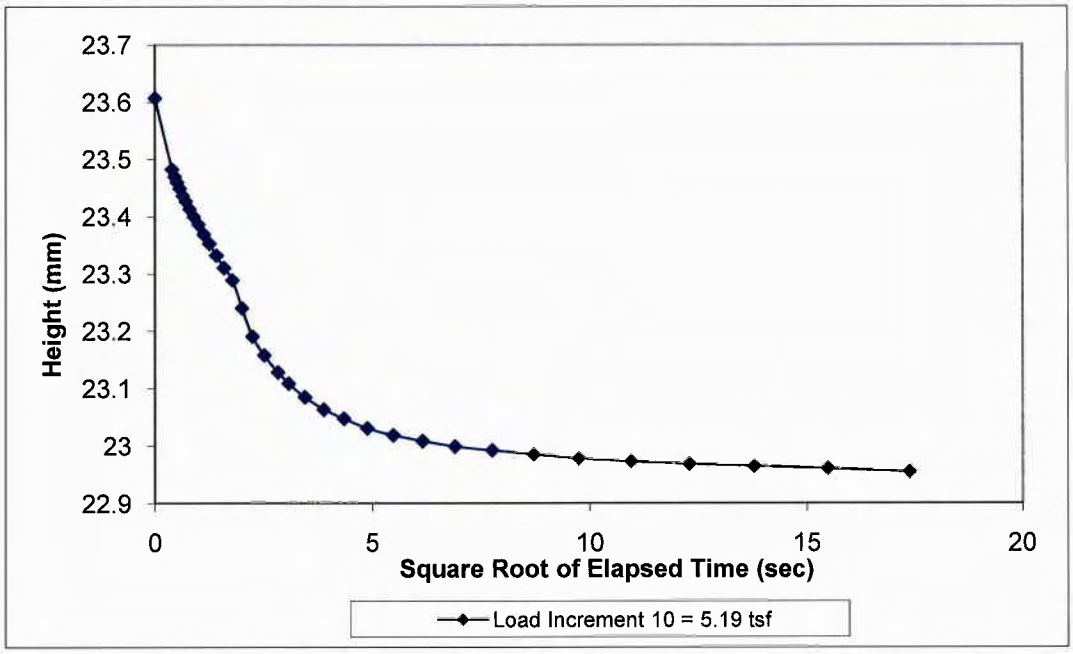


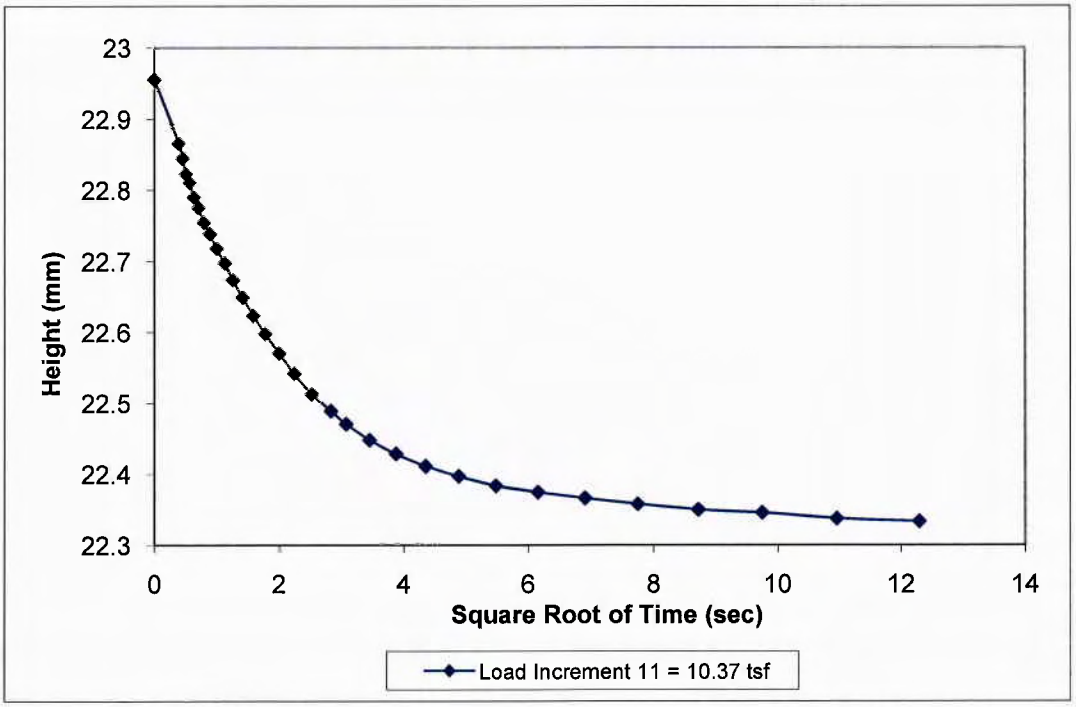



# Change in Sample Height vs. Time

**Client :** KMA Consulting Enginers, Inc.
**Project:** Laytons Lake
**Project #:** 1121

**Tested by:** Khoury
**Tested at:** Temple University
**Date :** 4/10/2011



# APPENDIX D: SITE CLASS ANALYSIS

Project Laytons Lake Dam
Project No.: 1121
Boring B-1 Date: 4/21/2011

**Class 'F' Determination**

Does the profile contain any of the following:

Mark the appropriate boxes "1" if the answer is "yes" otherwise "2".

1. Liquifiable, quick and highly sensitive clay or collapsible weakly cemented soil?
2. Peat and/or highly organic clay layer greater than 10ft. in thickness?
3. Is high plasticity clay (PI>75) layer more than 25 ft. thick?

| | |
|---|---|
| 2 | |
| 2 | |
| 2 | 0 |

Check for A,B,C,D or E

Site Class Code 0

**Class 'E' Determination**

Does the profile contain a layer more than 10 thick having all of the following:

Mark the box next to Question No. 3 "1" if the answer is "yes" otherwise "2".

1. Plasticity Index (PI) >20
2. Moisture Content (w)>=40%
3. Undrained shear strength (Cu)<500 psf

1

Site Class is 'E'

Site Class Code 0

**Class 'C','D' and 'E' Determination for Sand**

| Layer No. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| Thickness - d (ft) | 4 | 4 | 6 | 5 | 28 | | | | | 47 |
| N-Values | 18 | 21 | 13 | 8 | 100 | | | | | |
| | 30 | 25 | 7 | | | | | | | |
| Average N | 24 | 23 | 10 | 8 | 100 | | | | | 165 |
| d/N | 0.1667 | 0.1739 | 0.6 | 0.625 | 0.28 | | | | | 1.84558 |

| | |
|---|---|
| N-bar | 25.4663 |

| | | |
|---|---|---|
| Site Class | 0 | |
| Determination | 5 | 5 |
| Code | 0 | |

Project Laytons Lake Dam
Project No.: 1121
Boring B-1 Date: 4/21/2011

**Class 'C','D' and 'E' Determination for Clay**

| N-value | Description | Shear Strength(psf) |
|---|---|---|
| <2 | Very Soft | <500 |
| 2 - 4 | Soft | 500 - 1250 |
| 4 - 8 | Medium | 1250 - 2500 |
| 8 - 15 | Stiff | 2500 - 5000 |
| 15 - 30 | Very Stiff | 5000 - 10000 |
| >30 | Hard | >10000 |

| Layer No. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| Thickness - d (ft) | 41 | | | | | | | | | 41 |
| Undrained Shear Strength - $C_u$ (psf) | 573 | | | | | | | | | |
| | 827.67 | | | | | | | | | |
| | 1273.3 | | | | | | | | | |
| | 700.33 | | | | | | | | | |
| | 636.67 | | | | | | | | | |
| | 700.33 | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| Average $C_u$ | 785.22 | | | | | | | | | 785.222 |
| $d/C_u$ | 0.0522 | | | | | | | | | 0.05221 |

| Su-bar | 785.222 |
|---|---|

| Site Class Determination Code | |
|---|---|
| | 6 |
| | 0 |
| | 0 |

Site Class 6

**Site Class is 'E'**

Project Laytons Lake Dam
Project No.: 1121
Boring B-2 Date: 4/21/2011

**Class 'F' Determination**

Does the profile contain any of the following:

Mark the appropriate boxes "1" if the answer is "yes" otherwise "2".

1. Liquifiable, quick and highly sensitive clay or collapsible weakly cemented soil?
2. Peat and/or highly organic clay layer greater than 10ft. in thickness?
3. Is high plasticity clay (PI>75) layer more than 25 ft. thick?

| | |
|---|---|
| 2 | |
| 2 | |
| 2 | 0 |

Check for A,B,C,D or E

Site Class Code 0

**Class 'E' Determination**

Does the profile contain a layer more than 10 thick having all of the following:

Mark the box next to Question No. 3 "1" if the answer is "yes" otherwise "2".

1. Plasticity Index (PI) >20
2. Moisture Content (w)>=40%
3. Undrained shear strength (Cu)<500 psf 2

Check for A,B,C,D or E

Site Class Code 0

**Class 'C','D' and 'E' Determination for Sand**

| Layer No. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| Thickness - d (ft) | 6 | 2 | 10 | 45 | | | | | | 63 |
| N-Values | 19 | 17 | 35 | 100 | | | | | | |
| | 15 | | | | | | | | | |
| | 22 | | | | | | | | | |
| Average N | 18.667 | 17 | 35 | 100 | | | | | | 170.667 |
| d/N | 0.3214 | 0.1176 | 0.285714 | 0.45 | | | | | | 1.17479 |

N-bar 53.6266

| | | |
|---|---|---|
| Site Class | 0 | |
| Determination | 0 | |
| Code | 4 | 4 |

Project Laytons Lake Dam

Project No.: 1121

Boring B-2 Date: 4/21/2011

**Class 'C','D' and 'E' Determination for Clay**

| N-value | Description | Shear Strength(psf) |
|---|---|---|
| <2 | Very Soft | <500 |
| 2 - 4 | Soft | 500 - 1250 |
| 4 - 8 | Medium | 1250 - 2500 |
| 8 - 15 | Stiff | 2500 - 5000 |
| 15 - 30 | Very Stiff | 5000 - 10000 |
| >30 | Hard | >10000 |

| Layer No. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| Thickness - d (ft) | 36 | | | | | | | | | 36 |
| Undrained Shear Strength - $C_u$ (psf) | 676 | | | | | | | | | |
| | 215 | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| Average $C_u$ | 445.5 | | | | | | | | | 445.5 |
| $d/C_u$ | 0.0808 | | | | | | | | | 0.08081 |

| Su-bar | 445.5 |
|---|---|

| Site Class Determination Code | 6 |
|---|---|
| | 0 |
| | 0 |

| | |
|---|---|
| | |
| | |
| | |

Site Class 6

**Site Class is 'E'**

# APPENDIX E: LIQUIFACTION POTENTIAL ANALYSIS

KMA Consulting Engineers, Inc.
520 Stokes Road
Building C, Suite C6
Medford, NJ 08055
TEL (609) 953-1523 FAX (609) 953-1530

| | |
|---|---|
| Boring No. | B-1 |
| Groundwater Depth - ft. | 5 |
| Acceleration due to gravity | 32.2 |
| Ground Acceleration | 3.22 |
| One Atmosphere ($P_a$) - psf | 2000 |

Magnitude Scaling Factor

| Magnitude | MSF | Applicable Magnitude |
|---|---|---|
| 8.5 | 0.77 | 0 |
| 7.5 | 1.00 | 1 |
| 6.75 | 1.22 | 0 |
| 6 | 1.48 | 0 |
| 5.25 | 1.80 | 0 |

| | |
|---|---|
| Magnitude | 7.50 |
| Applicable MSF | 1.00 |

| Test No. | Depth (ft) | Bulk Density (pcf) | Overburden Pressure (psf) | | SPT N-Value Correction | | | | Fines Content (%) | CRR Calculation | | | | | | | CSR Calculation | | | | Factor of Safety |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Total | Effective | $(N)_{60}$ | α | $C_N$ | $(N_1)_{60}$ | | $\Delta(N_1)_{60}$ | $(N_1)_{60CS}$ | $C_\sigma$ | $K_\sigma$ | $K_\alpha$ | $CRR_{M=7.5,\sigma=1atm}$ | CRR | α(z) | β(z) | rd | CSR | |
| 1 | 1 | 121 | 121.00 | 121.00 | 18.00 | 0.33 | 1.94 | 34.92 | 3.00 | 0.00 | 34.92 | 0.26 | 1.00 | 1.00 | 0.80 | 0.80 | -0.99 | 0.10 | 0.41 | 0.03 | 29.97 |
| 2 | 4 | 121 | 484.00 | 484.00 | 30.00 | 0.27 | 1.48 | 44.29 | 3.00 | 0.00 | 44.29 | 0.30 | 1.00 | 1.00 | 0.80 | 0.80 | -0.99 | 0.10 | 0.41 | 0.03 | 29.99 |
| 3 | 8 | 114 | 940.00 | 752.80 | 23.00 | 0.36 | 1.33 | 30.56 | 3.00 | 0.00 | 30.56 | 0.21 | 1.00 | 1.00 | 0.52 | 0.52 | -1.00 | 0.10 | 0.41 | 0.03 | 15.69 |
| 4 | 14 | 114 | 1624.00 | 1062.40 | 10.00 | 0.52 | 1.21 | 12.13 | 3.00 | 0.00 | 12.13 | 0.10 | 1.00 | 1.00 | 0.13 | 0.13 | -1.00 | 0.10 | 0.41 | 0.04 | 3.28 |
| 5 | 19 | 112 | 2184.00 | 1310.40 | 8.00 | 0.55 | 1.14 | 9.15 | 3.00 | 0.00 | 9.15 | 0.09 | 1.00 | 1.00 | 0.11 | 0.11 | -1.00 | 0.10 | 0.41 | 0.04 | 2.54 |
| 6 | 25 | 119 | 2898.00 | 1650.00 | 10.00 | 0.53 | 1.07 | 10.66 | 85.00 | 5.53 | 16.19 | 0.09 | 1.00 | 1.00 | 0.17 | 0.17 | -1.00 | 0.11 | 0.41 | 0.05 | 3.58 |
| 7 | 45 | 119 | 5278.00 | 2782.00 | 12.00 | 0.53 | 0.89 | 10.70 | 85.00 | 5.53 | 16.23 | 0.09 | 0.97 | 1.00 | 0.17 | 0.16 | -1.01 | 0.11 | 0.40 | 0.05 | 3.14 |
| 8 | 50 | 119 | 5873.00 | 3065.00 | 11.00 | 0.55 | 0.86 | 9.45 | 85.00 | 5.53 | 14.98 | 0.09 | 0.96 | 1.00 | 0.16 | 0.15 | -1.01 | 0.11 | 0.40 | 0.05 | 2.87 |
| 9 | 60 | 119 | 7063.00 | 3631.00 | 10.00 | 0.57 | 0.80 | 8.02 | 85.00 | 5.53 | 13.55 | 0.09 | 0.95 | 1.00 | 0.14 | 0.14 | -1.02 | 0.11 | 0.40 | 0.05 | 2.56 |
| 10 | 67 | 120 | 7903.00 | 4034.20 | 32.00 | 0.40 | 0.77 | 24.55 | 85.00 | 5.53 | 30.08 | 0.16 | 0.89 | 1.00 | 0.49 | 0.43 | -1.02 | 0.11 | 0.40 | 0.06 | 7.58 |
| 11 | 72 | 120 | 8503.00 | 4322.20 | 44.00 | 0.34 | 0.74 | 32.74 | 85.00 | 5.53 | 38.27 | 0.23 | 0.82 | 1.00 | 0.80 | 0.66 | -1.02 | 0.11 | 0.40 | 0.06 | 10.56 |
| 12 | 80 | 120 | 9463.00 | 4783.00 | 17.00 | 0.52 | 0.71 | 12.07 | 9.00 | 0.72 | 12.79 | 0.10 | 0.91 | 1.00 | 0.14 | 0.13 | -1.03 | 0.11 | 0.15 | 0.02 | 6.00 |
| 13 | 87 | 130 | 10373.00 | 5256.20 | 50.00 | 0.34 | 0.68 | 33.93 | 9.00 | 0.72 | 34.65 | 0.25 | 0.76 | 1.00 | 0.80 | 0.61 | -1.03 | 0.11 | 0.15 | 0.03 | 24.16 |
| 14 | 100 | 130 | 12063.00 | 6135.00 | 50.00 | 0.35 | 0.63 | 31.35 | 9.00 | 0.72 | 32.06 | 0.22 | 0.76 | 1.00 | 0.65 | 0.49 | -1.03 | 0.11 | 0.15 | 0.03 | 19.54 |

KMA Consulting Engineers, Inc.
520 Stokes Road
Building C, Suite C6
Medford, NJ 08055
TEL (609) 953-1523 FAX (609) 953-1530

| | |
|---|---|
| Boring No. | B-2 |
| Groundwater Depth - ft. | 5 |
| Acceleration due to gravity | 32.2 |
| Ground Acceleration | 3.22 |
| One Atmosphere ($P_a$) - psf | 2000 |

Magnitude Scaling Factor

| Magnitude | MSF | Applicable Magnitude |
|---|---|---|
| 8.5 | 0.77 | 0 |
| 7.5 | 1.00 | 1 |
| 6.75 | 1.22 | 0 |
| 6 | 1.48 | 0 |
| 5.25 | 1.80 | 0 |

| | |
|---|---|
| Magnitude | 7.50 |
| Applicable MSF | 1.00 |

| Test No. | Depth (ft) | Bulk Density (pcf) | Overburden Pressure (psf) | | SPT N-Value Correction | | | | Fines Content (%) | CRR Calculation | | | | | | | CSR Calculation | | | | Factor of Safety |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Total | Effective | $(N)_{60}$ | $\alpha$ | $C_N$ | $(N_1)_{60}$ | | $\Delta(N_1)_{60}$ | $(N_1)_{60CS}$ | $C_\sigma$ | $K_\sigma$ | $K_\alpha$ | $CRR_{M=7.5,\sigma=1atm}$ | CRR | $\alpha(z)$ | $\beta(z)$ | rd | CSR | |
| 1 | 1 | 121 | 121.00 | 121.00 | 13.00 | 0.40 | 1.94 | 25.22 | 3.00 | 0.00 | 25.22 | 0.16 | 1.00 | 1.00 | 0.30 | 0.30 | -0.99 | 0.10 | 0.41 | 0.03 | 11.06 |
| 2 | 7 | 121 | 847.00 | 722.20 | 18.00 | 0.41 | 1.34 | 24.16 | 3.00 | 0.00 | 24.16 | 0.16 | 1.00 | 1.00 | 0.27 | 0.27 | -1.00 | 0.10 | 0.41 | 0.03 | 8.69 |
| 3 | 9 | 114 | 1075.00 | 825.40 | 17.00 | 0.42 | 1.30 | 22.06 | 3.00 | 0.00 | 22.06 | 0.14 | 1.00 | 1.00 | 0.23 | 0.23 | -1.00 | 0.10 | 0.41 | 0.03 | 6.74 |
| 4 | 19 | 112 | 2195.00 | 1321.40 | 35.00 | 0.30 | 1.14 | 39.91 | 3.00 | 0.00 | 39.91 | 0.30 | 1.00 | 1.00 | 0.80 | 0.80 | -1.00 | 0.10 | 0.41 | 0.04 | 18.14 |
| 5 | 32 | 119 | 3742.00 | 2057.20 | 9.00 | 0.55 | 0.99 | 8.93 | 3.00 | 0.00 | 8.93 | 0.09 | 1.00 | 1.00 | 0.11 | 0.11 | -1.01 | 0.11 | 0.41 | 0.05 | 2.29 |
| 6 | 55 | 120 | 6502.00 | 3382.00 | 15.00 | 0.51 | 0.83 | 12.39 | 85.00 | 5.53 | 17.92 | 0.10 | 0.95 | 1.00 | 0.18 | 0.17 | -1.02 | 0.11 | 0.40 | 0.05 | 3.26 |
| 7 | 100 | 130 | 12352.00 | 6424.00 | 50.00 | 0.36 | 0.61 | 30.58 | 85.00 | 5.53 | 36.11 | 0.21 | 0.76 | 1.00 | 0.80 | 0.61 | -1.03 | 0.11 | 0.15 | 0.02 | 24.52 |

# APPENDIX F: VERTICAL RESISTANCE ANALYSES RESULTS

# APPENDIX F-1: H-PILE DOWNWARD (DRIVEN)

# DRIVEN 1.2

## GENERAL PROJECT INFORMATION

Filename: D:\CHARBE~1\KMACON~1\JOB#11~2\PILEAN~1\DRIVEN\1121_B1.DVN
Project Name: Laytons LAke  Project Date: 03/24/2011
Project Client: New Jersey DOT
Computed By: Charbel Khoury
Project Manager: John Dogbey

## PILE INFORMATION

Pile Type: H Pile - HP14X117
Top of Pile: 0.00 ft
Perimeter Analysis: Pile
Tip Analysis: Pile Area

## ULTIMATE CONSIDERATIONS

| | | |
|---|---|---|
| Water Table Depth At Time Of: | - Drilling: | 5.00 ft |
| | - Driving/Restrike | 0.00 ft |
| | - Ultimate: | 0.00 ft |
| Ultimate Considerations: | - Local Scour: | 0.00 ft |
| | - Long Term Scour: | 0.00 ft |
| | - Soft Soil: | 0.00 ft |

## ULTIMATE PROFILE

| Layer | Type | Thickness | Driving Loss | Unit Weight | Strength | Ultimate Curve |
|---|---|---|---|---|---|---|
| 1 | Cohesionless | 5.00 ft | 0.00% | 121.40 pcf | 36.4/36.4 | Nordlund |
| 2 | Cohesionless | 3.00 ft | 0.00% | 121.40 pcf | 36.4/36.4 | Nordlund |
| 3 | Cohesionless | 6.00 ft | 0.00% | 114.90 pcf | 33.0/33.0 | Nordlund |
| 4 | Cohesionless | 5.00 ft | 0.00% | 112.10 pcf | 31.8/31.8 | Nordlund |
| 5 | Cohesive | 41.00 ft | 0.00% | 119.00 pcf | 573.00 psf | T-80 Sand |
| 6 | Cohesive | 12.00 ft | 0.00% | 136.30 pcf | 1970.00 psf | T-80 Sand |
| 7 | Cohesionless | 8.00 ft | 0.00% | 120.10 pcf | 35.6/35.6 | Nordlund |
| 8 | Cohesionless | 20.00 ft | 0.00% | 130.10 pcf | 40.0/40.0 | Nordlund |

# RESTRIKE - SKIN FRICTION

| Depth | Soil Type | Effective Stress At Midpoint | Sliding Friction Angle | Adhesion | Skin Friction |
|---|---|---|---|---|---|
| 0.01 ft | Cohesionless | 0.29 psf | 30.96 | N/A | 0.00 Kips |
| 4.99 ft | Cohesionless | 147.20 psf | 30.96 | N/A | 4.06 Kips |
| 5.01 ft | Cohesionless | 295.29 psf | 30.96 | N/A | 4.10 Kips |
| 7.99 ft | Cohesionless | 383.20 psf | 30.96 | N/A | 10.42 Kips |
| 8.01 ft | Cohesionless | 472.26 psf | 28.07 | N/A | 10.46 Kips |
| 13.99 ft | Cohesionless | 629.24 psf | 28.07 | N/A | 25.04 Kips |
| 14.01 ft | Cohesionless | 787.25 psf | 27.05 | N/A | 25.10 Kips |
| 18.99 ft | Cohesionless | 911.00 psf | 27.05 | N/A | 40.76 Kips |
| 19.01 ft | Cohesive | N/A | N/A | 573.00 psf | 40.84 Kips |
| 28.01 ft | Cohesive | N/A | N/A | 573.00 psf | 77.95 Kips |
| 37.01 ft | Cohesive | N/A | N/A | 573.00 psf | 115.06 Kips |
| 46.01 ft | Cohesive | N/A | N/A | 572.55 psf | 152.08 Kips |
| 55.01 ft | Cohesive | N/A | N/A | 570.70 psf | 188.68 Kips |
| 59.99 ft | Cohesive | N/A | N/A | 569.68 psf | 208.83 Kips |
| 60.01 ft | Cohesive | N/A | N/A | 1970.00 psf | 209.01 Kips |
| 69.01 ft | Cohesive | N/A | N/A | 1970.00 psf | 336.59 Kips |
| 71.99 ft | Cohesive | N/A | N/A | 1970.00 psf | 378.84 Kips |
| 72.01 ft | Cohesionless | 4243.19 psf | 30.28 | N/A | 379.19 Kips |
| 79.99 ft | Cohesionless | 4473.41 psf | 30.28 | N/A | 557.64 Kips |
| 80.01 ft | Cohesionless | 4704.84 psf | 34.02 | N/A | 558.25 Kips |
| 89.01 ft | Cohesionless | 5009.49 psf | 34.02 | N/A | 921.91 Kips |
| 98.01 ft | Cohesionless | 5314.14 psf | 34.02 | N/A | 1329.79 Kips |
| 99.99 ft | Cohesionless | 5381.16 psf | 34.02 | N/A | 1425.46 Kips |

# RESTRIKE - END BEARING

| Depth | Soil Type | Effective Stress At Tip | Bearing Cap. Factor | Limiting End Bearing | End Bearing |
|---|---|---|---|---|---|
| 0.01 ft | Cohesionless | 0.59 psf | 83.04 | 40.92 Kips | 0.01 Kips |
| 4.99 ft | Cohesionless | 294.41 psf | 83.04 | 40.92 Kips | 4.08 Kips |
| 5.01 ft | Cohesionless | 295.59 psf | 83.04 | 40.92 Kips | 4.10 Kips |
| 7.99 ft | Cohesionless | 471.41 psf | 83.04 | 40.92 Kips | 6.53 Kips |
| 8.01 ft | Cohesionless | 472.53 psf | 47.20 | 11.94 Kips | 3.44 Kips |
| 13.99 ft | Cohesionless | 786.48 psf | 47.20 | 11.94 Kips | 5.73 Kips |
| 14.01 ft | Cohesionless | 787.50 psf | 39.36 | 7.21 Kips | 4.60 Kips |
| 18.99 ft | Cohesionless | 1035.00 psf | 39.36 | 7.21 Kips | 6.04 Kips |
| 19.01 ft | Cohesive | N/A | N/A | N/A | 1.23 Kips |
| 28.01 ft | Cohesive | N/A | N/A | N/A | 1.23 Kips |
| 37.01 ft | Cohesive | N/A | N/A | N/A | 1.23 Kips |
| 46.01 ft | Cohesive | N/A | N/A | N/A | 1.23 Kips |
| 55.01 ft | Cohesive | N/A | N/A | N/A | 1.23 Kips |
| 59.99 ft | Cohesive | N/A | N/A | N/A | 1.23 Kips |
| 60.01 ft | Cohesive | N/A | N/A | N/A | 4.24 Kips |
| 69.01 ft | Cohesive | N/A | N/A | N/A | 4.24 Kips |
| 71.99 ft | Cohesive | N/A | N/A | N/A | 4.24 Kips |
| 72.01 ft | Cohesionless | 4243.48 psf | 72.16 | 32.01 Kips | 32.01 Kips |
| 79.99 ft | Cohesionless | 4703.92 psf | 72.16 | 32.01 Kips | 32.01 Kips |
| 80.01 ft | Cohesionless | 4705.18 psf | 160.00 | 99.76 Kips | 99.76 Kips |
| 89.01 ft | Cohesionless | 5314.48 psf | 160.00 | 99.76 Kips | 99.76 Kips |
| 98.01 ft | Cohesionless | 5923.78 psf | 160.00 | 99.76 Kips | 99.76 Kips |
| 99.99 ft | Cohesionless | 6057.82 psf | 160.00 | 99.76 Kips | 99.76 Kips |

# RESTRIKE - SUMMARY OF CAPACITIES

| Depth | Skin Friction | End Bearing | Total Capacity |
|---|---|---|---|
| 0.01 ft | 0.00 Kips | 0.01 Kips | 0.01 Kips |
| 4.99 ft | 4.06 Kips | 4.08 Kips | 8.14 Kips |
| 5.01 ft | 4.10 Kips | 4.10 Kips | 8.19 Kips |
| 7.99 ft | 10.42 Kips | 6.53 Kips | 16.95 Kips |
| 8.01 ft | 10.46 Kips | 3.44 Kips | 13.90 Kips |
| 13.99 ft | 25.04 Kips | 5.73 Kips | 30.77 Kips |
| 14.01 ft | 25.10 Kips | 4.60 Kips | 29.70 Kips |
| 18.99 ft | 40.76 Kips | 6.04 Kips | 46.81 Kips |
| 19.01 ft | 40.84 Kips | 1.23 Kips | 42.07 Kips |
| 28.01 ft | 77.95 Kips | 1.23 Kips | 79.18 Kips |
| 37.01 ft | 115.06 Kips | 1.23 Kips | 116.29 Kips |
| 46.01 ft | 152.08 Kips | 1.23 Kips | 153.31 Kips |
| 55.01 ft | 188.68 Kips | 1.23 Kips | 189.91 Kips |
| 59.99 ft | 208.83 Kips | 1.23 Kips | 210.06 Kips |
| 60.01 ft | 209.01 Kips | 4.24 Kips | 213.25 Kips |
| 69.01 ft | 336.59 Kips | 4.24 Kips | 340.83 Kips |
| 71.99 ft | 378.84 Kips | 4.24 Kips | 383.07 Kips |
| 72.01 ft | 379.19 Kips | 32.01 Kips | 411.20 Kips |
| 79.99 ft | 557.64 Kips | 32.01 Kips | 589.65 Kips |
| 80.01 ft | 558.25 Kips | 99.76 Kips | 658.01 Kips |
| 89.01 ft | 921.91 Kips | 99.76 Kips | 1021.67 Kips |
| 98.01 ft | 1329.79 Kips | 99.76 Kips | 1429.55 Kips |
| 99.99 ft | 1425.46 Kips | 99.76 Kips | 1525.22 Kips |

# DRIVING - SKIN FRICTION

| Depth | Soil Type | Effective Stress At Midpoint | Sliding Friction Angle | Adhesion | Skin Friction |
|---|---|---|---|---|---|
| 0.01 ft | Cohesionless | 0.29 psf | 30.96 | N/A | 0.00 Kips |
| 4.99 ft | Cohesionless | 147.20 psf | 30.96 | N/A | 4.06 Kips |
| 5.01 ft | Cohesionless | 295.29 psf | 30.96 | N/A | 4.10 Kips |
| 7.99 ft | Cohesionless | 383.20 psf | 30.96 | N/A | 10.42 Kips |
| 8.01 ft | Cohesionless | 472.26 psf | 28.07 | N/A | 10.46 Kips |
| 13.99 ft | Cohesionless | 629.24 psf | 28.07 | N/A | 25.04 Kips |
| 14.01 ft | Cohesionless | 787.25 psf | 27.05 | N/A | 25.10 Kips |
| 18.99 ft | Cohesionless | 911.00 psf | 27.05 | N/A | 40.76 Kips |
| 19.01 ft | Cohesive | N/A | N/A | 573.00 psf | 40.84 Kips |
| 28.01 ft | Cohesive | N/A | N/A | 573.00 psf | 77.95 Kips |
| 37.01 ft | Cohesive | N/A | N/A | 573.00 psf | 115.06 Kips |
| 46.01 ft | Cohesive | N/A | N/A | 572.55 psf | 152.08 Kips |
| 55.01 ft | Cohesive | N/A | N/A | 570.70 psf | 188.68 Kips |
| 59.99 ft | Cohesive | N/A | N/A | 569.68 psf | 208.83 Kips |
| 60.01 ft | Cohesive | N/A | N/A | 1970.00 psf | 209.01 Kips |
| 69.01 ft | Cohesive | N/A | N/A | 1970.00 psf | 336.59 Kips |
| 71.99 ft | Cohesive | N/A | N/A | 1970.00 psf | 378.84 Kips |
| 72.01 ft | Cohesionless | 4243.19 psf | 30.28 | N/A | 379.19 Kips |
| 79.99 ft | Cohesionless | 4473.41 psf | 30.28 | N/A | 557.64 Kips |
| 80.01 ft | Cohesionless | 4704.84 psf | 34.02 | N/A | 558.25 Kips |
| 89.01 ft | Cohesionless | 5009.49 psf | 34.02 | N/A | 921.91 Kips |
| 98.01 ft | Cohesionless | 5314.14 psf | 34.02 | N/A | 1329.79 Kips |
| 99.99 ft | Cohesionless | 5381.16 psf | 34.02 | N/A | 1425.46 Kips |

# DRIVING - END BEARING

| Depth | Soil Type | Effective Stress At Tip | Bearing Cap. Factor | Limiting End Bearing | End Bearing |
|---|---|---|---|---|---|
| 0.01 ft | Cohesionless | 0.59 psf | 83.04 | 40.92 Kips | 0.01 Kips |
| 4.99 ft | Cohesionless | 294.41 psf | 83.04 | 40.92 Kips | 4.08 Kips |
| 5.01 ft | Cohesionless | 295.59 psf | 83.04 | 40.92 Kips | 4.10 Kips |
| 7.99 ft | Cohesionless | 471.41 psf | 83.04 | 40.92 Kips | 6.53 Kips |
| 8.01 ft | Cohesionless | 472.53 psf | 47.20 | 11.94 Kips | 3.44 Kips |
| 13.99 ft | Cohesionless | 786.48 psf | 47.20 | 11.94 Kips | 5.73 Kips |
| 14.01 ft | Cohesionless | 787.50 psf | 39.36 | 7.21 Kips | 4.60 Kips |
| 18.99 ft | Cohesionless | 1035.00 psf | 39.36 | 7.21 Kips | 6.04 Kips |
| 19.01 ft | Cohesive | N/A | N/A | N/A | 1.23 Kips |
| 28.01 ft | Cohesive | N/A | N/A | N/A | 1.23 Kips |
| 37.01 ft | Cohesive | N/A | N/A | N/A | 1.23 Kips |
| 46.01 ft | Cohesive | N/A | N/A | N/A | 1.23 Kips |
| 55.01 ft | Cohesive | N/A | N/A | N/A | 1.23 Kips |
| 59.99 ft | Cohesive | N/A | N/A | N/A | 1.23 Kips |
| 60.01 ft | Cohesive | N/A | N/A | N/A | 4.24 Kips |
| 69.01 ft | Cohesive | N/A | N/A | N/A | 4.24 Kips |
| 71.99 ft | Cohesive | N/A | N/A | N/A | 4.24 Kips |
| 72.01 ft | Cohesionless | 4243.48 psf | 72.16 | 32.01 Kips | 32.01 Kips |
| 79.99 ft | Cohesionless | 4703.92 psf | 72.16 | 32.01 Kips | 32.01 Kips |
| 80.01 ft | Cohesionless | 4705.18 psf | 160.00 | 99.76 Kips | 99.76 Kips |
| 89.01 ft | Cohesionless | 5314.48 psf | 160.00 | 99.76 Kips | 99.76 Kips |
| 98.01 ft | Cohesionless | 5923.78 psf | 160.00 | 99.76 Kips | 99.76 Kips |
| 99.99 ft | Cohesionless | 6057.82 psf | 160.00 | 99.76 Kips | 99.76 Kips |

# DRIVING - SUMMARY OF CAPACITIES

| Depth | Skin Friction | End Bearing | Total Capacity |
|---|---|---|---|
| 0.01 ft | 0.00 Kips | 0.01 Kips | 0.01 Kips |
| 4.99 ft | 4.06 Kips | 4.08 Kips | 8.14 Kips |
| 5.01 ft | 4.10 Kips | 4.10 Kips | 8.19 Kips |
| 7.99 ft | 10.42 Kips | 6.53 Kips | 16.95 Kips |
| 8.01 ft | 10.46 Kips | 3.44 Kips | 13.90 Kips |
| 13.99 ft | 25.04 Kips | 5.73 Kips | 30.77 Kips |
| 14.01 ft | 25.10 Kips | 4.60 Kips | 29.70 Kips |
| 18.99 ft | 40.76 Kips | 6.04 Kips | 46.81 Kips |
| 19.01 ft | 40.84 Kips | 1.23 Kips | 42.07 Kips |
| 28.01 ft | 77.95 Kips | 1.23 Kips | 79.18 Kips |
| 37.01 ft | 115.06 Kips | 1.23 Kips | 116.29 Kips |
| 46.01 ft | 152.08 Kips | 1.23 Kips | 153.31 Kips |
| 55.01 ft | 188.68 Kips | 1.23 Kips | 189.91 Kips |
| 59.99 ft | 208.83 Kips | 1.23 Kips | 210.06 Kips |
| 60.01 ft | 209.01 Kips | 4.24 Kips | 213.25 Kips |
| 69.01 ft | 336.59 Kips | 4.24 Kips | 340.83 Kips |
| 71.99 ft | 378.84 Kips | 4.24 Kips | 383.07 Kips |
| 72.01 ft | 379.19 Kips | 32.01 Kips | 411.20 Kips |
| 79.99 ft | 557.64 Kips | 32.01 Kips | 589.65 Kips |
| 80.01 ft | 558.25 Kips | 99.76 Kips | 658.01 Kips |
| 89.01 ft | 921.91 Kips | 99.76 Kips | 1021.67 Kips |
| 98.01 ft | 1329.79 Kips | 99.76 Kips | 1429.55 Kips |
| 99.99 ft | 1425.46 Kips | 99.76 Kips | 1525.22 Kips |

# ULTIMATE - SKIN FRICTION

| Depth | Soil Type | Effective Stress At Midpoint | Sliding Friction Angle | Adhesion | Skin Friction |
|---|---|---|---|---|---|
| 0.01 ft | Cohesionless | 0.29 psf | 30.96 | N/A | 0.00 Kips |
| 4.99 ft | Cohesionless | 147.20 psf | 30.96 | N/A | 4.06 Kips |
| 5.01 ft | Cohesionless | 295.29 psf | 30.96 | N/A | 4.10 Kips |
| 7.99 ft | Cohesionless | 383.20 psf | 30.96 | N/A | 10.42 Kips |
| 8.01 ft | Cohesionless | 472.26 psf | 28.07 | N/A | 10.46 Kips |
| 13.99 ft | Cohesionless | 629.24 psf | 28.07 | N/A | 25.04 Kips |
| 14.01 ft | Cohesionless | 787.25 psf | 27.05 | N/A | 25.10 Kips |
| 18.99 ft | Cohesionless | 911.00 psf | 27.05 | N/A | 40.76 Kips |
| 19.01 ft | Cohesive | N/A | N/A | 573.00 psf | 40.84 Kips |
| 28.01 ft | Cohesive | N/A | N/A | 573.00 psf | 77.95 Kips |
| 37.01 ft | Cohesive | N/A | N/A | 573.00 psf | 115.06 Kips |
| 46.01 ft | Cohesive | N/A | N/A | 572.55 psf | 152.08 Kips |
| 55.01 ft | Cohesive | N/A | N/A | 570.70 psf | 188.68 Kips |
| 59.99 ft | Cohesive | N/A | N/A | 569.68 psf | 208.83 Kips |
| 60.01 ft | Cohesive | N/A | N/A | 1970.00 psf | 209.01 Kips |
| 69.01 ft | Cohesive | N/A | N/A | 1970.00 psf | 336.59 Kips |
| 71.99 ft | Cohesive | N/A | N/A | 1970.00 psf | 378.84 Kips |
| 72.01 ft | Cohesionless | 4243.19 psf | 30.28 | N/A | 379.19 Kips |
| 79.99 ft | Cohesionless | 4473.41 psf | 30.28 | N/A | 557.64 Kips |
| 80.01 ft | Cohesionless | 4704.84 psf | 34.02 | N/A | 558.25 Kips |
| 89.01 ft | Cohesionless | 5009.49 psf | 34.02 | N/A | 921.91 Kips |
| 98.01 ft | Cohesionless | 5314.14 psf | 34.02 | N/A | 1329.79 Kips |
| 99.99 ft | Cohesionless | 5381.16 psf | 34.02 | N/A | 1425.46 Kips |

# ULTIMATE - END BEARING

| Depth | Soil Type | Effective Stress At Tip | Bearing Cap. Factor | Limiting End Bearing | End Bearing |
|---|---|---|---|---|---|
| 0.01 ft | Cohesionless | 0.59 psf | 83.04 | 40.92 Kips | 0.01 Kips |
| 4.99 ft | Cohesionless | 294.41 psf | 83.04 | 40.92 Kips | 4.08 Kips |
| 5.01 ft | Cohesionless | 295.59 psf | 83.04 | 40.92 Kips | 4.10 Kips |
| 7.99 ft | Cohesionless | 471.41 psf | 83.04 | 40.92 Kips | 6.53 Kips |
| 8.01 ft | Cohesionless | 472.53 psf | 47.20 | 11.94 Kips | 3.44 Kips |
| 13.99 ft | Cohesionless | 786.48 psf | 47.20 | 11.94 Kips | 5.73 Kips |
| 14.01 ft | Cohesionless | 787.50 psf | 39.36 | 7.21 Kips | 4.60 Kips |
| 18.99 ft | Cohesionless | 1035.00 psf | 39.36 | 7.21 Kips | 6.04 Kips |
| 19.01 ft | Cohesive | N/A | N/A | N/A | 1.23 Kips |
| 28.01 ft | Cohesive | N/A | N/A | N/A | 1.23 Kips |
| 37.01 ft | Cohesive | N/A | N/A | N/A | 1.23 Kips |
| 46.01 ft | Cohesive | N/A | N/A | N/A | 1.23 Kips |
| 55.01 ft | Cohesive | N/A | N/A | N/A | 1.23 Kips |
| 59.99 ft | Cohesive | N/A | N/A | N/A | 1.23 Kips |
| 60.01 ft | Cohesive | N/A | N/A | N/A | 4.24 Kips |
| 69.01 ft | Cohesive | N/A | N/A | N/A | 4.24 Kips |
| 71.99 ft | Cohesive | N/A | N/A | N/A | 4.24 Kips |
| 72.01 ft | Cohesionless | 4243.48 psf | 72.16 | 32.01 Kips | 32.01 Kips |
| 79.99 ft | Cohesionless | 4703.92 psf | 72.16 | 32.01 Kips | 32.01 Kips |
| 80.01 ft | Cohesionless | 4705.18 psf | 160.00 | 99.76 Kips | 99.76 Kips |
| 89.01 ft | Cohesionless | 5314.48 psf | 160.00 | 99.76 Kips | 99.76 Kips |
| 98.01 ft | Cohesionless | 5923.78 psf | 160.00 | 99.76 Kips | 99.76 Kips |
| 99.99 ft | Cohesionless | 6057.82 psf | 160.00 | 99.76 Kips | 99.76 Kips |

# ULTIMATE - SUMMARY OF CAPACITIES

| Depth | Skin Friction | End Bearing | Total Capacity |
|---|---|---|---|
| 0.01 ft | 0.00 Kips | 0.01 Kips | 0.01 Kips |
| 4.99 ft | 4.06 Kips | 4.08 Kips | 8.14 Kips |
| 5.01 ft | 4.10 Kips | 4.10 Kips | 8.19 Kips |
| 7.99 ft | 10.42 Kips | 6.53 Kips | 16.95 Kips |
| 8.01 ft | 10.46 Kips | 3.44 Kips | 13.90 Kips |
| 13.99 ft | 25.04 Kips | 5.73 Kips | 30.77 Kips |
| 14.01 ft | 25.10 Kips | 4.60 Kips | 29.70 Kips |
| 18.99 ft | 40.76 Kips | 6.04 Kips | 46.81 Kips |
| 19.01 ft | 40.84 Kips | 1.23 Kips | 42.07 Kips |
| 28.01 ft | 77.95 Kips | 1.23 Kips | 79.18 Kips |
| 37.01 ft | 115.06 Kips | 1.23 Kips | 116.29 Kips |
| 46.01 ft | 152.08 Kips | 1.23 Kips | 153.31 Kips |
| 55.01 ft | 188.68 Kips | 1.23 Kips | 189.91 Kips |
| 59.99 ft | 208.83 Kips | 1.23 Kips | 210.06 Kips |
| 60.01 ft | 209.01 Kips | 4.24 Kips | 213.25 Kips |
| 69.01 ft | 336.59 Kips | 4.24 Kips | 340.83 Kips |
| 71.99 ft | 378.84 Kips | 4.24 Kips | 383.07 Kips |
| 72.01 ft | 379.19 Kips | 32.01 Kips | 411.20 Kips |
| 79.99 ft | 557.64 Kips | 32.01 Kips | 589.65 Kips |
| 80.01 ft | 558.25 Kips | 99.76 Kips | 658.01 Kips |
| 89.01 ft | 921.91 Kips | 99.76 Kips | 1021.67 Kips |
| 98.01 ft | 1329.79 Kips | 99.76 Kips | 1429.55 Kips |
| 99.99 ft | 1425.46 Kips | 99.76 Kips | 1525.22 Kips |

# APPENDIX F-2: H-PILE 25- FOOT LONG (ALLPILE)

Output_H_pile_vertical_L25'_new

**********

ALLPILE 7
VERTICAL ANALYSIS SUMMARY OUTPUT
Copyright by CivilTech Software
www.civiltechsoftware.com

**********

TOTAL LOADS:

Vertical Load, Q: 100.0 -kp
Vertical Load with Load Factor, Q: 100.0 -kp
Vertical Load with Load factor and Pile Cap, Q= 100.0 -kp
Load Factor for Vertical Load and Torsion= 1.0
Vertical Loads Supported by Pile Cap: 0 %
Load Factor for Vertical Loads: 1.0

PILE PROFILE:

Pile Length, L= 25.0 -ft
Top Height, H= 0 -ft
Slope Angle, As= 0
Batter Angle, Ab= 0.00 Batter Factor, Kbat= 1.00

SINGLE PILE:

Kdown= 1.0 Kup= 0.5 Ka= 1.00

Single Pile Vertical Analysis:

Total Ultimate Capacity (Down)= 45.082-kp Total Ultimate Capacity (Up)= 33.209-kp
Total Allowable Capacity (Down)= 20.492-kp Total Allowable Capacity (Up)= 11.452-kp

Weight above Ground= 0.00 Total Weight= 3.00-kp *Soil Weight is not included
Side Resistance (Down)= 43.850-kp Side Resistance (Up)= 30.209-kp
Tip Resistance (Down)= 1.232-kp Tip Resistance (Up)= 0.000-kp
Negative Friction, Qneg= 0.000-kp, which has been subtracted from Total Ultimate Capacity (Down)
Negative friction does not affect Total Ultimate Capacity (Up)

At Work Load= 100.00-kp, Settlement= 99999.00000-in
At Work Load= 100.00-kp, Secant Stiffness Kqx= 99999.00-kp/-in
At Allowable Settlement= 1.000000-in, Capacity= 99999.00-kp
Work Load, 100.00-kp, OK with the Capacity at Allowable Settlement= 1.00000-in, Capacity= 99999.00-kp
!!! Work Load, 100.00-kp, Exceeds the Allowable Capacity (Down)= 20.49-kp

FACTOR OF SAFETY:

| FSside | FStip | FSuplif | FSweight |
|---|---|---|---|
| 2.2 | 2.2 | 2.9 | 2.9 |

Note: If the program cannot find a result or the result exceeds the upper limit. The result will be displayed as 99999.

1 1 1 1 1

# APPENDIX F-3: H-PILE 50- FOOT LONG (ALLPILE)

Output_H_pile_vertical_L50'_new

**********

ALLPILE 7
VERTICAL ANALYSIS SUMMARY OUTPUT
Copyright by CivilTech Software
www.civiltechsoftware.com

**********

TOTAL LOADS:
Vertical Load, Q: 100.0 -kp
Vertical Load with Load Factor, Q: 100.0 -kp
Vertical Load with Load factor and Pile Cap, Q= 100.0 -kp
Load Factor for Vertical Load and Torsion= 1.0
Vertical Loads Supported by Pile Cap: 0 %
Load Factor for Vertical Loads: 1.0

PILE PROFILE:
Pile Length, L= 50.0 -ft
Top Height, H= 0 -ft
Slope Angle, As= 0
Batter Angle, Ab= 0.00 Batter Factor, Kbat= 1.00

SINGLE PILE:
Kdown= 1.0 Kup= 0.5 Ka= 1.00

Single Pile Vertical Analysis:
Total Ultimate Capacity (Down)= 116.377-kp Total Ultimate Capacity (Up)= 105.707-kp
Total Allowable Capacity (Down)= 52.898-kp Total Allowable Capacity (Up)= 36.451-kp

Weight above Ground= 0.00 Total Weight= 6.00-kp *Soil Weight is not included
Side Resistance (Down)= 113.369-kp Side Resistance (Up)= 99.707-kp
Tip Resistance (Down)= 3.007-kp Tip Resistance (Up)= 0.000-kp
Negative Friction, Qneg= 0.000-kp, which has been subtracted from Total Ultimate Capacity (Down)
Negative friction does not affect Total Ultimate Capacity (Up)

At Work Load= 100.00-kp, Settlement= 0.03507-in
At Work Load= 100.00-kp, Secant Stiffness Kqx= 2851.41-kp/-in
At Allowable Settlement= 1.000000-in, Capacity= 99999.00-kp
Work Load, 100.00-kp, OK with the Capacity at Allowable Settlement= 1.00000-in, Capacity= 99999.00-kp
!!! Work Load, 100.00-kp, Exceeds the Allowable Capacity (Down)= 52.90-kp

FACTOR OF SAFETY:

| FSside | FStip | FSuplif | FSweight |
|---|---|---|---|
| 2.2 | 2.2 | 2.9 | 2.9 |

Note: If the program cannot find a result or the result exceeds the upper limit. The result will be displayed as 99999.

1 1 1 1 1

# APPENDIX F-4: H-PILE 60- FOOT LONG (ALLPILE)

Output_H_pile_vertical_L60'_new

**********

ALLPILE 7
VERTICAL ANALYSIS SUMMARY OUTPUT
Copyright by CivilTech Software
www.civiltechsoftware.com

**********

TOTAL LOADS:
Vertical Load, Q: 100.0 -kp
Vertical Load with Load Factor, Q: 100.0 -kp
Vertical Load with Load factor and Pile Cap, Q= 100.0 -kp
Load Factor for Vertical Load and Torsion= 1.0
Vertical Loads Supported by Pile Cap: 0 %
Load Factor for Vertical Loads: 1.0

PILE PROFILE:
Pile Length, L= 60.0 -ft
Top Height, H= 0 -ft
Slope Angle, As= 0
Batter Angle, Ab= 0.00 Batter Factor, Kbat= 1.00

SINGLE PILE:
Kdown= 1.0 Kup= 0.5 Ka= 1.00

Single Pile Vertical Analysis:
Total Ultimate Capacity (Down)= 166.688-kp Total Ultimate Capacity (Up)= 134.613-kp
Total Allowable Capacity (Down)= 75.767-kp Total Allowable Capacity (Up)= 46.418-kp

Weight above Ground= 0.00 Total Weight= 7.20-kp *Soil Weight is not included
Side Resistance (Down)= 141.214-kp Side Resistance (Up)= 127.413-kp
Tip Resistance (Down)= 25.475-kp Tip Resistance (Up)= 0.000-kp
Negative Friction, Qneg= 0.000-kp, which has been subtracted from Total Ultimate Capacity (Down)
Negative friction does not affect Total Ultimate Capacity (Up)

At Work Load= 100.00-kp, Settlement= 0.03909-in
At Work Load= 100.00-kp, Secant Stiffness Kqx= 2558.38-kp/-in
At Allowable Settlement= 1.000000-in, Capacity= 99999.00-kp
Work Load, 100.00-kp, OK with the Capacity at Allowable Settlement= 1.00000-in, Capacity= 99999.00-kp
!!! Work Load, 100.00-kp, Exceeds the Allowable Capacity (Down)= 75.77-kp

FACTOR OF SAFETY:

| FSside | FStip | FSuplif | FSweight |
|---|---|---|---|
| 2.2 | 2.2 | 2.9 | 2.9 |

Note: If the program cannot find a result or the result exceeds the upper limit. The result will be displayed as 99999.

1 1 1 1 1

# APPENDIX F-5: H-PILE 75- FOOT LONG (ALLPILE)

Output_H_pile_vertical_L75'_new

**********

ALLPILE 7
VERTICAL ANALYSIS SUMMARY OUTPUT
Copyright by CivilTech Software
www.civiltechsoftware.com

**********

TOTAL LOADS:

Vertical Load, Q: 100.0 -kp
Vertical Load with Load Factor, Q: 100.0 -kp
Vertical Load with Load factor and Pile Cap, Q= 100.0 -kp
Load Factor for Vertical Load and Torsion= 1.0
Vertical Loads Supported by Pile Cap: 0 %
Load Factor for Vertical Loads: 1.0

PILE PROFILE:

Pile Length, L= 75.0 -ft
Top Height, H= 0 -ft
Slope Angle, As= 0
Batter Angle, Ab= 0.00 Batter Factor, Kbat= 1.00

SINGLE PILE:

Kdown= 1.0 Kup= 0.5 Ka= 1.00

Single Pile Vertical Analysis:

Total Ultimate Capacity (Down)= 340.679-kp Total Ultimate Capacity (Up)= 273.997-kp
Total Allowable Capacity (Down)= 154.854-kp Total Allowable Capacity (Up)= 94.482-kp

Weight above Ground= 0.00 Total Weight= 9.00-kp *Soil Weight is not included
Side Resistance (Down)= 301.080-kp Side Resistance (Up)= 264.997-kp
Tip Resistance (Down)= 39.600-kp Tip Resistance (Up)= 0.000-kp
Negative Friction, Qneg= 0.000-kp, which has been subtracted from Total Ultimate Capacity (Down)
Negative friction does not affect Total Ultimate Capacity (Up)

At Work Load= 100.00-kp, Settlement= 0.04705-in
At Work Load= 100.00-kp, Secant Stiffness Kqx= 2125.52-kp/-in
At Allowable Settlement= 1.000000-in, Capacity= 99999.00-kp
Work Load, 100.00-kp, OK with the Capacity at Allowable Settlement= 1.00000-in, Capacity= 99999.00-kp
Work Load, 100.00-kp, OK with the Allowable Capacity (Down)= 154.85-kp

FACTOR OF SAFETY:

| FSside | FStip | FSuplif | FSweight |
|---|---|---|---|
| 2.2 | 2.2 | 2.9 | 2.9 |

Note: If the program cannot find a result or the result exceeds the upper limit. The result will be displayed as 99999.

1 1 1 1 1

# APPENDIX F-6: STEEL PIPE PILE DOWNWARD (DRIVEN)

# DRIVEN 1.2

## GENERAL PROJECT INFORMATION

Filename: D:\CHARBE~1\KMACON~1\JOB#11~2\PILEAN~1\DRIVEN\1121_B1.DVN
Project Name: Laytons LAke  Project Date: 03/24/2011
Project Client: New Jersey DOT
Computed By: Charbel Khoury
Project Manager: John Dogbey

## PILE INFORMATION

Pile Type: Pipe Pile - Closed End
Top of Pile: 0.00 ft
Diameter of Pile: 16.00 in

## ULTIMATE CONSIDERATIONS

| | | |
|---|---|---|
| Water Table Depth At Time Of: | - Drilling: | 5.00 ft |
| | - Driving/Restrike | 0.00 ft |
| | - Ultimate: | 0.00 ft |
| Ultimate Considerations: | - Local Scour: | 0.00 ft |
| | - Long Term Scour: | 0.00 ft |
| | - Soft Soil: | 0.00 ft |

## ULTIMATE PROFILE

| Layer | Type | Thickness | Driving Loss | Unit Weight | Strength | Ultimate Curve |
|---|---|---|---|---|---|---|
| 1 | Cohesionless | 5.00 ft | 0.00% | 121.40 pcf | 36.4/36.4 | Nordlund |
| 2 | Cohesionless | 3.00 ft | 0.00% | 121.40 pcf | 36.4/36.4 | Nordlund |
| 3 | Cohesionless | 6.00 ft | 0.00% | 114.90 pcf | 33.0/33.0 | Nordlund |
| 4 | Cohesionless | 5.00 ft | 0.00% | 112.10 pcf | 31.8/31.8 | Nordlund |
| 5 | Cohesive | 41.00 ft | 0.00% | 119.00 pcf | 573.00 psf | T-80 Sand |
| 6 | Cohesive | 12.00 ft | 0.00% | 136.30 pcf | 1970.00 psf | T-80 Sand |
| 7 | Cohesionless | 8.00 ft | 0.00% | 120.10 pcf | 35.6/35.6 | Nordlund |
| 8 | Cohesionless | 20.00 ft | 0.00% | 130.10 pcf | 40.0/40.0 | Nordlund |

# RESTRIKE - SKIN FRICTION

| Depth | Soil Type | Effective Stress At Midpoint | Sliding Friction Angle | Adhesion | Skin Friction |
|---|---|---|---|---|---|
| 0.01 ft | Cohesionless | 0.29 psf | 26.66 | N/A | 0.00 Kips |
| 4.99 ft | Cohesionless | 147.20 psf | 26.66 | N/A | 2.60 Kips |
| 5.01 ft | Cohesionless | 295.29 psf | 26.66 | N/A | 2.62 Kips |
| 7.99 ft | Cohesionless | 383.20 psf | 26.66 | N/A | 6.67 Kips |
| 8.01 ft | Cohesionless | 472.26 psf | 24.17 | N/A | 6.70 Kips |
| 13.99 ft | Cohesionless | 629.24 psf | 24.17 | N/A | 15.64 Kips |
| 14.01 ft | Cohesionless | 787.25 psf | 23.29 | N/A | 15.68 Kips |
| 18.99 ft | Cohesionless | 911.00 psf | 23.29 | N/A | 25.17 Kips |
| 19.01 ft | Cohesive | N/A | N/A | 573.00 psf | 25.21 Kips |
| 28.01 ft | Cohesive | N/A | N/A | 573.00 psf | 46.82 Kips |
| 37.01 ft | Cohesive | N/A | N/A | 573.00 psf | 68.42 Kips |
| 46.01 ft | Cohesive | N/A | N/A | 572.93 psf | 90.01 Kips |
| 55.01 ft | Cohesive | N/A | N/A | 571.22 psf | 111.35 Kips |
| 59.99 ft | Cohesive | N/A | N/A | 570.27 psf | 123.10 Kips |
| 60.01 ft | Cohesive | N/A | N/A | 1970.00 psf | 123.21 Kips |
| 69.01 ft | Cohesive | N/A | N/A | 1970.00 psf | 197.48 Kips |
| 71.99 ft | Cohesive | N/A | N/A | 1970.00 psf | 222.07 Kips |
| 72.01 ft | Cohesionless | 4243.19 psf | 26.07 | N/A | 222.28 Kips |
| 79.99 ft | Cohesionless | 4473.41 psf | 26.07 | N/A | 334.92 Kips |
| 80.01 ft | Cohesionless | 4704.84 psf | 29.30 | N/A | 335.32 Kips |
| 89.01 ft | Cohesionless | 5009.49 psf | 29.30 | N/A | 576.68 Kips |
| 98.01 ft | Cohesionless | 5314.14 psf | 29.30 | N/A | 847.39 Kips |
| 99.99 ft | Cohesionless | 5381.16 psf | 29.30 | N/A | 910.89 Kips |

# RESTRIKE - END BEARING

| Depth | Soil Type | Effective Stress At Tip | Bearing Cap. Factor | Limiting End Bearing | End Bearing |
|---|---|---|---|---|---|
| 0.01 ft | Cohesionless | 0.59 psf | 83.04 | 239.16 Kips | 0.05 Kips |
| 4.99 ft | Cohesionless | 294.41 psf | 83.04 | 239.16 Kips | 23.85 Kips |
| 5.01 ft | Cohesionless | 295.59 psf | 83.04 | 239.16 Kips | 23.94 Kips |
| 7.99 ft | Cohesionless | 471.41 psf | 83.04 | 239.16 Kips | 38.19 Kips |
| 8.01 ft | Cohesionless | 472.53 psf | 47.20 | 69.81 Kips | 20.10 Kips |
| 13.99 ft | Cohesionless | 786.48 psf | 47.20 | 69.81 Kips | 33.46 Kips |
| 14.01 ft | Cohesionless | 787.50 psf | 39.36 | 42.17 Kips | 26.88 Kips |
| 18.99 ft | Cohesionless | 1035.00 psf | 39.36 | 42.17 Kips | 35.33 Kips |
| 19.01 ft | Cohesive | N/A | N/A | N/A | 7.20 Kips |
| 28.01 ft | Cohesive | N/A | N/A | N/A | 7.20 Kips |
| 37.01 ft | Cohesive | N/A | N/A | N/A | 7.20 Kips |
| 46.01 ft | Cohesive | N/A | N/A | N/A | 7.20 Kips |
| 55.01 ft | Cohesive | N/A | N/A | N/A | 7.20 Kips |
| 59.99 ft | Cohesive | N/A | N/A | N/A | 7.20 Kips |
| 60.01 ft | Cohesive | N/A | N/A | N/A | 24.76 Kips |
| 69.01 ft | Cohesive | N/A | N/A | N/A | 24.76 Kips |
| 71.99 ft | Cohesive | N/A | N/A | N/A | 24.76 Kips |
| 72.01 ft | Cohesionless | 4243.48 psf | 72.16 | 187.10 Kips | 187.10 Kips |
| 79.99 ft | Cohesionless | 4703.92 psf | 72.16 | 187.10 Kips | 187.10 Kips |
| 80.01 ft | Cohesionless | 4705.18 psf | 160.00 | 583.08 Kips | 583.08 Kips |
| 89.01 ft | Cohesionless | 5314.48 psf | 160.00 | 583.08 Kips | 583.08 Kips |
| 98.01 ft | Cohesionless | 5923.78 psf | 160.00 | 583.08 Kips | 583.08 Kips |
| 99.99 ft | Cohesionless | 6057.82 psf | 160.00 | 583.08 Kips | 583.08 Kips |

# RESTRIKE - SUMMARY OF CAPACITIES

| Depth | Skin Friction | End Bearing | Total Capacity |
|---|---|---|---|
| 0.01 ft | 0.00 Kips | 0.05 Kips | 0.05 Kips |
| 4.99 ft | 2.60 Kips | 23.85 Kips | 26.45 Kips |
| 5.01 ft | 2.62 Kips | 23.94 Kips | 26.57 Kips |
| 7.99 ft | 6.67 Kips | 38.19 Kips | 44.86 Kips |
| 8.01 ft | 6.70 Kips | 20.10 Kips | 26.81 Kips |
| 13.99 ft | 15.64 Kips | 33.46 Kips | 49.11 Kips |
| 14.01 ft | 15.68 Kips | 26.88 Kips | 42.56 Kips |
| 18.99 ft | 25.17 Kips | 35.33 Kips | 60.49 Kips |
| 19.01 ft | 25.21 Kips | 7.20 Kips | 32.41 Kips |
| 28.01 ft | 46.82 Kips | 7.20 Kips | 54.02 Kips |
| 37.01 ft | 68.42 Kips | 7.20 Kips | 75.62 Kips |
| 46.01 ft | 90.01 Kips | 7.20 Kips | 97.21 Kips |
| 55.01 ft | 111.35 Kips | 7.20 Kips | 118.55 Kips |
| 59.99 ft | 123.10 Kips | 7.20 Kips | 130.30 Kips |
| 60.01 ft | 123.21 Kips | 24.76 Kips | 147.97 Kips |
| 69.01 ft | 197.48 Kips | 24.76 Kips | 222.23 Kips |
| 71.99 ft | 222.07 Kips | 24.76 Kips | 246.82 Kips |
| 72.01 ft | 222.28 Kips | 187.10 Kips | 409.38 Kips |
| 79.99 ft | 334.92 Kips | 187.10 Kips | 522.02 Kips |
| 80.01 ft | 335.32 Kips | 583.08 Kips | 918.40 Kips |
| 89.01 ft | 576.68 Kips | 583.08 Kips | 1159.76 Kips |
| 98.01 ft | 847.39 Kips | 583.08 Kips | 1430.47 Kips |
| 99.99 ft | 910.89 Kips | 583.08 Kips | 1493.97 Kips |

# DRIVING - SKIN FRICTION

| Depth | Soil Type | Effective Stress At Midpoint | Sliding Friction Angle | Adhesion | Skin Friction |
|---|---|---|---|---|---|
| 0.01 ft | Cohesionless | 0.29 psf | 26.66 | N/A | 0.00 Kips |
| 4.99 ft | Cohesionless | 147.20 psf | 26.66 | N/A | 2.60 Kips |
| 5.01 ft | Cohesionless | 295.29 psf | 26.66 | N/A | 2.62 Kips |
| 7.99 ft | Cohesionless | 383.20 psf | 26.66 | N/A | 6.67 Kips |
| 8.01 ft | Cohesionless | 472.26 psf | 24.17 | N/A | 6.70 Kips |
| 13.99 ft | Cohesionless | 629.24 psf | 24.17 | N/A | 15.64 Kips |
| 14.01 ft | Cohesionless | 787.25 psf | 23.29 | N/A | 15.68 Kips |
| 18.99 ft | Cohesionless | 911.00 psf | 23.29 | N/A | 25.17 Kips |
| 19.01 ft | Cohesive | N/A | N/A | 573.00 psf | 25.21 Kips |
| 28.01 ft | Cohesive | N/A | N/A | 573.00 psf | 46.82 Kips |
| 37.01 ft | Cohesive | N/A | N/A | 573.00 psf | 68.42 Kips |
| 46.01 ft | Cohesive | N/A | N/A | 572.93 psf | 90.01 Kips |
| 55.01 ft | Cohesive | N/A | N/A | 571.22 psf | 111.35 Kips |
| 59.99 ft | Cohesive | N/A | N/A | 570.27 psf | 123.10 Kips |
| 60.01 ft | Cohesive | N/A | N/A | 1970.00 psf | 123.21 Kips |
| 69.01 ft | Cohesive | N/A | N/A | 1970.00 psf | 197.48 Kips |
| 71.99 ft | Cohesive | N/A | N/A | 1970.00 psf | 222.07 Kips |
| 72.01 ft | Cohesionless | 4243.19 psf | 26.07 | N/A | 222.28 Kips |
| 79.99 ft | Cohesionless | 4473.41 psf | 26.07 | N/A | 334.92 Kips |
| 80.01 ft | Cohesionless | 4704.84 psf | 29.30 | N/A | 335.32 Kips |
| 89.01 ft | Cohesionless | 5009.49 psf | 29.30 | N/A | 576.68 Kips |
| 98.01 ft | Cohesionless | 5314.14 psf | 29.30 | N/A | 847.39 Kips |
| 99.99 ft | Cohesionless | 5381.16 psf | 29.30 | N/A | 910.89 Kips |

# DRIVING - END BEARING

| Depth | Soil Type | Effective Stress At Tip | Bearing Cap. Factor | Limiting End Bearing | End Bearing |
|---|---|---|---|---|---|
| 0.01 ft | Cohesionless | 0.59 psf | 83.04 | 239.16 Kips | 0.05 Kips |
| 4.99 ft | Cohesionless | 294.41 psf | 83.04 | 239.16 Kips | 23.85 Kips |
| 5.01 ft | Cohesionless | 295.59 psf | 83.04 | 239.16 Kips | 23.94 Kips |
| 7.99 ft | Cohesionless | 471.41 psf | 83.04 | 239.16 Kips | 38.19 Kips |
| 8.01 ft | Cohesionless | 472.53 psf | 47.20 | 69.81 Kips | 20.10 Kips |
| 13.99 ft | Cohesionless | 786.48 psf | 47.20 | 69.81 Kips | 33.46 Kips |
| 14.01 ft | Cohesionless | 787.50 psf | 39.36 | 42.17 Kips | 26.88 Kips |
| 18.99 ft | Cohesionless | 1035.00 psf | 39.36 | 42.17 Kips | 35.33 Kips |
| 19.01 ft | Cohesive | N/A | N/A | N/A | 7.20 Kips |
| 28.01 ft | Cohesive | N/A | N/A | N/A | 7.20 Kips |
| 37.01 ft | Cohesive | N/A | N/A | N/A | 7.20 Kips |
| 46.01 ft | Cohesive | N/A | N/A | N/A | 7.20 Kips |
| 55.01 ft | Cohesive | N/A | N/A | N/A | 7.20 Kips |
| 59.99 ft | Cohesive | N/A | N/A | N/A | 7.20 Kips |
| 60.01 ft | Cohesive | N/A | N/A | N/A | 24.76 Kips |
| 69.01 ft | Cohesive | N/A | N/A | N/A | 24.76 Kips |
| 71.99 ft | Cohesive | N/A | N/A | N/A | 24.76 Kips |
| 72.01 ft | Cohesionless | 4243.48 psf | 72.16 | 187.10 Kips | 187.10 Kips |
| 79.99 ft | Cohesionless | 4703.92 psf | 72.16 | 187.10 Kips | 187.10 Kips |
| 80.01 ft | Cohesionless | 4705.18 psf | 160.00 | 583.08 Kips | 583.08 Kips |
| 89.01 ft | Cohesionless | 5314.48 psf | 160.00 | 583.08 Kips | 583.08 Kips |
| 98.01 ft | Cohesionless | 5923.78 psf | 160.00 | 583.08 Kips | 583.08 Kips |
| 99.99 ft | Cohesionless | 6057.82 psf | 160.00 | 583.08 Kips | 583.08 Kips |

# DRIVING - SUMMARY OF CAPACITIES

| Depth | Skin Friction | End Bearing | Total Capacity |
|---|---|---|---|
| 0.01 ft | 0.00 Kips | 0.05 Kips | 0.05 Kips |
| 4.99 ft | 2.60 Kips | 23.85 Kips | 26.45 Kips |
| 5.01 ft | 2.62 Kips | 23.94 Kips | 26.57 Kips |
| 7.99 ft | 6.67 Kips | 38.19 Kips | 44.86 Kips |
| 8.01 ft | 6.70 Kips | 20.10 Kips | 26.81 Kips |
| 13.99 ft | 15.64 Kips | 33.46 Kips | 49.11 Kips |
| 14.01 ft | 15.68 Kips | 26.88 Kips | 42.56 Kips |
| 18.99 ft | 25.17 Kips | 35.33 Kips | 60.49 Kips |
| 19.01 ft | 25.21 Kips | 7.20 Kips | 32.41 Kips |
| 28.01 ft | 46.82 Kips | 7.20 Kips | 54.02 Kips |
| 37.01 ft | 68.42 Kips | 7.20 Kips | 75.62 Kips |
| 46.01 ft | 90.01 Kips | 7.20 Kips | 97.21 Kips |
| 55.01 ft | 111.35 Kips | 7.20 Kips | 118.55 Kips |
| 59.99 ft | 123.10 Kips | 7.20 Kips | 130.30 Kips |
| 60.01 ft | 123.21 Kips | 24.76 Kips | 147.97 Kips |
| 69.01 ft | 197.48 Kips | 24.76 Kips | 222.23 Kips |
| 71.99 ft | 222.07 Kips | 24.76 Kips | 246.82 Kips |
| 72.01 ft | 222.28 Kips | 187.10 Kips | 409.38 Kips |
| 79.99 ft | 334.92 Kips | 187.10 Kips | 522.02 Kips |
| 80.01 ft | 335.32 Kips | 583.08 Kips | 918.40 Kips |
| 89.01 ft | 576.68 Kips | 583.08 Kips | 1159.76 Kips |
| 98.01 ft | 847.39 Kips | 583.08 Kips | 1430.47 Kips |
| 99.99 ft | 910.89 Kips | 583.08 Kips | 1493.97 Kips |

# ULTIMATE - SKIN FRICTION

| Depth | Soil Type | Effective Stress At Midpoint | Sliding Friction Angle | Adhesion | Skin Friction |
|---|---|---|---|---|---|
| 0.01 ft | Cohesionless | 0.29 psf | 26.66 | N/A | 0.00 Kips |
| 4.99 ft | Cohesionless | 147.20 psf | 26.66 | N/A | 2.60 Kips |
| 5.01 ft | Cohesionless | 295.29 psf | 26.66 | N/A | 2.62 Kips |
| 7.99 ft | Cohesionless | 383.20 psf | 26.66 | N/A | 6.67 Kips |
| 8.01 ft | Cohesionless | 472.26 psf | 24.17 | N/A | 6.70 Kips |
| 13.99 ft | Cohesionless | 629.24 psf | 24.17 | N/A | 15.64 Kips |
| 14.01 ft | Cohesionless | 787.25 psf | 23.29 | N/A | 15.68 Kips |
| 18.99 ft | Cohesionless | 911.00 psf | 23.29 | N/A | 25.17 Kips |
| 19.01 ft | Cohesive | N/A | N/A | 573.00 psf | 25.21 Kips |
| 28.01 ft | Cohesive | N/A | N/A | 573.00 psf | 46.82 Kips |
| 37.01 ft | Cohesive | N/A | N/A | 573.00 psf | 68.42 Kips |
| 46.01 ft | Cohesive | N/A | N/A | 572.93 psf | 90.01 Kips |
| 55.01 ft | Cohesive | N/A | N/A | 571.22 psf | 111.35 Kips |
| 59.99 ft | Cohesive | N/A | N/A | 570.27 psf | 123.10 Kips |
| 60.01 ft | Cohesive | N/A | N/A | 1970.00 psf | 123.21 Kips |
| 69.01 ft | Cohesive | N/A | N/A | 1970.00 psf | 197.48 Kips |
| 71.99 ft | Cohesive | N/A | N/A | 1970.00 psf | 222.07 Kips |
| 72.01 ft | Cohesionless | 4243.19 psf | 26.07 | N/A | 222.28 Kips |
| 79.99 ft | Cohesionless | 4473.41 psf | 26.07 | N/A | 334.92 Kips |
| 80.01 ft | Cohesionless | 4704.84 psf | 29.30 | N/A | 335.32 Kips |
| 89.01 ft | Cohesionless | 5009.49 psf | 29.30 | N/A | 576.68 Kips |
| 98.01 ft | Cohesionless | 5314.14 psf | 29.30 | N/A | 847.39 Kips |
| 99.99 ft | Cohesionless | 5381.16 psf | 29.30 | N/A | 910.89 Kips |

# ULTIMATE - END BEARING

| Depth | Soil Type | Effective Stress At Tip | Bearing Cap. Factor | Limiting End Bearing | End Bearing |
|---|---|---|---|---|---|
| 0.01 ft | Cohesionless | 0.59 psf | 83.04 | 239.16 Kips | 0.05 Kips |
| 4.99 ft | Cohesionless | 294.41 psf | 83.04 | 239.16 Kips | 23.85 Kips |
| 5.01 ft | Cohesionless | 295.59 psf | 83.04 | 239.16 Kips | 23.94 Kips |
| 7.99 ft | Cohesionless | 471.41 psf | 83.04 | 239.16 Kips | 38.19 Kips |
| 8.01 ft | Cohesionless | 472.53 psf | 47.20 | 69.81 Kips | 20.10 Kips |
| 13.99 ft | Cohesionless | 786.48 psf | 47.20 | 69.81 Kips | 33.46 Kips |
| 14.01 ft | Cohesionless | 787.50 psf | 39.36 | 42.17 Kips | 26.88 Kips |
| 18.99 ft | Cohesionless | 1035.00 psf | 39.36 | 42.17 Kips | 35.33 Kips |
| 19.01 ft | Cohesive | N/A | N/A | N/A | 7.20 Kips |
| 28.01 ft | Cohesive | N/A | N/A | N/A | 7.20 Kips |
| 37.01 ft | Cohesive | N/A | N/A | N/A | 7.20 Kips |
| 46.01 ft | Cohesive | N/A | N/A | N/A | 7.20 Kips |
| 55.01 ft | Cohesive | N/A | N/A | N/A | 7.20 Kips |
| 59.99 ft | Cohesive | N/A | N/A | N/A | 7.20 Kips |
| 60.01 ft | Cohesive | N/A | N/A | N/A | 24.76 Kips |
| 69.01 ft | Cohesive | N/A | N/A | N/A | 24.76 Kips |
| 71.99 ft | Cohesive | N/A | N/A | N/A | 24.76 Kips |
| 72.01 ft | Cohesionless | 4243.48 psf | 72.16 | 187.10 Kips | 187.10 Kips |
| 79.99 ft | Cohesionless | 4703.92 psf | 72.16 | 187.10 Kips | 187.10 Kips |
| 80.01 ft | Cohesionless | 4705.18 psf | 160.00 | 583.08 Kips | 583.08 Kips |
| 89.01 ft | Cohesionless | 5314.48 psf | 160.00 | 583.08 Kips | 583.08 Kips |
| 98.01 ft | Cohesionless | 5923.78 psf | 160.00 | 583.08 Kips | 583.08 Kips |
| 99.99 ft | Cohesionless | 6057.82 psf | 160.00 | 583.08 Kips | 583.08 Kips |

# ULTIMATE - SUMMARY OF CAPACITIES

| Depth | Skin Friction | End Bearing | Total Capacity |
|---|---|---|---|
| 0.01 ft | 0.00 Kips | 0.05 Kips | 0.05 Kips |
| 4.99 ft | 2.60 Kips | 23.85 Kips | 26.45 Kips |
| 5.01 ft | 2.62 Kips | 23.94 Kips | 26.57 Kips |
| 7.99 ft | 6.67 Kips | 38.19 Kips | 44.86 Kips |
| 8.01 ft | 6.70 Kips | 20.10 Kips | 26.81 Kips |
| 13.99 ft | 15.64 Kips | 33.46 Kips | 49.11 Kips |
| 14.01 ft | 15.68 Kips | 26.88 Kips | 42.56 Kips |
| 18.99 ft | 25.17 Kips | 35.33 Kips | 60.49 Kips |
| 19.01 ft | 25.21 Kips | 7.20 Kips | 32.41 Kips |
| 28.01 ft | 46.82 Kips | 7.20 Kips | 54.02 Kips |
| 37.01 ft | 68.42 Kips | 7.20 Kips | 75.62 Kips |
| 46.01 ft | 90.01 Kips | 7.20 Kips | 97.21 Kips |
| 55.01 ft | 111.35 Kips | 7.20 Kips | 118.55 Kips |
| 59.99 ft | 123.10 Kips | 7.20 Kips | 130.30 Kips |
| 60.01 ft | 123.21 Kips | 24.76 Kips | 147.97 Kips |
| 69.01 ft | 197.48 Kips | 24.76 Kips | 222.23 Kips |
| 71.99 ft | 222.07 Kips | 24.76 Kips | 246.82 Kips |
| 72.01 ft | 222.28 Kips | 187.10 Kips | 409.38 Kips |
| 79.99 ft | 334.92 Kips | 187.10 Kips | 522.02 Kips |
| 80.01 ft | 335.32 Kips | 583.08 Kips | 918.40 Kips |
| 89.01 ft | 576.68 Kips | 583.08 Kips | 1159.76 Kips |
| 98.01 ft | 847.39 Kips | 583.08 Kips | 1430.47 Kips |
| 99.99 ft | 910.89 Kips | 583.08 Kips | 1493.97 Kips |

# APPENDIX F-7: STEEL PIPE 25- FOOT LONG PILE (ALLPILE)

Output_Steel_concrete_pile_vertical_L25'_new

**********

ALLPILE 7
VERTICAL ANALYSIS SUMMARY OUTPUT
Copyright by CivilTech Software
www.civiltechsoftware.com

**********

TOTAL LOADS:

Vertical Load, Q: 100.0 -kp
Vertical Load with Load Factor, Q: 100.0 -kp
Vertical Load with Load factor and Pile Cap, Q= 100.0 -kp
Load Factor for Vertical Load and Torsion= 1.0
Vertical Loads Supported by Pile Cap: 0 %
Load Factor for Vertical Loads: 1.0

PILE PROFILE:

Pile Length, L= 25.0 -ft
Top Height, H= 0 -ft
Slope Angle, As= 0
Batter Angle, Ab= 0.00 Batter Factor, Kbat= 1.00

SINGLE PILE:

Kdown= 1.0 Kup= 0.5 Ka= 1.00

Single Pile Vertical Analysis:

Total Ultimate Capacity (Down)= 39.424-kp Total Ultimate Capacity (Up)= 31.017-kp
Total Allowable Capacity (Down)= 17.920-kp Total Allowable Capacity (Up)= 10.695-kp

Weight above Ground= 0.00 Total Weight= 4.91-kp *Soil Weight is not included
Side Resistance (Down)= 37.898-kp Side Resistance (Up)= 26.109-kp
Tip Resistance (Down)= 1.526-kp Tip Resistance (Up)= 0.000-kp
Negative Friction, Qneg= 0.000-kp, which has been subtracted from Total Ultimate Capacity (Down)
Negative friction does not affect Total Ultimate Capacity (Up)

At Work Load= 100.00-kp, Settlement= 99999.00000-in
At Work Load= 100.00-kp, Secant Stiffness Kqx= 99999.00-kp/-in
At Allowable Settlement= 1.000000-in, Capacity= 99999.00-kp
Work Load, 100.00-kp, OK with the Capacity at Allowable Settlement= 1.00000-in, Capacity= 99999.00-kp
!!! Work Load, 100.00-kp, Exceeds the Allowable Capacity (Down)= 17.92-kp

FACTOR OF SAFETY:

| FSside | FStip | FSuplif | FSweight |
|---|---|---|---|
| 2.2 | 2.2 | 2.9 | 2.9 |

Note: If the program cannot find a result or the result exceeds the upper limit. The result will be displayed as 99999.

| | | | | |
|---|---|---|---|---|
| 1 | 1 | 1 | 1 | 1 |

## APPENDIX F-8: STEEL PIPE 50- FOOT LONG PILE (ALLPILE)

Output_Steel_concrete_pile_vertical_L50'_new

**********

ALLPILE 7

VERTICAL ANALYSIS SUMMARY OUTPUT

Copyright by CivilTech Software

www.civiltechsoftware.com

**********

TOTAL LOADS:

Vertical Load, Q: 100.0 -kp

Vertical Load with Load Factor, Q: 100.0 -kp

Vertical Load with Load factor and Pile Cap, Q= 100.0 -kp

Load Factor for Vertical Load and Torsion= 1.0

Vertical Loads Supported by Pile Cap: 0 %

Load Factor for Vertical Loads: 1.0

PILE PROFILE:

Pile Length, L= 50.0 -ft

Top Height, H= 0 -ft

Slope Angle, As= 0

Batter Angle, Ab= 0.00 Batter Factor, Kbat= 1.00

SINGLE PILE:

Kdown= 1.0 Kup= 0.5 Ka= 1.00

Single Pile Vertical Analysis:

Total Ultimate Capacity (Down)= 102.119-kp Total Ultimate Capacity (Up)= 95.552-kp

Total Allowable Capacity (Down)= 46.418-kp Total Allowable Capacity (Up)= 32.949-kp

Weight above Ground= 0.00 Total Weight= 9.38-kp *Soil Weight is not included

Side Resistance (Down)= 97.981-kp Side Resistance (Up)= 86.173-kp

Tip Resistance (Down)= 4.138-kp Tip Resistance (Up)= 0.000-kp

Negative Friction, Qneg= 0.000-kp, which has been subtracted from Total Ultimate Capacity (Down)

Negative friction does not affect Total Ultimate Capacity (Up)

At Work Load= 100.00-kp, Settlement= 99999.00000-in

At Work Load= 100.00-kp, Secant Stiffness Kqx= 99999.00-kp/-in

At Allowable Settlement= 1.000000-in, Capacity= 99999.00-kp

Work Load, 100.00-kp, OK with the Capacity at Allowable Settlement= 1.00000-in, Capacity= 99999.00-kp

!!! Work Load, 100.00-kp, Exceeds the Allowable Capacity (Down)= 46.42-kp

FACTOR OF SAFETY:

| FSside | FStip | FSuplif | FSweight |
|---|---|---|---|
| 2.2 | 2.2 | 2.9 | 2.9 |

Note: If the program cannot find a result or the result exceeds the upper limit. The result will be displayed as 99999.

1 1 1 1 1

# APPENDIX F-9: STEEL PIPE 60- FOOT LONG PILE (ALLPILE)

Output_Steel_concrete_pile_vertical_L60'_new

**********

ALLPILE 7

VERTICAL ANALYSIS SUMMARY OUTPUT

Copyright by CivilTech Software

www.civiltechsoftware.com

**********

TOTAL LOADS:

Vertical Load, Q: 100.0 -kp

Vertical Load with Load Factor, Q: 100.0 -kp

Vertical Load with Load factor and Pile Cap, Q= 100.0 -kp

Load Factor for Vertical Load and Torsion= 1.0

Vertical Loads Supported by Pile Cap: 0 %

Load Factor for Vertical Loads: 1.0

PILE PROFILE:

Pile Length, L= 60.0 -ft

Top Height, H= 0 -ft

Slope Angle, As= 0

Batter Angle, Ab= 0.00 Batter Factor, Kbat= 1.00

SINGLE PILE:

Kdown= 1.0 Kup= 0.5 Ka= 1.00

Single Pile Vertical Analysis:

Total Ultimate Capacity (Down)= 154.969-kp Total Ultimate Capacity (Up)= 121.290-kp

Total Allowable Capacity (Down)= 70.440-kp Total Allowable Capacity (Up)= 41.824-kp

Weight above Ground= 0.00 Total Weight= 11.17-kp *Soil Weight is not included

Side Resistance (Down)= 122.045-kp Side Resistance (Up)= 110.118-kp

Tip Resistance (Down)= 32.923-kp Tip Resistance (Up)= 0.000-kp

Negative Friction, Qneg= 0.000-kp, which has been subtracted from Total Ultimate Capacity (Down)

Negative friction does not affect Total Ultimate Capacity (Up)

At Work Load= 100.00-kp, Settlement= 0.03319-in

At Work Load= 100.00-kp, Secant Stiffness Kqx= 3013.01-kp/-in

At Allowable Settlement= 1.000000-in, Capacity= 99999.00-kp

Work Load, 100.00-kp, OK with the Capacity at Allowable Settlement= 1.00000-in, Capacity= 99999.00-kp

!!! Work Load, 100.00-kp, Exceeds the Allowable Capacity (Down)= 70.44-kp

FACTOR OF SAFETY:

| FSside | FStip | FSuplif | FSweight |
|---|---|---|---|
| 2.2 | 2.2 | 2.9 | 2.9 |

Note: If the program cannot find a result or the result exceeds the upper limit. The result will be displayed as 99999.

1 1 1 1 1

# APPENDIX F-10: STEEL PIPE 75- FOOT LONG PILE (ALLPILE)

Output_Steel_concrete_pile_vertical_L75'_new

**********

ALLPILE 7
VERTICAL ANALYSIS SUMMARY OUTPUT
Copyright by CivilTech Software
www.civiltechsoftware.com

**********

TOTAL LOADS:

Vertical Load, Q: 100.0 -kp
Vertical Load with Load Factor, Q: 100.0 -kp
Vertical Load with Load factor and Pile Cap, Q= 100.0 -kp
Load Factor for Vertical Load and Torsion= 1.0
Vertical Loads Supported by Pile Cap: 0 %
Load Factor for Vertical Loads: 1.0

PILE PROFILE:

Pile Length, L= 75.0 -ft
Top Height, H= 0 -ft
Slope Angle, As= 0
Batter Angle, Ab= 0.00 Batter Factor, Kbat= 1.00

SINGLE PILE:

Kdown= 1.0 Kup= 0.5 Ka= 1.00

Single Pile Vertical Analysis:

Total Ultimate Capacity (Down)= 315.973-kp Total Ultimate Capacity (Up)= 244.053-kp
Total Allowable Capacity (Down)= 143.624-kp Total Allowable Capacity (Up)= 84.156-kp

Weight above Ground= 0.00 Total Weight= 13.86-kp *Soil Weight is not included
Side Resistance (Down)= 262.544-kp Side Resistance (Up)= 230.194-kp
Tip Resistance (Down)= 53.428-kp Tip Resistance (Up)= 0.000-kp
Negative Friction, Qneg= 0.000-kp, which has been subtracted from Total Ultimate Capacity (Down)
Negative friction does not affect Total Ultimate Capacity (Up)

At Work Load= 100.00-kp, Settlement= 0.03886-in
At Work Load= 100.00-kp, Secant Stiffness Kqx= 2573.53-kp/-in
At Allowable Settlement= 1.000000-in, Capacity= 99999.00-kp
Work Load, 100.00-kp, OK with the Capacity at Allowable Settlement= 1.00000-in, Capacity= 99999.00-kp
Work Load, 100.00-kp, OK with the Allowable Capacity (Down)= 143.62-kp

FACTOR OF SAFETY:

| FSside | FStip | FSuplif | FSweight |
|---|---|---|---|
| 2.2 | 2.2 | 2.9 | 2.9 |

Note: If the program cannot find a result or the result exceeds the upper limit. The result will be displayed as 99999.

| | | | | |
|---|---|---|---|---|
| 1 | 1 | 1 | 1 | 1 |

# APPENDIX G: LATERAL ANALYSES RESULTS (LPILE)

# APPENDIX G-1: H-PILE 25- FOOT LONG

Output_H_pile_L25'_new

==========

LPILE Plus for Windows, Version 5.0 (5.0.39)

Analysis of Individual Piles and Drilled Shafts
Subjected to Lateral Loading Using the p-y Method

(c) 1985-2007 by Ensoft, Inc.
All Rights Reserved

==========

This program is licensed to:

Charbel Khoury
KMA Consulting Engineers

Path to file locations: D:\charbel files\KMA Consulting Engineers CO\Job#1121_Laytons Lake\Pile Analysis\Lpile\
Name of input data file: H_pile_L25'_new.lpd
Name of output file: H_pile_L25'_new.lpo
Name of plot output file: H_pile_L25'_new.lpp
Name of runtime file: H_pile_L25'_new.lpr

---

Time and Date of Analysis

---

Date: April 21, 2011 Time: 10:46:21

---

Problem Title

---

New LPILE Plus 5.0 Data File

---

Program Options

---

Output_H_pile_L25'_new

Units Used in Computations - US Customary Units: Inches, Pounds

Basic Program Options:

Analysis Type 1:
- Computation of Lateral Pile Response Using User-specified Constant EI

Computation Options:
- Only internally-generated p-y curves used in analysis
- Analysis does not use p-y multipliers (individual pile or shaft action only)
- Analysis assumes no shear resistance at pile tip
- Analysis for fixed-length pile or shaft only
- No computation of foundation stiffness matrix elements
- Output pile response for full length of pile
- Analysis assumes no soil movements acting on pile
- No additional p-y curves to be computed at user-specified depths

Solution Control Parameters:
- Number of pile increments = 100
- Maximum number of iterations allowed = 100
- Deflection tolerance for convergence = 1.0000E-05 in
- Maximum allowable deflection = 1.0000E+02 in

Printing Options:
- Values of pile-head deflection, bending moment, shear force, and soil reaction are printed for full length of pile.
- Printing Increment (spacing of output points) = 1

---

Pile Structural Properties and Geometry

---

Pile Length = 300.00 in

Depth of ground surface below top of pile = .00 in

Slope angle of ground surface = .00 deg.

Structural properties of pile defined using 2 points

| Point | Depth X | Pile Diameter | Moment of Inertia | Pile Area | Modulus of Elasticity |
|---|---|---|---|---|---|
| | in | in | in**4 | Sq.in | lbs/Sq.in |

| | | | | | |
|---|---|---|---|---|---|
| 1 | 0.0000 | 14.90000000 | 1220.0000 | 34.4000 | 29000000. |
| 2 | 300.0000 | 14.90000000 | 1220.0000 | 34.4000 | 29000000. |

---

Soil and Rock Layering Information

---

The soil profile is modelled using 8 layers

Layer 1 is sand, p-y criteria by Reese et al., 1974
Distance from top of pile to top of layer = .000 in
Distance from top of pile to bottom of layer = 60.000 in
p-y subgrade modulus k for top of soil layer = 107.700 lbs/in**3
p-y subgrade modulus k for bottom of layer = 107.700 lbs/in**3

Layer 2 is sand, p-y criteria by Reese et al., 1974
Distance from top of pile to top of layer = 60.000 in
Distance from top of pile to bottom of layer = 96.000 in
p-y subgrade modulus k for top of soil layer = 67.200 lbs/in**3
p-y subgrade modulus k for bottom of layer = 67.200 lbs/in**3

Layer 3 is sand, p-y criteria by Reese et al., 1974
Distance from top of pile to top of layer = 96.000 in
Distance from top of pile to bottom of layer = 168.000 in
p-y subgrade modulus k for top of soil layer = 32.500 lbs/in**3
p-y subgrade modulus k for bottom of layer = 32.500 lbs/in**3

Layer 4 is sand, p-y criteria by Reese et al., 1974
Distance from top of pile to top of layer = 168.000 in
Distance from top of pile to bottom of layer = 228.000 in
p-y subgrade modulus k for top of soil layer = 24.500 lbs/in**3
p-y subgrade modulus k for bottom of layer = 24.500 lbs/in**3

Layer 5 is stiff clay with water-induced erosion
Distance from top of pile to top of layer = 228.000 in
Distance from top of pile to bottom of layer = 720.000 in
p-y subgrade modulus k for top of soil layer = 272.000 lbs/in**3
p-y subgrade modulus k for bottom of layer = 272.000 lbs/in**3

Layer 6 is silt with cohesion and friction
Distance from top of pile to top of layer = 720.000 in
Distance from top of pile to bottom of layer = 864.000 in
p-y subgrade modulus k for top of soil layer = 1451.800 lbs/in**3

p-y subgrade modulus k for bottom of layer = 1451.800 lbs/in**3

Layer 7 is sand, p-y criteria by Reese et al., 1974
Distance from top of pile to top of layer = 864.000 in
Distance from top of pile to bottom of layer = 960.000 in
p-y subgrade modulus k for top of soil layer = 56.000 lbs/in**3
p-y subgrade modulus k for bottom of layer = 56.000 lbs/in**3

Layer 8 is sand, p-y criteria by Reese et al., 1974
Distance from top of pile to top of layer = 960.000 in
Distance from top of pile to bottom of layer = 1200.000 in
p-y subgrade modulus k for top of soil layer = 156.800 lbs/in**3
p-y subgrade modulus k for bottom of layer = 156.800 lbs/in**3

(Depth of lowest layer extends 900.00 in below pile tip)

---

Effective Unit Weight of Soil vs. Depth

---

Effective unit weight of soil with depth defined using 16 points

| Point No. | Depth X in | Eff. Unit Weight lbs/in**3 |
|---|---|---|
| 1 | .00 | .07025 |
| 2 | 60.00 | .07025 |
| 3 | 60.00 | .03414 |
| 4 | 96.00 | .03414 |
| 5 | 96.00 | .03038 |
| 6 | 168.00 | .03038 |
| 7 | 168.00 | .02876 |
| 8 | 228.00 | .02876 |
| 9 | 228.00 | .03275 |
| 10 | 720.00 | .03275 |
| 11 | 720.00 | .04277 |
| 12 | 864.00 | .04277 |
| 13 | 864.00 | .03339 |
| 14 | 960.00 | .03339 |
| 15 | 960.00 | .03918 |
| 16 | 1200.00 | .03918 |

---

Shear Strength of Soils

---

Shear strength parameters with depth defined using 16 points

| Point No. | Depth X in | Cohesion c lbs/in**2 | Angle of Friction Deg. | k_rm | E50 or % | RQD |
|---|---|---|---|---|---|---|
| 1 | .000 | .00000 | 36.40 | ------ | ------ | |
| 2 | 60.000 | .00000 | 36.40 | ------ | ------ | |
| 3 | 60.000 | .00000 | 36.40 | ------ | ------ | |
| 4 | 96.000 | .00000 | 36.40 | ------ | ------ | |
| 5 | 96.000 | .00000 | 33.00 | ------ | ------ | |
| 6 | 168.000 | .00000 | 33.00 | ------ | ------ | |
| 7 | 168.000 | .00000 | 31.80 | ------ | ------ | |
| 8 | 228.000 | .00000 | 31.80 | ------ | ------ | |
| 9 | 228.000 | 3.98000 | .00 | .92000 | .0 | |
| 10 | 720.000 | 3.98000 | .00 | .92000 | .0 | |
| 11 | 720.000 | 13.70000 | 35.30 | .43000 | .0 | |
| 12 | 864.000 | 13.70000 | 35.30 | .43000 | .0 | |
| 13 | 864.000 | .00000 | 35.60 | ------ | ------ | |
| 14 | 960.000 | .00000 | 35.60 | ------ | ------ | |
| 15 | 960.000 | .00000 | 40.00 | ------ | ------ | |
| 16 | 1200.000 | .00000 | 40.00 | ------ | ------ | |

Notes:

(1) Cohesion = uniaxial compressive strength for rock materials.
(2) Values of E50 are reported for clay strata.
(3) Default values will be generated for E50 when input values are 0.
(4) RQD and k_rm are reported only for weak rock strata.

---

Loading Type

---

Static loading criteria was used for computation of p-y curves.

---

Pile-head Loading and Pile-head Fixity Conditions

---

Number of loads specified = 1

Load Case Number 1

Pile-head boundary conditions are Shear and Moment (BC Type 1)
Shear force at pile head = 25000.000 lbs
Bending moment at pile head = .000 in-lbs
Axial load at pile head = 100000.000 lbs

(Zero moment at pile head for this load indicates a free-head condition)

---

Computed Values of Load Distribution and Deflection
for Lateral Loading for Load Case Number 1

---

Pile-head boundary conditions are Shear and Moment (BC Type 1)
Specified shear force at pile head = 25000.000 lbs
Specified moment at pile head = .000 in-lbs
Specified axial load at pile head = 100000.000 lbs

(Zero moment for this load indicates free-head conditions)

| Depth X in | Deflect. y in | Moment M lbs-in | Shear V lbs | Slope S Rad. | Total Stress lbs/in**2 | Soil Res. p lbs/in | Es*h F/L lbs/in |
|---|---|---|---|---|---|---|---|
| 0.000 | .378725 | 5.6737E-06 | 25000.0000 | -.0042574 | 2906.9767 | 0.0000 | 0.0000 |
| 3.000 | .365953 | 76277.2231 | 24953.5798 | -.0042542 | 3372.7680 | -30.9468 | 253.6949 |
| 6.000 | .353200 | 152274. | 24807.3141 | -.0042445 | 3836.8466 | -66.5637 | 565.3773 |
| 9.000 | .340486 | 227668. | 24549.9634 | -.0042284 | 4297.2432 | -105.0034 | 925.1783 |
| 12.000 | .327830 | 302111. | 24175.6026 | -.0042059 | 4751.8336 | -144.5706 | 1322.9791 |
| 15.000 | .315250 | 375245. | 23683.4187 | -.0041772 | 5198.4317 | -183.5520 | 1746.7262 |
| 18.000 | .302766 | 446718. | 23075.9348 | -.0041424 | 5634.8835 | -221.4373 | 2194.1404 |
| 21.000 | .290396 | 516186. | 22359.5619 | -.0041015 | 6059.0961 | -256.1446 | 2646.1566 |
| 24.000 | .278157 | 583336. | 21541.9870 | -.0040549 | 6469.1510 | -288.9054 | 3115.9214 |
| 27.000 | .266067 | 647871. | 20629.6357 | -.0040027 | 6863.2373 | -319.3288 | 3600.5502 |
| 30.000 | .254141 | 709515. | 19633.3962 | -.0039452 | 7239.6730 | -344.8308 | 4070.5460 |
| 33.000 | .242396 | 768038. | 18563.3937 | -.0038825 | 7597.0469 | -368.5041 | 4560.7752 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 36.000 | .230846 | 823225. | 17431.2645 | -.0038151 | 7934.0488 | -386.2486 | 5019.5655 |
| 39.000 | .219505 | 874915. | 16249.5891 | -.0037431 | 8249.6951 | -401.5350 | 5487.8144 |
| 42.000 | .208388 | 922969. | 15027.2119 | -.0036668 | 8543.1374 | -413.3831 | 5951.1694 |
| 45.000 | .197504 | 967278. | 13777.6845 | -.0035867 | 8813.7173 | -419.6352 | 6374.0637 |
| 48.000 | .186867 | 1007787. | 12499.4478 | -.0035030 | 9061.0842 | -432.5226 | 6943.7903 |
| 51.000 | .176487 | 1044377. | 11191.0975 | -.0034160 | 9284.5235 | -439.7110 | 7474.4064 |
| 54.000 | .166372 | 1076983. | 9870.5892 | -.0033260 | 9483.6345 | -440.6279 | 7945.3663 |
| 57.000 | .156531 | 1105596. | 8557.4764 | -.0032335 | 9658.3617 | -434.7806 | 8332.8249 |
| 60.000 | .146971 | 1130268. | 7268.2663 | -.0031387 | 9809.0220 | -424.6927 | 8668.9221 |
| 63.000 | .137698 | 1151089. | 5988.2828 | -.0030420 | 9936.1661 | -428.6296 | 9338.4399 |
| 66.000 | .128719 | 1168023. | 4699.5699 | -.0029436 | 10039.5743 | -430.5123 | 10033.7714 |
| 69.000 | .120037 | 1181052. | 3408.3751 | -.0028440 | 10119.1406 | -430.2842 | 10753.8218 |
| 72.000 | .111655 | 1190179. | 2121.0919 | -.0027435 | 10174.8754 | -427.9046 | 11497.1760 |
| 75.000 | .103576 | 1195425. | 842.5507 | -.0026424 | 10206.9081 | -424.4562 | 12294.1029 |
| 78.000 | .095800 | 1196820. | -434.9409 | -.0025409 | 10215.4274 | -427.2049 | 13377.9549 |
| 81.000 | .088330 | 1194340. | -1718.5223 | -.0024396 | 10200.2820 | -428.5161 | 14553.9478 |
| 84.000 | .081163 | 1187973. | -3003.8067 | -.0023386 | 10161.4003 | -428.3402 | 15832.5787 |
| 87.000 | .074298 | 1177720. | -4286.2572 | -.0022383 | 10098.7928 | -426.6268 | 17226.2033 |
| 90.000 | .067733 | 1163598. | -5539.7655 | -.0021390 | 10012.5555 | -409.0454 | 18117.1377 |
| 93.000 | .061464 | 1145765. | -6728.7002 | -.0020411 | 9903.6566 | -383.5777 | 18721.9377 |
| 96.000 | .055487 | 1124451. | -7591.0123 | -.0019448 | 9773.4987 | -191.2970 | 10342.8242 |
| 99.000 | .049795 | 1101386. | -8142.7526 | -.0018505 | 9632.6527 | -176.5299 | 10635.3242 |
| 102.000 | .044384 | 1076704. | -8650.0578 | -.0017581 | 9481.9337 | -161.6735 | 10927.8242 |
| 105.000 | .039247 | 1050540. | -9112.7477 | -.0016679 | 9322.1619 | -146.7864 | 11220.3242 |
| 108.000 | .034376 | 1023029. | -9530.8116 | -.0015800 | 9154.1598 | -131.9229 | 11512.8242 |
| 111.000 | .029766 | 994304. | -9904.3968 | -.0014945 | 8978.7484 | -117.1339 | 11805.3242 |
| 114.000 | .025409 | 964499. | -10233.7963 | -.0014115 | 8796.7450 | -102.4658 | 12097.8242 |
| 117.000 | .021298 | 933748. | -10519.4373 | -.0013310 | 8608.9603 | -87.9615 | 12390.3242 |
| 120.000 | .017423 | 902181. | -10761.8689 | -.0012531 | 8416.1963 | -73.6596 | 12682.8242 |
| 123.000 | .013779 | 869928. | -10961.7504 | -.0011780 | 8219.2439 | -59.5948 | 12975.3242 |
| 126.000 | .010355 | 837117. | -11119.8394 | -.0011056 | 8018.8811 | -45.7979 | 13267.8242 |
| 129.000 | .007145 | 803873. | -11236.9805 | -.0010361 | 7815.8712 | -32.2961 | 13560.3242 |
| 132.000 | .004139 | 770317. | -11314.0934 | -.0009693 | 7610.9615 | -19.1125 | 13852.8242 |
| 135.000 | .001329 | 736570. | -11352.1622 | -.0009054 | 7404.8818 | -6.2667 | 14145.3242 |
| 138.000 | -.001294 | 702747. | -11352.2242 | -.0008444 | 7198.3432 | 6.2254 | 14437.8242 |
| 141.000 | -.003737 | 668963. | -11315.3596 | -.0007863 | 6992.0376 | 18.3510 | 14730.3242 |
| 144.000 | -.006011 | 635327. | -11242.6813 | -.0007310 | 6786.6366 | 30.1011 | 15022.8242 |
| 147.000 | -.008123 | 601945. | -11135.3253 | -.0006785 | 6582.7913 | 41.4695 | 15315.3242 |
| 150.000 | -.010082 | 568922. | -10994.4413 | -.0006289 | 6381.1316 | 52.4531 | 15607.8242 |
| 153.000 | -.011896 | 536356. | -10821.1841 | -.0005820 | 6182.2663 | 63.0517 | 15900.3242 |
| 156.000 | -.013574 | 504344. | -10616.7052 | -.0005379 | 5986.7829 | 73.2676 | 16192.8242 |
| 159.000 | -.015124 | 472979. | -10382.1455 | -.0004964 | 5795.2479 | 83.1056 | 16485.3242 |
| 162.000 | -.016553 | 442349. | -10118.6277 | -.0004576 | 5608.2069 | 92.5729 | 16777.8242 |
| 165.000 | -.017869 | 412541. | -9827.2504 | -.0004214 | 5426.1848 | 101.6786 | 17070.3242 |
| 168.000 | -.019081 | 383638. | -9540.4511 | -.0003876 | 5249.6868 | 89.5209 | 14074.8321 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 171.000 | -.020195 | 355531. | -9261.8213 | -.0003563 | 5078.0492 | 96.2322 | 14295.3321 |
| 174.000 | -.021219 | 328281. | -8963.4684 | -.0003273 | 4911.6452 | 102.6697 | 14515.8321 |
| 177.000 | -.022159 | 301947. | -8646.1927 | -.0003006 | 4750.8328 | 108.8475 | 14736.3321 |
| 180.000 | -.023022 | 276584. | -8310.7508 | -.0002761 | 4595.9557 | 114.7805 | 14956.8321 |
| 183.000 | -.023815 | 252248. | -7957.8534 | -.0002536 | 4447.3438 | 120.4844 | 15177.3321 |
| 186.000 | -.024544 | 228990. | -7588.1633 | -.0002332 | 4305.3144 | 125.9756 | 15397.8321 |
| 189.000 | -.025215 | 206859. | -7202.2938 | -.0002148 | 4170.1730 | 131.2707 | 15618.3321 |
| 192.000 | -.025833 | 185905. | -6800.8080 | -.0001981 | 4042.2140 | 136.3865 | 15838.8321 |
| 195.000 | -.026403 | 166173. | -6384.2181 | -.0001832 | 3921.7217 | 141.3401 | 16059.3321 |
| 198.000 | -.026932 | 147709. | -5952.9859 | -.0001699 | 3808.9715 | 146.1481 | 16279.8321 |
| 201.000 | -.027423 | 130557. | -5507.5231 | -.0001581 | 3704.2306 | 150.8271 | 16500.3321 |
| 204.000 | -.027880 | 114759. | -5048.1927 | -.0001477 | 3607.7587 | 155.3932 | 16720.8321 |
| 207.000 | -.028309 | 100356. | -4575.3104 | -.0001385 | 3519.8092 | 159.8617 | 16941.3321 |
| 210.000 | -.028711 | 87390.1859 | -4089.1473 | -.0001306 | 3440.6299 | 164.2471 | 17161.8321 |
| 213.000 | -.029092 | 75899.9211 | -3589.9323 | -.0001237 | 3370.4640 | 168.5629 | 17382.3321 |
| 216.000 | -.029453 | 65924.7918 | -3077.8558 | -.0001177 | 3309.5503 | 172.8214 | 17602.8321 |
| 219.000 | -.029798 | 57503.3783 | -2553.0736 | -.0001124 | 3258.1244 | 177.0334 | 17823.3321 |
| 222.000 | -.030128 | 50673.8028 | -2015.7113 | -.0001078 | 3216.4192 | 181.2081 | 18043.8321 |
| 225.000 | -.030445 | 45473.8109 | -1465.8700 | -.0001038 | 3184.6652 | 185.3528 | 18264.3321 |
| 228.000 | -.030751 | 41940.8373 | -1164.6686 | -.0001001 | 3163.0909 | 15.4482 | 1507.1131 |
| 231.000 | -.031045 | 38545.8303 | -1118.2133 | -9.6639E-05 | 3142.3591 | 15.5221 | 1499.9406 |
| 234.000 | -.031330 | 35289.5413 | -1071.5404 | -9.3509E-05 | 3122.4744 | 15.5932 | 1493.1033 |
| 237.000 | -.031606 | 32172.6930 | -1024.6582 | -9.0649E-05 | 3103.4411 | 15.6617 | 1486.5696 |
| 240.000 | -.031874 | 29195.9817 | -977.5737 | -8.8047E-05 | 3085.2637 | 15.7279 | 1480.3110 |
| 243.000 | -.032135 | 26360.0791 | -930.2937 | -8.5692E-05 | 3067.9461 | 15.7921 | 1474.3011 |
| 246.000 | -.032388 | 23665.6346 | -882.8241 | -8.3571E-05 | 3051.4923 | 15.8543 | 1468.5158 |
| 249.000 | -.032636 | 21113.2767 | -835.1705 | -8.1672E-05 | 3035.9062 | 15.9148 | 1462.9331 |
| 252.000 | -.032878 | 18703.6152 | -787.3375 | -7.9984E-05 | 3021.1914 | 15.9738 | 1457.5325 |
| 255.000 | -.033116 | 16437.2420 | -739.3297 | -7.8494E-05 | 3007.3517 | 16.0314 | 1452.2957 |
| 258.000 | -.033349 | 14314.7334 | -691.1509 | -7.7190E-05 | 2994.3905 | 16.0878 | 1447.2056 |
| 261.000 | -.033579 | 12336.6510 | -642.8044 | -7.6061E-05 | 2982.3112 | 16.1431 | 1442.2468 |
| 264.000 | -.033806 | 10503.5431 | -594.2934 | -7.5092E-05 | 2971.1172 | 16.1975 | 1437.4054 |
| 267.000 | -.034030 | 8815.9458 | -545.6205 | -7.4273E-05 | 2960.8118 | 16.2511 | 1432.6687 |
| 270.000 | -.034251 | 7274.3842 | -496.7879 | -7.3591E-05 | 2951.3982 | 16.3040 | 1428.0252 |
| 273.000 | -.034471 | 5879.3731 | -447.7976 | -7.3033E-05 | 2942.8795 | 16.3562 | 1423.4648 |
| 276.000 | -.034690 | 4631.4183 | -398.6514 | -7.2588E-05 | 2935.2588 | 16.4079 | 1418.9784 |
| 279.000 | -.034907 | 3531.0172 | -349.3507 | -7.2242E-05 | 2928.5391 | 16.4592 | 1414.5581 |
| 282.000 | -.035123 | 2578.6592 | -299.8966 | -7.1983E-05 | 2922.7235 | 16.5101 | 1410.1968 |
| 285.000 | -.035339 | 1774.8269 | -250.2903 | -7.1798E-05 | 2917.8148 | 16.5607 | 1405.8887 |
| 288.000 | -.035554 | 1119.9962 | -200.5325 | -7.1675E-05 | 2913.8161 | 16.6111 | 1401.6287 |
| 291.000 | -.035769 | 614.6368 | -150.6240 | -7.1602E-05 | 2910.7301 | 16.6612 | 1397.4128 |
| 294.000 | -.035983 | 259.2129 | -100.5655 | -7.1565E-05 | 2908.5596 | 16.7112 | 1393.2377 |
| 297.000 | -.036198 | 54.1829 | -50.3573 | -7.1551E-05 | 2907.3076 | 16.7609 | 1389.1010 |
| 300.000 | -.036413 | 0.0000 | 0.0000 | -7.1549E-05 | 2906.9767 | 16.8106 | 692.5007 |

Output_H_pile_L25'_new

Output Verification:

Computed forces and moments are within specified convergence limits.

Output Summary for Load Case No. 1:

Pile-head deflection = .37872493 in
Computed slope at pile head = -.00425741
Maximum bending moment = 1196820. lbs-in
Maximum shear force = 25000.00000 lbs
Depth of maximum bending moment = 78.00000000 in
Depth of maximum shear force = 0.00000 in
Number of iterations = 14
Number of zero deflection points = 1

---

Summary of Pile Response(s)

---

Definition of Symbols for Pile-Head Loading Conditions:

Type 1 = Shear and Moment, y = pile-head displacment in
Type 2 = Shear and Slope, M = Pile-head Moment lbs-in
Type 3 = Shear and Rot. Stiffness, V = Pile-head Shear Force lbs
Type 4 = Deflection and Moment, S = Pile-head Slope, radians
Type 5 = Deflection and Slope, R = Rot. Stiffness of Pile-head in-lbs/rad

| Load Type | Pile-Head Condition 1 | Pile-Head Condition 2 | Axial Load lbs | Pile-Head Deflection in | Maximum Moment in-lbs | Maximum Shear lbs |
|---|---|---|---|---|---|---|
| 1 | V= | 25000. | M= | 0.000 | 100000.0000 | .3787249 | 1196820. | 25000.0000 |

The analysis ended normally.

# APPENDIX G-2: H-PILE 50- FOOT LONG

Output_H_pile_L50'_new

==========

LPILE Plus for Windows, Version 5.0 (5.0.39)

Analysis of Individual Piles and Drilled Shafts
Subjected to Lateral Loading Using the p-y Method

(c) 1985-2007 by Ensoft, Inc.
All Rights Reserved

==========

This program is licensed to:

Charbel Khoury
KMA Consulting Engineers

Path to file locations: D:\charbel files\KMA Consulting Engineers CO\Job#1121_Laytons Lake\Pile Analysis\Lpile\
Name of input data file: H_pile_L50'_new.lpd
Name of output file: H_pile_L50'_new.lpo
Name of plot output file: H_pile_L50'_new.lpp
Name of runtime file: H_pile_L50'_new.lpr

---

Time and Date of Analysis

---

Date: April 21, 2011 Time: 10:49:00

---

Problem Title

---

New LPILE Plus 5.0 Data File

---

Program Options

---

Output_H_pile_L50'_new

Units Used in Computations - US Customary Units: Inches, Pounds

Basic Program Options:

Analysis Type 1:
- Computation of Lateral Pile Response Using User-specified Constant EI

Computation Options:
- Only internally-generated p-y curves used in analysis
- Analysis does not use p-y multipliers (individual pile or shaft action only)
- Analysis assumes no shear resistance at pile tip
- Analysis for fixed-length pile or shaft only
- No computation of foundation stiffness matrix elements
- Output pile response for full length of pile
- Analysis assumes no soil movements acting on pile
- No additional p-y curves to be computed at user-specified depths

Solution Control Parameters:
- Number of pile increments = 100
- Maximum number of iterations allowed = 100
- Deflection tolerance for convergence = 1.0000E-05 in
- Maximum allowable deflection = 1.0000E+02 in

Printing Options:
- Values of pile-head deflection, bending moment, shear force, and soil reaction are printed for full length of pile.
- Printing Increment (spacing of output points) = 1

---

Pile Structural Properties and Geometry

---

Pile Length = 600.00 in

Depth of ground surface below top of pile = .00 in

Slope angle of ground surface = .00 deg.

Structural properties of pile defined using 2 points

| Point | Depth X | Pile Diameter | Moment of Inertia | Pile Area | Modulus of Elasticity |
|---|---|---|---|---|---|
| | in | in | in**4 | Sq.in | lbs/Sq.in |

| | | | | | |
|---|---|---|---|---|---|
| 1 | 0.0000 | 14.90000000 | 1220.0000 | 34.4000 | 29000000. |
| 2 | 600.0000 | 14.90000000 | 1220.0000 | 34.4000 | 29000000. |

---

Soil and Rock Layering Information

---

The soil profile is modelled using 8 layers

Layer 1 is sand, p-y criteria by Reese et al., 1974
Distance from top of pile to top of layer = .000 in
Distance from top of pile to bottom of layer = 60.000 in
p-y subgrade modulus k for top of soil layer = 107.700 lbs/in**3
p-y subgrade modulus k for bottom of layer = 107.700 lbs/in**3

Layer 2 is sand, p-y criteria by Reese et al., 1974
Distance from top of pile to top of layer = 60.000 in
Distance from top of pile to bottom of layer = 96.000 in
p-y subgrade modulus k for top of soil layer = 67.200 lbs/in**3
p-y subgrade modulus k for bottom of layer = 67.200 lbs/in**3

Layer 3 is sand, p-y criteria by Reese et al., 1974
Distance from top of pile to top of layer = 96.000 in
Distance from top of pile to bottom of layer = 168.000 in
p-y subgrade modulus k for top of soil layer = 32.500 lbs/in**3
p-y subgrade modulus k for bottom of layer = 32.500 lbs/in**3

Layer 4 is sand, p-y criteria by Reese et al., 1974
Distance from top of pile to top of layer = 168.000 in
Distance from top of pile to bottom of layer = 228.000 in
p-y subgrade modulus k for top of soil layer = 24.500 lbs/in**3
p-y subgrade modulus k for bottom of layer = 24.500 lbs/in**3

Layer 5 is stiff clay with water-induced erosion
Distance from top of pile to top of layer = 228.000 in
Distance from top of pile to bottom of layer = 720.000 in
p-y subgrade modulus k for top of soil layer = 272.000 lbs/in**3
p-y subgrade modulus k for bottom of layer = 272.000 lbs/in**3

Layer 6 is silt with cohesion and friction
Distance from top of pile to top of layer = 720.000 in
Distance from top of pile to bottom of layer = 864.000 in
p-y subgrade modulus k for top of soil layer = 1451.800 lbs/in**3

p-y subgrade modulus k for bottom of layer = 1451.800 lbs/in**3

Layer 7 is sand, p-y criteria by Reese et al., 1974
Distance from top of pile to top of layer = 864.000 in
Distance from top of pile to bottom of layer = 960.000 in
p-y subgrade modulus k for top of soil layer = 56.000 lbs/in**3
p-y subgrade modulus k for bottom of layer = 56.000 lbs/in**3

Layer 8 is sand, p-y criteria by Reese et al., 1974
Distance from top of pile to top of layer = 960.000 in
Distance from top of pile to bottom of layer = 1200.000 in
p-y subgrade modulus k for top of soil layer = 156.800 lbs/in**3
p-y subgrade modulus k for bottom of layer = 156.800 lbs/in**3

(Depth of lowest layer extends 600.00 in below pile tip)

---

Effective Unit Weight of Soil vs. Depth

---

Effective unit weight of soil with depth defined using 16 points

| Point No. | Depth X in | Eff. Unit Weight lbs/in**3 |
|---|---|---|
| 1 | .00 | .07025 |
| 2 | 60.00 | .07025 |
| 3 | 60.00 | .03414 |
| 4 | 96.00 | .03414 |
| 5 | 96.00 | .03038 |
| 6 | 168.00 | .03038 |
| 7 | 168.00 | .02876 |
| 8 | 228.00 | .02876 |
| 9 | 228.00 | .03275 |
| 10 | 720.00 | .03275 |
| 11 | 720.00 | .04277 |
| 12 | 864.00 | .04277 |
| 13 | 864.00 | .03339 |
| 14 | 960.00 | .03339 |
| 15 | 960.00 | .03918 |
| 16 | 1200.00 | .03918 |

---

Shear Strength of Soils

---

Shear strength parameters with depth defined using 16 points

| Point No. | Depth X in | Cohesion c lbs/in**2 | Angle of Friction Deg. | k_rm | E50 or % | RQD |
|---|---|---|---|---|---|---|
| 1 | .000 | .00000 | 36.40 | ------ | ------ | |
| 2 | 60.000 | .00000 | 36.40 | ------ | ------ | |
| 3 | 60.000 | .00000 | 36.40 | ------ | ------ | |
| 4 | 96.000 | .00000 | 36.40 | ------ | ------ | |
| 5 | 96.000 | .00000 | 33.00 | ------ | ------ | |
| 6 | 168.000 | .00000 | 33.00 | ------ | ------ | |
| 7 | 168.000 | .00000 | 31.80 | ------ | ------ | |
| 8 | 228.000 | .00000 | 31.80 | ------ | ------ | |
| 9 | 228.000 | 3.98000 | .00 | .92000 | .0 | |
| 10 | 720.000 | 3.98000 | .00 | .92000 | .0 | |
| 11 | 720.000 | 13.70000 | 35.30 | .43000 | .0 | |
| 12 | 864.000 | 13.70000 | 35.30 | .43000 | .0 | |
| 13 | 864.000 | .00000 | 35.60 | ------ | ------ | |
| 14 | 960.000 | .00000 | 35.60 | ------ | ------ | |
| 15 | 960.000 | .00000 | 40.00 | ------ | ------ | |
| 16 | 1200.000 | .00000 | 40.00 | ------ | ------ | |

Notes:

(1) Cohesion = uniaxial compressive strength for rock materials.
(2) Values of E50 are reported for clay strata.
(3) Default values will be generated for E50 when input values are 0.
(4) RQD and k_rm are reported only for weak rock strata.

---

Loading Type

---

Static loading criteria was used for computation of p-y curves.

---

Pile-head Loading and Pile-head Fixity Conditions

---

Number of loads specified = 1

Load Case Number 1

Pile-head boundary conditions are Shear and Moment (BC Type 1)
Shear force at pile head = 25000.000 lbs
Bending moment at pile head = .000 in-lbs
Axial load at pile head = 100000.000 lbs

(Zero moment at pile head for this load indicates a free-head condition)

---

Computed Values of Load Distribution and Deflection
for Lateral Loading for Load Case Number 1

---

Pile-head boundary conditions are Shear and Moment (BC Type 1)
Specified shear force at pile head = 25000.000 lbs
Specified moment at pile head = .000 in-lbs
Specified axial load at pile head = 100000.000 lbs

(Zero moment for this load indicates free-head conditions)

| Depth X in | Deflect. y in | Moment M lbs-in | Shear V lbs | Slope S Rad. | Total Stress lbs/in**2 | Soil Res. p lbs/in | Es*h F/L lbs/in |
|---|---|---|---|---|---|---|---|
| 0.000 | .378585 | 1.6367E-07 | 25000.0000 | -.0042636 | 2906.9767 | 0.0000 | 0.0000 |
| 6.000 | .353004 | 152558. | 24800.3482 | -.0042506 | 3838.5818 | -66.5506 | 1131.1587 |
| 12.000 | .327578 | 302705. | 24167.1022 | -.0042120 | 4755.4618 | -144.5314 | 2647.2745 |
| 18.000 | .302460 | 447618. | 23069.4281 | -.0041484 | 5640.3805 | -221.3599 | 4391.1952 |
| 24.000 | .277797 | 584516. | 21539.0115 | -.0040609 | 6476.3581 | -288.7789 | 6237.1923 |
| 30.000 | .253729 | 710959. | 19638.7417 | -.0039510 | 7248.4886 | -344.6443 | 8149.8953 |
| 36.000 | .230385 | 824922. | 17446.8540 | -.0038208 | 7944.4120 | -385.9849 | 10052.3611 |
| 42.000 | .207880 | 924906. | 15049.8824 | -.0036724 | 8554.9695 | -413.0056 | 11920.5267 |
| 48.000 | .186316 | 1009928. | 12514.9221 | -.0035084 | 9074.1587 | -431.9812 | 13911.2786 |
| 54.000 | .165779 | 1079295. | 9899.3824 | -.0033312 | 9497.7554 | -439.8653 | 15919.9271 |
| 60.000 | .146341 | 1132718. | 7315.3242 | -.0031436 | 9823.9832 | -421.4874 | 17281.0391 |
| 66.000 | .128055 | 1170852. | 4768.9875 | -.0029483 | 10056.8490 | -427.2915 | 20020.6269 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 72.000 | .110961 | 1193484. | 2213.1922 | -.0027478 | 10195.0532 | -424.6402 | 22961.5593 |
| 78.000 | .095081 | 1200707. | -330.1514 | -.0025448 | 10239.1646 | -423.1410 | 26701.8334 |
| 84.000 | .080423 | 1192576. | -2871.5362 | -.0023419 | 10189.5083 | -423.9873 | 31631.6977 |
| 90.000 | .066979 | 1169059. | -5354.1000 | -.0021416 | 10045.9033 | -403.5339 | 36148.8917 |
| 96.000 | .054724 | 1130896. | -7128.5074 | -.0019466 | 9812.8605 | -187.9352 | 20605.5813 |
| 102.000 | .043619 | 1085853. | -8167.2301 | -.0017587 | 9537.8002 | -158.3057 | 21775.5813 |
| 108.000 | .033620 | 1035000. | -9027.8597 | -.0015788 | 9227.2638 | -128.5708 | 22945.5813 |
| 114.000 | .024673 | 979413. | -9711.0794 | -.0014080 | 8887.8198 | -99.1690 | 24115.5813 |
| 120.000 | .016724 | 920157. | -10220.0206 | -.0012469 | 8525.9663 | -70.4780 | 25285.5813 |
| 126.000 | .009710 | 858269. | -10559.8994 | -.0010961 | 8148.0475 | -42.8149 | 26455.5813 |
| 132.000 | .003570 | 794753. | -10737.6565 | -.0009560 | 7760.1831 | -16.4375 | 27625.5813 |
| 138.000 | -.001761 | 730565. | -10761.6083 | -.0008266 | 7368.2113 | 8.4535 | 28795.5813 |
| 144.000 | -.006350 | 666606. | -10641.1138 | -.0007082 | 6977.6440 | 31.7113 | 29965.5813 |
| 150.000 | -.010259 | 603721. | -10386.2643 | -.0006004 | 6593.6338 | 53.2386 | 31135.5813 |
| 156.000 | -.013555 | 542691. | -10007.5994 | -.0005032 | 6220.9522 | 72.9831 | 32305.5813 |
| 162.000 | -.016298 | 484234. | -9515.8540 | -.0004162 | 5863.9777 | 90.9320 | 33475.5813 |
| 168.000 | -.018549 | 429000. | -8982.6250 | -.0003387 | 5526.6924 | 86.8110 | 28080.8061 |
| 174.000 | -.020363 | 376849. | -8427.3086 | -.0002704 | 5208.2248 | 98.2945 | 28962.8061 |
| 180.000 | -.021794 | 328197. | -7807.2133 | -.0002106 | 4911.1317 | 108.4040 | 29844.8061 |
| 186.000 | -.022890 | 283415. | -7130.3296 | -.0001587 | 4637.6658 | 117.2239 | 30726.8061 |
| 192.000 | -.023699 | 242824. | -6404.1168 | -.0001141 | 4389.7938 | 124.8470 | 31608.8061 |
| 198.000 | -.024260 | 206702. | -5635.4662 | -7.6010E-05 | 4169.2168 | 131.3698 | 32490.8061 |
| 204.000 | -.024611 | 175289. | -4830.6935 | -4.3620E-05 | 3977.3912 | 136.8878 | 33372.8061 |
| 210.000 | -.024783 | 148786. | -3995.5586 | -1.6140E-05 | 3815.5496 | 141.4906 | 34254.8061 |
| 216.000 | -.024804 | 127362. | -3135.3143 | 7.2753E-06 | 3684.7202 | 145.2575 | 35136.8061 |
| 222.000 | -.024696 | 111154. | -2254.7836 | 2.7500E-05 | 3585.7445 | 148.2527 | 36018.8061 |
| 228.000 | -.024474 | 100272. | -1768.6798 | 4.5427E-05 | 3519.2911 | 13.7819 | 3378.6938 |
| 234.000 | -.024151 | 89875.2501 | -1686.2626 | 6.1551E-05 | 3455.8051 | 13.6905 | 3401.2590 |
| 240.000 | -.023736 | 79962.6003 | -1604.4740 | 7.5952E-05 | 3395.2730 | 13.5724 | 3430.8730 |
| 246.000 | -.023239 | 70530.4198 | -1523.4677 | 8.8713E-05 | 3337.6748 | 13.4297 | 3467.3283 |
| 252.000 | -.022671 | 61574.5329 | -1443.3847 | 9.9914E-05 | 3282.9852 | 13.2646 | 3510.5142 |
| 258.000 | -.022040 | 53089.9056 | -1364.3547 | .0001096 | 3231.1733 | 13.0788 | 3560.4049 |
| 264.000 | -.021356 | 45070.7119 | -1286.4964 | .0001180 | 3182.2036 | 12.8740 | 3617.0513 |
| 270.000 | -.020625 | 37510.3964 | -1209.9187 | .0001250 | 3136.0361 | 12.6519 | 3680.5757 |
| 276.000 | -.019856 | 30401.7316 | -1134.7215 | .0001307 | 3092.6267 | 12.4139 | 3751.1691 |
| 282.000 | -.019056 | 23736.8721 | -1060.9961 | .0001353 | 3051.9273 | 12.1613 | 3829.0908 |
| 288.000 | -.018232 | 17507.4041 | -988.8256 | .0001388 | 3013.8867 | 11.8955 | 3914.6695 |
| 294.000 | -.017390 | 11704.3936 | -918.2859 | .0001413 | 2978.4503 | 11.6177 | 4008.3065 |
| 300.000 | -.016537 | 6318.4299 | -849.4457 | .0001428 | 2945.5606 | 11.3290 | 4110.4799 |
| 306.000 | -.015677 | 1339.6681 | -782.3671 | .0001435 | 2915.1575 | 11.0305 | 4221.7524 |
| 312.000 | -.014815 | -3242.1315 | -717.1059 | .0001433 | 2926.7750 | 10.7232 | 4342.7792 |
| 318.000 | -.013957 | -7437.5658 | -653.7121 | .0001424 | 2952.3947 | 10.4081 | 4474.3195 |
| 324.000 | -.013106 | -11257.5534 | -592.2301 | .0001408 | 2975.7216 | 10.0860 | 4617.2511 |
| 330.000 | -.012267 | -14713.3007 | -532.6987 | .0001386 | 2996.8244 | 9.7578 | 4772.5870 |
| 336.000 | -.011443 | -17816.2699 | -475.1522 | .0001359 | 3015.7728 | 9.4244 | 4941.4977 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 342.000 | -.010637 | -20578.1489 | -419.6197 | .0001326 | 3032.6384 | 9.0865 | 5125.3384 |
| 348.000 | -.009852 | -23010.8216 | -366.1261 | .0001289 | 3047.4936 | 8.7448 | 5325.6818 |
| 354.000 | -.009090 | -25126.3415 | -314.6918 | .0001248 | 3060.4122 | 8.4000 | 5544.3613 |
| 360.000 | -.008354 | -26936.9053 | -265.3336 | .0001204 | 3071.4685 | 8.0528 | 5783.5243 |
| 366.000 | -.007645 | -28454.8287 | -218.0642 | .0001157 | 3080.7378 | 7.7037 | 6045.7007 |
| 372.000 | -.006966 | -29692.5239 | -172.8932 | .0001108 | 3088.2958 | 7.3533 | 6333.8915 |
| 378.000 | -.006316 | -30662.4779 | -129.8267 | .0001057 | 3094.2189 | 7.0022 | 6651.6853 |
| 384.000 | -.005698 | -31377.2337 | -88.8681 | .0001004 | 3098.5836 | 6.6507 | 7003.4129 |
| 390.000 | -.005111 | -31849.3726 | -50.0184 | 9.5036E-05 | 3101.4668 | 6.2992 | 7394.3562 |
| 396.000 | -.004557 | -32091.4987 | -13.2763 | 8.9615E-05 | 3102.9453 | 5.9481 | 7831.0362 |
| 402.000 | -.004036 | -32116.2262 | 21.3611 | 8.4170E-05 | 3103.0963 | 5.5977 | 8321.6185 |
| 408.000 | -.003547 | -31936.1694 | 53.8980 | 7.8739E-05 | 3101.9968 | 5.2480 | 8876.4977 |
| 414.000 | -.003091 | -31563.9364 | 84.3390 | 7.3355E-05 | 3099.7237 | 4.8990 | 9509.1637 |
| 420.000 | -.002667 | -31012.1272 | 112.6881 | 6.8049E-05 | 3096.3541 | 4.5507 | 10237.5285 |
| 426.000 | -.002275 | -30293.3376 | 138.9480 | 6.2850E-05 | 3091.9647 | 4.2026 | 11086.0360 |
| 432.000 | -.001913 | -29420.1710 | 163.1184 | 5.7787E-05 | 3086.6327 | 3.8542 | 12089.1721 |
| 438.000 | -.001581 | -28405.2615 | 185.1933 | 5.2884E-05 | 3080.4351 | 3.5042 | 13297.6345 |
| 444.000 | -.001278 | -27261.3117 | 205.1585 | 4.8163E-05 | 3073.4495 | 3.1509 | 14789.9406 |
| 450.000 | -.001003 | -26001.1558 | 222.9856 | 4.3647E-05 | 3065.7543 | 2.7915 | 16696.2657 |
| 456.000 | -.000754 | -24637.8616 | 238.6232 | 3.9353E-05 | 3057.4293 | 2.4211 | 19253.4675 |
| 462.000 | -.000531 | -23184.9010 | 251.9800 | 3.5298E-05 | 3048.5567 | 2.0312 | 22955.0740 |
| 468.000 | -.000331 | -21656.4594 | 262.8853 | 3.1496E-05 | 3039.2232 | 1.6039 | 29081.9650 |
| 474.000 | -.000153 | -20068.0726 | 270.9704 | 2.7958E-05 | 3029.5236 | 1.0911 | 42801.2941 |
| 480.000 | 4.58E-06 | -18438.3641 | 273.6962 | 2.4693E-05 | 3019.5717 | -.1824950 | 238881. |
| 486.000 | .000143 | -16813.3492 | 269.9863 | 2.1704E-05 | 3009.6484 | -1.0542 | 44119.2704 |
| 492.000 | .000265 | -15224.5732 | 262.5215 | 1.8987E-05 | 2999.9465 | -1.4341 | 32466.4906 |
| 498.000 | .000371 | -13685.8755 | 253.1265 | 1.6536E-05 | 2990.5503 | -1.6976 | 27439.0539 |
| 504.000 | .000463 | -12206.8985 | 242.3424 | 1.4340E-05 | 2981.5189 | -1.8971 | 24560.1168 |
| 510.000 | .000543 | -10794.9749 | 230.4885 | 1.2390E-05 | 2972.8969 | -2.0542 | 22686.3835 |
| 516.000 | .000612 | -9455.9045 | 217.7838 | 1.0673E-05 | 2964.7198 | -2.1807 | 21374.4839 |
| 522.000 | .000671 | -8194.3763 | 204.3900 | 9.1760E-06 | 2957.0162 | -2.2839 | 20411.6067 |
| 528.000 | .000722 | -7014.2356 | 190.4310 | 7.8864E-06 | 2949.8096 | -2.3691 | 19680.9563 |
| 534.000 | .000766 | -5918.6683 | 176.0038 | 6.7898E-06 | 2943.1194 | -2.4400 | 19112.1264 |
| 540.000 | .000804 | -4910.3378 | 161.1853 | 5.8716E-06 | 2936.9620 | -2.4995 | 18659.5889 |
| 546.000 | .000836 | -3991.4907 | 146.0364 | 5.1167E-06 | 2931.3510 | -2.5501 | 18292.2547 |
| 552.000 | .000865 | -3164.0414 | 130.6051 | 4.5100E-06 | 2926.2981 | -2.5936 | 17987.9689 |
| 558.000 | .000891 | -2429.6413 | 114.9290 | 4.0357E-06 | 2921.8135 | -2.6317 | 17730.4225 |
| 564.000 | .000914 | -1789.7356 | 99.0370 | 3.6779E-06 | 2917.9059 | -2.6656 | 17507.3355 |
| 570.000 | .000935 | -1245.6113 | 82.9504 | 3.4205E-06 | 2914.5831 | -2.6965 | 17309.3484 |
| 576.000 | .000955 | -798.4355 | 66.6850 | 3.2472E-06 | 2911.8524 | -2.7253 | 17129.3244 |
| 582.000 | .000974 | -449.2884 | 50.2514 | 3.1414E-06 | 2909.7203 | -2.7526 | 16961.8978 |
| 588.000 | .000992 | -199.1881 | 33.6569 | 3.0864E-06 | 2908.1931 | -2.7790 | 16803.1689 |
| 594.000 | .001011 | -49.1099 | 16.9055 | 3.0654E-06 | 2907.2766 | -2.8048 | 16650.4897 |
| 600.000 | .001029 | 0.0000 | 0.0000 | 3.0612E-06 | 2906.9767 | -2.8304 | 8251.1501 |

Output_H_pile_L50'_new

Output Verification:

Computed forces and moments are within specified convergence limits.

Output Summary for Load Case No. 1:

Pile-head deflection = .37858536 in
Computed slope at pile head = -.00426356
Maximum bending moment = 1200707. lbs-in
Maximum shear force = 25000.00000 lbs
Depth of maximum bending moment = 78.00000000 in
Depth of maximum shear force = 0.00000 in
Number of iterations = 14
Number of zero deflection points = 2

---

Summary of Pile Response(s)

---

Definition of Symbols for Pile-Head Loading Conditions:

Type 1 = Shear and Moment, y = pile-head displacment in
Type 2 = Shear and Slope, M = Pile-head Moment lbs-in
Type 3 = Shear and Rot. Stiffness, V = Pile-head Shear Force lbs
Type 4 = Deflection and Moment, S = Pile-head Slope, radians
Type 5 = Deflection and Slope, R = Rot. Stiffness of Pile-head in-lbs/rad

| Load Type | Pile-Head Condition 1 | Pile-Head Condition 2 | Axial Load lbs | Pile-Head Deflection in | Maximum Moment in-lbs | Maximum Shear lbs |
|---|---|---|---|---|---|---|
| 1 | V= | 25000. | M= | 0.000 | 100000.0000 | .3785854 | 1200707. | 25000.0000 |

The analysis ended normally.

# APPENDIX G-3: H-PILE 60- FOOT LONG

Output_H_pile_L60'_new

==========

LPILE Plus for Windows, Version 5.0 (5.0.39)

Analysis of Individual Piles and Drilled Shafts
Subjected to Lateral Loading Using the p-y Method

(c) 1985-2007 by Ensoft, Inc.
All Rights Reserved

==========

This program is licensed to:

Charbel Khoury
KMA Consulting Engineers

Path to file locations: D:\charbel files\KMA Consulting Engineers CO\Job#1121_Laytons Lake\Pile Analysis\Lpile\
Name of input data file: H_pile_L60'_new.lpd
Name of output file: H_pile_L60'_new.lpo
Name of plot output file: H_pile_L60'_new.lpp
Name of runtime file: H_pile_L60'_new.lpr

---

Time and Date of Analysis

---

Date: April 21, 2011 Time: 10:52:14

---

Problem Title

---

New LPILE Plus 5.0 Data File

---

Program Options

---

Units Used in Computations - US Customary Units: Inches, Pounds

Basic Program Options:

Analysis Type 1:
- Computation of Lateral Pile Response Using User-specified Constant EI

Computation Options:
- Only internally-generated p-y curves used in analysis
- Analysis does not use p-y multipliers (individual pile or shaft action only)
- Analysis assumes no shear resistance at pile tip
- Analysis for fixed-length pile or shaft only
- No computation of foundation stiffness matrix elements
- Output pile response for full length of pile
- Analysis assumes no soil movements acting on pile
- No additional p-y curves to be computed at user-specified depths

Solution Control Parameters:
- Number of pile increments = 100
- Maximum number of iterations allowed = 100
- Deflection tolerance for convergence = 1.0000E-05 in
- Maximum allowable deflection = 1.0000E+02 in

Printing Options:
- Values of pile-head deflection, bending moment, shear force, and soil reaction are printed for full length of pile.
- Printing Increment (spacing of output points) = 1

---

Pile Structural Properties and Geometry

---

Pile Length = 720.00 in

Depth of ground surface below top of pile = .00 in

Slope angle of ground surface = .00 deg.

Structural properties of pile defined using 2 points

| Point | Depth X | Pile Diameter | Moment of Inertia | Pile Area | Modulus of Elasticity |
|---|---|---|---|---|---|
| | in | in | in**4 | Sq.in | lbs/Sq.in |

| | | | | | |
|---|---|---|---|---|---|
| 1 | 0.0000 | 14.90000000 | 1220.0000 | 34.4000 | 29000000. |
| 2 | 720.0000 | 14.90000000 | 1220.0000 | 34.4000 | 29000000. |

---

Soil and Rock Layering Information

---

The soil profile is modelled using 8 layers

Layer 1 is sand, p-y criteria by Reese et al., 1974
Distance from top of pile to top of layer = .000 in
Distance from top of pile to bottom of layer = 60.000 in
p-y subgrade modulus k for top of soil layer = 107.700 lbs/in**3
p-y subgrade modulus k for bottom of layer = 107.700 lbs/in**3

Layer 2 is sand, p-y criteria by Reese et al., 1974
Distance from top of pile to top of layer = 60.000 in
Distance from top of pile to bottom of layer = 96.000 in
p-y subgrade modulus k for top of soil layer = 67.200 lbs/in**3
p-y subgrade modulus k for bottom of layer = 67.200 lbs/in**3

Layer 3 is sand, p-y criteria by Reese et al., 1974
Distance from top of pile to top of layer = 96.000 in
Distance from top of pile to bottom of layer = 168.000 in
p-y subgrade modulus k for top of soil layer = 32.500 lbs/in**3
p-y subgrade modulus k for bottom of layer = 32.500 lbs/in**3

Layer 4 is sand, p-y criteria by Reese et al., 1974
Distance from top of pile to top of layer = 168.000 in
Distance from top of pile to bottom of layer = 228.000 in
p-y subgrade modulus k for top of soil layer = 24.500 lbs/in**3
p-y subgrade modulus k for bottom of layer = 24.500 lbs/in**3

Layer 5 is stiff clay with water-induced erosion
Distance from top of pile to top of layer = 228.000 in
Distance from top of pile to bottom of layer = 720.000 in
p-y subgrade modulus k for top of soil layer = 272.000 lbs/in**3
p-y subgrade modulus k for bottom of layer = 272.000 lbs/in**3

Layer 6 is silt with cohesion and friction
Distance from top of pile to top of layer = 720.000 in
Distance from top of pile to bottom of layer = 864.000 in
p-y subgrade modulus k for top of soil layer = 1451.800 lbs/in**3

p-y subgrade modulus k for bottom of layer = 1451.800 lbs/in**3

Layer 7 is sand, p-y criteria by Reese et al., 1974
Distance from top of pile to top of layer = 864.000 in
Distance from top of pile to bottom of layer = 960.000 in
p-y subgrade modulus k for top of soil layer = 56.000 lbs/in**3
p-y subgrade modulus k for bottom of layer = 56.000 lbs/in**3

Layer 8 is sand, p-y criteria by Reese et al., 1974
Distance from top of pile to top of layer = 960.000 in
Distance from top of pile to bottom of layer = 1200.000 in
p-y subgrade modulus k for top of soil layer = 156.800 lbs/in**3
p-y subgrade modulus k for bottom of layer = 156.800 lbs/in**3

(Depth of lowest layer extends 480.00 in below pile tip)

---

Effective Unit Weight of Soil vs. Depth

---

Effective unit weight of soil with depth defined using 16 points

| Point No. | Depth X in | Eff. Unit Weight lbs/in**3 |
|---|---|---|
| 1 | .00 | .07025 |
| 2 | 60.00 | .07025 |
| 3 | 60.00 | .03414 |
| 4 | 96.00 | .03414 |
| 5 | 96.00 | .03038 |
| 6 | 168.00 | .03038 |
| 7 | 168.00 | .02876 |
| 8 | 228.00 | .02876 |
| 9 | 228.00 | .03275 |
| 10 | 720.00 | .03275 |
| 11 | 720.00 | .04277 |
| 12 | 864.00 | .04277 |
| 13 | 864.00 | .03339 |
| 14 | 960.00 | .03339 |
| 15 | 960.00 | .03918 |
| 16 | 1200.00 | .03918 |

---

Shear Strength of Soils

---

Shear strength parameters with depth defined using 16 points

| Point No. | Depth X in | Cohesion c lbs/in**2 | Angle of Friction Deg. | k_rm | E50 or % | RQD |
|---|---|---|---|---|---|---|
| 1 | .000 | .00000 | 36.40 | ------ | ------ | |
| 2 | 60.000 | .00000 | 36.40 | ------ | ------ | |
| 3 | 60.000 | .00000 | 36.40 | ------ | ------ | |
| 4 | 96.000 | .00000 | 36.40 | ------ | ------ | |
| 5 | 96.000 | .00000 | 33.00 | ------ | ------ | |
| 6 | 168.000 | .00000 | 33.00 | ------ | ------ | |
| 7 | 168.000 | .00000 | 31.80 | ------ | ------ | |
| 8 | 228.000 | .00000 | 31.80 | ------ | ------ | |
| 9 | 228.000 | 3.98000 | .00 | .92000 | .0 | |
| 10 | 720.000 | 3.98000 | .00 | .92000 | .0 | |
| 11 | 720.000 | 13.70000 | 35.30 | .43000 | .0 | |
| 12 | 864.000 | 13.70000 | 35.30 | .43000 | .0 | |
| 13 | 864.000 | .00000 | 35.60 | ------ | ------ | |
| 14 | 960.000 | .00000 | 35.60 | ------ | ------ | |
| 15 | 960.000 | .00000 | 40.00 | ------ | ------ | |
| 16 | 1200.000 | .00000 | 40.00 | ------ | ------ | |

Notes:

(1) Cohesion = uniaxial compressive strength for rock materials.
(2) Values of E50 are reported for clay strata.
(3) Default values will be generated for E50 when input values are 0.
(4) RQD and k_rm are reported only for weak rock strata.

---

Loading Type

---

Static loading criteria was used for computation of p-y curves.

Output_H_pile_L60'_new

---

Pile-head Loading and Pile-head Fixity Conditions

---

Number of loads specified = 1

Load Case Number 1

Pile-head boundary conditions are Shear and Moment (BC Type 1)
Shear force at pile head = 25000.000 lbs
Bending moment at pile head = .000 in-lbs
Axial load at pile head = 100000.000 lbs

(Zero moment at pile head for this load indicates a free-head condition)

---

Computed Values of Load Distribution and Deflection
for Lateral Loading for Load Case Number 1

---

Pile-head boundary conditions are Shear and Moment (BC Type 1)
Specified shear force at pile head = 25000.000 lbs
Specified moment at pile head = .000 in-lbs
Specified axial load at pile head = 100000.000 lbs

(Zero moment for this load indicates free-head conditions)

| Depth X in | Deflect. y in | Moment M lbs-in | Shear V lbs | Slope S Rad. | Total Stress lbs/in**2 | Soil Res. p lbs/in | Es*h F/L lbs/in |
|---|---|---|---|---|---|---|---|
| 0.000 | .372078 | -1.5154E-07 | 25000.0000 | -.0042294 | 2906.9767 | 0.0000 | 0.0000 |
| 7.200 | .341627 | 183045. | 24707.8924 | -.0042107 | 4024.7524 | -81.1410 | 1710.0993 |
| 14.400 | .311443 | 361857. | 23787.0747 | -.0041553 | 5116.6779 | -174.6417 | 4037.3951 |
| 21.600 | .281790 | 531563. | 22219.9207 | -.0040644 | 6152.9944 | -260.6789 | 6660.5818 |
| 28.800 | .252916 | 687677. | 20084.1855 | -.0039403 | 7106.3137 | -332.5809 | 9467.8820 |
| 36.000 | .225050 | 826449. | 17508.3958 | -.0037863 | 7953.7347 | -382.9163 | 12250.6060 |
| 43.200 | .198394 | 945250. | 14647.4893 | -.0036060 | 8679.1986 | -411.7799 | 14944.0531 |
| 50.400 | .173124 | 1042565. | 11607.1215 | -.0034037 | 9273.4622 | -432.7667 | 17998.2169 |
| 57.600 | .149381 | 1117294. | 8519.2997 | -.0031839 | 9729.7945 | -424.9616 | 20482.6948 |
| 64.800 | .127275 | 1169828. | 5437.8675 | -.0029512 | 10050.5997 | -430.9918 | 24381.3700 |
| 72.000 | .106883 | 1199849. | 2354.3541 | -.0027101 | 10233.9217 | -425.5397 | 28665.7025 |
| 79.200 | .088250 | 1207633. | -711.3859 | -.0024651 | 10281.4596 | -426.0547 | 34760.4093 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 86.400 | .071385 | 1193155. | -3754.5602 | -.0022208 | 10193.0434 | -419.2715 | 42288.1052 |
| 93.600 | .056269 | 1156766. | -6551.7135 | -.0019817 | 9970.8334 | -357.7155 | 45771.7532 |
| 100.800 | .042848 | 1101664. | -8418.3045 | -.0017519 | 9634.3485 | -160.7820 | 27016.8643 |
| 108.000 | .031042 | 1038065. | -9442.5921 | -.0015342 | 9245.9801 | -123.7424 | 28701.6643 |
| 115.200 | .020756 | 967900. | -10203.4116 | -.0013301 | 8817.5106 | -87.5964 | 30386.4643 |
| 122.400 | .011888 | 893051. | -10709.3921 | -.0011407 | 8360.4452 | -52.9538 | 32071.2643 |
| 129.600 | .004329 | 815327. | -10973.0910 | -.0009669 | 7885.8174 | -20.2959 | 33756.0643 |
| 136.800 | -.002035 | 736431. | -11010.0874 | -.0008090 | 7404.0352 | 10.0191 | 35440.8643 |
| 144.000 | -.007321 | 657947. | -10838.1228 | -.0006671 | 6924.7658 | 37.7488 | 37125.6643 |
| 151.200 | -.011642 | 581323. | -10476.3072 | -.0005410 | 6456.8575 | 62.7555 | 38810.4643 |
| 158.400 | -.015112 | 507867. | -9944.4088 | -.0004302 | 6008.2953 | 84.9940 | 40495.2643 |
| 165.600 | -.017837 | 438743. | -9262.2421 | -.0003339 | 5586.1847 | 104.4968 | 42180.0643 |
| 172.800 | -.019920 | 374971. | -8534.7619 | -.0002511 | 5196.7614 | 97.5811 | 35270.5333 |
| 180.000 | -.021453 | 316204. | -7791.5170 | -.0001808 | 4837.8933 | 108.8759 | 36540.6133 |
| 187.200 | -.022523 | 263034. | -6973.7613 | -.0001218 | 4513.2084 | 118.2785 | 37810.6933 |
| 194.400 | -.023207 | 215957. | -6094.4788 | -7.3088E-05 | 4225.7309 | 125.9666 | 39080.7733 |
| 201.600 | -.023575 | 175379. | -5165.3566 | -3.3269E-05 | 3977.9366 | 132.1229 | 40350.8533 |
| 208.800 | -.023686 | 141624. | -4196.7896 | -1.0128E-06 | 3771.8107 | 136.9235 | 41620.9333 |
| 216.000 | -.023590 | 114946. | -3197.9673 | 2.5094E-05 | 3608.9032 | 140.5271 | 42891.0133 |
| 223.200 | -.023325 | 95536.9575 | -2177.0402 | 4.6511E-05 | 3490.3787 | 143.0637 | 44161.0933 |
| 230.400 | -.022920 | 83529.9929 | -1613.9968 | 6.4731E-05 | 3417.0574 | 13.3372 | 4189.6705 |
| 237.600 | -.022393 | 72202.1902 | -1518.5242 | 8.0578E-05 | 3347.8836 | 13.1830 | 4238.7211 |
| 244.800 | -.021760 | 61547.2123 | -1424.2825 | 9.4187E-05 | 3282.8183 | 12.9953 | 4299.9512 |
| 252.000 | -.021037 | 51556.8933 | -1331.5001 | .0001057 | 3221.8119 | 12.7776 | 4373.2579 |
| 259.200 | -.020238 | 42221.4092 | -1240.3832 | .0001152 | 3164.8042 | 12.5327 | 4458.7452 |
| 266.400 | -.019377 | 33529.4329 | -1151.1175 | .0001229 | 3111.7261 | 12.2634 | 4556.7068 |
| 273.600 | -.018467 | 25468.2758 | -1063.8700 | .0001289 | 3062.5002 | 11.9721 | 4667.6189 |
| 280.800 | -.017520 | 18024.0186 | -978.7907 | .0001334 | 3017.0414 | 11.6611 | 4792.1405 |
| 288.000 | -.016547 | 11181.6312 | -896.0136 | .0001363 | 2975.2580 | 11.3326 | 4931.1211 |
| 295.200 | -.015557 | 4925.0850 | -815.6581 | .0001380 | 2937.0521 | 10.9884 | 5085.6157 |
| 302.400 | -.014560 | -762.5432 | -737.8299 | .0001384 | 2911.6333 | 10.6305 | 5256.9065 |
| 309.600 | -.013564 | -5898.9738 | -662.6221 | .0001377 | 2942.9992 | 10.2606 | 5446.5337 |
| 316.800 | -.012577 | -10502.6327 | -590.1155 | .0001361 | 2971.1117 | 9.8801 | 5656.3362 |
| 324.000 | -.011605 | -14592.5661 | -520.3802 | .0001335 | 2996.0871 | 9.4908 | 5888.5043 |
| 331.200 | -.010654 | -18188.3597 | -453.4756 | .0001302 | 3018.0450 | 9.0939 | 6145.6484 |
| 338.400 | -.009730 | -21310.0628 | -389.4511 | .0001262 | 3037.1079 | 8.6907 | 6430.8882 |
| 345.600 | -.008837 | -23978.1172 | -328.3474 | .0001215 | 3053.4005 | 8.2826 | 6747.9690 |
| 352.800 | -.007980 | -26213.2902 | -270.1961 | .0001164 | 3067.0497 | 7.8706 | 7101.4156 |
| 360.000 | -.007161 | -28036.6118 | -215.0211 | .0001109 | 3078.1839 | 7.4558 | 7496.7373 |
| 367.200 | -.006383 | -29469.3169 | -162.8391 | .0001051 | 3086.9328 | 7.0392 | 7940.7061 |
| 374.400 | -.005648 | -30532.7904 | -113.6595 | 9.8961E-05 | 3093.4270 | 6.6217 | 8441.7407 |
| 381.600 | -.004958 | -31248.5187 | -67.4863 | 9.2675E-05 | 3097.7976 | 6.2042 | 9010.4474 |
| 388.800 | -.004313 | -31638.0451 | -24.3177 | 8.6276E-05 | 3100.1763 | 5.7871 | 9660.4005 |
| 396.000 | -.003715 | -31722.9318 | 15.8521 | 7.9829E-05 | 3100.6946 | 5.3712 | 10409.2999 |
| 403.200 | -.003164 | -31524.7282 | 53.0326 | 7.3393E-05 | 3099.4843 | 4.9567 | 11280.7462 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 410.400 | -.002658 | -31064.9486 | 87.2349 | 6.7025E-05 | 3096.6766 | 4.5439 | 12307.0682 |
| 417.600 | -.002199 | -30365.0609 | 118.4703 | 6.0774E-05 | 3092.4027 | 4.1326 | 13534.0408 |
| 424.800 | -.001783 | -29446.4907 | 146.7475 | 5.4688E-05 | 3086.7934 | 3.7222 | 15029.2160 |
| 432.000 | -.001411 | -28330.6478 | 172.0686 | 4.8809E-05 | 3079.9795 | 3.3115 | 16897.7121 |
| 439.200 | -.001080 | -27038.9875 | 194.4231 | 4.3175E-05 | 3072.0919 | 2.8981 | 19314.9919 |
| 446.400 | -.000789 | -25593.1271 | 213.7766 | 3.7820E-05 | 3063.2626 | 2.4778 | 22603.8054 |
| 453.600 | -.000536 | -24015.0653 | 230.0494 | 3.2772E-05 | 3053.6261 | 2.0424 | 27449.6254 |
| 460.800 | -.000317 | -22327.6070 | 243.0668 | 2.8057E-05 | 3043.3216 | 1.5736 | 35700.3101 |
| 468.000 | -.000132 | -20555.3043 | 252.3935 | 2.3693E-05 | 3032.4989 | 1.0172 | 55608.2321 |
| 475.200 | 2.38E-05 | -18727.2589 | 254.5539 | 1.9696E-05 | 3021.3358 | -.4170779 | 126021. |
| 482.400 | .000152 | -16918.0908 | 249.1614 | 1.6069E-05 | 3010.2880 | -1.0808 | 51224.3516 |
| 489.600 | .000255 | -15162.4745 | 240.2167 | 1.2805E-05 | 2999.5673 | -1.4038 | 39602.0457 |
| 496.800 | .000336 | -13477.4095 | 229.3574 | 9.8906E-06 | 2989.2773 | -1.6127 | 34525.5943 |
| 504.000 | .000398 | -11873.9710 | 217.2363 | 7.3110E-06 | 2979.4858 | -1.7543 | 31764.1692 |
| 511.200 | .000442 | -10359.7354 | 204.2638 | 5.0487E-06 | 2970.2391 | -1.8492 | 30150.1179 |
| 518.400 | .000470 | -8939.8421 | 190.7353 | 3.0849E-06 | 2961.5684 | -1.9088 | 29219.0086 |
| 525.600 | .000486 | -7617.5895 | 176.8777 | 1.4001E-06 | 2953.4940 | -1.9406 | 28748.2724 |
| 532.800 | .000491 | -6394.8188 | 162.8727 | -2.5647E-08 | 2946.0271 | -1.9497 | 28619.2413 |
| 540.000 | .000486 | -5272.1850 | 148.8690 | -1.2128E-06 | 2939.1716 | -1.9402 | 28765.0668 |
| 547.200 | .000473 | -4249.3592 | 134.9901 | -2.1816E-06 | 2932.9257 | -1.9150 | 29147.9150 |
| 554.400 | .000454 | -3325.1866 | 121.3398 | -2.9524E-06 | 2927.2822 | -1.8767 | 29747.9665 |
| 561.600 | .000431 | -2497.8153 | 108.0055 | -3.5449E-06 | 2922.2298 | -1.8272 | 30557.8260 |
| 568.800 | .000403 | -1764.8023 | 95.0613 | -3.9786E-06 | 2917.7536 | -1.7684 | 31579.7163 |
| 576.000 | .000373 | -1123.2032 | 82.5695 | -4.2725E-06 | 2913.8356 | -1.7016 | 32824.3064 |
| 583.200 | .000342 | -569.6494 | 70.5826 | -4.4447E-06 | 2910.4553 | -1.6281 | 34310.6864 |
| 590.400 | .000309 | -100.4139 | 59.1447 | -4.5129E-06 | 2907.5899 | -1.5491 | 36067.3704 |
| 597.600 | .000277 | 288.5321 | 48.2926 | -4.4937E-06 | 2908.7387 | -1.4654 | 38134.4782 |
| 604.800 | .000245 | 601.4709 | 38.0573 | -4.4032E-06 | 2910.6497 | -1.3778 | 40567.5758 |
| 612.000 | .000213 | 842.8985 | 28.4649 | -4.2562E-06 | 2912.1240 | -1.2868 | 43444.1624 |
| 619.200 | .000183 | 1017.4938 | 19.5377 | -4.0669E-06 | 2913.1901 | -1.1929 | 46874.7857 |
| 626.400 | .000155 | 1130.0977 | 11.2964 | -3.8484E-06 | 2913.8778 | -1.0963 | 51022.8709 |
| 633.600 | .000128 | 1185.7043 | 3.7617 | -3.6128E-06 | 2914.2173 | -.9966856 | 56142.2948 |
| 640.800 | .000103 | 1189.4690 | -3.0429 | -3.3711E-06 | 2914.2403 | -.8935014 | 62654.6515 |
| 648.000 | 7.93E-05 | 1146.7403 | -9.0868 | -3.1334E-06 | 2913.9794 | -.7853577 | 71326.8627 |
| 655.200 | 5.76E-05 | 1063.1306 | -14.3243 | -2.9085E-06 | 2913.4688 | -.6694969 | 83749.8977 |
| 662.400 | 3.74E-05 | 944.6584 | -18.6789 | -2.7042E-06 | 2912.7454 | -.5401089 | 103994. |
| 669.600 | 1.86E-05 | 798.0485 | -21.9985 | -2.5269E-06 | 2911.8501 | -.3819974 | 147741. |
| 676.800 | 1.01E-06 | 631.5190 | -23.7232 | -2.3814E-06 | 2910.8332 | -.0970958 | 694015. |
| 684.000 | -1.57E-05 | 459.8635 | -22.8233 | -2.2704E-06 | 2909.7849 | .3470672 | 159406. |
| 691.200 | -3.17E-05 | 306.1326 | -19.7926 | -2.1924E-06 | 2908.8462 | .4948043 | 112434. |
| 698.400 | -4.72E-05 | 178.0075 | -15.8341 | -2.1432E-06 | 2908.0638 | .6047655 | 92160.0948 |
| 705.600 | -6.25E-05 | 81.2073 | -11.1508 | -2.1168E-06 | 2907.4726 | .6961569 | 80136.1867 |
| 712.800 | -7.77E-05 | 20.4840 | -5.8500 | -2.1064E-06 | 2907.1018 | .7762780 | 71906.2128 |
| 720.000 | -9.29E-05 | 0.0000 | 0.0000 | -2.1044E-06 | 2906.9767 | .8487336 | 32896.4944 |

Output_H_pile_L60'_new

Output Verification:

Computed forces and moments are within specified convergence limits.

Output Summary for Load Case No. 1:

Pile-head deflection = .37207788 in
Computed slope at pile head = -.00422935
Maximum bending moment = 1207633. lbs-in
Maximum shear force = 25000.00000 lbs
Depth of maximum bending moment = 79.20000000 in
Depth of maximum shear force = 0.00000 in
Number of iterations = 13
Number of zero deflection points = 3

---

Summary of Pile Response(s)

---

Definition of Symbols for Pile-Head Loading Conditions:

Type 1 = Shear and Moment, y = pile-head displacment in
Type 2 = Shear and Slope, M = Pile-head Moment lbs-in
Type 3 = Shear and Rot. Stiffness, V = Pile-head Shear Force lbs
Type 4 = Deflection and Moment, S = Pile-head Slope, radians
Type 5 = Deflection and Slope, R = Rot. Stiffness of Pile-head in-lbs/rad

| Load Type | Pile-Head Condition 1 | Pile-Head Condition 2 | Axial Load lbs | Pile-Head Deflection in | Maximum Moment in-lbs | Maximum Shear lbs |
|---|---|---|---|---|---|---|
| 1 | V= | 25000. | M= | 0.000 | 100000.0000 | .3720779 | 1207633. | 25000.0000 |

The analysis ended normally.

# APPENDIX G-4: H-PILE 75- FOOT LONG

==========

LPILE Plus for Windows, Version 5.0 (5.0.39)

Analysis of Individual Piles and Drilled Shafts
Subjected to Lateral Loading Using the p-y Method

(c) 1985-2007 by Ensoft, Inc.
All Rights Reserved

==========

This program is licensed to:

Charbel Khoury
KMA Consulting Engineers

Path to file locations: D:\charbel files\KMA Consulting Engineers CO\Job#1121_Laytons Lake\Pile Analysis\Lpile\
Name of input data file: H_pile_L75'_new.lpd
Name of output file: H_pile_L75'_new.lpo
Name of plot output file: H_pile_L75'_new.lpp
Name of runtime file: H_pile_L75'_new.lpr

---

Time and Date of Analysis

---

Date: April 21, 2011 Time: 10:55:05

---

Problem Title

---

New LPILE Plus 5.0 Data File

---

Program Options

---

Output_H_pile_L75'_new

Units Used in Computations - US Customary Units: Inches, Pounds

Basic Program Options:

Analysis Type 1:
- Computation of Lateral Pile Response Using User-specified Constant EI

Computation Options:
- Only internally-generated p-y curves used in analysis
- Analysis does not use p-y multipliers (individual pile or shaft action only)
- Analysis assumes no shear resistance at pile tip
- Analysis for fixed-length pile or shaft only
- No computation of foundation stiffness matrix elements
- Output pile response for full length of pile
- Analysis assumes no soil movements acting on pile
- No additional p-y curves to be computed at user-specified depths

Solution Control Parameters:
- Number of pile increments = 100
- Maximum number of iterations allowed = 100
- Deflection tolerance for convergence = 1.0000E-05 in
- Maximum allowable deflection = 1.0000E+02 in

Printing Options:
- Values of pile-head deflection, bending moment, shear force, and soil reaction are printed for full length of pile.
- Printing Increment (spacing of output points) = 1

---

Pile Structural Properties and Geometry

---

Pile Length = 900.00 in

Depth of ground surface below top of pile = .00 in

Slope angle of ground surface = .00 deg.

Structural properties of pile defined using 2 points

| Point | Depth X | Pile Diameter | Moment of Inertia | Pile Area | Modulus of Elasticity |
|---|---|---|---|---|---|
| | in | in | in**4 | Sq.in | lbs/Sq.in |

| | | | | | |
|---|---|---|---|---|---|
| 1 | 0.0000 | 14.90000000 | 1220.0000 | 34.4000 | 29000000. |
| 2 | 900.0000 | 14.90000000 | 1220.0000 | 34.4000 | 29000000. |

---

Soil and Rock Layering Information

---

The soil profile is modelled using 8 layers

Layer 1 is sand, p-y criteria by Reese et al., 1974
Distance from top of pile to top of layer = .000 in
Distance from top of pile to bottom of layer = 60.000 in
p-y subgrade modulus k for top of soil layer = 107.700 lbs/in**3
p-y subgrade modulus k for bottom of layer = 107.700 lbs/in**3

Layer 2 is sand, p-y criteria by Reese et al., 1974
Distance from top of pile to top of layer = 60.000 in
Distance from top of pile to bottom of layer = 96.000 in
p-y subgrade modulus k for top of soil layer = 67.200 lbs/in**3
p-y subgrade modulus k for bottom of layer = 67.200 lbs/in**3

Layer 3 is sand, p-y criteria by Reese et al., 1974
Distance from top of pile to top of layer = 96.000 in
Distance from top of pile to bottom of layer = 168.000 in
p-y subgrade modulus k for top of soil layer = 32.500 lbs/in**3
p-y subgrade modulus k for bottom of layer = 32.500 lbs/in**3

Layer 4 is sand, p-y criteria by Reese et al., 1974
Distance from top of pile to top of layer = 168.000 in
Distance from top of pile to bottom of layer = 228.000 in
p-y subgrade modulus k for top of soil layer = 24.500 lbs/in**3
p-y subgrade modulus k for bottom of layer = 24.500 lbs/in**3

Layer 5 is stiff clay with water-induced erosion
Distance from top of pile to top of layer = 228.000 in
Distance from top of pile to bottom of layer = 720.000 in
p-y subgrade modulus k for top of soil layer = 272.000 lbs/in**3
p-y subgrade modulus k for bottom of layer = 272.000 lbs/in**3

Layer 6 is silt with cohesion and friction
Distance from top of pile to top of layer = 720.000 in
Distance from top of pile to bottom of layer = 864.000 in
p-y subgrade modulus k for top of soil layer = 1451.800 lbs/in**3

p-y subgrade modulus k for bottom of layer = 1451.800 lbs/in**3

Layer 7 is sand, p-y criteria by Reese et al., 1974
Distance from top of pile to top of layer = 864.000 in
Distance from top of pile to bottom of layer = 960.000 in
p-y subgrade modulus k for top of soil layer = 56.000 lbs/in**3
p-y subgrade modulus k for bottom of layer = 56.000 lbs/in**3

Layer 8 is sand, p-y criteria by Reese et al., 1974
Distance from top of pile to top of layer = 960.000 in
Distance from top of pile to bottom of layer = 1200.000 in
p-y subgrade modulus k for top of soil layer = 156.800 lbs/in**3
p-y subgrade modulus k for bottom of layer = 156.800 lbs/in**3

(Depth of lowest layer extends 300.00 in below pile tip)

---

Effective Unit Weight of Soil vs. Depth

---

Effective unit weight of soil with depth defined using 16 points

| Point No. | Depth X in | Eff. Unit Weight lbs/in**3 |
|---|---|---|
| 1 | .00 | .07025 |
| 2 | 60.00 | .07025 |
| 3 | 60.00 | .03414 |
| 4 | 96.00 | .03414 |
| 5 | 96.00 | .03038 |
| 6 | 168.00 | .03038 |
| 7 | 168.00 | .02876 |
| 8 | 228.00 | .02876 |
| 9 | 228.00 | .03275 |
| 10 | 720.00 | .03275 |
| 11 | 720.00 | .04277 |
| 12 | 864.00 | .04277 |
| 13 | 864.00 | .03339 |
| 14 | 960.00 | .03339 |
| 15 | 960.00 | .03918 |
| 16 | 1200.00 | .03918 |

---

Shear Strength of Soils

---

Shear strength parameters with depth defined using 16 points

| Point No. | Depth X in | Cohesion c lbs/in**2 | Angle of Friction Deg. | k_rm | E50 or % | RQD |
|---|---|---|---|---|---|---|
| 1 | .000 | .00000 | 36.40 | ------ | ------ | |
| 2 | 60.000 | .00000 | 36.40 | ------ | ------ | |
| 3 | 60.000 | .00000 | 36.40 | ------ | ------ | |
| 4 | 96.000 | .00000 | 36.40 | ------ | ------ | |
| 5 | 96.000 | .00000 | 33.00 | ------ | ------ | |
| 6 | 168.000 | .00000 | 33.00 | ------ | ------ | |
| 7 | 168.000 | .00000 | 31.80 | ------ | ------ | |
| 8 | 228.000 | .00000 | 31.80 | ------ | ------ | |
| 9 | 228.000 | 3.98000 | .00 | .92000 | .0 | |
| 10 | 720.000 | 3.98000 | .00 | .92000 | .0 | |
| 11 | 720.000 | 13.70000 | 35.30 | .43000 | .0 | |
| 12 | 864.000 | 13.70000 | 35.30 | .43000 | .0 | |
| 13 | 864.000 | .00000 | 35.60 | ------ | ------ | |
| 14 | 960.000 | .00000 | 35.60 | ------ | ------ | |
| 15 | 960.000 | .00000 | 40.00 | ------ | ------ | |
| 16 | 1200.000 | .00000 | 40.00 | ------ | ------ | |

Notes:

(1) Cohesion = uniaxial compressive strength for rock materials.
(2) Values of E50 are reported for clay strata.
(3) Default values will be generated for E50 when input values are 0.
(4) RQD and k_rm are reported only for weak rock strata.

---

Loading Type

---

Static loading criteria was used for computation of p-y curves.

Output_H_pile_L75'_new

---

Pile-head Loading and Pile-head Fixity Conditions

---

Number of loads specified = 1

Load Case Number 1

Pile-head boundary conditions are Shear and Moment (BC Type 1)
Shear force at pile head = 25000.000 lbs
Bending moment at pile head = .000 in-lbs
Axial load at pile head = 100000.000 lbs

(Zero moment at pile head for this load indicates a free-head condition)

---

Computed Values of Load Distribution and Deflection
for Lateral Loading for Load Case Number 1

---

Pile-head boundary conditions are Shear and Moment (BC Type 1)
Specified shear force at pile head = 25000.000 lbs
Specified moment at pile head = .000 in-lbs
Specified axial load at pile head = 100000.000 lbs

(Zero moment for this load indicates free-head conditions)

| Depth X in | Deflect. y in | Moment M lbs-in | Shear V lbs | Slope S Rad. | Total Stress lbs/in**2 | Soil Res. p lbs/in | Es*h F/L lbs/in |
|---|---|---|---|---|---|---|---|
| 0.000 | .375381 | 7.2740E-08 | 25000.0000 | -.0042456 | 2906.9767 | 0.0000 | 0.0000 |
| 9.000 | .337170 | 228821. | 24529.1149 | -.0042165 | 4304.2856 | -104.6411 | 2793.1601 |
| 18.000 | .299483 | 449114. | 23065.4722 | -.0041303 | 5649.5158 | -220.6128 | 6629.7983 |
| 27.000 | .262825 | 651434. | 20641.5869 | -.0039903 | 6884.9962 | -318.0284 | 10890.3451 |
| 36.000 | .227658 | 827845. | 17480.5484 | -.0038022 | 7962.2591 | -384.4246 | 15197.4503 |
| 45.000 | .194386 | 972928. | 13874.1543 | -.0035731 | 8848.2162 | -416.9963 | 19306.7456 |
| 54.000 | .163342 | 1084011. | 10032.4360 | -.0033115 | 9526.5538 | -436.7189 | 24062.8233 |
| 63.000 | .134779 | 1159472. | 6142.2764 | -.0030261 | 9987.3611 | -427.7610 | 28564.0590 |
| 72.000 | .108872 | 1200019. | 2304.9777 | -.0027260 | 10234.9635 | -424.9720 | 35130.8482 |
| 81.000 | .085711 | 1205869. | -1520.0597 | -.0024200 | 10270.6837 | -425.0363 | 44630.5879 |
| 90.000 | .065311 | 1177014. | -5216.4550 | -.0021169 | 10094.4820 | -396.3849 | 54622.7169 |
| 99.000 | .047606 | 1115783. | -7791.2674 | -.0018253 | 9720.5703 | -175.7956 | 33234.6163 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 108.000 | .032455 | 1040057. | -9164.3836 | -.0015511 | 9258.1448 | -129.3413 | 35867.1163 |
| 117.000 | .019686 | 953616. | -10125.3632 | -.0012975 | 8730.2890 | -84.2097 | 38499.6163 |
| 126.000 | .009099 | 860136. | -10691.4431 | -.0010669 | 8159.4472 | -41.5858 | 41132.1163 |
| 135.000 | .000482 | 763091. | -10889.1306 | -.0008604 | 7566.8332 | -2.3447 | 43764.6163 |
| 144.000 | -.006388 | 665680. | -10751.4929 | -.0006787 | 6971.9927 | 32.9309 | 46397.1163 |
| 153.000 | -.011734 | 570785. | -10315.6501 | -.0005214 | 6392.5101 | 63.9230 | 49029.6163 |
| 162.000 | -.015773 | 480937. | -9620.5601 | -.0003876 | 5843.8479 | 90.5414 | 51662.1163 |
| 171.000 | -.018711 | 398313. | -8803.0337 | -.0002758 | 5339.2979 | 91.1311 | 43833.4279 |
| 180.000 | -.020738 | 322979. | -7917.8678 | -.0001841 | 4879.2673 | 105.5724 | 45817.9279 |
| 189.000 | -.022024 | 256123. | -6916.3824 | -.0001104 | 4471.0046 | 116.9799 | 47802.4279 |
| 198.000 | -.022725 | 198683. | -5824.2732 | -5.2557E-05 | 4120.2457 | 125.7111 | 49786.9279 |
| 207.000 | -.022970 | 151380. | -4663.9679 | -8.0326E-06 | 3831.3896 | 132.1346 | 51771.4279 |
| 216.000 | -.022869 | 114746. | -3454.6790 | 2.5816E-05 | 3607.6798 | 136.5963 | 53755.9279 |
| 225.000 | -.022506 | 89149.6718 | -2212.7564 | 5.1750E-05 | 3451.3743 | 139.3865 | 55740.4279 |
| 234.000 | -.021938 | 74823.2378 | -1526.7996 | 7.2606E-05 | 3363.8891 | 13.0483 | 5353.0639 |
| 243.000 | -.021199 | 61536.5895 | -1410.3618 | 8.9949E-05 | 3282.7535 | 12.8267 | 5445.6051 |
| 252.000 | -.020319 | 49274.8164 | -1296.1319 | .0001040 | 3207.8762 | 12.5577 | 5562.3024 |
| 261.000 | -.019326 | 38018.9377 | -1184.5099 | .0001151 | 3139.1416 | 12.2472 | 5703.4126 |
| 270.000 | -.018246 | 27746.3743 | -1075.8471 | .0001235 | 3076.4116 | 11.9001 | 5869.7886 |
| 279.000 | -.017103 | 18431.3705 | -970.4504 | .0001294 | 3019.5290 | 11.5213 | 6062.8571 |
| 288.000 | -.015917 | 10045.3757 | -868.5872 | .0001330 | 2968.3194 | 11.1149 | 6284.6356 |
| 297.000 | -.014709 | 2557.3898 | -770.4888 | .0001346 | 2922.5936 | 10.6847 | 6537.7836 |
| 306.000 | -.013494 | -4065.7195 | -676.3536 | .0001344 | 2931.8043 | 10.2342 | 6825.6911 |
| 315.000 | -.012289 | -9858.9259 | -586.3496 | .0001326 | 2967.1808 | 9.7667 | 7152.6104 |
| 324.000 | -.011107 | -14858.7759 | -500.6172 | .0001295 | 2997.7127 | 9.2850 | 7523.8418 |
| 333.000 | -.009958 | -19103.1402 | -419.2710 | .0001252 | 3023.6312 | 8.7919 | 7945.9915 |
| 342.000 | -.008853 | -22630.9838 | -342.4021 | .0001199 | 3045.1741 | 8.2900 | 8427.3299 |
| 351.000 | -.007800 | -25482.1527 | -270.0797 | .0001138 | 3062.5850 | 7.7816 | 8978.2946 |
| 360.000 | -.006806 | -27697.1778 | -202.3532 | .0001070 | 3076.1111 | 7.2687 | 9612.2062 |
| 369.000 | -.005875 | -29317.0940 | -139.2538 | 9.9740E-05 | 3086.0033 | 6.7534 | 10346.3128 |
| 378.000 | -.005010 | -30383.2768 | -80.7966 | 9.2146E-05 | 3092.5140 | 6.2371 | 11203.3535 |
| 387.000 | -.004216 | -30937.2965 | -26.9829 | 8.4347E-05 | 3095.8971 | 5.7215 | 12213.9803 |
| 396.000 | -.003492 | -31020.7927 | 22.1979 | 7.6466E-05 | 3096.4070 | 5.2076 | 13420.6602 |
| 405.000 | -.002840 | -30675.3747 | 66.7641 | 6.8619E-05 | 3094.2977 | 4.6961 | 14884.2812 |
| 414.000 | -.002257 | -29942.5529 | 106.7386 | 6.0909E-05 | 3089.8227 | 4.1871 | 16696.0313 |
| 423.000 | -.001743 | -28863.7170 | 142.1413 | 5.3430E-05 | 3083.2347 | 3.6801 | 19000.4614 |
| 432.000 | -.001295 | -27480.1827 | 172.9799 | 4.6263E-05 | 3074.7861 | 3.1729 | 22044.9848 |
| 441.000 | -.000910 | -25833.3535 | 199.2309 | 3.9482E-05 | 3064.7296 | 2.6607 | 26301.7831 |
| 450.000 | -.000585 | -23965.0949 | 220.8029 | 3.3148E-05 | 3053.3210 | 2.1331 | 32835.6679 |
| 459.000 | -.000314 | -21918.5681 | 237.4409 | 2.7312E-05 | 3040.8237 | 1.5642 | 44868.0935 |
| 468.000 | -9.30E-05 | -19740.3205 | 248.3325 | 2.2014E-05 | 3027.5221 | .8561164 | 82810.5452 |
| 477.000 | 8.25E-05 | -17488.2082 | 248.6113 | 1.7279E-05 | 3013.7695 | -.7941470 | 86652.0937 |
| 486.000 | .000218 | -15296.4179 | 239.1995 | 1.3109E-05 | 3000.3852 | -1.2974 | 53568.3578 |
| 495.000 | .000318 | -13206.2134 | 226.2975 | 9.4835E-06 | 2987.6212 | -1.5697 | 44364.6728 |
| 504.000 | .000389 | -11240.1333 | 211.4262 | 6.3742E-06 | 2975.6153 | -1.7350 | 40175.2255 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 513.000 | .000433 | -9412.0162 | 195.3739 | 3.7474E-06 | 2964.4518 | -1.8322 | 38066.2782 |
| 522.000 | .000456 | -7730.1492 | 178.6671 | 1.5671E-06 | 2954.1813 | -1.8805 | 37103.5822 |
| 531.000 | .000461 | -6198.8288 | 161.6931 | -2.0452E-07 | 2944.8302 | -1.8916 | 36897.6903 |
| 540.000 | .000452 | -4819.3057 | 144.7506 | -1.6059E-06 | 2936.4061 | -1.8734 | 37265.7561 |
| 549.000 | .000432 | -3590.4268 | 128.0768 | -2.6756E-06 | 2928.9019 | -1.8319 | 38121.8335 |
| 558.000 | .000404 | -2509.1078 | 111.8619 | -3.4514E-06 | 2922.2988 | -1.7714 | 39434.2469 |
| 567.000 | .000370 | -1570.6996 | 96.2598 | -3.9703E-06 | 2916.5683 | -1.6957 | 41207.7282 |
| 576.000 | .000333 | -769.2849 | 81.3940 | -4.2679E-06 | 2911.6744 | -1.6078 | 43476.6422 |
| 585.000 | .000294 | -97.9245 | 67.3631 | -4.3782E-06 | 2907.5747 | -1.5102 | 46304.4215 |
| 594.000 | .000254 | 451.1318 | 54.2438 | -4.3333E-06 | 2909.7316 | -1.4052 | 49787.6942 |
| 603.000 | .000216 | 886.2630 | 42.0939 | -4.1632E-06 | 2912.3888 | -1.2948 | 54065.3328 |
| 612.000 | .000179 | 1216.3154 | 30.9547 | -3.8957E-06 | 2914.4042 | -1.1806 | 59334.1356 |
| 621.000 | .000145 | 1450.4599 | 20.8525 | -3.5566E-06 | 2915.8341 | -1.0643 | 65874.8757 |
| 630.000 | .000115 | 1598.0626 | 11.8003 | -3.1688E-06 | 2916.7354 | -.9472870 | 74096.1037 |
| 639.000 | 8.84E-05 | 1668.5693 | 3.7989 | -2.7533E-06 | 2917.1660 | -.8307936 | 84610.6206 |
| 648.000 | 6.55E-05 | 1671.3996 | -3.1615 | -2.3285E-06 | 2917.1832 | -.7159780 | 98376.6774 |
| 657.000 | 4.65E-05 | 1615.8531 | -9.1007 | -1.9104E-06 | 2916.8440 | -.6038471 | 116979. |
| 666.000 | 3.11E-05 | 1511.0250 | -14.0466 | -1.5127E-06 | 2916.2039 | -.4952401 | 143252. |
| 675.000 | 1.92E-05 | 1365.7365 | -18.0335 | -1.1468E-06 | 2915.3167 | -.3907309 | 182874. |
| 684.000 | 1.05E-05 | 1188.4862 | -21.0983 | -8.2193E-07 | 2914.2343 | -.2903347 | 249531. |
| 693.000 | 4.43E-06 | 987.4467 | -23.2707 | -5.4517E-07 | 2913.0066 | -.1924322 | 390520. |
| 702.000 | 6.59E-07 | 770.5940 | -24.5428 | -3.2156E-07 | 2911.6824 | -.0902549 | 1233237. |
| 711.000 | -1.35E-06 | 546.2543 | -24.5150 | -1.5407E-07 | 2910.3125 | .0964411 | 641386. |
| 720.000 | -2.11E-06 | 329.6013 | -21.2188 | -4.2670E-08 | 2908.9895 | .6360453 | 2707083. |
| 729.000 | -2.12E-06 | 164.3925 | -15.3606 | 2.0161E-08 | 2907.9806 | .6657878 | 2824679. |
| 738.000 | -1.75E-06 | 53.0749 | -9.7875 | 4.7821E-08 | 2907.3008 | .5726653 | 2942275. |
| 747.000 | -1.26E-06 | -11.8690 | -5.2820 | 5.3062E-08 | 2907.0492 | .4285713 | 3059871. |
| 756.000 | -7.97E-07 | -42.0959 | -2.0878 | 4.6198E-08 | 2907.2338 | .2812361 | 3177466. |
| 765.000 | -4.29E-07 | -49.5331 | -.1154893 | 3.4544E-08 | 2907.2792 | .1570611 | 3295062. |
| 774.000 | -1.75E-07 | -44.2369 | .8895472 | 2.2617E-08 | 2907.2469 | .0662803 | 3412658. |
| 783.000 | -2.19E-08 | -33.5619 | 1.2264 | 1.2722E-08 | 2907.1817 | .0085830 | 3530254. |
| 792.000 | 5.42E-08 | -22.1840 | 1.1662 | 5.6315E-09 | 2907.1122 | -.0219669 | 3647850. |
| 801.000 | 7.95E-08 | -12.5804 | .9177023 | 1.2098E-09 | 2907.0536 | -.0332557 | 3765445. |
| 810.000 | 7.60E-08 | -5.6676 | .6205464 | -1.1111E-09 | 2907.0114 | -.0327789 | 3883041. |
| 819.000 | 5.95E-08 | -1.4085 | .3540503 | -2.0111E-09 | 2906.9853 | -.0264425 | 4000637. |
| 828.000 | 3.98E-08 | .7089556 | .1531613 | -2.1001E-09 | 2906.9811 | -.0181995 | 4118233. |
| 837.000 | 2.17E-08 | 1.3521 | .0253390 | -1.8380E-09 | 2906.9850 | -.0102054 | 4235829. |
| 846.000 | 6.69E-09 | 1.1684 | -.0351470 | -1.5174E-09 | 2906.9839 | -.0032359 | 4353424. |
| 855.000 | -5.63E-09 | .7222192 | -.0371244 | -1.2769E-09 | 2906.9812 | .0027965 | 4471020. |
| 864.000 | -1.63E-08 | .5024257 | -.0232497 | -1.1212E-09 | 2906.9798 | .0002867 | 158365. |
| 873.000 | -2.58E-08 | .3057421 | -.0198572 | -1.0184E-09 | 2906.9786 | .0004672 | 162901. |
| 882.000 | -3.46E-08 | .1468291 | -.0148561 | -9.6081E-10 | 2906.9776 | .0006442 | 167437. |
| 891.000 | -4.31E-08 | .0400612 | -.0082509 | -9.3704E-10 | 2906.9770 | .0008237 | 171973. |
| 900.000 | -5.15E-08 | 0.0000 | 0.0000 | -9.3194E-10 | 2906.9767 | .0010099 | 88254.5844 |

Output_H_pile_L75'_new

Output Verification:

Computed forces and moments are within specified convergence limits.

Output Summary for Load Case No. 1:

Pile-head deflection = .37538066 in
Computed slope at pile head = -.00424561
Maximum bending moment = 1205869. lbs-in
Maximum shear force = 25000.00000 lbs
Depth of maximum bending moment = 81.00000000 in
Depth of maximum shear force = 0.00000 in
Number of iterations = 13
Number of zero deflection points = 5

---

Summary of Pile Response(s)

---

Definition of Symbols for Pile-Head Loading Conditions:

Type 1 = Shear and Moment, y = pile-head displacment in
Type 2 = Shear and Slope, M = Pile-head Moment lbs-in
Type 3 = Shear and Rot. Stiffness, V = Pile-head Shear Force lbs
Type 4 = Deflection and Moment, S = Pile-head Slope, radians
Type 5 = Deflection and Slope, R = Rot. Stiffness of Pile-head in-lbs/rad

| Load Type | Pile-Head Condition 1 | Pile-Head Condition 2 | Axial Load lbs | Pile-Head Deflection in | Maximum Moment in-lbs | Maximum Shear lbs |
|---|---|---|---|---|---|---|
| 1 | V= | 25000. | M= | 0.000 | 100000.0000 | .3753807 | 1205869. | 25000.0000 |

The analysis ended normally.

# APPENDIX G-5: STEEL PIPE 25- FOOT LONG PILE

==========

LPILE Plus for Windows, Version 5.0 (5.0.39)

Analysis of Individual Piles and Drilled Shafts
Subjected to Lateral Loading Using the p-y Method

(c) 1985-2007 by Ensoft, Inc.
All Rights Reserved

==========

This program is licensed to:

Charbel Khoury
KMA Consulting Engineers

Path to file locations: D:\charbel files\KMA Consulting Engineers CO\Job#1121_Laytons Lake\Pile Analysis\Lpile\
Name of input data file: Steel_concrete_pile_L25'_new.lpd
Name of output file: Steel_concrete_pile_L25'_new.lpo
Name of plot output file: Steel_concrete_pile_L25'_new.lpp
Name of runtime file: Steel_concrete_pile_L25'_new.lpr

---

Time and Date of Analysis

---

Date: April 21, 2011 Time: 10:56:06

---

Problem Title

---

New LPILE Plus 5.0 Data File

---

Program Options

---

Output_steel_concrete_pile_L25'_new

Units Used in Computations - US Customary Units: Inches, Pounds

Basic Program Options:

Analysis Type 1:
- Computation of Lateral Pile Response Using User-specified Constant EI

Computation Options:
- Only internally-generated p-y curves used in analysis
- Analysis does not use p-y multipliers (individual pile or shaft action only)
- Analysis assumes no shear resistance at pile tip
- Analysis for fixed-length pile or shaft only
- No computation of foundation stiffness matrix elements
- Output pile response for full length of pile
- Analysis assumes no soil movements acting on pile
- No additional p-y curves to be computed at user-specified depths

Solution Control Parameters:
- Number of pile increments = 100
- Maximum number of iterations allowed = 100
- Deflection tolerance for convergence = 1.0000E-05 in
- Maximum allowable deflection = 1.0000E+02 in

Printing Options:
- Values of pile-head deflection, bending moment, shear force, and soil reaction are printed for full length of pile.
- Printing Increment (spacing of output points) = 1

---

Pile Structural Properties and Geometry

---

Pile Length = 300.00 in

Depth of ground surface below top of pile = .00 in

Slope angle of ground surface = .00 deg.

Structural properties of pile defined using 2 points

| Point | Depth X | Pile Diameter | Moment of Inertia | Pile Area | Modulus of Elasticity |
|---|---|---|---|---|---|
| | in | in | in**4 | Sq.in | lbs/Sq.in |

| | | | | | |
|---|---|---|---|---|---|
| 1 | 0.0000 | 16.00000000 | 4113.0000 | 42.6000 | 29000000. |
| 2 | 300.0000 | 16.00000000 | 4113.0000 | 42.6000 | 29000000. |

---

Soil and Rock Layering Information

---

The soil profile is modelled using 8 layers

Layer 1 is sand, p-y criteria by Reese et al., 1974
Distance from top of pile to top of layer = .000 in
Distance from top of pile to bottom of layer = 60.000 in
p-y subgrade modulus k for top of soil layer = 107.700 lbs/in**3
p-y subgrade modulus k for bottom of layer = 107.700 lbs/in**3

Layer 2 is sand, p-y criteria by Reese et al., 1974
Distance from top of pile to top of layer = 60.000 in
Distance from top of pile to bottom of layer = 96.000 in
p-y subgrade modulus k for top of soil layer = 67.200 lbs/in**3
p-y subgrade modulus k for bottom of layer = 67.200 lbs/in**3

Layer 3 is sand, p-y criteria by Reese et al., 1974
Distance from top of pile to top of layer = 96.000 in
Distance from top of pile to bottom of layer = 168.000 in
p-y subgrade modulus k for top of soil layer = 32.500 lbs/in**3
p-y subgrade modulus k for bottom of layer = 32.500 lbs/in**3

Layer 4 is sand, p-y criteria by Reese et al., 1974
Distance from top of pile to top of layer = 168.000 in
Distance from top of pile to bottom of layer = 228.000 in
p-y subgrade modulus k for top of soil layer = 24.500 lbs/in**3
p-y subgrade modulus k for bottom of layer = 24.500 lbs/in**3

Layer 5 is stiff clay with water-induced erosion
Distance from top of pile to top of layer = 228.000 in
Distance from top of pile to bottom of layer = 720.000 in
p-y subgrade modulus k for top of soil layer = 272.000 lbs/in**3
p-y subgrade modulus k for bottom of layer = 272.000 lbs/in**3

Layer 6 is silt with cohesion and friction
Distance from top of pile to top of layer = 720.000 in
Distance from top of pile to bottom of layer = 864.000 in
p-y subgrade modulus k for top of soil layer = 1451.800 lbs/in**3

p-y subgrade modulus k for bottom of layer = 1451.800 lbs/in**3

Layer 7 is sand, p-y criteria by Reese et al., 1974
Distance from top of pile to top of layer = 864.000 in
Distance from top of pile to bottom of layer = 960.000 in
p-y subgrade modulus k for top of soil layer = 56.000 lbs/in**3
p-y subgrade modulus k for bottom of layer = 56.000 lbs/in**3

Layer 8 is sand, p-y criteria by Reese et al., 1974
Distance from top of pile to top of layer = 960.000 in
Distance from top of pile to bottom of layer = 1200.000 in
p-y subgrade modulus k for top of soil layer = 156.800 lbs/in**3
p-y subgrade modulus k for bottom of layer = 156.800 lbs/in**3

(Depth of lowest layer extends 900.00 in below pile tip)

---

Effective Unit Weight of Soil vs. Depth

---

Effective unit weight of soil with depth defined using 16 points

| Point No. | Depth X in | Eff. Unit Weight lbs/in**3 |
|---|---|---|
| 1 | .00 | .07025 |
| 2 | 60.00 | .07025 |
| 3 | 60.00 | .03414 |
| 4 | 96.00 | .03414 |
| 5 | 96.00 | .03038 |
| 6 | 168.00 | .03038 |
| 7 | 168.00 | .02876 |
| 8 | 228.00 | .02876 |
| 9 | 228.00 | .03275 |
| 10 | 720.00 | .03275 |
| 11 | 720.00 | .04277 |
| 12 | 864.00 | .04277 |
| 13 | 864.00 | .03339 |
| 14 | 960.00 | .03339 |
| 15 | 960.00 | .03918 |
| 16 | 1200.00 | .03918 |

---

## Shear Strength of Soils

---

Shear strength parameters with depth defined using 16 points

| Point No. | Depth X in | Cohesion c lbs/in**2 | Angle of Friction Deg. | k_rm | E50 or % | RQD |
|---|---|---|---|---|---|---|
| 1 | .000 | .00000 | 36.40 | ------ | ------ | |
| 2 | 60.000 | .00000 | 36.40 | ------ | ------ | |
| 3 | 60.000 | .00000 | 36.40 | ------ | ------ | |
| 4 | 96.000 | .00000 | 36.40 | ------ | ------ | |
| 5 | 96.000 | .00000 | 33.00 | ------ | ------ | |
| 6 | 168.000 | .00000 | 33.00 | ------ | ------ | |
| 7 | 168.000 | .00000 | 31.80 | ------ | ------ | |
| 8 | 228.000 | .00000 | 31.80 | ------ | ------ | |
| 9 | 228.000 | 3.98000 | .00 | .92000 | .0 | |
| 10 | 720.000 | 3.98000 | .00 | .92000 | .0 | |
| 11 | 720.000 | 13.70000 | 35.30 | .43000 | .0 | |
| 12 | 864.000 | 13.70000 | 35.30 | .43000 | .0 | |
| 13 | 864.000 | .00000 | 35.60 | ------ | ------ | |
| 14 | 960.000 | .00000 | 35.60 | ------ | ------ | |
| 15 | 960.000 | .00000 | 40.00 | ------ | ------ | |
| 16 | 1200.000 | .00000 | 40.00 | ------ | ------ | |

Notes:

(1) Cohesion = uniaxial compressive strength for rock materials.
(2) Values of E50 are reported for clay strata.
(3) Default values will be generated for E50 when input values are 0.
(4) RQD and k_rm are reported only for weak rock strata.

---

## Loading Type

---

Static loading criteria was used for computation of p-y curves.

Output_steel_concrete_pile_L25'_new

---

Pile-head Loading and Pile-head Fixity Conditions

---

Number of loads specified = 1

Load Case Number 1

Pile-head boundary conditions are Shear and Moment (BC Type 1)
Shear force at pile head = 25000.000 lbs
Bending moment at pile head = .000 in-lbs
Axial load at pile head = 100000.000 lbs

(Zero moment at pile head for this load indicates a free-head condition)

---

Computed Values of Load Distribution and Deflection
for Lateral Loading for Load Case Number 1

---

Pile-head boundary conditions are Shear and Moment (BC Type 1)
Specified shear force at pile head = 25000.000 lbs
Specified moment at pile head = .000 in-lbs
Specified axial load at pile head = 100000.000 lbs

(Zero moment for this load indicates free-head conditions)

| Depth X in | Deflect. y in | Moment M lbs-in | Shear V lbs | Slope S Rad. | Total Stress lbs/in**2 | Soil Res. p lbs/in | Es*h F/L lbs/in |
|---|---|---|---|---|---|---|---|
| 0.000 | .222675 | 3.6784E-06 | 25000.0000 | -.0019705 | 2347.4178 | 0.0000 | 0.0000 |
| 3.000 | .216763 | 75591.1518 | 24958.4102 | -.0019696 | 2494.4466 | -27.7265 | 383.7349 |
| 6.000 | .210857 | 150932. | 24827.7843 | -.0019667 | 2640.9888 | -59.3574 | 844.5142 |
| 9.000 | .204963 | 225738. | 24598.5155 | -.0019620 | 2786.4898 | -93.4885 | 1368.3721 |
| 12.000 | .199086 | 299700. | 24264.5713 | -.0019554 | 2930.3509 | -129.1409 | 1946.0101 |
| 15.000 | .193231 | 372499. | 23823.7987 | -.0019469 | 3071.9469 | -164.7076 | 2557.1629 |
| 18.000 | .187404 | 443811. | 23277.3543 | -.0019366 | 3210.6542 | -199.5887 | 3195.0517 |
| 21.000 | .181611 | 513325. | 22629.0859 | -.0019246 | 3345.8611 | -232.5903 | 3842.1189 |
| 24.000 | .175857 | 580741. | 21886.8365 | -.0019108 | 3476.9888 | -262.2426 | 4473.6920 |
| 27.000 | .170146 | 645792. | 21055.4719 | -.0018954 | 3603.5174 | -292.0004 | 5148.5306 |
| 30.000 | .164484 | 708211. | 20140.8400 | -.0018784 | 3724.9248 | -317.7541 | 5795.4726 |
| 33.000 | .158876 | 767764. | 19154.1462 | -.0018598 | 3840.7594 | -340.0417 | 6420.9086 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 36.000 | .153325 | 824252. | 18103.5931 | -.0018398 | 3950.6302 | -360.3270 | 7050.2609 |
| 39.000 | .147837 | 877490. | 17000.0012 | -.0018184 | 4054.1812 | -375.4009 | 7617.8866 |
| 42.000 | .142415 | 927343. | 15854.9289 | -.0017957 | 4151.1477 | -387.9806 | 8172.9154 |
| 45.000 | .137062 | 973697. | 14678.2484 | -.0017718 | 4241.3088 | -396.4731 | 8677.9435 |
| 48.000 | .131784 | 1016475. | 13485.4460 | -.0017468 | 4324.5152 | -398.7285 | 9076.8875 |
| 51.000 | .126582 | 1055657. | 12275.4134 | -.0017207 | 4400.7267 | -407.9599 | 9668.6960 |
| 54.000 | .121459 | 1091160. | 11045.0052 | -.0016937 | 4469.7813 | -412.3122 | 10183.9577 |
| 57.000 | .116419 | 1122944. | 9809.4056 | -.0016659 | 4531.6020 | -411.4208 | 10601.8691 |
| 60.000 | .111464 | 1151016. | 8584.7776 | -.0016373 | 4586.2042 | -404.9978 | 10900.3161 |
| 63.000 | .106596 | 1175435. | 7402.0059 | -.0016080 | 4633.6998 | -383.5167 | 10793.5943 |
| 66.000 | .101816 | 1196393. | 6260.6587 | -.0015782 | 4674.4646 | -377.3814 | 11119.5229 |
| 69.000 | .097126 | 1213946. | 5121.6603 | -.0015479 | 4708.6055 | -381.9509 | 11797.5340 |
| 72.000 | .092529 | 1228052. | 3971.0028 | -.0015172 | 4736.0424 | -385.1541 | 12487.6257 |
| 75.000 | .088023 | 1238682. | 2812.8469 | -.0014862 | 4756.7189 | -386.9499 | 13187.9669 |
| 78.000 | .083612 | 1245820. | 1651.4667 | -.0014549 | 4770.6036 | -387.3036 | 13896.5163 |
| 81.000 | .079294 | 1249464. | 487.5239 | -.0014235 | 4777.6900 | -388.6583 | 14704.4675 |
| 84.000 | .075070 | 1249600. | -688.6989 | -.0013921 | 4777.9544 | -395.4902 | 15804.7585 |
| 87.000 | .070941 | 1246167. | -1884.1409 | -.0013607 | 4771.2773 | -401.4710 | 16977.5997 |
| 90.000 | .066906 | 1239111. | -3092.1271 | -.0013295 | 4757.5539 | -403.8531 | 18108.3325 |
| 93.000 | .062965 | 1228412. | -4287.0385 | -.0012984 | 4736.7427 | -392.7546 | 18713.1325 |
| 96.000 | .059116 | 1214168. | -5182.6363 | -.0012677 | 4709.0382 | -204.3106 | 10368.3635 |
| 99.000 | .055358 | 1198076. | -5784.1856 | -.0012374 | 4677.7392 | -196.7222 | 10660.8635 |
| 102.000 | .051691 | 1180205. | -6362.3659 | -.0012075 | 4642.9790 | -188.7313 | 10953.3635 |
| 105.000 | .048113 | 1160627. | -6916.0013 | -.0011780 | 4604.8976 | -180.3590 | 11245.8635 |
| 108.000 | .044623 | 1139416. | -7443.9788 | -.0011491 | 4563.6418 | -171.6259 | 11538.3635 |
| 111.000 | .041219 | 1116652. | -7945.2446 | -.0011207 | 4519.3650 | -162.5513 | 11830.8635 |
| 114.000 | .037899 | 1092417. | -8418.8015 | -.0010930 | 4472.2263 | -153.1533 | 12123.3635 |
| 117.000 | .034661 | 1066795. | -8863.7050 | -.0010658 | 4422.3905 | -143.4490 | 12415.8635 |
| 120.000 | .031504 | 1039874. | -9279.0601 | -.0010393 | 4370.0279 | -133.4544 | 12708.3635 |
| 123.000 | .028425 | 1011745. | -9664.0179 | -.0010135 | 4315.3139 | -123.1841 | 13000.8635 |
| 126.000 | .025423 | 982498. | -10017.7718 | -.0009884 | 4258.4286 | -112.6518 | 13293.3635 |
| 129.000 | .022495 | 952231. | -10339.5542 | -.0009641 | 4199.5568 | -101.8698 | 13585.8635 |
| 132.000 | .019638 | 921040. | -10628.6324 | -.0009405 | 4138.8879 | -90.8491 | 13878.3635 |
| 135.000 | .016851 | 889023. | -10884.3056 | -.0009178 | 4076.6150 | -79.5997 | 14170.8635 |
| 138.000 | .014132 | 856284. | -11105.9006 | -.0008958 | 4012.9357 | -68.1303 | 14463.3635 |
| 141.000 | .011476 | 822926. | -11292.7685 | -.0008747 | 3948.0511 | -56.4483 | 14755.8635 |
| 144.000 | .008883 | 789053. | -11444.2811 | -.0008544 | 3882.1663 | -44.5600 | 15048.3635 |
| 147.000 | .006350 | 754773. | -11559.8270 | -.0008350 | 3815.4899 | -32.4706 | 15340.8635 |
| 150.000 | .003873 | 720195. | -11638.8086 | -.0008165 | 3748.2340 | -20.1838 | 15633.3635 |
| 153.000 | .001451 | 685430. | -11680.6383 | -.0007988 | 3680.6142 | -7.7026 | 15925.8635 |
| 156.000 | -.000920 | 650590. | -11684.7353 | -.0007820 | 3612.8495 | 4.9713 | 16218.3635 |
| 159.000 | -.003241 | 615790. | -11650.5225 | -.0007661 | 3545.1623 | 17.8373 | 16510.8635 |
| 162.000 | -.005516 | 581147. | -11577.4229 | -.0007510 | 3477.7783 | 30.8957 | 16803.3635 |
| 165.000 | -.007747 | 546776. | -11464.8574 | -.0007368 | 3410.9266 | 44.1479 | 17095.8635 |
| 168.000 | -.009937 | 512800. | -11328.5487 | -.0007235 | 3344.8397 | 46.7246 | 14106.2489 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 171.000 | -.012088 | 479239. | -11171.8697 | -.0007110 | 3279.5633 | 57.7281 | 14326.7489 |
| 174.000 | -.014203 | 446195. | -10981.9689 | -.0006994 | 3215.2903 | 68.8725 | 14547.2489 |
| 177.000 | -.016285 | 413767. | -10758.4171 | -.0006886 | 3152.2165 | 80.1620 | 14767.7489 |
| 180.000 | -.018335 | 382058. | -10500.7717 | -.0006786 | 3090.5398 | 91.6016 | 14988.2489 |
| 183.000 | -.020356 | 351170. | -10208.5748 | -.0006694 | 3030.4611 | 103.1963 | 15208.7489 |
| 186.000 | -.022351 | 321208. | -9881.3523 | -.0006609 | 2972.1837 | 114.9520 | 15429.2489 |
| 189.000 | -.024321 | 292278. | -9518.6128 | -.0006532 | 2915.9139 | 126.8744 | 15649.7489 |
| 192.000 | -.026270 | 264488. | -9119.8465 | -.0006462 | 2861.8608 | 138.9698 | 15870.2489 |
| 195.000 | -.028198 | 237947. | -8684.5248 | -.0006399 | 2810.2365 | 151.2446 | 16090.7489 |
| 198.000 | -.030109 | 212765. | -8212.0998 | -.0006342 | 2761.2564 | 163.7053 | 16311.2489 |
| 201.000 | -.032004 | 189055. | -7702.0041 | -.0006291 | 2715.1389 | 176.3584 | 16531.7489 |
| 204.000 | -.033884 | 166930. | -7153.6509 | -.0006247 | 2672.1058 | 189.2104 | 16752.2489 |
| 207.000 | -.035752 | 146507. | -6566.4342 | -.0006207 | 2632.3825 | 202.2675 | 16972.7489 |
| 210.000 | -.037608 | 127904. | -5939.7294 | -.0006173 | 2596.1979 | 215.5357 | 17193.2489 |
| 213.000 | -.039455 | 111239. | -5272.8945 | -.0006143 | 2563.7844 | 229.0209 | 17413.7489 |
| 216.000 | -.041294 | 96635.2211 | -4565.2707 | -.0006116 | 2535.3784 | 242.7282 | 17634.2489 |
| 219.000 | -.043125 | 84214.8159 | -3816.1846 | -.0006094 | 2511.2201 | 256.6625 | 17854.7489 |
| 222.000 | -.044950 | 74103.7376 | -3024.9495 | -.0006074 | 2491.5535 | 270.8276 | 18075.2489 |
| 225.000 | -.046769 | 66429.5487 | -2190.8677 | -.0006056 | 2476.6268 | 285.2269 | 18295.7489 |
| 228.000 | -.048584 | 61321.9007 | -1732.8450 | -.0006040 | 2466.6921 | 20.1216 | 1242.4895 |
| 231.000 | -.050393 | 56394.8843 | -1671.9232 | -.0006025 | 2457.1088 | 20.4929 | 1219.9758 |
| 234.000 | -.052199 | 51651.8787 | -1609.8986 | -.0006012 | 2447.8834 | 20.8568 | 1198.6920 |
| 237.000 | -.054000 | 47096.1945 | -1546.7929 | -.0005999 | 2439.0224 | 21.2137 | 1178.5272 |
| 240.000 | -.055798 | 42731.0780 | -1482.6265 | -.0005988 | 2430.5320 | 21.5639 | 1159.3839 |
| 243.000 | -.057593 | 38559.7145 | -1417.4186 | -.0005978 | 2422.4185 | 21.9080 | 1141.1760 |
| 246.000 | -.059385 | 34585.2322 | -1351.1873 | -.0005969 | 2414.6879 | 22.2462 | 1123.8275 |
| 249.000 | -.061174 | 30810.7047 | -1283.9497 | -.0005960 | 2407.3463 | 22.5789 | 1107.2705 |
| 252.000 | -.062961 | 27239.1546 | -1215.7220 | -.0005953 | 2400.3994 | 22.9063 | 1091.4445 |
| 255.000 | -.064746 | 23873.5553 | -1146.5196 | -.0005947 | 2393.8532 | 23.2287 | 1076.2953 |
| 258.000 | -.066529 | 20716.8339 | -1076.3570 | -.0005941 | 2387.7132 | 23.5464 | 1061.7743 |
| 261.000 | -.068311 | 17771.8735 | -1005.2481 | -.0005936 | 2381.9851 | 23.8595 | 1047.8376 |
| 264.000 | -.070091 | 15041.5149 | -933.2062 | -.0005932 | 2376.6744 | 24.1684 | 1034.4456 |
| 267.000 | -.071870 | 12528.5588 | -860.2437 | -.0005929 | 2371.7865 | 24.4732 | 1021.5623 |
| 270.000 | -.073648 | 10235.7672 | -786.3726 | -.0005926 | 2367.3269 | 24.7741 | 1009.1551 |
| 273.000 | -.075425 | 8165.8656 | -711.6045 | -.0005923 | 2363.3009 | 25.0713 | 997.1945 |
| 276.000 | -.077202 | 6321.5439 | -635.9503 | -.0005922 | 2359.7136 | 25.3649 | 985.6532 |
| 279.000 | -.078978 | 4705.4581 | -559.4205 | -.0005920 | 2356.5702 | 25.6550 | 974.5065 |
| 282.000 | -.080754 | 3320.2318 | -482.0253 | -.0005919 | 2353.8759 | 25.9418 | 963.7317 |
| 285.000 | -.082530 | 2168.4568 | -403.7744 | -.0005918 | 2351.6356 | 26.2255 | 953.3081 |
| 288.000 | -.084305 | 1252.6947 | -324.6771 | -.0005918 | 2349.8544 | 26.5061 | 943.2164 |
| 291.000 | -.086081 | 575.4777 | -244.7424 | -.0005918 | 2348.5372 | 26.7837 | 933.4392 |
| 294.000 | -.087856 | 139.3099 | -163.9791 | -.0005918 | 2347.6888 | 27.0585 | 923.9600 |
| 297.000 | -.089631 | -53.3326 | -82.3956 | -.0005918 | 2347.5216 | 27.3305 | 914.7639 |
| 300.000 | -.091407 | 0.0000 | 0.0000 | -.0005918 | 2347.4178 | 27.5999 | 452.9185 |

Output_steel_concrete_pile_L25'_new

Output Verification:

Computed forces and moments are within specified convergence limits.

Output Summary for Load Case No. 1:

Pile-head deflection = .22267475 in
Computed slope at pile head = -.00197051
Maximum bending moment = 1249600. lbs-in
Maximum shear force = 25000.00000 lbs
Depth of maximum bending moment = 84.00000000 in
Depth of maximum shear force = 0.00000 in
Number of iterations = 14
Number of zero deflection points = 1

---

Summary of Pile Response(s)

---

Definition of Symbols for Pile-Head Loading Conditions:

Type 1 = Shear and Moment, y = pile-head displacment in
Type 2 = Shear and Slope, M = Pile-head Moment lbs-in
Type 3 = Shear and Rot. Stiffness, V = Pile-head Shear Force lbs
Type 4 = Deflection and Moment, S = Pile-head Slope, radians
Type 5 = Deflection and Slope, R = Rot. Stiffness of Pile-head in-lbs/rad

| Load Type | Pile-Head Condition 1 | Pile-Head Condition 2 | Axial Load lbs | Pile-Head Deflection in | Maximum Moment in-lbs | Maximum Shear lbs |
|---|---|---|---|---|---|---|
| 1 | V= | 25000. | M= | 0.000 | 100000.0000 | .2226748 | 1249600. | 25000.0000 |

The analysis ended normally.

# APPENDIX G-6: STEEL PIPE 50- FOOT LONG PILE

==========

LPILE Plus for Windows, Version 5.0 (5.0.39)

Analysis of Individual Piles and Drilled Shafts
Subjected to Lateral Loading Using the p-y Method

(c) 1985-2007 by Ensoft, Inc.
All Rights Reserved

==========

This program is licensed to:

Charbel Khoury
KMA Consulting Engineers

Path to file locations: D:\charbel files\KMA Consulting Engineers CO\Job#1121_Laytons Lake\Pile Analysis\Lpile\
Name of input data file: Steel_concrete_pile_L50'_new.lpd
Name of output file: Steel_concrete_pile_L50'_new.lpo
Name of plot output file: Steel_concrete_pile_L50'_new.lpp
Name of runtime file: Steel_concrete_pile_L50'_new.lpr

---

Time and Date of Analysis

---

Date: April 21, 2011 Time: 10:59:22

---

Problem Title

---

New LPILE Plus 5.0 Data File

---

Program Options

---

Output_steel_concrete_pile_L50'_new

Units Used in Computations - US Customary Units: Inches, Pounds

Basic Program Options:

Analysis Type 1:
- Computation of Lateral Pile Response Using User-specified Constant EI

Computation Options:
- Only internally-generated p-y curves used in analysis
- Analysis does not use p-y multipliers (individual pile or shaft action only)
- Analysis assumes no shear resistance at pile tip
- Analysis for fixed-length pile or shaft only
- No computation of foundation stiffness matrix elements
- Output pile response for full length of pile
- Analysis assumes no soil movements acting on pile
- No additional p-y curves to be computed at user-specified depths

Solution Control Parameters:
- Number of pile increments = 100
- Maximum number of iterations allowed = 100
- Deflection tolerance for convergence = 1.0000E-05 in
- Maximum allowable deflection = 1.0000E+02 in

Printing Options:
- Values of pile-head deflection, bending moment, shear force, and soil reaction are printed for full length of pile.
- Printing Increment (spacing of output points) = 1

---

Pile Structural Properties and Geometry

---

Pile Length = 600.00 in

Depth of ground surface below top of pile = .00 in

Slope angle of ground surface = .00 deg.

Structural properties of pile defined using 2 points

| Point | Depth X in | Pile Diameter in | Moment of Inertia in**4 | Pile Area Sq.in | Modulus of Elasticity lbs/Sq.in |
|---|---|---|---|---|---|

| | | | | | |
|---|---|---|---|---|---|
| 1 | 0.0000 | 16.00000000 | 4113.0000 | 42.6000 | 29000000. |
| 2 | 600.0000 | 16.00000000 | 4113.0000 | 42.6000 | 29000000. |

---

Soil and Rock Layering Information

---

The soil profile is modelled using 8 layers

Layer 1 is sand, p-y criteria by Reese et al., 1974
Distance from top of pile to top of layer = .000 in
Distance from top of pile to bottom of layer = 60.000 in
p-y subgrade modulus k for top of soil layer = 107.700 lbs/in**3
p-y subgrade modulus k for bottom of layer = 107.700 lbs/in**3

Layer 2 is sand, p-y criteria by Reese et al., 1974
Distance from top of pile to top of layer = 60.000 in
Distance from top of pile to bottom of layer = 96.000 in
p-y subgrade modulus k for top of soil layer = 67.200 lbs/in**3
p-y subgrade modulus k for bottom of layer = 67.200 lbs/in**3

Layer 3 is sand, p-y criteria by Reese et al., 1974
Distance from top of pile to top of layer = 96.000 in
Distance from top of pile to bottom of layer = 168.000 in
p-y subgrade modulus k for top of soil layer = 32.500 lbs/in**3
p-y subgrade modulus k for bottom of layer = 32.500 lbs/in**3

Layer 4 is sand, p-y criteria by Reese et al., 1974
Distance from top of pile to top of layer = 168.000 in
Distance from top of pile to bottom of layer = 228.000 in
p-y subgrade modulus k for top of soil layer = 24.500 lbs/in**3
p-y subgrade modulus k for bottom of layer = 24.500 lbs/in**3

Layer 5 is stiff clay with water-induced erosion
Distance from top of pile to top of layer = 228.000 in
Distance from top of pile to bottom of layer = 720.000 in
p-y subgrade modulus k for top of soil layer = 272.000 lbs/in**3
p-y subgrade modulus k for bottom of layer = 272.000 lbs/in**3

Layer 6 is silt with cohesion and friction
Distance from top of pile to top of layer = 720.000 in
Distance from top of pile to bottom of layer = 864.000 in
p-y subgrade modulus k for top of soil layer = 1451.800 lbs/in**3

p-y subgrade modulus k for bottom of layer = 1451.800 lbs/in**3

Layer 7 is sand, p-y criteria by Reese et al., 1974
Distance from top of pile to top of layer = 864.000 in
Distance from top of pile to bottom of layer = 960.000 in
p-y subgrade modulus k for top of soil layer = 56.000 lbs/in**3
p-y subgrade modulus k for bottom of layer = 56.000 lbs/in**3

Layer 8 is sand, p-y criteria by Reese et al., 1974
Distance from top of pile to top of layer = 960.000 in
Distance from top of pile to bottom of layer = 1200.000 in
p-y subgrade modulus k for top of soil layer = 156.800 lbs/in**3
p-y subgrade modulus k for bottom of layer = 156.800 lbs/in**3

(Depth of lowest layer extends 600.00 in below pile tip)

---

Effective Unit Weight of Soil vs. Depth

---

Effective unit weight of soil with depth defined using 16 points

| Point No. | Depth X in | Eff. Unit Weight lbs/in**3 |
|---|---|---|
| 1 | .00 | .07025 |
| 2 | 60.00 | .07025 |
| 3 | 60.00 | .03414 |
| 4 | 96.00 | .03414 |
| 5 | 96.00 | .03038 |
| 6 | 168.00 | .03038 |
| 7 | 168.00 | .02876 |
| 8 | 228.00 | .02876 |
| 9 | 228.00 | .03275 |
| 10 | 720.00 | .03275 |
| 11 | 720.00 | .04277 |
| 12 | 864.00 | .04277 |
| 13 | 864.00 | .03339 |
| 14 | 960.00 | .03339 |
| 15 | 960.00 | .03918 |
| 16 | 1200.00 | .03918 |

---

Shear Strength of Soils

---

Shear strength parameters with depth defined using 16 points

| Point No. | Depth X in | Cohesion c lbs/in**2 | Angle of Friction Deg. | k_rm | E50 or % | RQD |
|---|---|---|---|---|---|---|
| 1 | .000 | .00000 | 36.40 | ------ | ------ | |
| 2 | 60.000 | .00000 | 36.40 | ------ | ------ | |
| 3 | 60.000 | .00000 | 36.40 | ------ | ------ | |
| 4 | 96.000 | .00000 | 36.40 | ------ | ------ | |
| 5 | 96.000 | .00000 | 33.00 | ------ | ------ | |
| 6 | 168.000 | .00000 | 33.00 | ------ | ------ | |
| 7 | 168.000 | .00000 | 31.80 | ------ | ------ | |
| 8 | 228.000 | .00000 | 31.80 | ------ | ------ | |
| 9 | 228.000 | 3.98000 | .00 | .92000 | .0 | |
| 10 | 720.000 | 3.98000 | .00 | .92000 | .0 | |
| 11 | 720.000 | 13.70000 | 35.30 | .43000 | .0 | |
| 12 | 864.000 | 13.70000 | 35.30 | .43000 | .0 | |
| 13 | 864.000 | .00000 | 35.60 | ------ | ------ | |
| 14 | 960.000 | .00000 | 35.60 | ------ | ------ | |
| 15 | 960.000 | .00000 | 40.00 | ------ | ------ | |
| 16 | 1200.000 | .00000 | 40.00 | ------ | ------ | |

Notes:

(1) Cohesion = uniaxial compressive strength for rock materials.
(2) Values of E50 are reported for clay strata.
(3) Default values will be generated for E50 when input values are 0.
(4) RQD and k_rm are reported only for weak rock strata.

---

Loading Type

---

Static loading criteria was used for computation of p-y curves.

Output_steel_concrete_pile_L50'_new

---

Pile-head Loading and Pile-head Fixity Conditions

---

Number of loads specified = 1

Load Case Number 1

Pile-head boundary conditions are Shear and Moment (BC Type 1)
Shear force at pile head = 25000.000 lbs
Bending moment at pile head = .000 in-lbs
Axial load at pile head = 100000.000 lbs

(Zero moment at pile head for this load indicates a free-head condition)

---

Computed Values of Load Distribution and Deflection
for Lateral Loading for Load Case Number 1

---

Pile-head boundary conditions are Shear and Moment (BC Type 1)
Specified shear force at pile head = 25000.000 lbs
Specified moment at pile head = .000 in-lbs
Specified axial load at pile head = 100000.000 lbs

(Zero moment for this load indicates free-head conditions)

| Depth X in | Deflect. y in | Moment M lbs-in | Shear V lbs | Slope S Rad. | Total Stress lbs/in**2 | Soil Res. p lbs/in | Es*h F/L lbs/in |
|---|---|---|---|---|---|---|---|
| 0.000 | .199370 | 1.8392E-06 | 25000.0000 | -.0018251 | 2347.4178 | 0.0000 | 0.0000 |
| 6.000 | .188420 | 151095. | 24827.3871 | -.0018213 | 2641.3056 | -57.5376 | 1832.2137 |
| 12.000 | .177515 | 300114. | 24280.0054 | -.0018099 | 2931.1556 | -124.9229 | 4222.3835 |
| 18.000 | .166701 | 444627. | 23327.0503 | -.0017912 | 3212.2406 | -192.7287 | 6936.8029 |
| 24.000 | .156021 | 582188. | 21990.6632 | -.0017654 | 3479.8043 | -252.7336 | 9719.2123 |
| 30.000 | .145517 | 710633. | 20316.0900 | -.0017328 | 3729.6369 | -305.4575 | 12594.7339 |
| 36.000 | .135227 | 828061. | 18363.2823 | -.0016941 | 3958.0392 | -345.4784 | 15328.8287 |
| 42.000 | .125187 | 933026. | 16214.9753 | -.0016498 | 4162.2017 | -370.6239 | 17763.3687 |
| 48.000 | .115429 | 1024620. | 13967.8155 | -.0016006 | 4340.3577 | -378.4294 | 19670.8040 |
| 54.000 | .105980 | 1102560. | 11668.4173 | -.0015471 | 4491.9552 | -388.0367 | 21968.5464 |
| 60.000 | .096863 | 1166498. | 9372.1749 | -.0014900 | 4616.3169 | -377.3775 | 23375.8462 |
| 66.000 | .088099 | 1216814. | 7202.1445 | -.0014301 | 4714.1855 | -345.9660 | 23562.0200 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 72.000 | .079702 | 1254640. | 5109.8012 | -.0013679 | 4787.7574 | -351.4818 | 26459.5976 |
| 78.000 | .071684 | 1279774. | 3000.3436 | -.0013042 | 4836.6443 | -351.6707 | 29435.0693 |
| 84.000 | .064052 | 1292209. | 874.1326 | -.0012395 | 4860.8314 | -357.0663 | 33447.7764 |
| 90.000 | .056810 | 1291751. | -1222.8114 | -.0011745 | 4859.9402 | -341.9151 | 36111.4144 |
| 96.000 | .049958 | 1278944. | -2764.2431 | -.0011099 | 4835.0316 | -171.8955 | 20644.8398 |
| 102.000 | .043492 | 1259911. | -3754.3128 | -.0010460 | 4798.0115 | -158.1277 | 21814.8398 |
| 108.000 | .037406 | 1235148. | -4658.5808 | -.0009832 | 4749.8450 | -143.2949 | 22984.8398 |
| 114.000 | .031693 | 1205188. | -5471.2339 | -.0009219 | 4691.5722 | -127.5894 | 24154.8398 |
| 120.000 | .026344 | 1170599. | -6187.5755 | -.0008621 | 4624.2947 | -111.1911 | 25324.8398 |
| 126.000 | .021348 | 1131972. | -6803.9492 | -.0008042 | 4549.1625 | -94.2668 | 26494.8398 |
| 132.000 | .016693 | 1089917. | -7317.6572 | -.0007483 | 4467.3633 | -76.9692 | 27664.8398 |
| 138.000 | .012368 | 1045058. | -7726.8770 | -.0006946 | 4380.1104 | -59.4374 | 28834.8398 |
| 144.000 | .008358 | 998028. | -8030.5772 | -.0006432 | 4288.6344 | -41.7960 | 30004.8398 |
| 150.000 | .004649 | 949463. | -8228.4327 | -.0005942 | 4194.1731 | -24.1558 | 31174.8398 |
| 156.000 | .001227 | 900000. | -8320.7423 | -.0005477 | 4097.9646 | -6.6140 | 32344.8398 |
| 162.000 | -.001924 | 850271. | -8308.3493 | -.0005037 | 4001.2402 | 10.7451 | 33514.8398 |
| 168.000 | -.004818 | 800904. | -8208.3432 | -.0004622 | 3905.2182 | 22.5903 | 28134.9300 |
| 174.000 | -.007470 | 752326. | -8032.1975 | -.0004231 | 3810.7310 | 36.1249 | 29016.9300 |
| 180.000 | -.009895 | 705025. | -7775.8995 | -.0003865 | 3718.7292 | 49.3078 | 29898.9300 |
| 186.000 | -.012107 | 659479. | -7441.6404 | -.0003521 | 3630.1387 | 62.1120 | 30780.9300 |
| 192.000 | -.014121 | 616148. | -7031.7559 | -.0003201 | 3545.8586 | 74.5162 | 31662.9300 |
| 198.000 | -.015948 | 575482. | -6548.6964 | -.0002901 | 3466.7601 | 86.5037 | 32544.9300 |
| 204.000 | -.017601 | 537912. | -5995.0034 | -.0002621 | 3393.6850 | 98.0607 | 33426.9300 |
| 210.000 | -.019093 | 503856. | -5373.2948 | -.0002359 | 3327.4447 | 109.1755 | 34308.9300 |
| 216.000 | -.020432 | 473716. | -4686.2576 | -.0002113 | 3268.8194 | 119.8369 | 35190.9300 |
| 222.000 | -.021628 | 447875. | -3936.6499 | -.0001881 | 3218.5576 | 130.0324 | 36072.9300 |
| 228.000 | -.022689 | 426702. | -3505.2997 | -.0001661 | 3177.3746 | 13.7510 | 3636.3436 |
| 234.000 | -.023622 | 406010. | -3421.9546 | -.0001452 | 3137.1294 | 14.0307 | 3563.8676 |
| 240.000 | -.024431 | 385812. | -3337.0549 | -.0001253 | 3097.8429 | 14.2692 | 3504.3151 |
| 246.000 | -.025125 | 366116. | -3250.8367 | -.0001063 | 3059.5328 | 14.4702 | 3455.6320 |
| 252.000 | -.025707 | 346930. | -3163.5147 | -8.8406E-05 | 3022.2145 | 14.6371 | 3416.2420 |
| 258.000 | -.026185 | 328260. | -3075.2855 | -7.1424E-05 | 2985.9008 | 14.7726 | 3384.9168 |
| 264.000 | -.026564 | 310112. | -2986.3302 | -5.5368E-05 | 2950.6021 | 14.8792 | 3360.6875 |
| 270.000 | -.026850 | 292491. | -2896.8160 | -4.0211E-05 | 2916.3272 | 14.9589 | 3342.7827 |
| 276.000 | -.027047 | 275399. | -2806.8982 | -2.5928E-05 | 2883.0825 | 15.0137 | 3330.5832 |
| 282.000 | -.027161 | 258839. | -2716.7209 | -1.2491E-05 | 2850.8729 | 15.0454 | 3323.5905 |
| 288.000 | -.027197 | 242813. | -2626.4189 | 1.2618E-07 | 2819.7017 | 15.0553 | 3321.4019 |
| 294.000 | -.027160 | 227322. | -2536.1180 | 1.1951E-05 | 2789.5704 | 15.0450 | 3323.6928 |
| 300.000 | -.027054 | 212365. | -2445.9362 | 2.3010E-05 | 2760.4792 | 15.0156 | 3330.2035 |
| 306.000 | -.026883 | 197943. | -2355.9843 | 3.3329E-05 | 2732.4270 | 14.9684 | 3340.7280 |
| 312.000 | -.026654 | 184053. | -2266.3665 | 4.2937E-05 | 2705.4113 | 14.9043 | 3355.1069 |
| 318.000 | -.026368 | 170695. | -2177.1809 | 5.1860E-05 | 2679.4283 | 14.8243 | 3373.2208 |
| 324.000 | -.026031 | 157865. | -2088.5203 | 6.0124E-05 | 2654.4734 | 14.7293 | 3394.9859 |
| 330.000 | -.025647 | 145561. | -2000.4722 | 6.7755E-05 | 2630.5406 | 14.6201 | 3420.3506 |
| 336.000 | -.025218 | 133778. | -1913.1194 | 7.4781E-05 | 2607.6230 | 14.4975 | 3449.2931 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 342.000 | -.024749 | 122513. | -1826.5407 | 8.1227E-05 | 2585.7127 | 14.3621 | 3481.8196 |
| 348.000 | -.024243 | 111762. | -1740.8106 | 8.7119E-05 | 2564.8008 | 14.2146 | 3517.9638 |
| 354.000 | -.023704 | 101519. | -1656.0002 | 9.2484E-05 | 2544.8777 | 14.0555 | 3557.7861 |
| 360.000 | -.023134 | 91779.0474 | -1572.1771 | 9.7346E-05 | 2525.9329 | 13.8855 | 3601.3747 |
| 366.000 | -.022536 | 82536.1315 | -1489.4059 | .0001017 | 2507.9549 | 13.7049 | 3648.8460 |
| 372.000 | -.021913 | 73784.1007 | -1407.7486 | .0001057 | 2490.9318 | 13.5142 | 3700.3468 |
| 378.000 | -.021268 | 65516.3547 | -1327.2644 | .0001092 | 2474.8506 | 13.3138 | 3756.0565 |
| 384.000 | -.020603 | 57725.9293 | -1248.0106 | .0001123 | 2459.6978 | 13.1041 | 3816.1904 |
| 390.000 | -.019921 | 50405.5092 | -1170.0424 | .0001150 | 2445.4592 | 12.8853 | 3881.0040 |
| 396.000 | -.019223 | 43547.4394 | -1093.4131 | .0001173 | 2432.1199 | 12.6578 | 3950.7984 |
| 402.000 | -.018512 | 37143.7347 | -1018.1750 | .0001194 | 2419.6643 | 12.4216 | 4025.9270 |
| 408.000 | -.017791 | 31186.0870 | -944.3790 | .0001211 | 2408.0764 | 12.1771 | 4106.8043 |
| 414.000 | -.017059 | 25665.8724 | -872.0752 | .0001225 | 2397.3393 | 11.9242 | 4193.9163 |
| 420.000 | -.016320 | 20574.1543 | -801.3133 | .0001237 | 2387.4356 | 11.6631 | 4287.8346 |
| 426.000 | -.015575 | 15901.6867 | -732.1428 | .0001246 | 2378.3475 | 11.3937 | 4389.2331 |
| 432.000 | -.014825 | 11638.9135 | -664.6135 | .0001253 | 2370.0561 | 11.1160 | 4498.9105 |
| 438.000 | -.014071 | 7775.9668 | -598.7756 | .0001258 | 2362.5425 | 10.8299 | 4617.8189 |
| 444.000 | -.013316 | 4302.6613 | -534.6809 | .0001261 | 2355.7867 | 10.5350 | 4747.1007 |
| 450.000 | -.012558 | 1208.4873 | -472.3823 | .0001262 | 2349.7684 | 10.2312 | 4888.1384 |
| 456.000 | -.011801 | -1517.4015 | -411.9354 | .0001262 | 2350.3693 | 9.9178 | 5042.6202 |
| 462.000 | -.011044 | -3886.2033 | -353.3986 | .0001261 | 2354.9767 | 9.5944 | 5212.6306 |
| 468.000 | -.010288 | -5909.4879 | -296.8344 | .0001258 | 2358.9121 | 9.2603 | 5400.7748 |
| 474.000 | -.009534 | -7599.2229 | -242.3099 | .0001255 | 2362.1987 | 8.9145 | 5610.3559 |
| 480.000 | -.008782 | -8967.8068 | -189.8990 | .0001251 | 2364.8607 | 8.5558 | 5845.6317 |
| 486.000 | -.008033 | -10028.1104 | -139.6831 | .0001246 | 2366.9230 | 8.1828 | 6112.1966 |
| 492.000 | -.007286 | -10793.5297 | -91.7538 | .0001241 | 2368.4118 | 7.7936 | 6417.5692 |
| 498.000 | -.006544 | -11278.0535 | -46.2158 | .0001235 | 2369.3542 | 7.3857 | 6772.1310 |
| 504.000 | -.005804 | -11496.3506 | -3.1905 | .0001230 | 2369.7788 | 6.9560 | 7190.6905 |
| 510.000 | -.005068 | -11463.8843 | 37.1780 | .0001224 | 2369.7157 | 6.5002 | 7695.2401 |
| 516.000 | -.004336 | -11197.0660 | 74.7152 | .0001218 | 2369.1967 | 6.0122 | 8320.1468 |
| 522.000 | -.003607 | -10713.4692 | 109.2027 | .0001213 | 2368.2561 | 5.4836 | 9122.8155 |
| 528.000 | -.002881 | -10032.1391 | 140.3566 | .0001207 | 2366.9309 | 4.9010 | 10208.2694 |
| 534.000 | -.002158 | -9174.0700 | 167.7858 | .0001203 | 2365.2619 | 4.2421 | 11795.9072 |
| 540.000 | -.001438 | -8163.0100 | 190.9013 | .0001198 | 2363.2953 | 3.4631 | 14453.6949 |
| 546.000 | -.000720 | -7027.0312 | 208.6465 | .0001194 | 2361.0858 | 2.4519 | 20434.0723 |
| 552.000 | -4.42E-06 | -5802.5704 | 216.6973 | .0001191 | 2358.7041 | .2316619 | 314186. |
| 558.000 | .000709 | -4569.5947 | 210.1050 | .0001188 | 2356.3059 | -2.4291 | 20546.3058 |
| 564.000 | .001422 | -3423.9290 | 192.4957 | .0001186 | 2354.0776 | -3.4406 | 14519.9493 |
| 570.000 | .002133 | -2402.0230 | 169.5286 | .0001185 | 2352.0899 | -4.2151 | 11856.0497 |
| 576.000 | .002844 | -1531.7873 | 142.2817 | .0001184 | 2350.3972 | -4.8672 | 10269.1903 |
| 582.000 | .003554 | -836.7245 | 111.3560 | .0001183 | 2349.0453 | -5.4414 | 9186.4721 |
| 588.000 | .004264 | -337.5260 | 77.1509 | .0001183 | 2348.0743 | -5.9603 | 8387.1814 |
| 594.000 | .004974 | -52.8888 | 39.9575 | .0001183 | 2347.5207 | -6.4375 | 7765.8402 |
| 600.000 | .005684 | 0.0000 | 0.0000 | .0001183 | 2347.4178 | -6.8817 | 3632.4317 |

Output_steel_concrete_pile_L50'_new

Output Verification:

Computed forces and moments are within specified convergence limits.

Output Summary for Load Case No. 1:

Pile-head deflection = .19937047 in
Computed slope at pile head = -.00182507
Maximum bending moment = 1292209. lbs-in
Maximum shear force = 25000.00000 lbs
Depth of maximum bending moment = 84.00000000 in
Depth of maximum shear force = 0.00000 in
Number of iterations = 13
Number of zero deflection points = 2

---

Summary of Pile Response(s)

---

Definition of Symbols for Pile-Head Loading Conditions:

Type 1 = Shear and Moment, y = pile-head displacment in
Type 2 = Shear and Slope, M = Pile-head Moment lbs-in
Type 3 = Shear and Rot. Stiffness, V = Pile-head Shear Force lbs
Type 4 = Deflection and Moment, S = Pile-head Slope, radians
Type 5 = Deflection and Slope, R = Rot. Stiffness of Pile-head in-lbs/rad

| Load Type | Pile-Head Condition 1 | Pile-Head Condition 2 | Axial Load lbs | Pile-Head Deflection in | Maximum Moment in-lbs | Maximum Shear lbs |
|---|---|---|---|---|---|---|
| 1 | V= | 25000. | M= | 0.000 | 100000.0000 | .1993705 | 1292209. | 25000.0000 |

The analysis ended normally.

# APPENDIX G-7: STEEL PIPE 60- FOOT LONG PILE

Output_steel_concrete_pile_L60'_new

==========

LPILE Plus for Windows, Version 5.0 (5.0.39)

Analysis of Individual Piles and Drilled Shafts
Subjected to Lateral Loading Using the p-y Method

(c) 1985-2007 by Ensoft, Inc.
All Rights Reserved

==========

This program is licensed to:

Charbel Khoury
KMA Consulting Engineers

Path to file locations: D:\charbel files\KMA Consulting Engineers CO\Job#1121_Laytons Lake\Pile Analysis\Lpile\
Name of input data file: Steel_concrete_pile_L60'_new.lpd
Name of output file: Steel_concrete_pile_L60'_new.lpo
Name of plot output file: Steel_concrete_pile_L60'_new.lpp
Name of runtime file: Steel_concrete_pile_L60'_new.lpr

---

Time and Date of Analysis

---

Date: April 21, 2011 Time: 11:01:41

---

Problem Title

---

New LPILE Plus 5.0 Data File

---

Program Options

---

Output_steel_concrete_pile_L60'_new

Units Used in Computations - US Customary Units: Inches, Pounds

Basic Program Options:

Analysis Type 1:
- Computation of Lateral Pile Response Using User-specified Constant EI

Computation Options:
- Only internally-generated p-y curves used in analysis
- Analysis does not use p-y multipliers (individual pile or shaft action only)
- Analysis assumes no shear resistance at pile tip
- Analysis for fixed-length pile or shaft only
- No computation of foundation stiffness matrix elements
- Output pile response for full length of pile
- Analysis assumes no soil movements acting on pile
- No additional p-y curves to be computed at user-specified depths

Solution Control Parameters:
- Number of pile increments = 100
- Maximum number of iterations allowed = 100
- Deflection tolerance for convergence = 1.0000E-05 in
- Maximum allowable deflection = 1.0000E+02 in

Printing Options:
- Values of pile-head deflection, bending moment, shear force, and soil reaction are printed for full length of pile.
- Printing Increment (spacing of output points) = 1

---

Pile Structural Properties and Geometry

---

Pile Length = 720.00 in

Depth of ground surface below top of pile = .00 in

Slope angle of ground surface = .00 deg.

Structural properties of pile defined using 2 points

| Point | Depth X | Pile Diameter | Moment of Inertia | Pile Area | Modulus of Elasticity |
|---|---|---|---|---|---|
| | in | in | in**4 | Sq.in | lbs/Sq.in |

| | | | | | |
|---|---|---|---|---|---|
| 1 | 0.0000 | 16.00000000 | 4113.0000 | 42.6000 | 29000000. |
| 2 | 720.0000 | 16.00000000 | 4113.0000 | 42.6000 | 29000000. |

---

Soil and Rock Layering Information

---

The soil profile is modelled using 8 layers

Layer 1 is sand, p-y criteria by Reese et al., 1974
Distance from top of pile to top of layer = .000 in
Distance from top of pile to bottom of layer = 60.000 in
p-y subgrade modulus k for top of soil layer = 107.700 lbs/in**3
p-y subgrade modulus k for bottom of layer = 107.700 lbs/in**3

Layer 2 is sand, p-y criteria by Reese et al., 1974
Distance from top of pile to top of layer = 60.000 in
Distance from top of pile to bottom of layer = 96.000 in
p-y subgrade modulus k for top of soil layer = 67.200 lbs/in**3
p-y subgrade modulus k for bottom of layer = 67.200 lbs/in**3

Layer 3 is sand, p-y criteria by Reese et al., 1974
Distance from top of pile to top of layer = 96.000 in
Distance from top of pile to bottom of layer = 168.000 in
p-y subgrade modulus k for top of soil layer = 32.500 lbs/in**3
p-y subgrade modulus k for bottom of layer = 32.500 lbs/in**3

Layer 4 is sand, p-y criteria by Reese et al., 1974
Distance from top of pile to top of layer = 168.000 in
Distance from top of pile to bottom of layer = 228.000 in
p-y subgrade modulus k for top of soil layer = 24.500 lbs/in**3
p-y subgrade modulus k for bottom of layer = 24.500 lbs/in**3

Layer 5 is stiff clay with water-induced erosion
Distance from top of pile to top of layer = 228.000 in
Distance from top of pile to bottom of layer = 720.000 in
p-y subgrade modulus k for top of soil layer = 272.000 lbs/in**3
p-y subgrade modulus k for bottom of layer = 272.000 lbs/in**3

Layer 6 is silt with cohesion and friction
Distance from top of pile to top of layer = 720.000 in
Distance from top of pile to bottom of layer = 864.000 in
p-y subgrade modulus k for top of soil layer = 1451.800 lbs/in**3

p-y subgrade modulus k for bottom of layer = 1451.800 lbs/in**3

Layer 7 is sand, p-y criteria by Reese et al., 1974
Distance from top of pile to top of layer = 864.000 in
Distance from top of pile to bottom of layer = 960.000 in
p-y subgrade modulus k for top of soil layer = 56.000 lbs/in**3
p-y subgrade modulus k for bottom of layer = 56.000 lbs/in**3

Layer 8 is sand, p-y criteria by Reese et al., 1974
Distance from top of pile to top of layer = 960.000 in
Distance from top of pile to bottom of layer = 1200.000 in
p-y subgrade modulus k for top of soil layer = 156.800 lbs/in**3
p-y subgrade modulus k for bottom of layer = 156.800 lbs/in**3

(Depth of lowest layer extends 480.00 in below pile tip)

---

Effective Unit Weight of Soil vs. Depth

---

Effective unit weight of soil with depth defined using 16 points

| Point No. | Depth X in | Eff. Unit Weight lbs/in**3 |
|---|---|---|
| 1 | .00 | .07025 |
| 2 | 60.00 | .07025 |
| 3 | 60.00 | .03414 |
| 4 | 96.00 | .03414 |
| 5 | 96.00 | .03038 |
| 6 | 168.00 | .03038 |
| 7 | 168.00 | .02876 |
| 8 | 228.00 | .02876 |
| 9 | 228.00 | .03275 |
| 10 | 720.00 | .03275 |
| 11 | 720.00 | .04277 |
| 12 | 864.00 | .04277 |
| 13 | 864.00 | .03339 |
| 14 | 960.00 | .03339 |
| 15 | 960.00 | .03918 |
| 16 | 1200.00 | .03918 |

---

Shear Strength of Soils

---

Shear strength parameters with depth defined using 16 points

| Point No. | Depth X in | Cohesion c lbs/in**2 | Angle of Friction Deg. | k_rm | E50 or % | RQD |
|---|---|---|---|---|---|---|
| 1 | .000 | .00000 | 36.40 | ------ | ------ | |
| 2 | 60.000 | .00000 | 36.40 | ------ | ------ | |
| 3 | 60.000 | .00000 | 36.40 | ------ | ------ | |
| 4 | 96.000 | .00000 | 36.40 | ------ | ------ | |
| 5 | 96.000 | .00000 | 33.00 | ------ | ------ | |
| 6 | 168.000 | .00000 | 33.00 | ------ | ------ | |
| 7 | 168.000 | .00000 | 31.80 | ------ | ------ | |
| 8 | 228.000 | .00000 | 31.80 | ------ | ------ | |
| 9 | 228.000 | 3.98000 | .00 | .92000 | .0 | |
| 10 | 720.000 | 3.98000 | .00 | .92000 | .0 | |
| 11 | 720.000 | 13.70000 | 35.30 | .43000 | .0 | |
| 12 | 864.000 | 13.70000 | 35.30 | .43000 | .0 | |
| 13 | 864.000 | .00000 | 35.60 | ------ | ------ | |
| 14 | 960.000 | .00000 | 35.60 | ------ | ------ | |
| 15 | 960.000 | .00000 | 40.00 | ------ | ------ | |
| 16 | 1200.000 | .00000 | 40.00 | ------ | ------ | |

Notes:

(1) Cohesion = uniaxial compressive strength for rock materials.
(2) Values of E50 are reported for clay strata.
(3) Default values will be generated for E50 when input values are 0.
(4) RQD and k_rm are reported only for weak rock strata.

---

Loading Type

---

Static loading criteria was used for computation of p-y curves.

Output_steel_concrete_pile_L60'_new

---

Pile-head Loading and Pile-head Fixity Conditions

---

Number of loads specified = 1

Load Case Number 1

Pile-head boundary conditions are Shear and Moment (BC Type 1)
Shear force at pile head = 25000.000 lbs
Bending moment at pile head = .000 in-lbs
Axial load at pile head = 100000.000 lbs

(Zero moment at pile head for this load indicates a free-head condition)

---

Computed Values of Load Distribution and Deflection
for Lateral Loading for Load Case Number 1

---

Pile-head boundary conditions are Shear and Moment (BC Type 1)
Specified shear force at pile head = 25000.000 lbs
Specified moment at pile head = .000 in-lbs
Specified axial load at pile head = 100000.000 lbs

(Zero moment for this load indicates free-head conditions)

| Depth X in | Deflect. y in | Moment M lbs-in | Shear V lbs | Slope S Rad. | Total Stress lbs/in**2 | Soil Res. p lbs/in | Es*h F/L lbs/in |
|---|---|---|---|---|---|---|---|
| 0.000 | .194858 | -4.4703E-07 | 25000.0000 | -.0018010 | 2347.4178 | 0.0000 | 0.0000 |
| 7.200 | .181891 | 181297. | 24747.9795 | -.0017955 | 2700.0495 | -70.0057 | 2771.1168 |
| 14.400 | .169002 | 358956. | 23951.1962 | -.0017792 | 3045.6070 | -151.3230 | 6446.8082 |
| 21.600 | .156270 | 528756. | 22583.4990 | -.0017524 | 3375.8760 | -228.5929 | 10532.2241 |
| 28.800 | .143767 | 686682. | 20703.0247 | -.0017158 | 3683.0510 | -293.7611 | 14711.8509 |
| 36.000 | .131563 | 829350. | 18413.1549 | -.0016700 | 3960.5476 | -342.3139 | 18733.7139 |
| 43.200 | .119719 | 954237. | 15847.9495 | -.0016162 | 4203.4580 | -370.2432 | 22266.7390 |
| 50.400 | .108290 | 1059888. | 13147.7555 | -.0015554 | 4408.9556 | -379.8107 | 25252.9382 |
| 57.600 | .097321 | 1145804. | 10418.7617 | -.0014888 | 4576.0667 | -378.2431 | 27983.0586 |
| 64.800 | .086851 | 1212062. | 7802.7509 | -.0014176 | 4704.9421 | -348.4265 | 28884.7913 |
| 72.000 | .076907 | 1260205. | 5276.1774 | -.0013430 | 4798.5827 | -353.3994 | 33084.9971 |
| 79.200 | .067511 | 1289973. | 2738.6625 | -.0012661 | 4856.4829 | -351.4658 | 37483.4281 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 86.400 | .058676 | 1301465. | 231.8909 | -.0011878 | 4878.8353 | -344.8596 | 42316.9940 |
| 93.600 | .050406 | 1295023. | -2163.9230 | -.0011095 | 4866.3049 | -320.6442 | 45800.6420 |
| 100.800 | .042699 | 1271902. | -3896.5760 | -.0010320 | 4821.3340 | -160.6482 | 27088.6094 |
| 108.000 | .035545 | 1240398. | -4986.2900 | -.0009562 | 4760.0572 | -142.0501 | 28773.4094 |
| 115.200 | .028930 | 1201476. | -5938.2543 | -.0008825 | 4684.3524 | -122.3844 | 30458.2094 |
| 122.400 | .022838 | 1156158. | -6745.8730 | -.0008113 | 4596.2058 | -101.9541 | 32143.0094 |
| 129.600 | .017247 | 1105504. | -7404.6275 | -.0007431 | 4497.6813 | -81.0332 | 33827.8094 |
| 136.800 | .012138 | 1050601. | -7911.8647 | -.0006780 | 4390.8926 | -59.8660 | 35512.6094 |
| 144.000 | .007484 | 992550. | -8266.5808 | -.0006163 | 4277.9788 | -38.6663 | 37197.4094 |
| 151.200 | .003262 | 932450. | -8469.2059 | -.0005582 | 4161.0823 | -17.6185 | 38882.2094 |
| 158.400 | -.000554 | 871397. | -8521.3941 | -.0005038 | 4042.3304 | 3.1218 | 40567.0094 |
| 165.600 | -.003992 | 810468. | -8425.8233 | -.0004530 | 3923.8197 | 23.4257 | 42251.8094 |
| 172.800 | -.007077 | 750717. | -8216.4014 | -.0004059 | 3807.6025 | 34.7471 | 35348.5482 |
| 180.000 | -.009837 | 692736. | -7911.2068 | -.0003623 | 3694.8254 | 50.0292 | 36618.6282 |
| 187.200 | -.012295 | 637318. | -7498.1800 | -.0003222 | 3587.0343 | 64.7005 | 37888.7082 |
| 194.400 | -.014476 | 585226. | -6981.8213 | -.0002853 | 3485.7131 | 78.7325 | 39158.7882 |
| 201.600 | -.016403 | 537190. | -6366.8030 | -.0002514 | 3392.2812 | 92.1059 | 40428.8682 |
| 208.800 | -.018097 | 493906. | -5657.9169 | -.0002203 | 3308.0911 | 104.8069 | 41698.9482 |
| 216.000 | -.019575 | 456034. | -4860.0444 | -.0001916 | 3234.4270 | 116.8243 | 42969.0282 |
| 223.200 | -.020856 | 424197. | -3978.1526 | -.0001651 | 3172.5040 | 128.1456 | 44239.1082 |
| 230.400 | -.021952 | 398986. | -3468.1347 | -.0001402 | 3123.4662 | 13.5260 | 4436.3399 |
| 237.600 | -.022875 | 374458. | -3369.7345 | -.0001169 | 3075.7586 | 13.8074 | 4345.9460 |
| 244.800 | -.023635 | 350630. | -3269.5021 | -9.4979E-05 | 3029.4115 | 14.0349 | 4275.5073 |
| 252.000 | -.024243 | 327514. | -3167.8050 | -7.4512E-05 | 2984.4499 | 14.2142 | 4221.5937 |
| 259.200 | -.024708 | 305121. | -3064.9736 | -5.5418E-05 | 2940.8939 | 14.3501 | 4181.6640 |
| 266.400 | -.025041 | 283458. | -2961.3064 | -3.7653E-05 | 2898.7591 | 14.4464 | 4153.8026 |
| 273.600 | -.025250 | 262532. | -2857.0752 | -2.1174E-05 | 2858.0569 | 14.5067 | 4136.5459 |
| 280.800 | -.025346 | 242347. | -2752.5280 | -5.9361E-06 | 2818.7952 | 14.5342 | 4128.7656 |
| 288.000 | -.025336 | 222904. | -2647.8921 | 8.1060E-06 | 2780.9786 | 14.5314 | 4129.5869 |
| 295.200 | -.025229 | 204206. | -2543.3766 | 2.0997E-05 | 2744.6084 | 14.5007 | 4138.3321 |
| 302.400 | -.025033 | 186250. | -2439.1738 | 3.2782E-05 | 2709.6830 | 14.4445 | 4154.4786 |
| 309.600 | -.024757 | 169034. | -2335.4613 | 4.3505E-05 | 2676.1984 | 14.3645 | 4177.6292 |
| 316.800 | -.024407 | 152556. | -2232.4033 | 5.3211E-05 | 2644.1478 | 14.2627 | 4207.4896 |
| 324.000 | -.023991 | 136811. | -2130.1514 | 6.1945E-05 | 2613.5225 | 14.1406 | 4243.8522 |
| 331.200 | -.023515 | 121793. | -2028.8461 | 6.9750E-05 | 2584.3114 | 13.9998 | 4286.5838 |
| 338.400 | -.022986 | 107495. | -1928.6174 | 7.6670E-05 | 2556.5017 | 13.8415 | 4335.6164 |
| 345.600 | -.022411 | 93910.4153 | -1829.5857 | 8.2749E-05 | 2530.0785 | 13.6673 | 4390.9408 |
| 352.800 | -.021795 | 81030.0343 | -1731.8622 | 8.8029E-05 | 2505.0255 | 13.4781 | 4452.6020 |
| 360.000 | -.021143 | 68844.8379 | -1635.5501 | 9.2552E-05 | 2481.3246 | 13.2752 | 4520.6960 |
| 367.200 | -.020462 | 57344.8381 | -1540.7444 | 9.6361E-05 | 2458.9565 | 13.0597 | 4595.3688 |
| 374.400 | -.019756 | 46519.3590 | -1447.5330 | 9.9496E-05 | 2437.9004 | 12.8324 | 4676.8154 |
| 381.600 | -.019029 | 36357.0882 | -1355.9971 | .0001020 | 2418.1343 | 12.5943 | 4765.2808 |
| 388.800 | -.018287 | 26846.1252 | -1266.2110 | .0001039 | 2399.6350 | 12.3463 | 4861.0622 |
| 396.000 | -.017533 | 17974.0267 | -1178.2434 | .0001053 | 2382.3783 | 12.0892 | 4964.5116 |
| 403.200 | -.016771 | 9727.8496 | -1092.1570 | .0001061 | 2366.3390 | 11.8237 | 5076.0402 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 410.400 | -.016005 | 2094.1906 | -1008.0094 | .0001065 | 2351.4912 | 11.5506 | 5196.1244 |
| 417.600 | -.015238 | -4940.7752 | -925.8531 | .0001064 | 2357.0279 | 11.2706 | 5325.3125 |
| 424.800 | -.014473 | -11391.2594 | -845.7359 | .0001059 | 2369.5744 | 10.9842 | 5464.2341 |
| 432.000 | -.013714 | -17271.8273 | -767.7012 | .0001050 | 2381.0124 | 10.6921 | 5613.6117 |
| 439.200 | -.012961 | -22597.3663 | -691.7885 | .0001038 | 2391.3709 | 10.3948 | 5774.2745 |
| 446.400 | -.012219 | -27383.0578 | -618.0333 | .0001023 | 2400.6793 | 10.0928 | 5947.1765 |
| 453.600 | -.011488 | -31644.3508 | -546.4681 | .0001005 | 2408.9678 | 9.7865 | 6133.4191 |
| 460.800 | -.010771 | -35396.9377 | -477.1220 | 9.8490E-05 | 2416.2667 | 9.4763 | 6334.2788 |
| 468.000 | -.010070 | -38656.7329 | -410.0215 | 9.6255E-05 | 2422.6072 | 9.1627 | 6551.2436 |
| 475.200 | -.009385 | -41439.8539 | -345.1908 | 9.3837E-05 | 2428.0205 | 8.8458 | 6786.0594 |
| 482.400 | -.008719 | -43762.6055 | -282.6521 | 9.1266E-05 | 2432.5384 | 8.5260 | 7040.7899 |
| 489.600 | -.008071 | -45641.4670 | -222.4264 | 8.8567E-05 | 2436.1929 | 8.2034 | 7317.8959 |
| 496.800 | -.007443 | -47093.0826 | -164.5336 | 8.5768E-05 | 2439.0163 | 7.8780 | 7620.3414 |
| 504.000 | -.006836 | -48134.2565 | -108.9932 | 8.2894E-05 | 2441.0415 | 7.5499 | 7951.7359 |
| 511.200 | -.006250 | -48781.9527 | -55.8255 | 7.9969E-05 | 2442.3013 | 7.2189 | 8316.5329 |
| 518.400 | -.005685 | -49053.2992 | -5.0517 | 7.7016E-05 | 2442.8291 | 6.8849 | 8720.3066 |
| 525.600 | -.005141 | -48965.6006 | 43.3045 | 7.4058E-05 | 2442.6585 | 6.5474 | 9170.1509 |
| 532.800 | -.004618 | -48536.3570 | 89.2161 | 7.1115E-05 | 2441.8236 | 6.2058 | 9675.2676 |
| 540.000 | -.004117 | -47783.2950 | 132.6505 | 6.8208E-05 | 2440.3588 | 5.8593 | 10247.8587 |
| 547.200 | -.003636 | -46724.4096 | 173.5682 | 6.5356E-05 | 2438.2993 | 5.5067 | 10904.5294 |
| 554.400 | -.003176 | -45378.0253 | 211.9194 | 6.2576E-05 | 2435.6805 | 5.1464 | 11668.5851 |
| 561.600 | -.002735 | -43762.8789 | 247.6406 | 5.9885E-05 | 2432.5389 | 4.7761 | 12573.9832 |
| 568.800 | -.002313 | -41898.2360 | 280.6483 | 5.7300E-05 | 2428.9121 | 4.3927 | 13672.5628 |
| 576.000 | -.001910 | -39804.0552 | 310.8312 | 5.4834E-05 | 2424.8388 | 3.9915 | 15048.3360 |
| 583.200 | -.001524 | -37501.2272 | 338.0358 | 5.2501E-05 | 2420.3597 | 3.5654 | 16848.7775 |
| 590.400 | -.001154 | -35011.9407 | 362.0414 | 5.0312E-05 | 2415.5179 | 3.1029 | 19363.6984 |
| 597.600 | -.000799 | -32360.2804 | 382.5094 | 4.8279E-05 | 2410.3603 | 2.5827 | 23270.6503 |
| 604.800 | -.000459 | -29573.3261 | 398.8527 | 4.6409E-05 | 2404.9395 | 1.9571 | 30731.3928 |
| 612.000 | -.000131 | -26683.6313 | 409.6689 | 4.4712E-05 | 2399.3189 | 1.0474 | 57655.7136 |
| 619.200 | .000185 | -23738.4789 | 408.9728 | 4.3190E-05 | 2393.5904 | -1.2408 | 48204.9333 |
| 626.400 | .000491 | -20856.6162 | 397.2254 | 4.1844E-05 | 2387.9850 | -2.0224 | 29648.3418 |
| 633.600 | .000788 | -18078.6879 | 380.7207 | 4.0669E-05 | 2382.5818 | -2.5623 | 23415.1967 |
| 640.800 | .001077 | -15432.8010 | 360.7117 | 3.9657E-05 | 2377.4354 | -2.9958 | 20032.0453 |
| 648.000 | .001359 | -12941.5451 | 337.8101 | 3.8801E-05 | 2372.5898 | -3.3658 | 17832.7945 |
| 655.200 | .001635 | -10624.2088 | 312.3999 | 3.8089E-05 | 2368.0825 | -3.6926 | 16256.1744 |
| 662.400 | .001907 | -8497.8358 | 284.7498 | 3.7512E-05 | 2363.9466 | -3.9880 | 15053.4311 |
| 669.600 | .002176 | -6577.8291 | 255.0598 | 3.7057E-05 | 2360.2121 | -4.2593 | 14095.3586 |
| 676.800 | .002441 | -4878.3375 | 223.4843 | 3.6712E-05 | 2356.9065 | -4.5117 | 13307.4391 |
| 684.000 | .002704 | -3412.5197 | 190.1464 | 3.6461E-05 | 2354.0554 | -4.7488 | 12643.3738 |
| 691.200 | .002966 | -2192.7334 | 155.1461 | 3.6292E-05 | 2351.6828 | -4.9735 | 12072.7527 |
| 698.400 | .003227 | -1230.6760 | 118.5663 | 3.6189E-05 | 2349.8116 | -5.1876 | 11574.7261 |
| 705.600 | .003487 | -537.4904 | 80.4768 | 3.6135E-05 | 2348.4633 | -5.3928 | 11134.5046 |
| 712.800 | .003747 | -123.8457 | 40.9373 | 3.6116E-05 | 2347.6587 | -5.5904 | 10741.3062 |
| 720.000 | .004007 | 0.0000 | 0.0000 | 3.6112E-05 | 2347.4178 | -5.7811 | 5193.5462 |

Output_steel_concrete_pile_L60'_new

Output Verification:

Computed forces and moments are within specified convergence limits.

Output Summary for Load Case No. 1:

Pile-head deflection = .19485824 in
Computed slope at pile head = -.00180102
Maximum bending moment = 1301465. lbs-in
Maximum shear force = 25000.00000 lbs
Depth of maximum bending moment = 86.40000000 in
Depth of maximum shear force = 0.00000 in
Number of iterations = 13
Number of zero deflection points = 2

---

Summary of Pile Response(s)

---

Definition of Symbols for Pile-Head Loading Conditions:

Type 1 = Shear and Moment, y = pile-head displacment in
Type 2 = Shear and Slope, M = Pile-head Moment lbs-in
Type 3 = Shear and Rot. Stiffness, V = Pile-head Shear Force lbs
Type 4 = Deflection and Moment, S = Pile-head Slope, radians
Type 5 = Deflection and Slope, R = Rot. Stiffness of Pile-head in-lbs/rad

| Load Type | Pile-Head Condition 1 | Pile-Head Condition 2 | Axial Load lbs | Pile-Head Deflection in | Maximum Moment in-lbs | Maximum Shear lbs |
|---|---|---|---|---|---|---|
| 1 | V= | 25000. | M= | 0.000 | 100000.0000 | .1948582 | 1301465. | 25000.0000 |

The analysis ended normally.

# APPENDIX G-8: STEEL PIPE 75- FOOT LONG PILE

Output_steel_concrete_pile_L75'_new

==========

LPILE Plus for Windows, Version 5.0 (5.0.39)

Analysis of Individual Piles and Drilled Shafts
Subjected to Lateral Loading Using the p-y Method

(c) 1985-2007 by Ensoft, Inc.
All Rights Reserved

==========

This program is licensed to:

Charbel Khoury
KMA Consulting Engineers

Path to file locations: D:\charbel files\KMA Consulting Engineers CO\Job#1121_Laytons Lake\Pile Analysis\Lpile\
Name of input data file: Steel_concrete_pile_L75'_new.lpd
Name of output file: Steel_concrete_pile_L75'_new.lpo
Name of plot output file: Steel_concrete_pile_L75'_new.lpp
Name of runtime file: Steel_concrete_pile_L75'_new.lpr

---

Time and Date of Analysis

---

Date: April 21, 2011 Time: 11:04:04

---

Problem Title

---

New LPILE Plus 5.0 Data File

---

Program Options

---

Output_steel_concrete_pile_L75'_new

Units Used in Computations - US Customary Units: Inches, Pounds

Basic Program Options:

Analysis Type 1:
- Computation of Lateral Pile Response Using User-specified Constant EI

Computation Options:
- Only internally-generated p-y curves used in analysis
- Analysis does not use p-y multipliers (individual pile or shaft action only)
- Analysis assumes no shear resistance at pile tip
- Analysis for fixed-length pile or shaft only
- No computation of foundation stiffness matrix elements
- Output pile response for full length of pile
- Analysis assumes no soil movements acting on pile
- No additional p-y curves to be computed at user-specified depths

Solution Control Parameters:
- Number of pile increments = 100
- Maximum number of iterations allowed = 100
- Deflection tolerance for convergence = 1.0000E-05 in
- Maximum allowable deflection = 1.0000E+02 in

Printing Options:
- Values of pile-head deflection, bending moment, shear force, and soil reaction are printed for full length of pile.
- Printing Increment (spacing of output points) = 1

---

Pile Structural Properties and Geometry

---

Pile Length = 900.00 in

Depth of ground surface below top of pile = .00 in

Slope angle of ground surface = .00 deg.

Structural properties of pile defined using 2 points

| Point | Depth X | Pile Diameter | Moment of Inertia | Pile Area | Modulus of Elasticity |
|---|---|---|---|---|---|
| | in | in | in**4 | Sq.in | lbs/Sq.in |

| | | | | | |
|---|---|---|---|---|---|
| 1 | 0.0000 | 16.00000000 | 4113.0000 | 42.6000 | 29000000. |
| 2 | 900.0000 | 16.00000000 | 4113.0000 | 42.6000 | 29000000. |

---

Soil and Rock Layering Information

---

The soil profile is modelled using 8 layers

Layer 1 is sand, p-y criteria by Reese et al., 1974
Distance from top of pile to top of layer = .000 in
Distance from top of pile to bottom of layer = 60.000 in
p-y subgrade modulus k for top of soil layer = 107.700 lbs/in**3
p-y subgrade modulus k for bottom of layer = 107.700 lbs/in**3

Layer 2 is sand, p-y criteria by Reese et al., 1974
Distance from top of pile to top of layer = 60.000 in
Distance from top of pile to bottom of layer = 96.000 in
p-y subgrade modulus k for top of soil layer = 67.200 lbs/in**3
p-y subgrade modulus k for bottom of layer = 67.200 lbs/in**3

Layer 3 is sand, p-y criteria by Reese et al., 1974
Distance from top of pile to top of layer = 96.000 in
Distance from top of pile to bottom of layer = 168.000 in
p-y subgrade modulus k for top of soil layer = 32.500 lbs/in**3
p-y subgrade modulus k for bottom of layer = 32.500 lbs/in**3

Layer 4 is sand, p-y criteria by Reese et al., 1974
Distance from top of pile to top of layer = 168.000 in
Distance from top of pile to bottom of layer = 228.000 in
p-y subgrade modulus k for top of soil layer = 24.500 lbs/in**3
p-y subgrade modulus k for bottom of layer = 24.500 lbs/in**3

Layer 5 is stiff clay with water-induced erosion
Distance from top of pile to top of layer = 228.000 in
Distance from top of pile to bottom of layer = 720.000 in
p-y subgrade modulus k for top of soil layer = 272.000 lbs/in**3
p-y subgrade modulus k for bottom of layer = 272.000 lbs/in**3

Layer 6 is silt with cohesion and friction
Distance from top of pile to top of layer = 720.000 in
Distance from top of pile to bottom of layer = 864.000 in
p-y subgrade modulus k for top of soil layer = 1451.800 lbs/in**3

p-y subgrade modulus k for bottom of layer = 1451.800 lbs/in**3

Layer 7 is sand, p-y criteria by Reese et al., 1974
Distance from top of pile to top of layer = 864.000 in
Distance from top of pile to bottom of layer = 960.000 in
p-y subgrade modulus k for top of soil layer = 56.000 lbs/in**3
p-y subgrade modulus k for bottom of layer = 56.000 lbs/in**3

Layer 8 is sand, p-y criteria by Reese et al., 1974
Distance from top of pile to top of layer = 960.000 in
Distance from top of pile to bottom of layer = 1200.000 in
p-y subgrade modulus k for top of soil layer = 156.800 lbs/in**3
p-y subgrade modulus k for bottom of layer = 156.800 lbs/in**3

(Depth of lowest layer extends 300.00 in below pile tip)

---

Effective Unit Weight of Soil vs. Depth

---

Effective unit weight of soil with depth defined using 16 points

| Point No. | Depth X in | Eff. Unit Weight lbs/in**3 |
|---|---|---|
| 1 | .00 | .07025 |
| 2 | 60.00 | .07025 |
| 3 | 60.00 | .03414 |
| 4 | 96.00 | .03414 |
| 5 | 96.00 | .03038 |
| 6 | 168.00 | .03038 |
| 7 | 168.00 | .02876 |
| 8 | 228.00 | .02876 |
| 9 | 228.00 | .03275 |
| 10 | 720.00 | .03275 |
| 11 | 720.00 | .04277 |
| 12 | 864.00 | .04277 |
| 13 | 864.00 | .03339 |
| 14 | 960.00 | .03339 |
| 15 | 960.00 | .03918 |
| 16 | 1200.00 | .03918 |

---

Shear Strength of Soils

---

Shear strength parameters with depth defined using 16 points

| Point No. | Depth X in | Cohesion c lbs/in**2 | Angle of Friction Deg. | k_rm | E50 or % | RQD |
|---|---|---|---|---|---|---|
| 1 | .000 | .00000 | 36.40 | ------ | ------ | |
| 2 | 60.000 | .00000 | 36.40 | ------ | ------ | |
| 3 | 60.000 | .00000 | 36.40 | ------ | ------ | |
| 4 | 96.000 | .00000 | 36.40 | ------ | ------ | |
| 5 | 96.000 | .00000 | 33.00 | ------ | ------ | |
| 6 | 168.000 | .00000 | 33.00 | ------ | ------ | |
| 7 | 168.000 | .00000 | 31.80 | ------ | ------ | |
| 8 | 228.000 | .00000 | 31.80 | ------ | ------ | |
| 9 | 228.000 | 3.98000 | .00 | .92000 | .0 | |
| 10 | 720.000 | 3.98000 | .00 | .92000 | .0 | |
| 11 | 720.000 | 13.70000 | 35.30 | .43000 | .0 | |
| 12 | 864.000 | 13.70000 | 35.30 | .43000 | .0 | |
| 13 | 864.000 | .00000 | 35.60 | ------ | ------ | |
| 14 | 960.000 | .00000 | 35.60 | ------ | ------ | |
| 15 | 960.000 | .00000 | 40.00 | ------ | ------ | |
| 16 | 1200.000 | .00000 | 40.00 | ------ | ------ | |

Notes:

(1) Cohesion = uniaxial compressive strength for rock materials.
(2) Values of E50 are reported for clay strata.
(3) Default values will be generated for E50 when input values are 0.
(4) RQD and k_rm are reported only for weak rock strata.

---

Loading Type

---

Static loading criteria was used for computation of p-y curves.

Output_steel_concrete_pile_L75'_new

---

Pile-head Loading and Pile-head Fixity Conditions

---

Number of loads specified = 1

Load Case Number 1

Pile-head boundary conditions are Shear and Moment (BC Type 1)
Shear force at pile head = 25000.000 lbs
Bending moment at pile head = .000 in-lbs
Axial load at pile head = 100000.000 lbs

(Zero moment at pile head for this load indicates a free-head condition)

---

Computed Values of Load Distribution and Deflection
for Lateral Loading for Load Case Number 1

---

Pile-head boundary conditions are Shear and Moment (BC Type 1)
Specified shear force at pile head = 25000.000 lbs
Specified moment at pile head = .000 in-lbs
Specified axial load at pile head = 100000.000 lbs

(Zero moment for this load indicates free-head conditions)

| Depth X in | Deflect. y in | Moment M lbs-in | Shear V lbs | Slope S Rad. | Total Stress lbs/in**2 | Soil Res. p lbs/in | Es*h F/L lbs/in |
|---|---|---|---|---|---|---|---|
| 0.000 | .196603 | 1.6349E-07 | 25000.0000 | -.0018067 | 2347.4178 | 0.0000 | 0.0000 |
| 9.000 | .180342 | 226626. | 24594.3895 | -.0017982 | 2788.2174 | -90.1357 | 4498.2324 |
| 18.000 | .164235 | 445936. | 23325.3532 | -.0017728 | 3214.7862 | -191.8724 | 10514.4923 |
| 27.000 | .148431 | 649674. | 21203.2244 | -.0017315 | 3611.0668 | -279.7118 | 16960.0662 |
| 36.000 | .133069 | 830710. | 18398.2282 | -.0016756 | 3963.1931 | -343.6207 | 23240.5430 |
| 45.000 | .118270 | 983858. | 15163.3443 | -.0016072 | 4261.0726 | -375.2424 | 28554.8614 |
| 54.000 | .104139 | 1106544. | 11742.1520 | -.0015283 | 4499.7030 | -385.0226 | 33274.6608 |
| 63.000 | .090760 | 1197967. | 8433.9920 | -.0014414 | 4677.5272 | -350.1241 | 34719.1089 |
| 72.000 | .078195 | 1260950. | 5271.4158 | -.0013486 | 4800.0313 | -352.6706 | 40591.4188 |
| 81.000 | .066485 | 1295280. | 2093.2082 | -.0012522 | 4866.8060 | -353.5977 | 47865.7794 |
| 90.000 | .055656 | 1300882. | -1019.1463 | -.0011542 | 4877.7005 | -338.0366 | 54663.2614 |
| 99.000 | .045710 | 1279013. | -3302.2517 | -.0010569 | 4835.1657 | -169.3201 | 33338.3127 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 108.000 | .036632 | 1243343. | -4723.0328 | -.0009617 | 4765.7858 | -146.4090 | 35970.8127 |
| 117.000 | .028399 | 1195730. | -5930.0139 | -.0008697 | 4673.1750 | -121.8090 | 38603.3127 |
| 126.000 | .020977 | 1138169. | -6910.6629 | -.0007816 | 4561.2153 | -96.1130 | 41235.8127 |
| 135.000 | .014329 | 1072745. | -7657.4645 | -.0006982 | 4433.9628 | -69.8429 | 43868.3127 |
| 144.000 | .008409 | 1001591. | -8167.2713 | -.0006200 | 4295.5649 | -43.4475 | 46500.8127 |
| 153.000 | .003169 | 926850. | -8440.6444 | -.0005472 | 4150.1895 | -17.3021 | 49133.3127 |
| 162.000 | -.001441 | 850644. | -8481.2070 | -.0004802 | 4001.9659 | 8.2882 | 51765.8127 |
| 171.000 | -.005474 | 775053. | -8323.6429 | -.0004188 | 3854.9356 | 26.7260 | 43944.1751 |
| 180.000 | -.008980 | 701573. | -7997.1575 | -.0003631 | 3712.0136 | 45.8263 | 45928.6751 |
| 189.000 | -.012010 | 631757. | -7503.2249 | -.0003128 | 3576.2189 | 63.9365 | 47913.1751 |
| 198.000 | -.014611 | 567078. | -6850.9913 | -.0002676 | 3450.4139 | 81.0043 | 49897.6751 |
| 207.000 | -.016826 | 508921. | -6049.9760 | -.0002270 | 3337.2961 | 96.9991 | 51882.1751 |
| 216.000 | -.018697 | 458587. | -5109.9186 | -.0001905 | 3239.3933 | 111.9026 | 53866.6751 |
| 225.000 | -.020255 | 417286. | -4040.7154 | -.0001574 | 3159.0600 | 125.6982 | 55851.1751 |
| 234.000 | -.021531 | 386137. | -3414.7942 | -.0001271 | 3098.4753 | 13.3954 | 5599.3991 |
| 243.000 | -.022544 | 356048. | -3292.8333 | -9.9138E-05 | 3039.9500 | 13.7070 | 5472.1469 |
| 252.000 | -.023315 | 327045. | -3168.4237 | -7.3367E-05 | 2983.5372 | 13.9396 | 5380.8820 |
| 261.000 | -.023864 | 299149. | -3042.2329 | -4.9742E-05 | 2929.2773 | 14.1028 | 5318.6152 |
| 270.000 | -.024211 | 272374. | -2914.8485 | -2.8180E-05 | 2877.1999 | 14.2048 | 5280.4786 |
| 279.000 | -.024372 | 246732. | -2786.7929 | -8.5954E-06 | 2827.3244 | 14.2520 | 5263.0108 |
| 288.000 | -.024365 | 222227. | -2658.5328 | 9.0971E-06 | 2779.6617 | 14.2502 | 5263.7223 |
| 297.000 | -.024208 | 198862. | -2530.4882 | 2.4984E-05 | 2734.2148 | 14.2042 | 5280.8193 |
| 306.000 | -.023916 | 176634. | -2403.0376 | 3.9150E-05 | 2690.9795 | 14.1182 | 5313.0224 |
| 315.000 | -.023503 | 155537. | -2276.5236 | 5.1682E-05 | 2649.9451 | 13.9960 | 5359.4470 |
| 324.000 | -.022985 | 135563. | -2151.2571 | 6.2664E-05 | 2611.0953 | 13.8410 | 5419.5203 |
| 333.000 | -.022375 | 116701. | -2027.5198 | 7.2182E-05 | 2574.4082 | 13.6562 | 5492.9260 |
| 342.000 | -.021686 | 98937.8991 | -1905.5679 | 8.0317E-05 | 2539.8572 | 13.4443 | 5579.5654 |
| 351.000 | -.020930 | 82256.6354 | -1785.6338 | 8.7153E-05 | 2507.4113 | 13.2078 | 5679.5328 |
| 360.000 | -.020117 | 66639.6150 | -1667.9283 | 9.2771E-05 | 2477.0354 | 12.9490 | 5793.0998 |
| 369.000 | -.019260 | 52066.9384 | -1552.6424 | 9.7249E-05 | 2448.6908 | 12.6701 | 5920.7071 |
| 378.000 | -.018367 | 38517.0030 | -1439.9486 | .0001007 | 2422.3354 | 12.3730 | 6062.9635 |
| 387.000 | -.017448 | 25966.6632 | -1330.0023 | .0001031 | 2397.9244 | 12.0595 | 6220.6493 |
| 396.000 | -.016511 | 14391.3817 | -1222.9430 | .0001046 | 2375.4098 | 11.7314 | 6394.7258 |
| 405.000 | -.015564 | 3765.3694 | -1118.8951 | .0001053 | 2354.7417 | 11.3903 | 6586.3498 |
| 414.000 | -.014615 | -5938.2820 | -1017.9689 | .0001052 | 2358.9681 | 11.0377 | 6796.8937 |
| 423.000 | -.013670 | -14747.4753 | -920.2615 | .0001044 | 2376.1025 | 10.6750 | 7027.9718 |
| 432.000 | -.012735 | -22690.9901 | -825.8576 | .0001030 | 2391.5530 | 10.3036 | 7281.4741 |
| 441.000 | -.011816 | -29798.3708 | -734.8298 | .0001011 | 2405.3772 | 9.9248 | 7559.6087 |
| 450.000 | -.010916 | -36099.8207 | -647.2395 | 9.8566E-05 | 2417.6339 | 9.5397 | 7864.9546 |
| 459.000 | -.010042 | -41626.1007 | -563.1373 | 9.5633E-05 | 2428.3828 | 9.1496 | 8200.5279 |
| 468.000 | -.009195 | -46408.4329 | -482.5637 | 9.2312E-05 | 2437.6847 | 8.7556 | 8569.8640 |
| 477.000 | -.008380 | -50478.4085 | -405.5491 | 8.8657E-05 | 2445.6010 | 8.3587 | 8977.1220 |
| 486.000 | -.007599 | -53867.8994 | -332.1150 | 8.4720E-05 | 2452.1937 | 7.9600 | 9427.2150 |
| 495.000 | -.006855 | -56608.9739 | -262.2734 | 8.0552E-05 | 2457.5253 | 7.5604 | 9925.9773 |
| 504.000 | -.006149 | -58733.8151 | -196.0282 | 7.6200E-05 | 2461.6582 | 7.1608 | 10480.3780 |

Output_steel_concrete_pile_L75'_new

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 513.000 | -.005483 | -60274.6431 | -133.3748 | 7.1711E-05 | 2464.6552 | 6.7622 | 11098.7989 |
| 522.000 | -.004859 | -61263.6398 | -74.3005 | 6.7125E-05 | 2466.5788 | 6.3654 | 11791.3975 |
| 531.000 | -.004275 | -61732.8768 | -18.7851 | 6.2485E-05 | 2467.4915 | 5.9713 | 12570.5902 |
| 540.000 | -.003734 | -61714.2453 | 33.1987 | 5.7828E-05 | 2467.4553 | 5.5807 | 13451.7022 |
| 549.000 | -.003234 | -61239.3894 | 81.6858 | 5.3189E-05 | 2466.5317 | 5.1942 | 14453.8560 |
| 558.000 | -.002776 | -60339.6415 | 126.7174 | 4.8602E-05 | 2464.7816 | 4.8128 | 15601.2093 |
| 567.000 | -.002359 | -59045.9596 | 168.3416 | 4.4098E-05 | 2462.2653 | 4.4370 | 16924.7127 |
| 576.000 | -.001983 | -57388.8685 | 206.6126 | 3.9705E-05 | 2459.0422 | 4.0676 | 18464.6667 |
| 585.000 | -.001645 | -55398.4023 | 241.5904 | 3.5450E-05 | 2455.1706 | 3.7052 | 20274.5405 |
| 594.000 | -.001345 | -53104.0511 | 273.3407 | 3.1357E-05 | 2450.7080 | 3.3504 | 22426.8602 |
| 603.000 | -.001080 | -50534.7111 | 301.9342 | 2.7447E-05 | 2445.7105 | 3.0037 | 25022.6330 |
| 612.000 | -.000850 | -47718.6398 | 327.4458 | 2.3740E-05 | 2440.2331 | 2.6656 | 28207.1343 |
| 621.000 | -.000653 | -44683.4180 | 349.9540 | 2.0254E-05 | 2434.3294 | 2.3363 | 32197.8784 |
| 630.000 | -.000486 | -41455.9238 | 369.5390 | 1.7004E-05 | 2428.0518 | 2.0159 | 37337.8304 |
| 639.000 | -.000347 | -38062.3228 | 386.2799 | 1.4004E-05 | 2421.4510 | 1.7043 | 44206.5321 |
| 648.000 | -.000234 | -34528.0920 | 400.2497 | 1.1265E-05 | 2414.5768 | 1.4001 | 53883.8100 |
| 657.000 | -.000144 | -30878.1055 | 411.5038 | 8.7976E-06 | 2407.4774 | 1.1008 | 68704.4911 |
| 666.000 | -7.55E-05 | -27136.8594 | 420.0511 | 6.6088E-06 | 2400.2005 | .7986358 | 95198.0194 |
| 675.000 | -2.52E-05 | -23329.0811 | 425.7444 | 4.7049E-06 | 2392.7941 | .4665462 | 166375. |
| 684.000 | 9.19E-06 | -19481.9282 | 426.6433 | 3.0897E-06 | 2385.3112 | -.2667903 | 261414. |
| 693.000 | 3.04E-05 | -15655.0623 | 423.1987 | 1.7641E-06 | 2377.8678 | -.4986966 | 147748. |
| 702.000 | 4.09E-05 | -11867.5278 | 418.3391 | 7.2577E-07 | 2370.5008 | -.5811981 | 127769. |
| 711.000 | 4.34E-05 | -8126.2644 | 413.0252 | -2.8547E-08 | 2363.2238 | -.5996820 | 124239. |
| 720.000 | 4.04E-05 | -4433.0234 | 355.0318 | -5.0237E-07 | 2356.0403 | -12.2877 | 2735648. |
| 729.000 | 3.44E-05 | -1734.7880 | 250.6629 | -7.3507E-07 | 2350.7921 | -10.9054 | 2853244. |
| 738.000 | 2.72E-05 | 80.2318 | 161.1941 | -7.9749E-07 | 2347.5739 | -8.9766 | 2970840. |
| 747.000 | 2.00E-05 | 1168.1415 | 89.8472 | -7.5039E-07 | 2349.6899 | -6.8783 | 3088435. |
| 756.000 | 1.37E-05 | 1698.8320 | 36.9544 | -6.4223E-07 | 2350.7222 | -4.8757 | 3206031. |
| 765.000 | 8.48E-06 | 1834.4775 | .9154238 | -5.0893E-07 | 2350.9860 | -3.1330 | 3323627. |
| 774.000 | 4.53E-06 | 1716.2257 | -20.9711 | -3.7497E-07 | 2350.7560 | -1.7307 | 3441223. |
| 783.000 | 1.73E-06 | 1457.6726 | -31.8452 | -2.5523E-07 | 2350.2531 | -.6857964 | 3558819. |
| 792.000 | -6.78E-08 | 1143.4710 | -34.8067 | -1.5709E-07 | 2349.6420 | .0276834 | 3676414. |
| 801.000 | -1.09E-06 | 831.4340 | -32.6081 | -8.2585E-08 | 2349.0350 | .4609086 | 3794010. |
| 810.000 | -1.55E-06 | 556.6742 | -27.4941 | -3.0216E-08 | 2348.5006 | .6755379 | 3911606. |
| 819.000 | -1.64E-06 | 336.5952 | -21.1558 | 3.4848E-09 | 2348.0725 | .7329721 | 4029202. |
| 828.000 | -1.49E-06 | 175.8641 | -14.7648 | 2.2818E-08 | 2347.7599 | .6872544 | 4146798. |
| 837.000 | -1.23E-06 | 70.7886 | -9.0570 | 3.2124E-08 | 2347.5555 | .5811430 | 4264393. |
| 846.000 | -9.13E-07 | 12.7809 | -4.4407 | 3.5277E-08 | 2347.4427 | .4446987 | 4381989. |
| 855.000 | -5.92E-07 | -9.2070 | -1.1087 | 3.5412E-08 | 2347.4357 | .2957318 | 4499585. |
| 864.000 | -2.76E-07 | -7.2401 | .2447304 | 3.4791E-08 | 2347.4319 | .0050391 | 164355. |
| 873.000 | 3.47E-08 | -4.8645 | .2644741 | 3.4335E-08 | 2347.4273 | -.0006516 | 168891. |
| 882.000 | 3.42E-07 | -2.5414 | .2318787 | 3.4055E-08 | 2347.4228 | -.0065918 | 173427. |
| 891.000 | 6.48E-07 | -.7520019 | .1445807 | 3.3931E-08 | 2347.4193 | -.0128077 | 177963. |
| 900.000 | 9.53E-07 | 0.0000 | 0.0000 | 3.3903E-08 | 2347.4178 | -.0193213 | 91249.4689 |

Output_steel_concrete_pile_L75'_new

Output Verification:

Computed forces and moments are within specified convergence limits.

Output Summary for Load Case No. 1:

Pile-head deflection = .19660289 in
Computed slope at pile head = -.00180675
Maximum bending moment = 1300882. lbs-in
Maximum shear force = 25000.00000 lbs
Depth of maximum bending moment = 90.00000000 in
Depth of maximum shear force = 0.00000 in
Number of iterations = 13
Number of zero deflection points = 4

---

Summary of Pile Response(s)

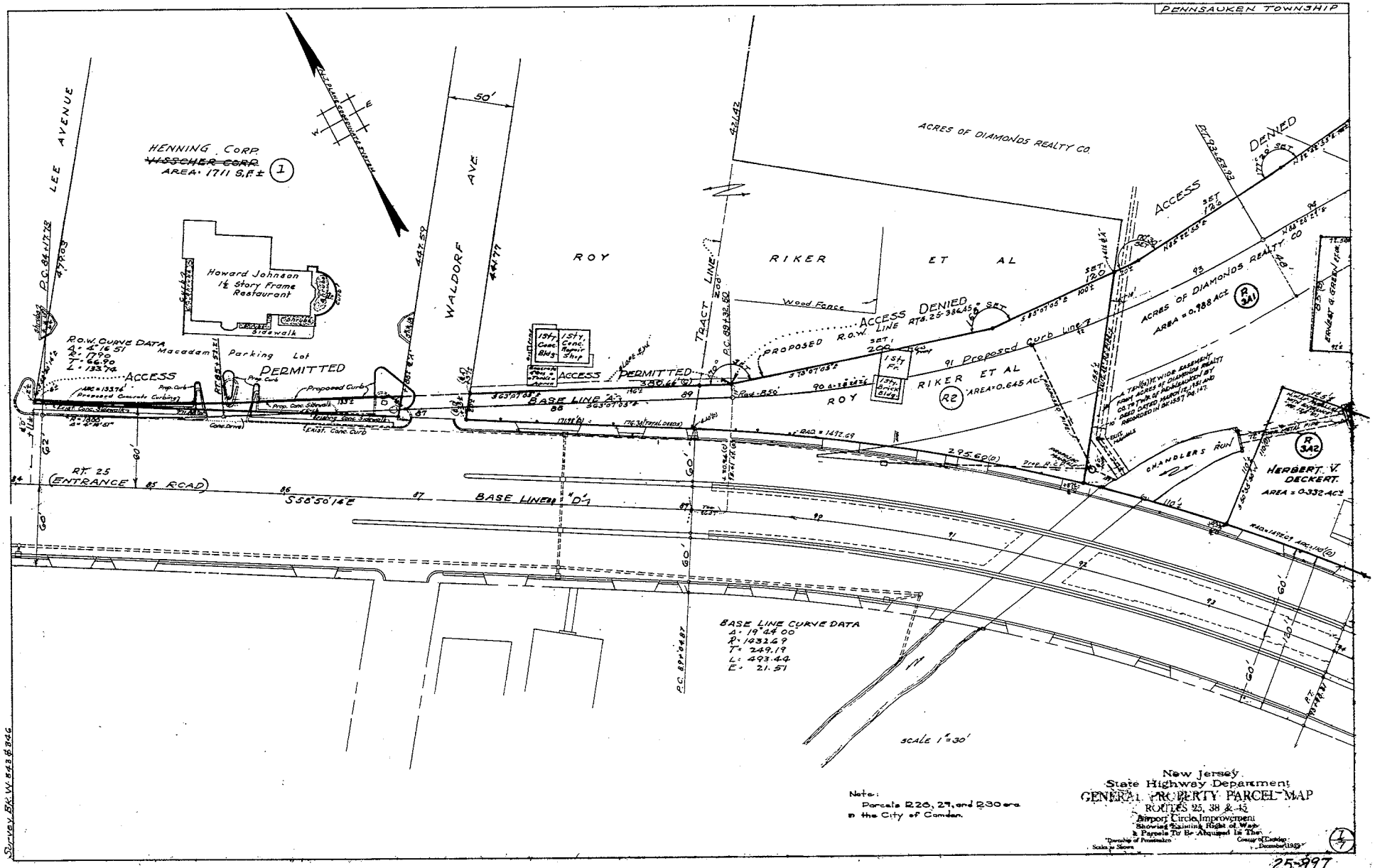
---

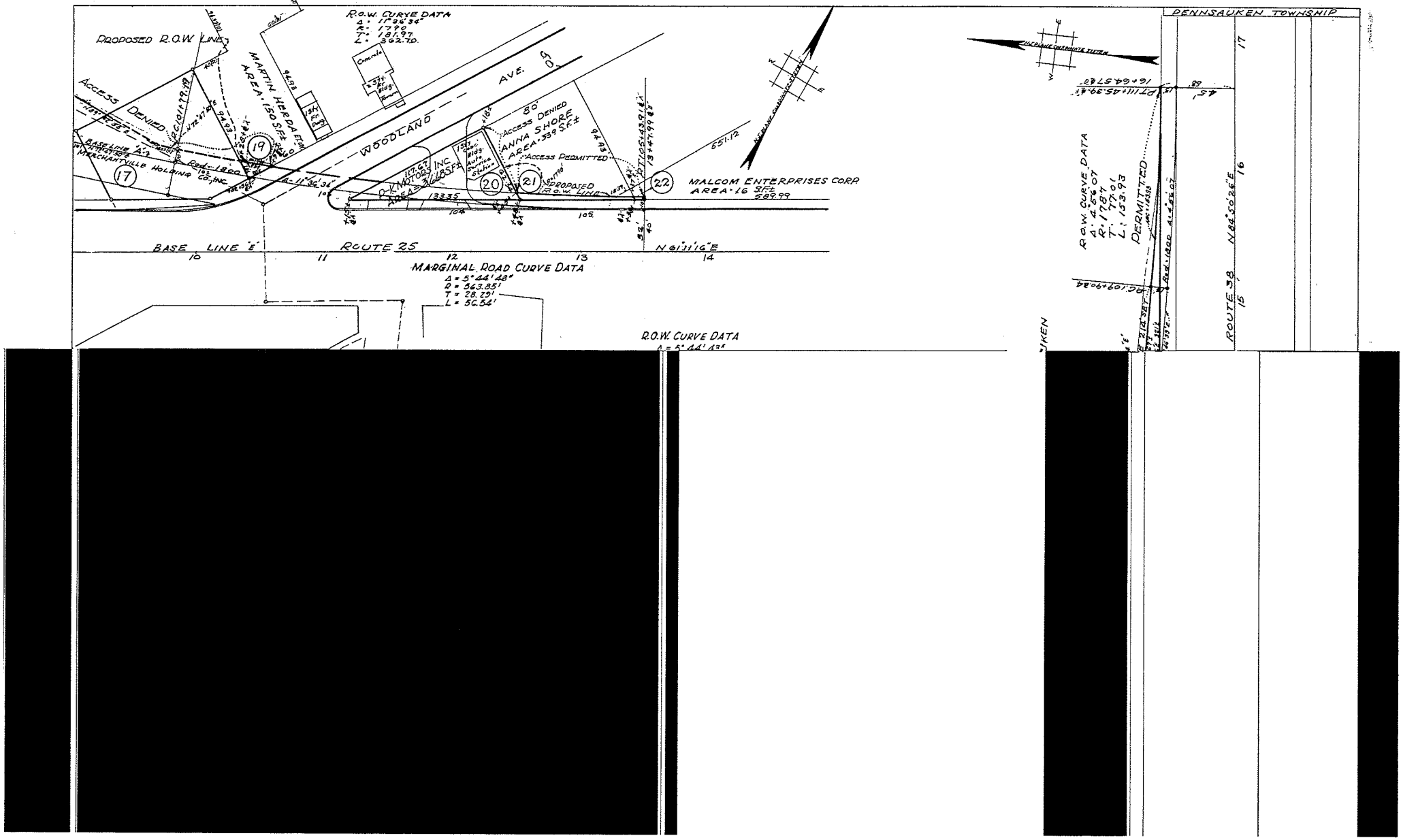
Definition of Symbols for Pile-Head Loading Conditions:

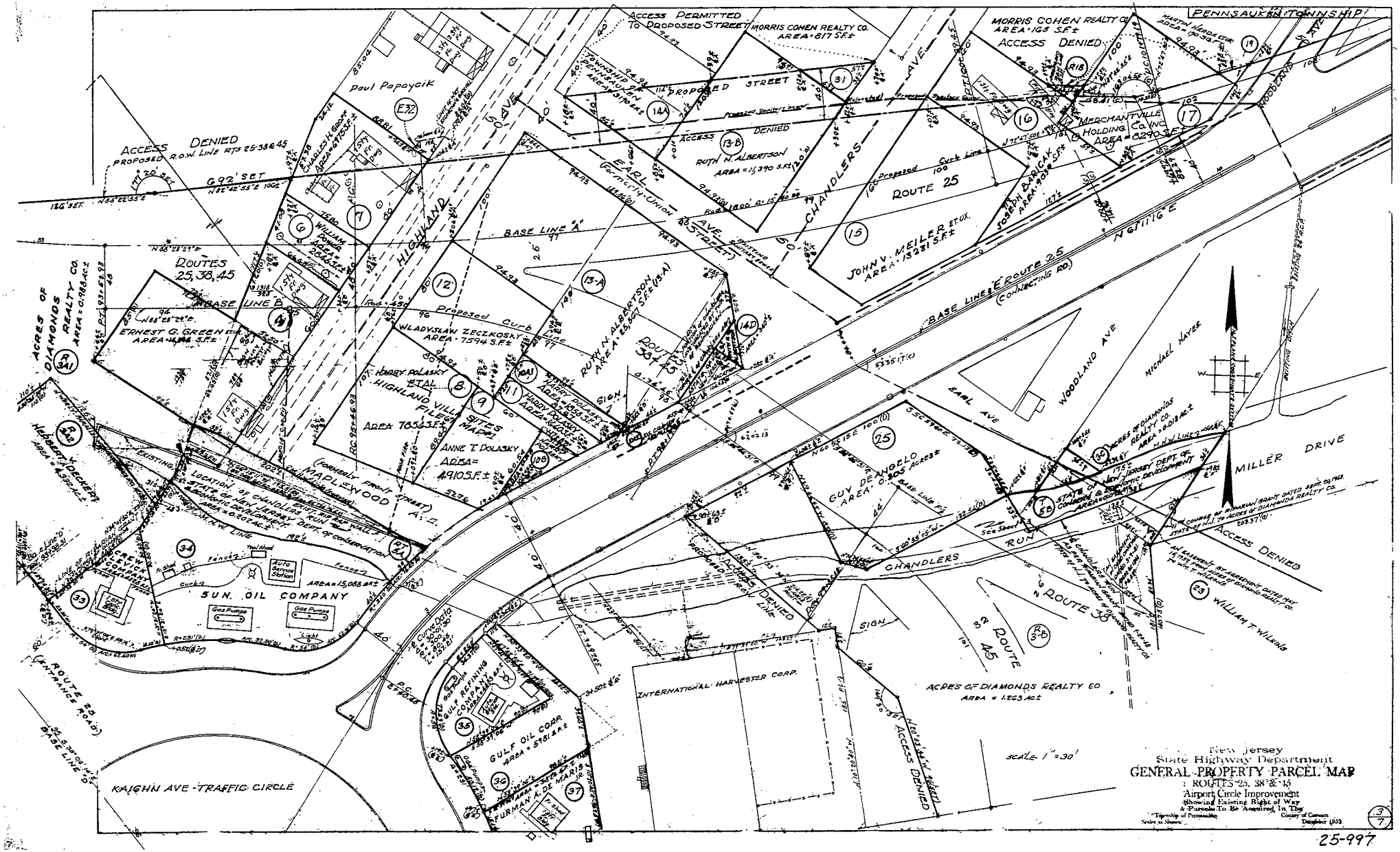
Type 1 = Shear and Moment, y = pile-head displacment in
Type 2 = Shear and Slope, M = Pile-head Moment lbs-in
Type 3 = Shear and Rot. Stiffness, V = Pile-head Shear Force lbs
Type 4 = Deflection and Moment, S = Pile-head Slope, radians
Type 5 = Deflection and Slope, R = Rot. Stiffness of Pile-head in-lbs/rad

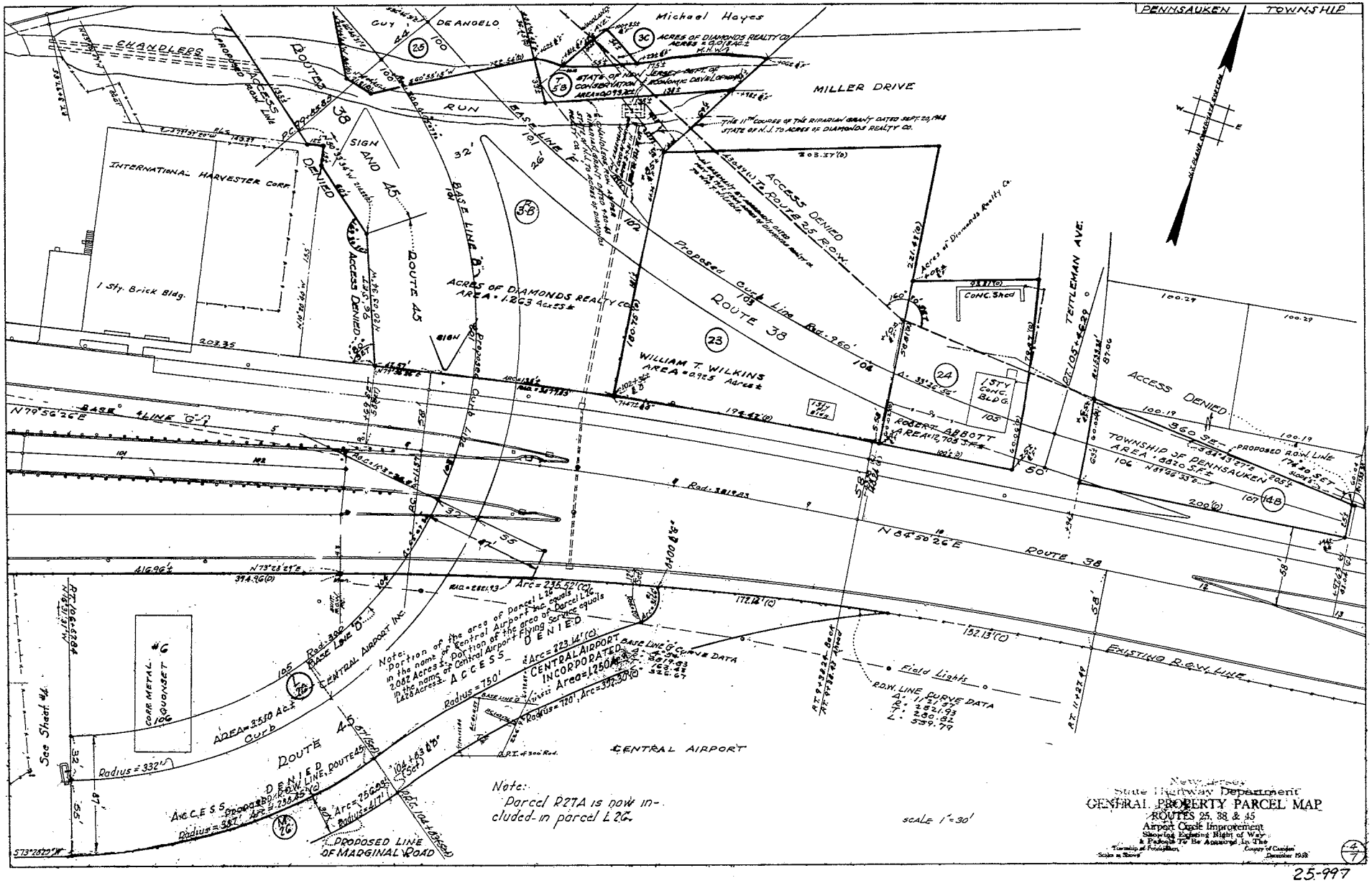
| Load Type | Pile-Head Condition 1 | Pile-Head Condition 2 | Axial Load lbs | Pile-Head Deflection in | Maximum Moment in-lbs | Maximum Shear lbs |
|---|---|---|---|---|---|---|
| 1 | V= 25000. | M= 0.000 | 100000.0000 | .1966029 | 1300882. | 25000.0000 |

The analysis ended normally.

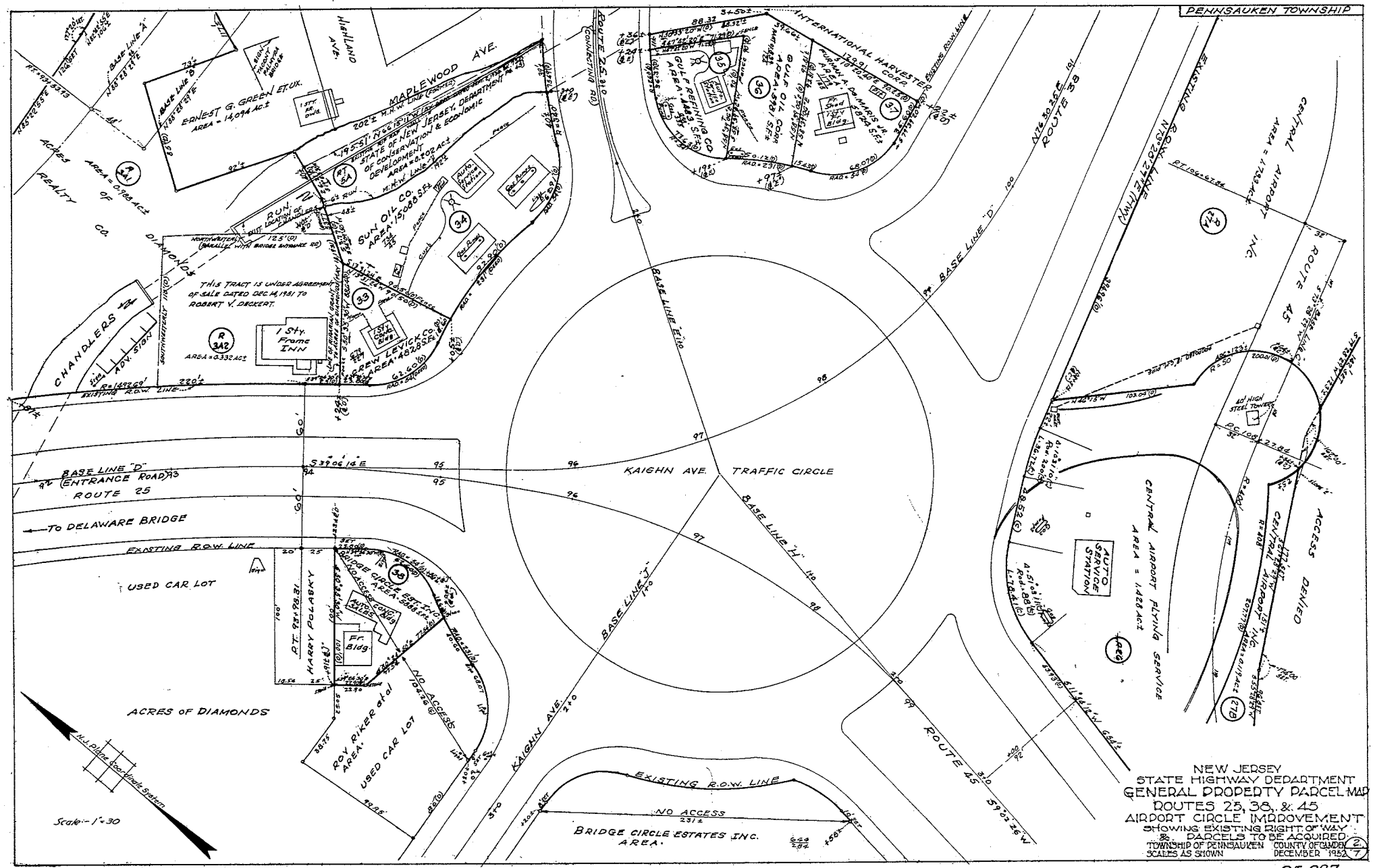

PENNSAUKEN TOWNSHIP
LEE AVENUE
HENNING CORP.
~~WISSCHER CORP~~
AREA: 1711 S.F.±
1
Howard Johnson
1½ Story Frame
Restaurant
Macadam Parking Lot
R.O.W. CURVE DATA
Δ: 4°16'51"
D: 17°00'
T: 66.90
L: 133.74
ACCESS
PERMITTED
Prop. Curb
Proposed Curb
Prop. Conc. Sidewalk
Existing Conc. Sidewalk
(Existing Conc. Curb)
WALDORF AVE.
50'
ROY
RIKER ET AL
TRACT LINE
ACCESS DENIED
PROPOSED R.O.W. LINE
Wood Fence
91 Proposed Curb Line
RIKER ET AL
AREA=0.645 AC±
R2
ACRES OF DIAMONDS REALTY CO.
ACCESS DENIED
ACRES OF DIAMONDS REALTY CO
AREA = 0.988 AC±
R 3A1
A TEN-FOOT WIDE EASEMENT FROM ACRES OF DIAMONDS REALTY CO. TO THE TOWN OF DELAIR, N.J. AND DEED DATED MARCH 12, 1931 AND RECORDED IN DB 1557 PG 147.
CHANDLER'S RUN
HERBERT V. DECKERT
AREA = 0.332 AC±
R 3A2
BASE LINE "A"
BASE LINE "D"
S 58°50'14"E
RT. 25 (ENTRANCE 85' ROAD)
BASE LINE CURVE DATA
Δ: 19°44'00"
D: 10°32'69"
T: 249.19
L: 493.44
E: 21.51
SCALE 1"=30'
Note:
Parcels R 26, 27, and R 30 are in the City of Camden.
New Jersey
State Highway Department
GENERAL PROPERTY PARCEL MAP
ROUTES 25, 38 & 45
Airport Circle Improvement
Showing Existing Right of Way & Parcels To Be Acquired Is Thereof
Township of Pennsauken
Scale as Shown
County of Camden
December 1959
Survey Bk. W. 548 & 846
25-497


PROPOSED R.O.W. LINE
ACCESS DENIED
MARTIN HERDA ET UX
AREA · 1150 SQ.FT.±
WOODLAND AVE. 50
R.O.W. CURVE DATA
Δ: 11°36'36"
R: 1700
T: 197.97
L: 362.70
ACCESS DENIED
ANNA SHORE
AREA · 339 S.F.±
ACCESS PERMITTED
PROPOSED R.O.W. LINE
MALCOM ENTERPRISES CORP.
AREA · 16 S.F.±
BASE LINE 'E'
ROUTE 25
N 61°11'16" E
MARGINAL ROAD CURVE DATA
Δ = 5°44'48"
R = 363.85'
T = 28.79'
L = 50.54'
R.O.W. CURVE DATA
PENNSAUKEN TOWNSHIP
NEW JERSEY COORDINATE SYSTEM
R.O.W. CURVE DATA
Δ: 4°56'07"
R: 1767.01'
T: 77.01'
L: 153.93'
PERMITTED
ROUTE 38
N 84°50'26" E


PENNSAUKEN TOWNSHIP
ACCESS PERMITTED TO PROPOSED STREET
MORRIS COHEN REALTY CO. AREA · 617 S.F.±
MORRIS COHEN REALTY CO. AREA · 165 S.F.±
ACCESS DENIED
PROPOSED STREET
ACCESS DENIED
ACCESS DENIED PROPOSED R.O.W. LINE RTS 25-38 & 45
Paul Papoycik
CHARLES HOROFF AREA = 6765 S.F.±
WILLIAM POWELL AREA = 20,684 S.F.±
ERNEST G. GREEN ETUX. AREA = 14,116 S.F.±
ACRES OF DIAMONDS REALTY CO. AREA = 0.988 AC.±
ROUTES 25, 38, 45
BASE LINE 'A'
BASE LINE 'B'
HIGHLAND AVE.
WLADYSLAW ZECZKOSKY AREA · 7594 S.F.±
HARRY POLASKY ETAL HIGHLAND VILLA FILES
AREA 7653 S.F.±
SITES MAP-1
ANNE T. POLASKY AREA = 4910 S.F.±
HARRY POLASKY AREA = 1058 S.F.±
HARRY POLASKY AREA = 1058 S.F.±
RUTH N. ALBERTSON AREA = 25,107 S.F.± (±0.4 A.)
RUTH N. ALBERTSON AREA = 11,390 S.F.±
JOHN V. MEILER ETUX. AREA = 15,281 S.F.±
JOSEPH BARICK AREA = 9038 S.F.±
MERCHANTVILLE Co. VNC HOLDING AREA = 6290 S.F.±
EARL AVE. (Formerly Union St.)
CHANDLERS ROUTE 25
BASE LINE 'E' ROUTE 25 (CONNECTING RD.)
WOODLAND AVE
MICHAEL HAYES
MARTIN HAROLD ETUX. AREA = 190.38 S.F.±
ACRES OF DIAMONDS REALTY CO. AREA = 0.018 AC.±
NEW JERSEY DEPT. OF ECONOMIC DEVELOPMENT
STATE OF NEW JERSEY CONVEYING TO ACRES OF DIAMONDS REALTY CO.
MILLER DRIVE
ACCESS DENIED
WILLIAM T. WILKINS
GUY DEANGELO AREA · 0.305 ACRES±
MAPLEWOOD AVE. (FORMERLY FRONT STREET)
LOCATION OF CHANDLERS RUN AS SHOWN ON MAP FILED IN CAMDEN COUNTY
STATE OF NEW JERSEY DEPT. OF CONSERVATION AREA = 0.202 AC.±
CREW-LEVICK COMPANY
SUN OIL COMPANY
AREA = 15,088 S.F.±
Gas Pumps
Auto Service Station
Tool shed
fences
curb
ROUTE 38 (ENTRANCE ROAD)
BASE LINE 'D'
KAIGHN AVE - TRAFFIC CIRCLE
GULF REFINING COMPANY AREA = 5,000 S.F.±
GULF OIL CORP. AREA = 5781.44 S.F.±
FURMAN A. DE MARIS
INTERNATIONAL HARVESTER CORP.
ACRES OF DIAMONDS REALTY CO. AREA = 1.263 AC.±
ROUTE 38
ROUTE 45
SIGN
SCALE 1" = 30'
New Jersey
State Highway Department
GENERAL PROPERTY PARCEL MAP
ROUTES 25, 38 & 45
Airport Circle Improvement
Showing Existing Right of Way & Parcels To Be Acquired, In The
Township of Pennsauken
County of Camden
December 1959
25-997

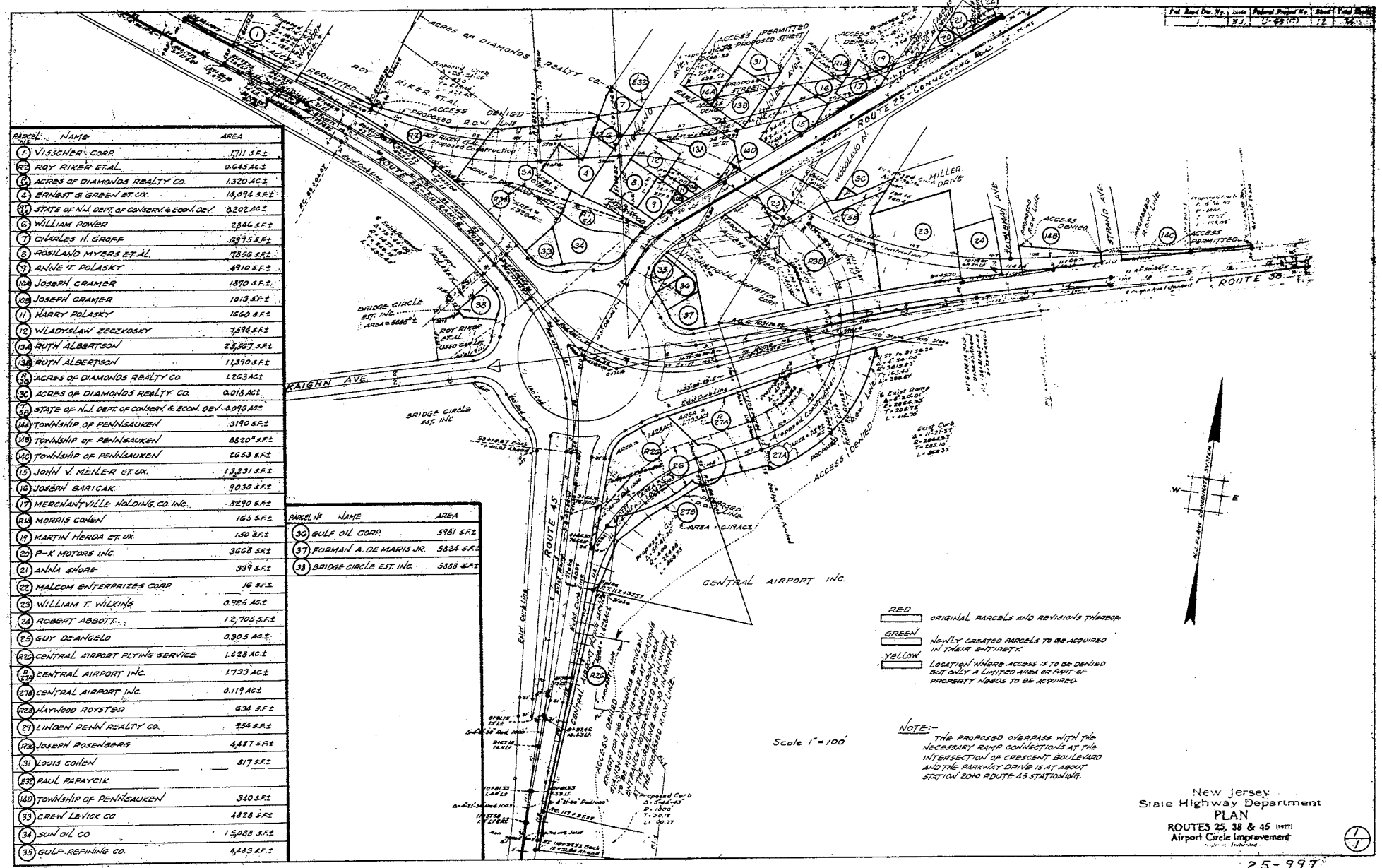

PENNSAUKEN TOWNSHIP
CHANDLERS
ACCESS ROAD LINE
DOUTEY RUN
GUY DEANGELO
Michael Hayes
30 ACRES OF DIAMONDS REALTY CO
STATE OF NEW JERSEY DEPT OF CONSERVATION & ECONOMIC DEVELOPMENT
MILLER DRIVE
THE 11TH COURSE OF THE RIPARIAN GRANT DATED SEPT 25, 1845 STATE OF N.J. TO ACRES OF DIAMONDS REALTY CO.
INTERNATIONAL HARVESTER CORP.
1 Sty. Brick Bldg.
SIGN AND 45
ACCESS DENIED
ROUTE 45
BASE LINE 'A'
ACRES OF DIAMONDS REALTY CO
AREA = 1.263 Acres ±
ACCESS DENIED TO ROUTE 38 R.O.W.
Proposed Curb Line
ROUTE 38
WILLIAM T. WILKINS
AREA = 0.925 Acres ±
CONC. Shed
1 STY CONC. BLDG.
ROBERT ABBOTT
AREA = 12,705 S.F.±
TETTLEMAN AVE.
ACCESS DENIED
TOWNSHIP OF PENNSAUKEN
AREA = 8820 S.F.±
PROPOSED R.O.W. LINE
BASE LINE 'G'
CENTRAL AIRPORT INC.
Note: Portion of the area of Parcel L 26 in the name of Central Airport Inc equals 2.062 Acres ± Portion of the area of Parcel L 26 in the name of Central Airport Flying Service equals 1.426 Acres ±
ACCESS DENIED
CENTRAL AIRPORT INCORPORATED
Area = 1.260 Ac.±
ROUTE 45
ACCESS DENIED TO PROPOSED R.O.W. LINE, ROUTE 45
PROPOSED LINE OF MARGINAL ROAD
CENTRAL AIRPORT
Field Lights
R.O.W. LINE CURVE DATA
EXISTING R.O.W. LINE
See Sheet #4
CORR. METAL QUONSET #6
Note: Parcel R27A is now included in parcel L 26.
scale 1" = 30'
New Jersey State Highway Department
GENERAL PROPERTY PARCEL MAP
ROUTES 25, 38 & 45
Airport Circle Improvement
Showing Existing Right of Way & Parcels To Be Acquired In The Township of Pennsauken, County of Camden
Scale as Shown December 1958
4/7

25-997




NEW JERSEY
STATE HIGHWAY DEPARTMENT
GENERAL PROPERTY PARCEL MAP
ROUTES 25, 38, & 45
AIRPORT CIRCLE IMPROVEMENT
SHOWING EXISTING RIGHT OF WAY
& PARCELS TO BE ACQUIRED
TOWNSHIP OF PENNSAUKEN COUNTY OF CAMDEN (2/7)
SCALES AS SHOWN DECEMBER 1952

25-997




| PARCEL No. | NAME | AREA |
|---|---|---|
| 1 | VISSCHER CORP | 1711 S.F.± |
| R2 | ROY RIKER ET AL. | 0.645 AC.± |
| 3A | ACRES OF DIAMONDS REALTY CO. | 1.320 AC.± |
| 4 | ERNEST & GREEN ET UX. | 14,096 S.F.± |
| 5A | STATE OF N.J. DEPT. OF CONSERV. & ECON. DEV. | 0.202 AC.± |
| 6 | WILLIAM POWER | 2846 S.F.± |
| 7 | CHARLES H. GROPF | 6975 S.F.± |
| 8 | ROSILAND MYERS ET AL. | 7856 S.F.± |
| 9 | ANNE T. POLASKY | 4910 S.F.± |
| 10A | JOSEPH CRAMER | 1890 S.F.± |
| 10B | JOSEPH CRAMER | 1013 S.F.± |
| 11 | HARRY POLASKY | 1660 S.F.± |
| 12 | WLADYSLAW ZECZKOSKY | 7594 S.F.± |
| 13A | RUTH ALBERTSON | 25,867 S.F.± |
| 13B | RUTH ALBERTSON | 11,390 S.F.± |
| 3B | ACRES OF DIAMONDS REALTY CO. | 1.263 AC.± |
| 3C | ACRES OF DIAMONDS REALTY CO. | 0.018 AC.± |
| 5B | STATE OF N.J. DEPT. OF CONSERV. & ECON. DEV. | 0.093 AC.± |
| 14A | TOWNSHIP OF PENNSAUKEN | 3190 S.F.± |
| 14B | TOWNSHIP OF PENNSAUKEN | 8820 S.F.± |
| 14C | TOWNSHIP OF PENNSAUKEN | 2653 S.F.± |
| 15 | JOHN V. MEILER ET UX. | 13,231 S.F.± |
| 16 | JOSEPH BARICAK | 9030 S.F.± |
| 17 | MERCHANTVILLE HOLDING CO. INC. | 8290 S.F.± |
| R18 | MORRIS COHEN | 165 S.F.± |
| 19 | MARTIN HERDA ET UX. | 150 S.F.± |
| 20 | P-K MOTORS INC. | 3668 S.F.± |
| 21 | ANNA SHORE | 339 S.F.± |
| 22 | MALCOM ENTERPRIZES CORP. | 16 S.F.± |
| 23 | WILLIAM T. WILKINS | 0.925 AC.± |
| 24 | ROBERT ABBOTT | 12,705 S.F.± |
| 25 | GUY DEANGELO | 0.305 AC.± |
| R26 | CENTRAL AIRPORT FLYING SERVICE | 1.428 AC.± |
| R27A | CENTRAL AIRPORT INC. | 1.733 AC.± |
| 27B | CENTRAL AIRPORT INC. | 0.119 AC.± |
| R28 | HAYWOOD ROYSTER | 634 S.F.± |
| 29 | LINDEN PENN REALTY CO. | 954 S.F.± |
| R30 | JOSEPH ROSENBERG | 4,887 S.F.± |
| 31 | LOUIS COHEN | 817 S.F.± |
| 32C | PAUL PAPAYCIK | |
| 14D | TOWNSHIP OF PENNSAUKEN | 340 S.F.± |
| 33 | CREW LEVICK CO | 4828 S.F.± |
| 34 | SUN OIL CO | 15,088 S.F.± |
| 35 | GULF REFINING CO. | 4,883 S.F.± |

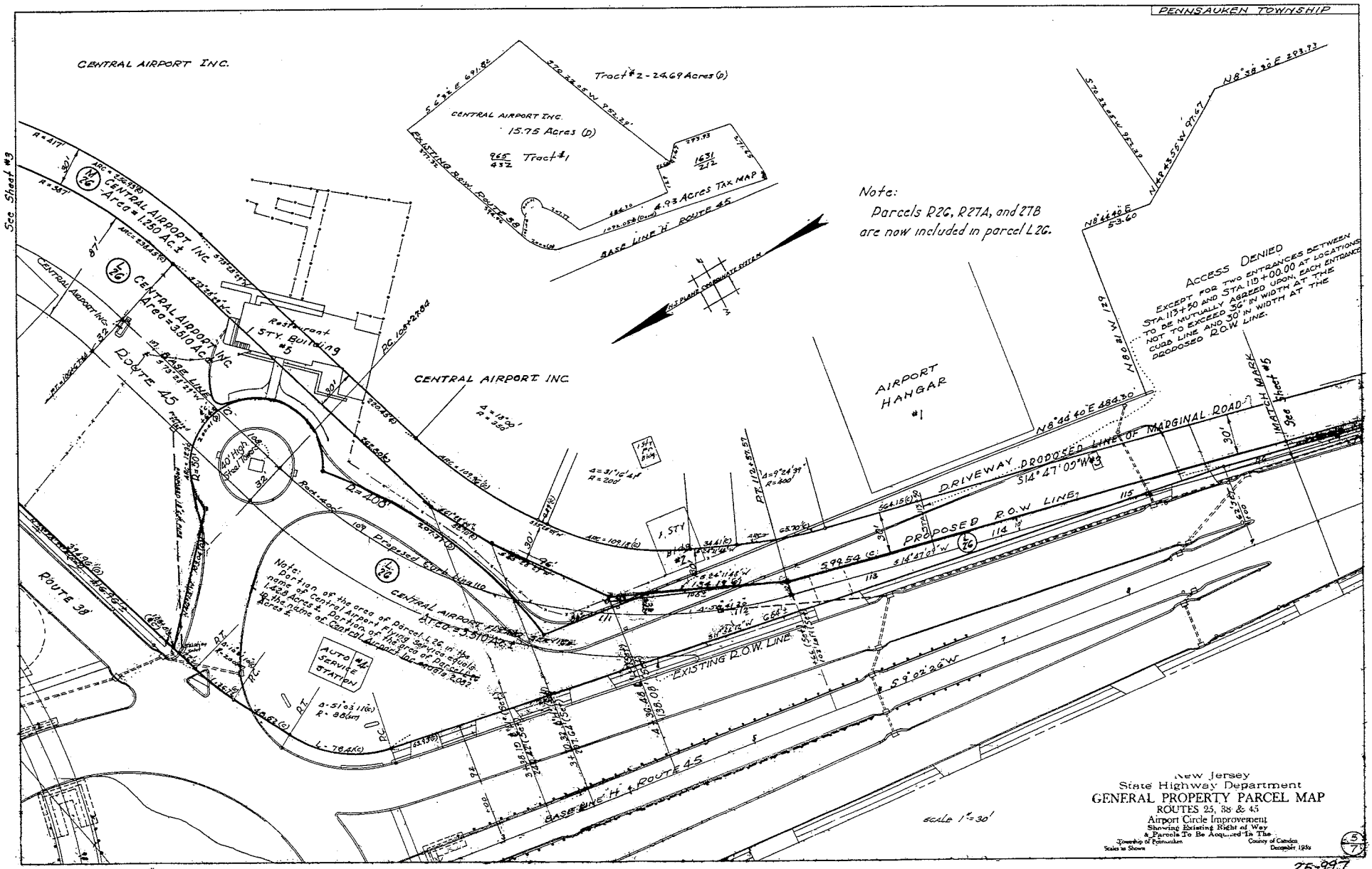
| PARCEL No. | NAME | AREA |
|---|---|---|
| 36 | GULF OIL CORP. | 5981 S.F.± |
| 37 | FURMAN A. DE MARIS JR. | 5824 S.F.± |
| 38 | BRIDGE CIRCLE EST. INC. | 5888 S.F.± |

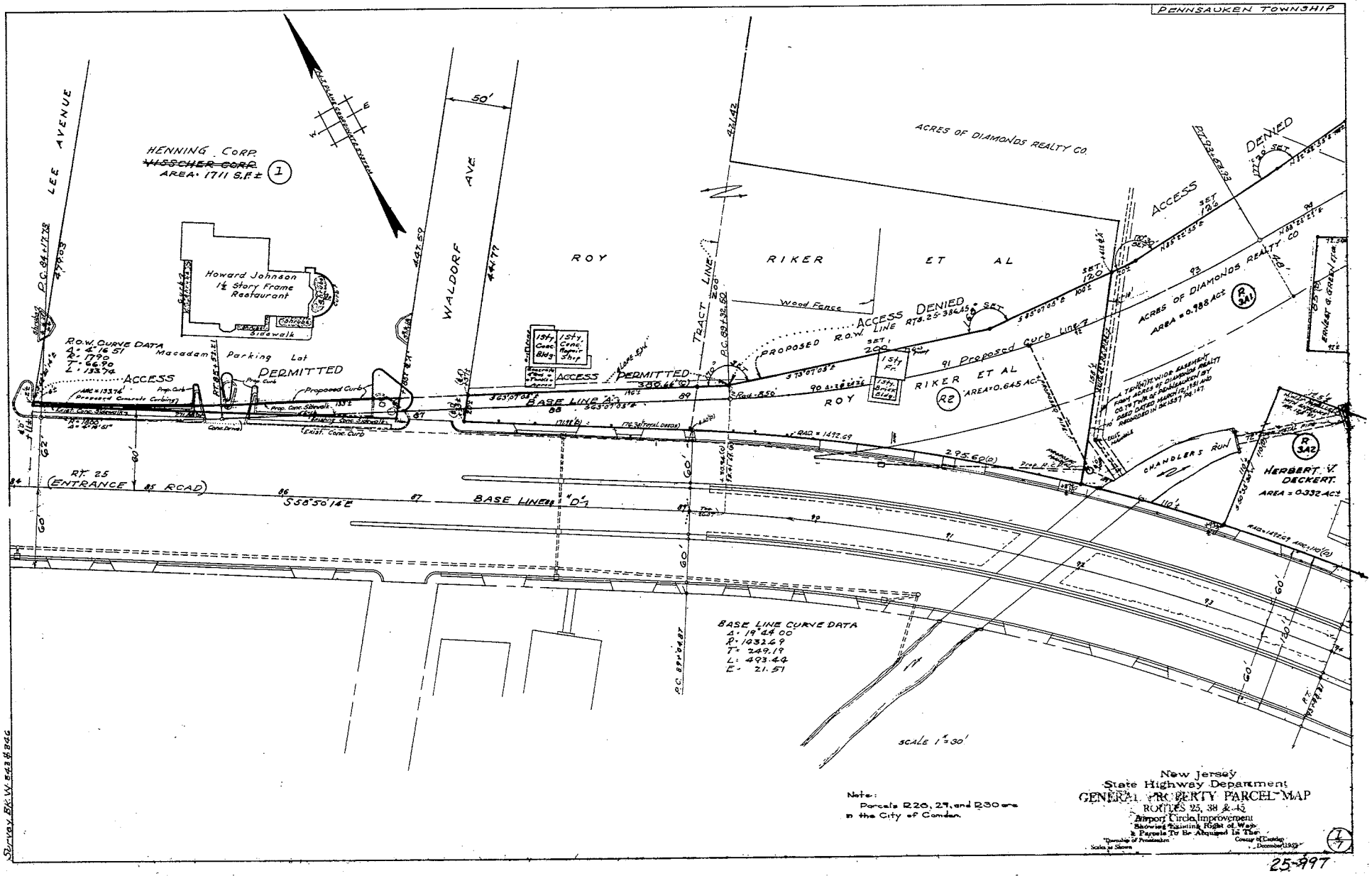
| Fed. Road Dist. No. | State | Federal Project No. | Sheet | Total Sheets |
|---|---|---|---|---|
| 1 | N.J. | U-69(17) | 12 | 14 |

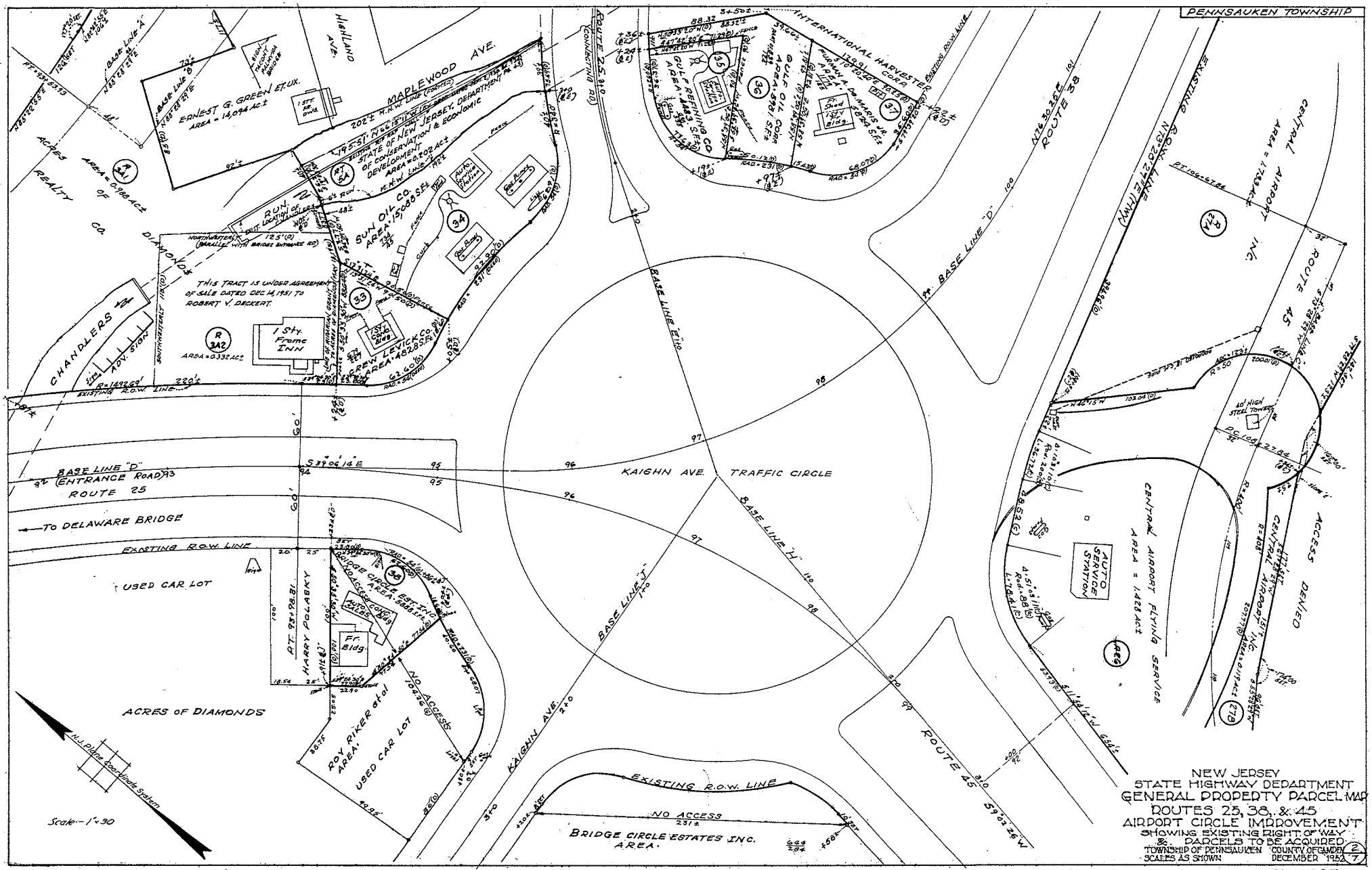
New Jersey
State Highway Department
PLAN
ROUTES 25, 38 & 45 (1927)
Airport Circle Improvement

1/1

25-997

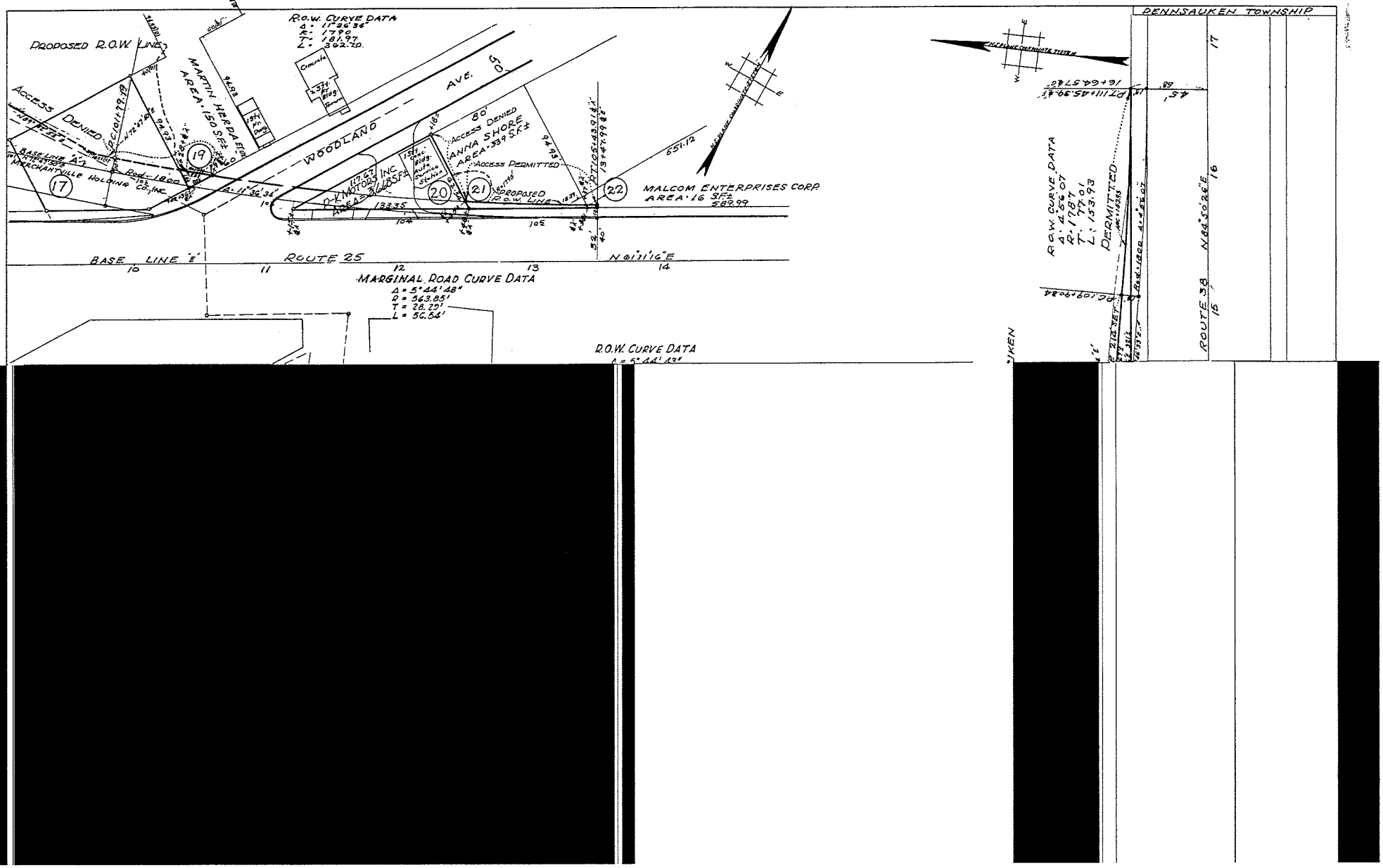

PENNSAUKEN TOWNSHIP
CENTRAL AIRPORT INC.
Tract #2 - 24.69 Acres (±)
CENTRAL AIRPORT INC.
15.75 Acres (±)
965/432 Tract #1
EXISTING R.O.W. ROUTE 38
1631/272
4.93 Acres Tax MAP
BASE LINE "H" ROUTE 45
Note:
Parcels R2C, R27A, and 27B
are now included in parcel L2C.
ACCESS DENIED
EXCEPT FOR TWO ENTRANCES BETWEEN STA 113+50 AND STA 115+00.00 AT LOCATIONS TO BE MUTUALLY AGREED UPON, EACH ENTRANCE NOT TO EXCEED 36' IN WIDTH AT THE CURB LINE AND 30' IN WIDTH AT THE PROPOSED R.O.W. LINE.
See Sheet #3
CENTRAL AIRPORT INC. Area = 1.250 Ac.±
CENTRAL AIRPORT INC. Area = 3.510 Ac.±
CENTRAL AIRPORT INC.
Restaurant 1 STY. Building #5
AIRPORT HANGAR #1
ROUTE 45
ROUTE 38
CENTRAL AIRPORT INC.
Area = 3.510 Ac.±
Note: Portion of the area of Parcel L2C in the name of Central Airport Flying Service equals 1.429 Acres ±. Portion of the area of Parcel L2C in the name of Central Airport Inc. equals 2.081 Acres ±.
AUTO SERVICE STATION #2
N8°44'40"E 484.30'
DRIVEWAY PROPOSED LINE OF MARGINAL ROAD
S14°47'09"W
PROPOSED R.O.W. LINE
EXISTING R.O.W. LINE
S9°02'26"W
BASE LINE "H" ROUTE 45
MATCH MARK See Sheet #5
SCALE 1" = 30'
New Jersey
State Highway Department
GENERAL PROPERTY PARCEL MAP
ROUTES 25, 38 & 45
Airport Circle Improvement
Showing Existing Right of Way & Parcels To Be Acquired In The
Township of Pennsauken County of Camden
Scales as Shown December, 1959
5/7
25-99-7

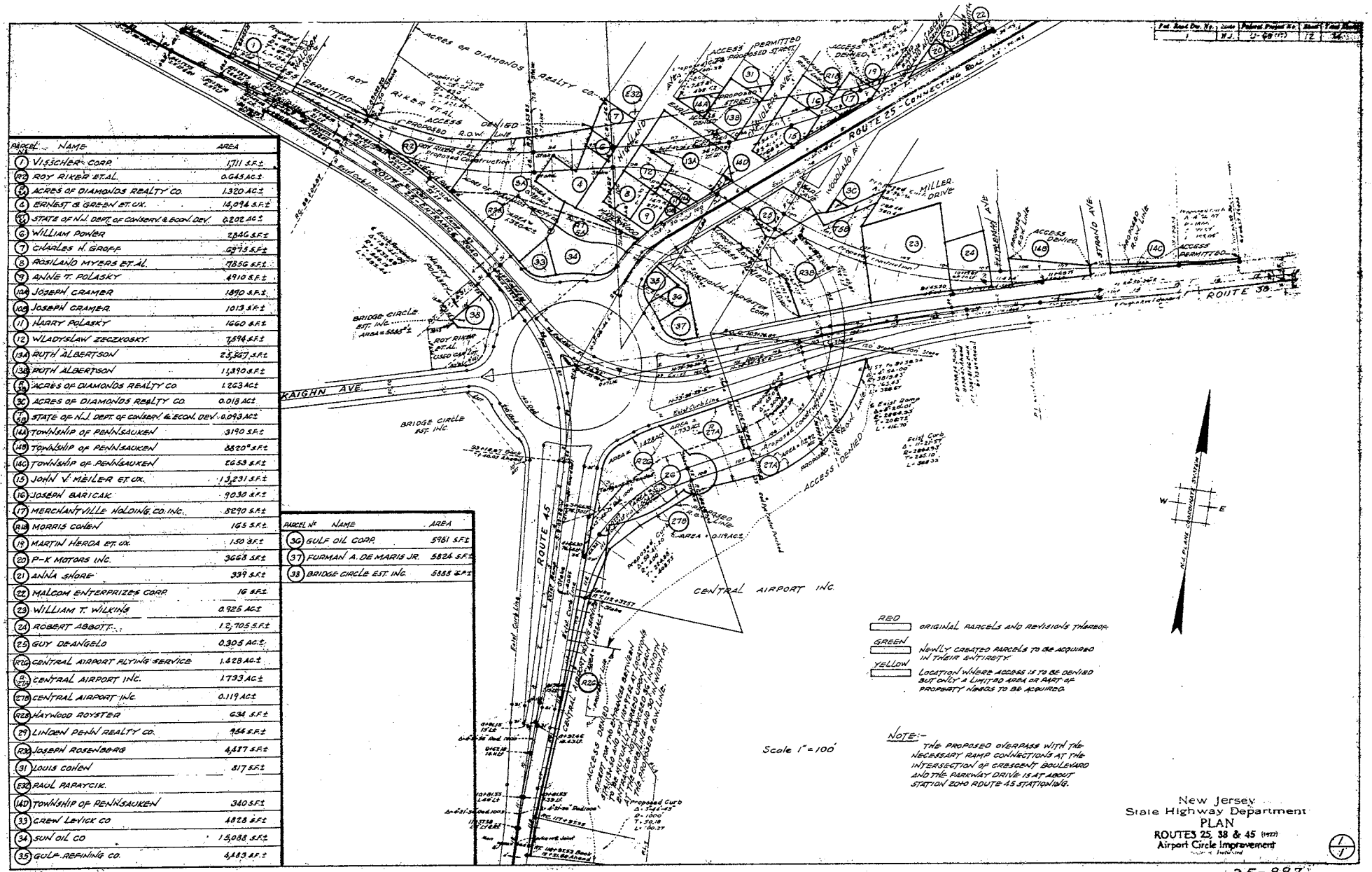

PENNSAUKEN TOWNSHIP
LEE AVENUE
HENNING CORP.
~~WISSCHER CORP.~~
AREA 1711 S.F.±
Howard Johnson
1½ Story Frame
Restaurant
Macadam Parking Lot
WALDORF AVE.
50'
ROY
RIKER ET AL
ACRES OF DIAMONDS REALTY CO.
ACCESS DENIED
ACCESS
PERMITTED
PROPOSED R.O.W. LINE
91 Proposed Curb Line
Wood Fence
TRACT LINE
BASE LINE "A"
BASE LINE "D"
RT. 25 (ENTRANCE ROAD)
S 58°50'14" E
ROW CURVE DATA
Δ = 4°16'51"
R = 1790
T = 66.90
L = 133.74
BASE LINE CURVE DATA
Δ = 19°44'00"
R = 1032.69
T = 249.19
L = 493.44
E = 21.51
R 341
AREA = 0.988 AC±
R2
AREA = 0.645 AC±
R 342
HERBERT V. DECKERT
AREA = 0.332 AC±
CHANDLERS RUN
SCALE 1" = 30'
Note:
Parcels R20, 27, and R30 are in the City of Camden.
New Jersey
State Highway Department
GENERAL PROPERTY PARCEL MAP
ROUTES 25, 38 & 45
Airport Circle Improvement
Showing Existing Right of Way & Parcels To Be Acquired In Thereof
Township of Pennsauken
County of Camden
Scale as Shown
December 1959
SURVEY BK. W. 243 & 246
25-497




NEW JERSEY
STATE HIGHWAY DEPARTMENT
GENERAL PROPERTY PARCEL MAP
ROUTES 25, 38, & 45
AIRPORT CIRCLE IMPROVEMENT
SHOWING EXISTING RIGHT OF WAY
& PARCELS TO BE ACQUIRED
TOWNSHIP OF PENNSAUKEN COUNTY OF CAMDEN 2
SCALES AS SHOWN DECEMBER 1952 7

25-997


PROPOSED R.O.W. LINE
ACCESS DENIED
MARTIN HERDA ET UX
AREA-1150 SQ.FT.±
WOODLAND AVE. 50'
R.O.W. CURVE DATA
Δ: 11°36'54"
R: 1790
T: 181.97
L: 362.70
Comm'l 1-STY. BLDG. Masonry
1-STY. BLDG. Frame
BASE LINE "A"
MERCHANTVILLE HOLDING CO., INC.
Rad.=1800
ACCESS DENIED
ANNA SHORE
AREA-339 S.F.±
ACCESS PERMITTED
PROPOSED R.O.W. LINE
P. KYMATOS INC.
AREA-3,660 SF±
1-STY. Conc. Block Service Station
MALCOM ENTERPRISES CORP.
AREA-16 SF±
589.99
651.12
BASE LINE "E"
ROUTE 25
N 61°11'16" E
MARGINAL ROAD CURVE DATA
Δ = 5°44'48"
D = 543.85'
T = 28.27'
L = 56.54'
R.O.W. CURVE DATA
PENNSAUKEN TOWNSHIP
ROUTE 38
N 66°50'22" E
R.O.W. CURVE DATA
Δ: 4°56'07"
R: 1787
T: 77.01
L: 153.93
PERMITTED



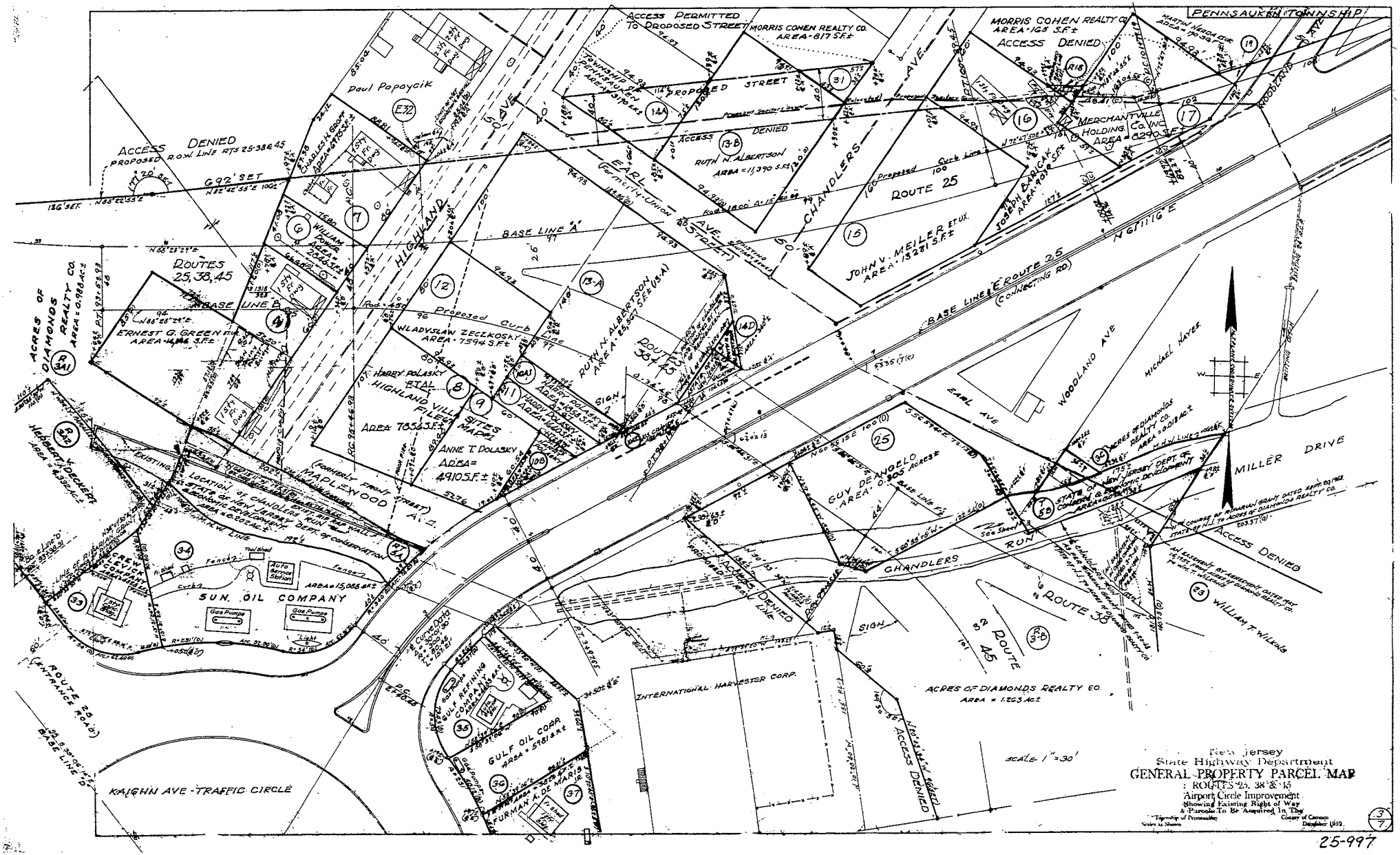

| PARCEL No. | NAME | AREA |
|---|---|---|
| 1 | VISSCHER CORP. | 1,711 S.F.± |
| 1A | ROY RIKER ET AL. | 0.645 AC.± |
| 2 | ACRES OF DIAMONDS REALTY CO. | 1.320 AC.± |
| 4 | ERNEST & GREEN ET UX. | 14,094 S.F.± |
| 5A | STATE OF N.J. DEPT. OF CONSERV. & ECON. DEV. | 0.202 AC.± |
| 6 | WILLIAM POWER | 2,846 S.F.± |
| 7 | CHARLES H. GROFF | 6975 S.F.± |
| 8 | ROSILAND MYERS ET AL. | 7856 S.F.± |
| 9 | ANNE T. POLASKY | 4910 S.F.± |
| 10A | JOSEPH CRAMER | 1890 S.F.± |
| 10B | JOSEPH CRAMER | 1013 S.F.± |
| 11 | HARRY POLASKY | 1660 S.F.± |
| 12 | WLADYSLAW ZECZKOSKY | 7,594 S.F.± |
| 13A | RUTH ALBERTSON | 25,567 S.F.± |
| 13B | RUTH ALBERTSON | 11,390 S.F.± |
| 13C | ACRES OF DIAMONDS REALTY CO. | 1.263 AC.± |
| 13C | ACRES OF DIAMONDS REALTY CO. | 0.018 AC.± |
| 13D | STATE OF N.J. DEPT. OF CONSERV. & ECON. DEV. | 0.093 AC.± |
| 14A | TOWNSHIP OF PENNSAUKEN | 3190 S.F.± |
| 14B | TOWNSHIP OF PENNSAUKEN | 8820 S.F.± |
| 14C | TOWNSHIP OF PENNSAUKEN | 6653 S.F.± |
| 15 | JOHN V. MEILER ET UX. | 13,231 S.F.± |
| 16 | JOSEPH BARICAK | 9030 S.F.± |
| 17 | MERCHANTVILLE HOLDING CO. INC. | 8890 S.F.± |
| R18 | MORRIS COHEN | 165 S.F.± |
| 19 | MARTIN HERDA ET UX. | 150 S.F.± |
| 20 | P-K MOTORS INC. | 3668 S.F.± |
| 21 | ANNA SHORE | 339 S.F.± |
| 22 | MALCOM ENTERPRIZES CORP. | 16 S.F.± |
| 23 | WILLIAM T. WILKINS | 0.925 AC.± |
| 24 | ROBERT ABBOTT | 12,705 S.F.± |
| 25 | GUY DEANGELO | 0.305 AC.± |
| R26 | CENTRAL AIRPORT FLYING SERVICE | 1.628 AC.± |
| R27A | CENTRAL AIRPORT INC. | 1.733 AC.± |
| 27B | CENTRAL AIRPORT INC. | 0.119 AC.± |
| R28 | HAYWOOD ROYSTER | 634 S.F.± |
| 29 | LINDEN PENN REALTY CO. | 956 S.F.± |
| R30 | JOSEPH ROSENBERG | 4,887 S.F.± |
| 31 | LOUIS COHEN | 817 S.F.± |
| E32 | PAUL PAPAYCIK | |
| 14D | TOWNSHIP OF PENNSAUKEN | 340 S.F.± |
| 33 | CREW LEVICK CO | 4828 S.F.± |
| 34 | SUN OIL CO | 15,088 S.F.± |
| 35 | GULF REFINING CO. | 4,883 S.F.± |

| PARCEL No. | NAME | AREA |
|---|---|---|
| 36 | GULF OIL CORP. | 5981 S.F.± |
| 37 | FURMAN A. DE MARIS JR. | 5824 S.F.± |
| 38 | BRIDGE CIRCLE EST. INC. | 5888 S.F.± |

New Jersey
State Highway Department
PLAN
ROUTES 25, 38 & 45 (1927)
Airport Circle Improvement

1/1

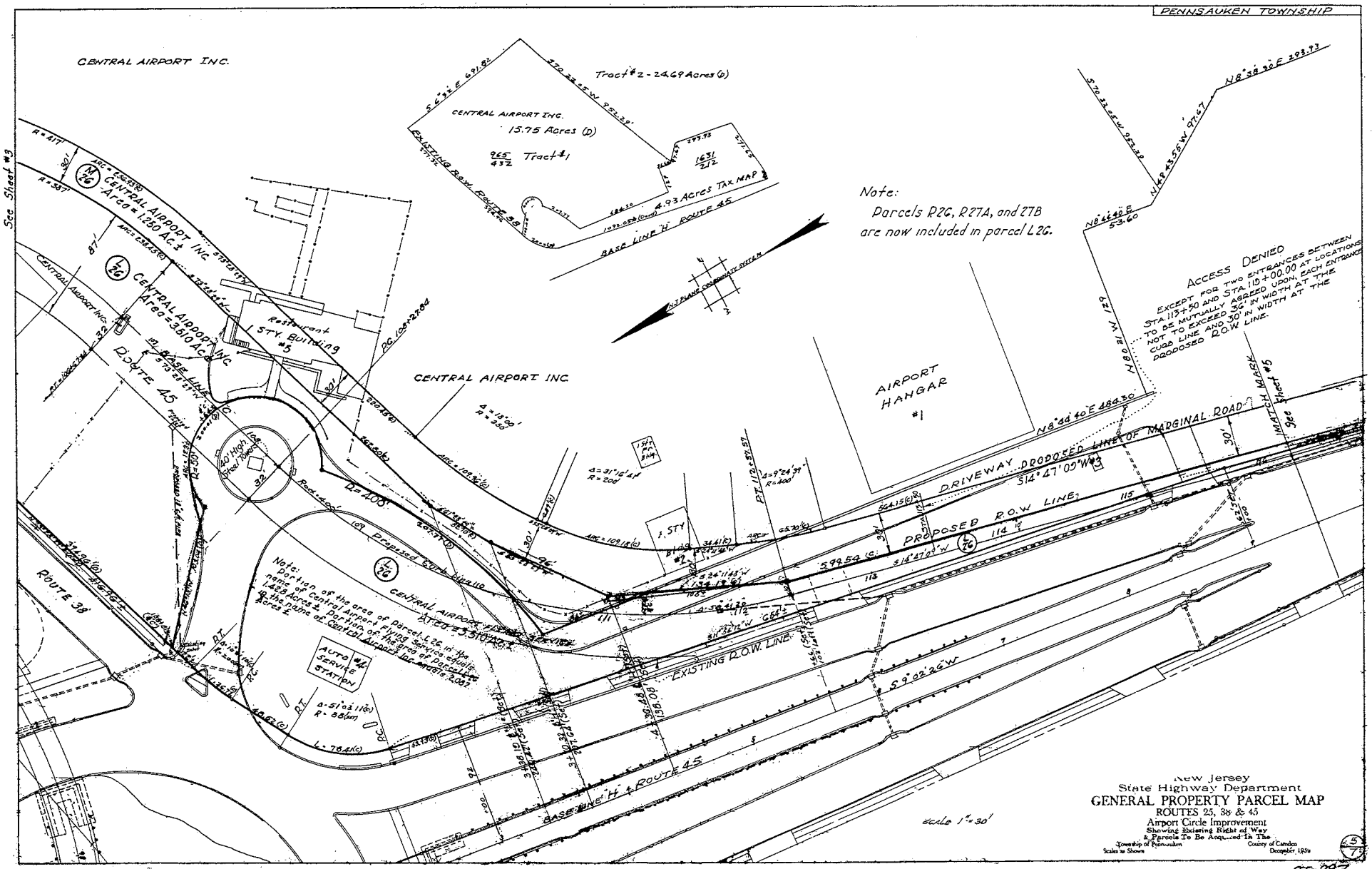
25-997

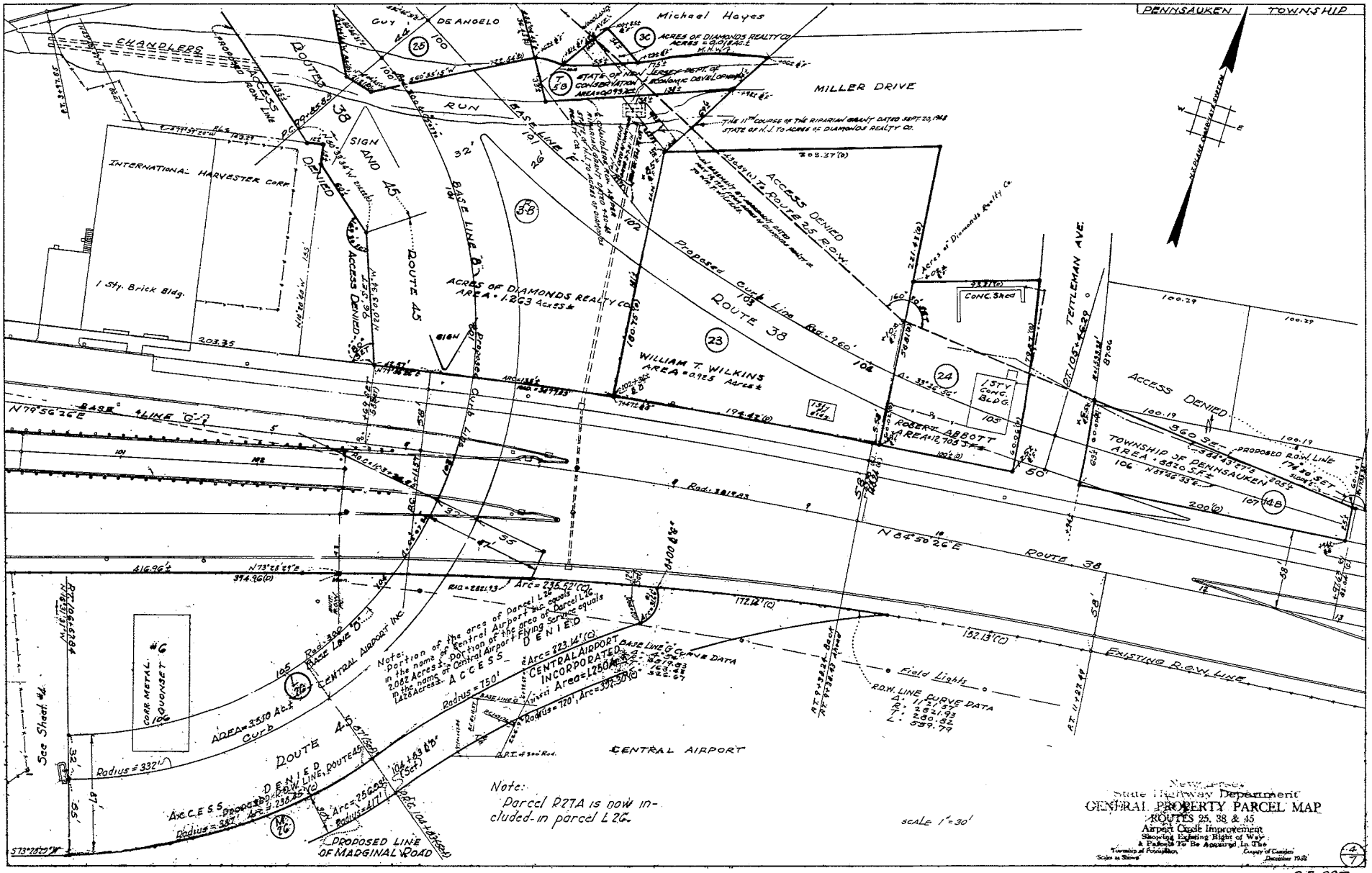


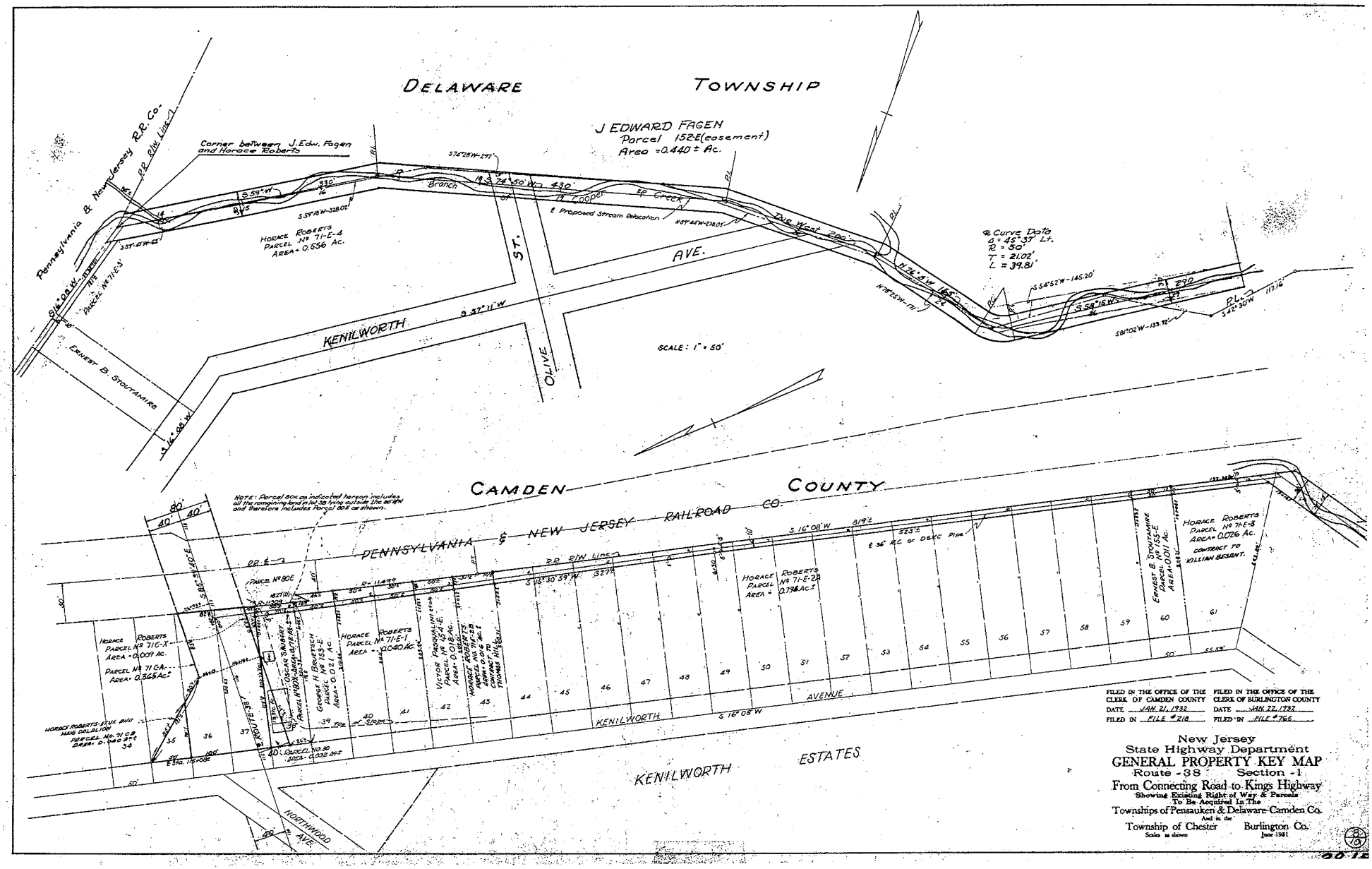

New Jersey
State Highway Department
GENERAL PROPERTY PARCEL MAP
ROUTES 25, 38 & 45
Airport Circle Improvement
Showing Existing Right of Way
& Parcels To Be Acquired In The
Township of Pennsauken
County of Camden
Scale as Shown
December 1952.

3/7

25-997


PENNSAUKEN TOWNSHIP
CENTRAL AIRPORT INC.
Tract #2 - 2.469 Acres (D)
CENTRAL AIRPORT INC.
15.75 Acres (D)
965/432 Tract #1
1631/272
4.93 Acres TAX MAP
Existing Row, Route 38
BASE LINE "H" ROUTE 45
See Sheet #3
CENTRAL AIRPORT INC. Area = 1.250 Ac.±
CENTRAL AIRPORT INC. Area = 3.810 Ac.±
CENTRAL AIRPORT INC.
Restaurant 1 STY. Building #5
AIRPORT HANGER #1
Note:
Parcels R2C, R27A, and 27B are now included in parcel L26.
ACCESS DENIED
EXCEPT FOR TWO ENTRANCES BETWEEN STA. 113+50 AND STA. 110+00.00 AT LOCATIONS TO BE MUTUALLY AGREED UPON, EACH ENTRANCE NOT TO EXCEED 36' IN WIDTH AT THE CURB LINE AND 30' IN WIDTH AT THE PROPOSED R.O.W. LINE.
DRIVEWAY
PROPOSED LINE OF MARGINAL ROAD
PROPOSED R.O.W. LINE
EXISTING R.O.W. LINE
ROUTE 38
ROUTE 45
BASE LINE "H" ROUTE 45
Note: Portion of the area of Parcel L26 in the name of Central Airport Flying Service Inc. 1.428 Acres ± Portion of the area of Parcel L26 in the name of Central Airport Inc. 3.082 Acres ±
AUTO SERVICE STATION
40' High Steel Tower
MATCH MARK See Sheet #6
scale 1" = 30'
New Jersey
State Highway Department
GENERAL PROPERTY PARCEL MAP
ROUTES 25, 38 & 45
Airport Circle Improvement
Showing Existing Right of Way & Parcels To Be Acquired In The
Township of Pennsauken County of Camden
Scales as Shown December, 1956
25-997


PENNSAUKEN TOWNSHIP
CHANDLERS
Guy DeANGELO
Michael Hayes
MILLER DRIVE
DOUTY'S RUN
INTERNATIONAL HARVESTER CORP.
1 Sty. Brick Bldg.
ACRES OF DIAMONDS REALTY CO.
AREA = 1.263 Acres±
WILLIAM T. WILKINS
AREA = 0.925 Acres±
ROBERT ABBOTT
AREA = 12,703 S.F.±
TOWNSHIP OF PENNSAUKEN
AREA = 8820 S.F.±
ACCESS DENIED
ROUTE 38
ROUTE 45
TEITLEMAN AVE.
CENTRAL AIRPORT INC.
CENTRAL AIRPORT INCORPORATED
CENTRAL AIRPORT
EXISTING R.O.W. LINE
PROPOSED LINE OF MARGINAL ROAD
Field Lights
CONC. Shed
1 STY. CONC. BLDG.
CORR. METAL
EQUONSET
#6
See Sheet #4
Note:
Parcel R27A is now included in parcel L2G.
SCALE 1"=30'
New Jersey
State Highway Department
CENTRAL PROPERTY PARCEL MAP
ROUTES 25, 38 & 45
Airport Circle Improvement
Showing Existing Right of Way
& Parcels To Be Acquired, In The
Township of Pennsauken — County of Camden
Scale as Shown — December 1952
4
7
25-997


DELAWARE TOWNSHIP
J EDWARD FAGEN
Parcel 152E(easement)
Area = 0.440 ± Ac.
Corner between J. Edw. Fagen and Horace Roberts
Pennsylvania & New Jersey R.R. Co.
P.R. R/W Line
Horace Roberts Parcel No 71-E-4 Area = 0.556 Ac.
Branch of Cooper Creek
℄ Proposed Stream Relocation
Due West 200'
℄ Curve Data
Δ = 45°37' Lt.
R = 50'
T = 21.02'
L = 39.81'
ST.
AVE.
KENILWORTH
OLIVE
SCALE: 1" = 50'
Ernest B. Stoutamire
CAMDEN COUNTY
PENNSYLVANIA & NEW JERSEY RAILROAD CO.
P.R. R/W Line
Parcel No 80E
Horace Roberts Parcel No 71-E-1 Area = 1.040 Ac.
Horace Roberts Parcel No 71-E-2A Area = 0.798 Ac.±
Horace Roberts Parcel No 71-E-3 Area = 0.026 Ac.
Contract to Killian Besant.
Ernest B. Stoutamire Parcel No 155-E Area = 0.011 Ac.
Horace Roberts Parcel No 71C-X Area = 0.009 Ac.
Parcel No 71 CA Area = 0.365 Ac.±
George H. Brewster Parcel No 155-E Area = 0.02 Ac.
Victor Passalaqua Parcel No 154-E Area = 0.018 Ac.
Horace Roberts Parcel No 71-E-2B Area = 0.016 Ac.
Contract Hill to Thomas Hill
Oscar Sinnett
Parcel No 80 Area = 0.032 Ac.±
ROUTE 38
KENILWORTH AVENUE
KENILWORTH ESTATES
NORTHWOOD AVE.
NOTE: Parcel 80K as indicated hereon includes all the remaining land in Lot 39 lying outside the ultimate R/W and therefore includes Parcel 80E as shown.
FILED IN THE OFFICE OF THE CLERK OF CAMDEN COUNTY
DATE JAN 21, 1932
FILED IN FILE # 218
FILED IN THE OFFICE OF THE CLERK OF BURLINGTON COUNTY
DATE JAN 22, 1932
FILED IN FILE # 796
New Jersey
State Highway Department
GENERAL PROPERTY KEY MAP
Route - 38 Section - 1
From Connecting Road to Kings Highway
Showing Existing Right of Way & Parcels To Be Acquired In The
Townships of Pensauken & Delaware-Camden Co.
And in the
Township of Chester Burlington Co.
Scales as shown June 1931

# *Appendix I – Environmental Section – Wetlands*
# *Environmental Section – Hazardous Waste*

**STATE OF NEW JERSEY**
**DEPARTMENT OF TRANSPORTATION**

# *Wetland Delineation Report*

*for*

**NJ ROUTE 48, MILEPOST 3.06**
**LAYTONS LAKE DAM**
**CARNEYS POINT TOWNSHIP**
**SALEM COUNTY, NEW JERSEY**

***Prepared for:***

New Jersey Department of Transportation
Division of Environmental Resources
1035 Parkway Avenue, PO Box 600
Trenton, New Jersey 08625-0600

***Prepared by:***

McCormick Taylor, Inc.
700 East Gate Drive, Suite 201
Mt. Laurel, New Jersey 08054

March 2011

# *WETLAND DELINEATION REPORT*

## NJ ROUTE 48, MILEPOST 3.06
## LAYTONS LAKE DAM
## CARNEYS POINT TOWNSHIP
## SALEM COUNTY, NEW JERSEY

## *Table of Contents*


| | | Page No. |
|---|---|---|
| 1. | Introduction | 1 |
| 2. | Methodology | 1 |
| 3. | Results | 8 |
| 4. | Conclusion | 9 |
| 5. | References | 10 |


### *Appendices*


Appendix A: Routine Wetland Determination Data Forms
Appendix B: Site Photographs
Appendix C: Wetland Delineation Plans


### *List of Figures*


Figure 1 – Project Location Map (USGS) ..... 3
Figure 2 – Project Location Map (County) ..... 4
Figure 3 – Soils Mapping ..... 5
Figure 4 – NJDEP-Mapped Freshwater Wetlands ..... 6
Figure 5 – National Wetlands Inventory Map ..... 7

# *WETLAND DELINEATION REPORT*

## NJ ROUTE 48, MILEPOST 3.06
## LAYTONS LAKE DAM
## CARNEYS POINT TOWNSHIP
## SALEM COUNTY, NEW JERSEY

## 1. Introduction

McCormick Taylor, Inc. (MT) was retained by the New Jersey Department of Transportation (NJDOT) to conduct detailed environmental studies to determine the potential impacts of proposed improvements to bring Laytons Lake Dam into conformance with current NJDEP Dam Safety Regulations.

Laytons Lake Dam (Dam No. 30-15) is located at Milepost 3.06 of NJ Route 48 in Carneys Point Township, Salem County, NJ (***Figures 1 and 2***). The dam embankment carries NJ Route 48 in a southeast to northwest direction over Game Creek. The existing Layton Lake Dam is about 13 feet high and 500 feet in length. The spillway is a concrete ogee type in a semi-circular configuration with an effective length of about 90 feet. Two 48-inch diameter sluice gates are located near the eastern limit of the spillway. The gates are operated with hand cranks accessed from a concrete walkway. The bridge under NJ Route 48 (Structure No. 1706199) has a span of about 32 feet and a rise of about 11 feet.

The NJDOT is proposing improvements to the dam structure which consist of construction of a new bridge with a span of 40 feet, a new 90-foot long ogee spillway (same size as existing, an anticipated preference of adjacent landowners), and elevation of the roadway profile by 1.1 feet. The improvements will convey the Spillway Design Storm with the required one-foot of freeboard. The 100-year water surface elevations under both the existing and proposed conditions for the downstream area remain the same. A stormwater management basin is also proposed west of NJ Route 48 and north of Game Creek.

This report documents the location, extent, and characteristics of regulated wetlands and waterways within the project study area. The purpose of this report is to provide guidance for a design that avoids and minimizes impacts to wetlands, wetland transition areas, and open water resources in the project area, and to provide documentation of ecological site conditions for future environmental permitting.

## 2. Methodology

Wetland field investigation of the project area was conducted on April 15, 2010. Prior to the field investigation, all readily available, pertinent background data were reviewed. These data included: USGS Topographical Maps (Penns Grove, NJ-DEL, 1993); Soil Survey Geographic (SSURGO) Database for Salem County, NJ (US Department of Agriculture [USDA]/Natural Resources Conservation Service (NRCS), 1999); National Wetlands Inventory (NWI) mapping; and NJDEP-Mapped Freshwater Wetlands (GIS). Copies of the NRCS SSURGO soils mapping, NJDEP Freshwater Wetlands mapping, and NWI mapping for the project area are provided as ***Figures 3, 4,* and 5**, respectively.

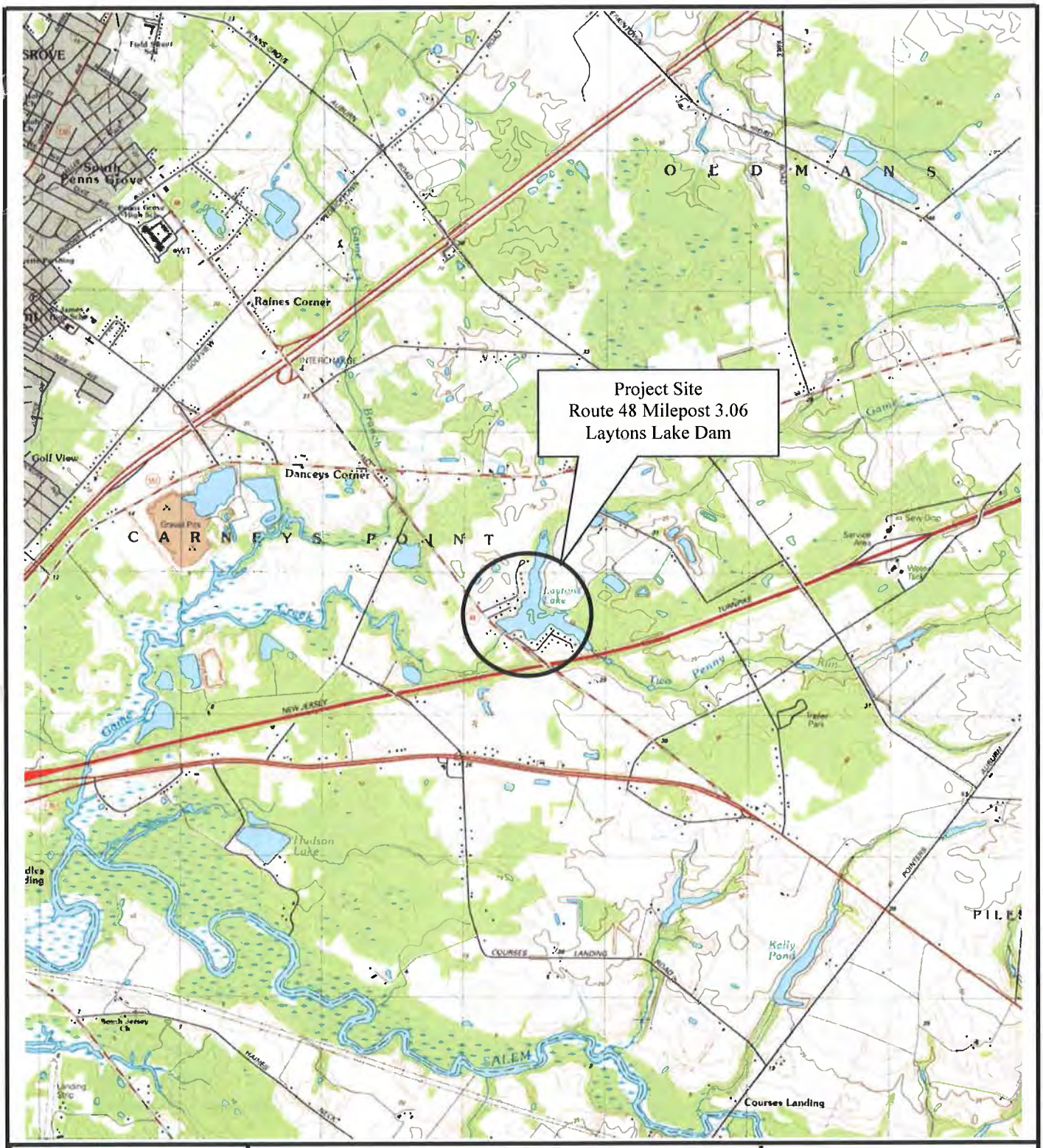
Wetland identification and delineation were conducted using the three-parameter approach (hydrology, soils, and vegetation) in accordance with the *Federal Manual for Identifying and Delineating Jurisdictional Wetlands* (FICWD, 1989). The Routine Onsite Determination Method - Plant Community Assessment Procedure was employed.

Delineated wetland areas were classified according to the *Classification of Wetlands and Deepwater Habitats of the United States* (Cowardin et al., 1979). Indicator statuses of plant species identified were determined utilizing the *National List of Plant Species that Occur in Wetlands: Northeast (Region 1)*

(Reed, 1988). Soils were sampled using a mud (Dutch) auger. Sampled soils were compared against the *Munsell Soil Color Charts* (GretagMacbeth, 2000) for color standardization.

Hydrologic indicators, soil profiles/hydric soil indicators, and dominant vegetative species were noted; and wetland boundaries were demarcated with survey ribbon/flagging. Data collected in the field was transcribed onto Routine Wetland Determination Data Forms. Copies of the data forms are provided in ***Appendix A***. Representative photographs of the site may be found in ***Appendix B***. The locations of surveyed soil borings and upland/wetland boundaries were plotted on the ***Wetland Delineation Plans***, which are provided in ***Appendix C*** as an attachment.

Carneys Point Township appears on neither The NJDEP *Freshwater Wetlands Permit Program Attachment C - Known Locations of Swamp Pink* (Helonias bullata) *in New Jersey (as of October 2008)*, nor the NJDEP *Freshwater Wetlands Permit Program Attachment D – Known Locations of Bog Turtles (*Clemmys muhlenbergii*) in New Jersey (as of October 2008)*. Further, Carneys Point Township does not appear on The United States Fish and Wildlife Service's *Federally Listed and Candidate Species Occurrences in New Jersey by County and Municipality* (as of December 2009). However, the resource value classification of wetlands/waterways within the project area was assumed to be Exceptional (N.J.A.C. 7:7A-2.4). This was due to the possible association with threatened and endangered species. The NJDEP Natural Heritage Program (NHP) reported Layton Lake as bald eagle (*Haliaeetus leucocephalus*) foraging area, and reported occurrences of bobcat (*Lynx rufus*) within ¼-mile of the site.





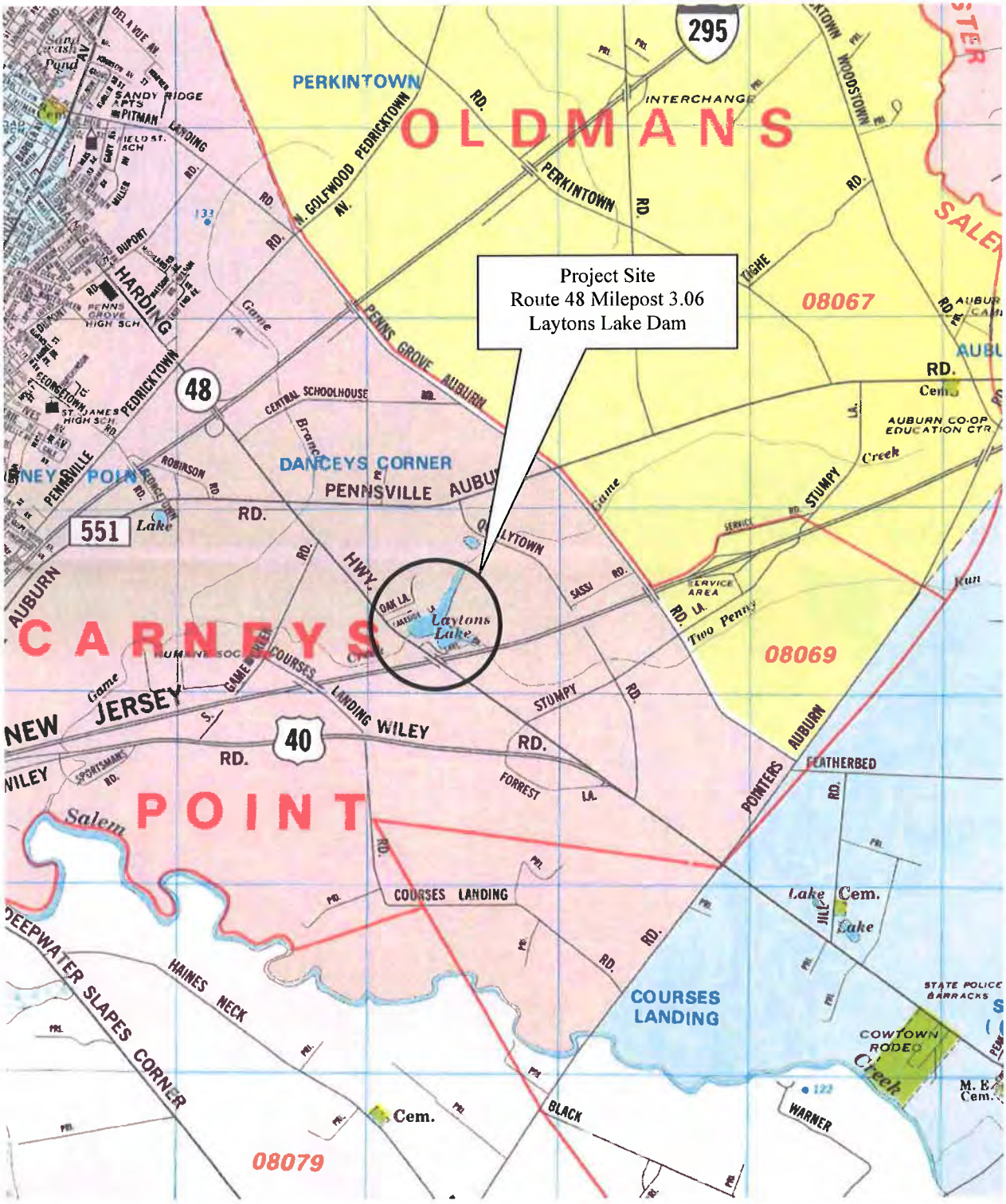


**ROUTE 48 AT LAYTONS LAKE DAM**
**CARNEYS POINT TOWNSHIP**
**SALEM COUNTY, NEW JERSEY**

**FIGURE 1 – PROJECT LOCATION MAP (USGS)**

PENNS GROVE, NJ-DEL QUADRANGLE
US GEOLOGICAL SURVEY, 1993
1 INCH = 3,000 FEET

McCormick Taylor
Engineers & Planners Since 1946





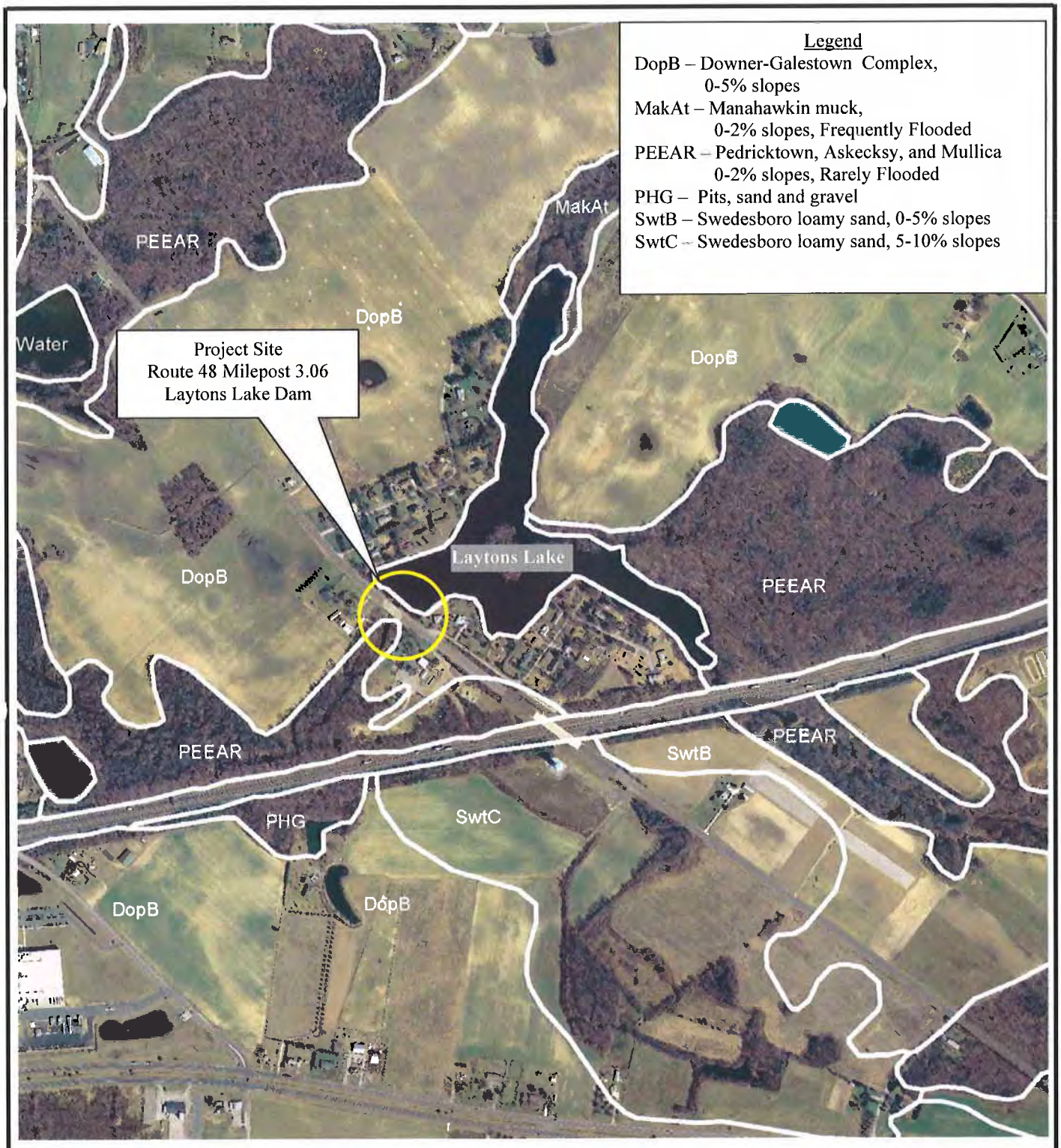


**ROUTE 48 AT LAYTONS LAKE DAM**
**CARNEYS POINT TOWNSHIP**
**SALEM COUNTY, NEW JERSEY**

**FIGURE 2 – PROJECT LOCATION MAP (COUNTY)**

FRANKLIN MAPPING: SALEM COUNTY, NJ (2000)
1 INCH = 2,000 FEET

McCormick Taylor
Engineers & Planners Since 1946





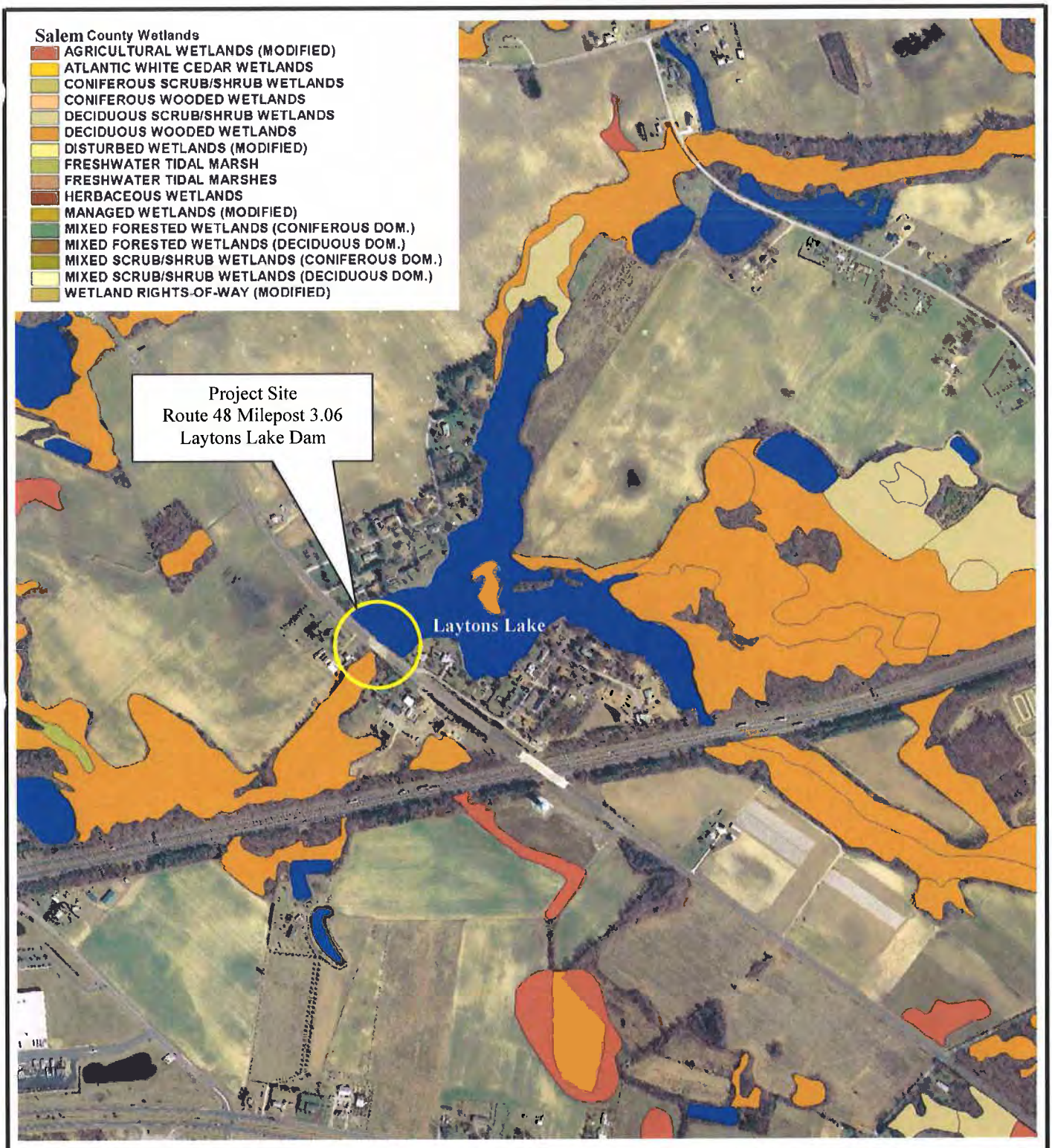


**ROUTE 48 AT LAYTONS LAKE DAM**
**CARNEYS POINT TOWNSHIP**
**SALEM COUNTY, NEW JERSEY**

**FIGURE 3 – SOILS MAPPING**

SOIL SURVEY GEOGRAPHIC (SSURGO) DATABASE
USDA NATURAL RESOURCES CONSERVATION SERVICE, 1999
1 INCH = 850 FEET

McCormick Taylor
Engineers & Planners Since 1946





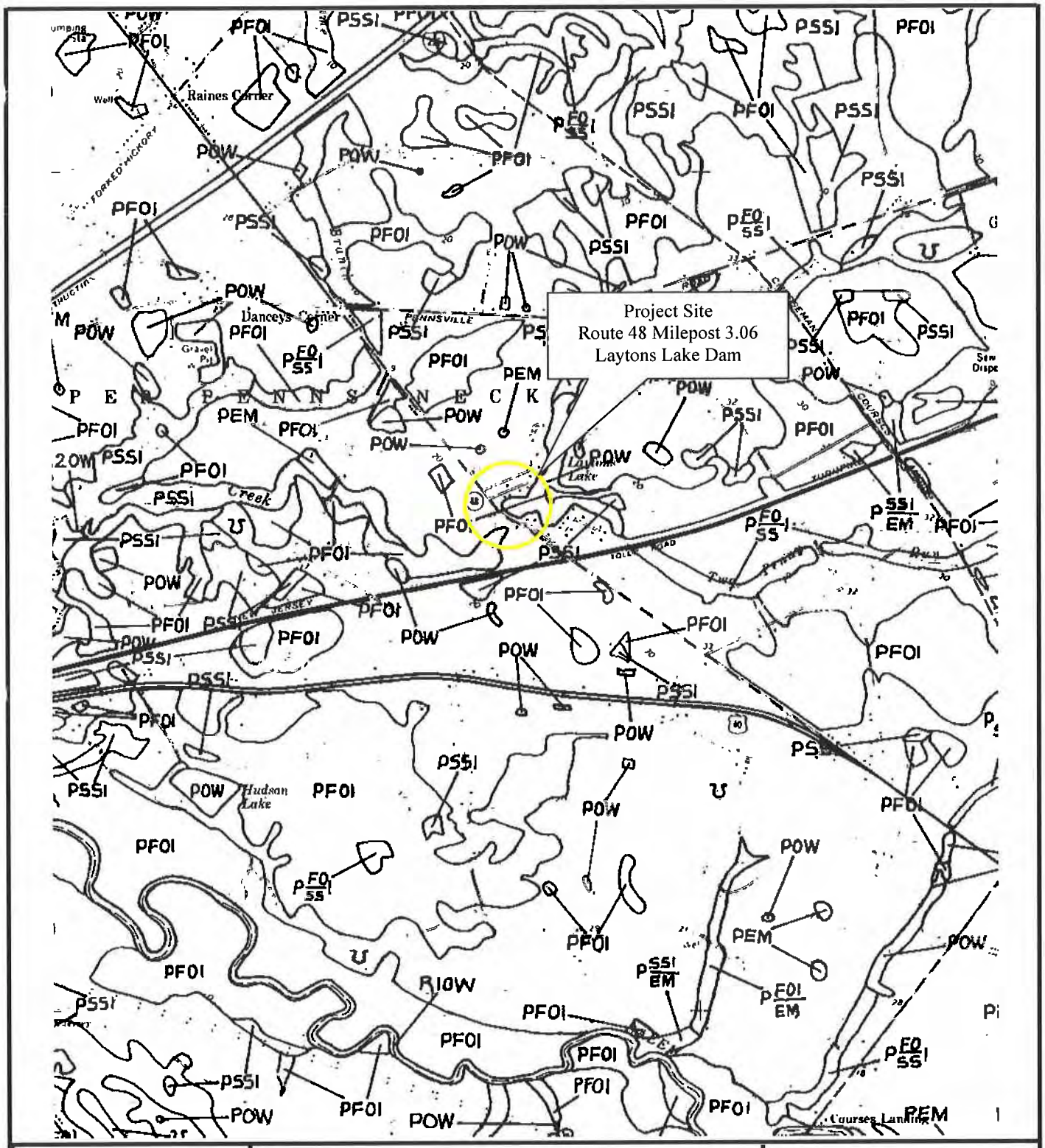


**ROUTE 48 AT LAYTON LAKE DAM**
**CARNEYS POINT TOWNSHIP**
**SALEM COUNTY, NEW JERSEY**

**FIGURE 4 – NJDEP MAPPED FRESHWATER WETLANDS**

NJDEP FRESHWATER WETLANDS OF NEW JERSEY
NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION, 1986
1 INCH = 850 FEET

McCormick Taylor
Engineers & Planners Since 1946




NEW JERSEY

QUADRANGLE LOCATION

ROUTE 48 AT LAYTONS LAKE DAM
CARNEYS POINT TOWNSHIP
SALEM COUNTY, NEW JERSEY

FIGURE 5 – NATIONAL WETLANDS INVENTORY MAP

PENNS GROVE, NJ-DEL
US DEPARTMENT OF INTERIOR US FISH AND WILDLIFE SERVICE
1 INCH = 2,300 FEET

McCormick Taylor
Engineers & Planners Since 1946

## 3. Results

Review of NJDEP freshwater wetland mapping for the project area identified potential wetland resources associated with Laytons Lake and Game Creek. Field investigations identified palustrine forested (PFO) and palustrine emergent (PEM) wetlands, and open waters within the project area (see below).

The project area is not associated with any USEPA Priority Wetlands.

The NJDEP Surface Water Quality Classifications for Two Penny Creek, Game Creek, and Laytons Lake is FW2-NT (Freshwater, Non-trout).

A search of the SSURGO Database for Salem County revealed that the dominant soil types within the project area were Downer-Galestown Complex, 0-5% slopes (DopB) and Pedrickstown, Askecksy, and Mullica, 0-2% slopes, rarely flooded (PEEAR).

The Downer series consists of very deep, well drained soils of the North Atlantic Coastal Plain, formed from fluviomarine deposits. These nearly level soils are typically used for agriculture. The Galestown Series consists of very deep, somewhat excessively drained soils of the coastal plain, and formed from sandy marine sediments and glacial outwash on glacial terminal moraine. These level soils are typically used for agriculture.

The Pedrickstown series consists of very deep, very poorly drained soils of the coastal plain lowlands, formed from loamy and sandy alluvial sediments. These nearly level soils are typically associated with floodplains and backswamp areas of small rivers and streams. The Askecksy series consists of very deep, poorly drained soils of the coastal plain lowlands, formed from sandy alluvial and marine sediments. These soils are typically associated with low-lying uplands, broad depressions, floodplains, and stream terraces. The Mullica series consists of very deep, very poorly drained soils of the coastal plain, formed from sandy and loamy siliceous fluviomarine sediments. These soils are typically associated with broad flats along streams in low headwater areas, depressions, swales, drainageways, or small scattered low-lying areas; and are typically wooded.

Two open water areas and one individual freshwater wetland area have been identified and delineated in the project study area, as indicated below:

**Open Water 1 (Layton Lake)**

Layton Lake, an approximately 28-acre artificial freshwater lake located on the confluence of Game Creek and Two Penny Run, was created by the Dam No. 30-15. The lake is surrounded predominantly by residential development, with extensive bulkheading.

**Open Water 2**

Open Water 2, Game Creek (FW2-NT), is a R3SB2 (Riverine, Upper Perennial, Streambed, Sand) occurring on the downstream side of the dam.

**Wetland 1**

Wetland 1 occurs downstream of the dam, consisting of Palustrine emergent wetland (PEM) and Palustrine forested wetland (PFO) west of Game Creek. Flags numbered W1-1 through W1-7 delineate the boundary of Wetland 1. As discussed in ***Section 2 - Methodology*** above, this wetland qualifies for classification as Exceptional Resource Value under the NJDEP Freshwater Wetlands Protection Act Rules at NJAC 7:7A-2.4.

**Vegetation**

Dominant vegetation in Wetland 1 consists of reed canary grass (*Phalaris arundinacea*, FACW), red maple (*Acer rubrum*, FAC), silky dogwood (*Cornus amomum*, FACW), and horsetail

(*Equisetum sp.*, FAC). Since greater than 50 percent of the dominant vegetative species are Facultative (FAC) or wetter, the hydrophytic vegetation criterion is met.

**Soils**
A soil borings was taken to assist in the determination of the boundary of Wetland 1. Data recovered from boring (B-4) within the wetland boundary revealed the presence of hydric soil conditions, evidenced by low chroma matrix colors.

**Hydrology**
Indicators of wetland hydrology included saturation of soil within the upper 12 inches, drift lines, and water-stained leaves.

## 4. Conclusion

The project will result in minor disturbances to the open water area of Laytons Lake and associated transition areas for construction of a new spillway and a new bridge with the necessary elevation of the roadway profile (1-foot maximum). Details are provided below:

### Wetland Areas

One additional freshwater wetland has been identified within the project area. This area appears to occur beyond the proposed project's disturbance area and is not expected to be directly impacted.

### Open Waters

The proposed spillway will be a two-stage concrete ogee weir constructed in a parabolic shape. The lower spillway section would be 10 feet long, at the same elevation as the existing spillway, to maintain the normal pool elevation of the lake. The second stage of the spillway would be three inches higher than the lower spillway section, with a length of about 71 feet. It is anticipated that open water will be affected by the construction of the new spillway. A portion of the impact will be for the temporary installation of a coffer dam to allow dry access for placement of the new spillway structure. This coffer dam would be removed following construction.

### Transition Area

Since elevation of the roadway profile to accommodate the new bridge will require reinforcement and stabilization of the adjacent slopes, and since all proposed activities must include removal of undesirable vegetation from the dam embankment, and stabilization of the embankment, freshwater wetland transition area will be disturbed by the slope stabilization work. This disturbance is temporary and not expected to negatively affect the quality or function of the transition area or the adjacent aquatic systems.

Based on the current design and right-of-way plans, it appears that the proposed project will result in the disturbance (both permanent and temporary) of less than one-half acre of freshwater wetlands, transition areas, and State/Federal open waters (inclusive). Work within these wetland and transition areas and open waters will be regulated under the NJDEP Freshwater Wetlands Protection Act Rules. Flood Hazard Area Control Act rules will not apply since this project is regulated by the NJDEP Dam Safety Standards (N.J.A.C. 7:20) under the NJDEP Bureau of Flood Control and Dam Safety.

# REFERENCES


Cowardin, L.M., V. Carter, F.C. Golet and E.T. LaRoe. 1977. *Classification of Wetlands and Deep-Water Habitats of the United States (An Operational Draft)*. US Fish and Wildlife Service.

Federal Interagency Committee for Wetland Delineation. 1989. *Federal Manual for Identifying and Delineating Jurisdictional Wetlands.* U.S. Army Corps of Engineers, U.S. Environmental Protection Agency, U.S. Fish and Wildlife Service, and USDA Soil Conservation Service, Washington, D.C. Cooperative technical publication.

GretagMacbeth. 2000. *Munsell Soil Color Charts.*

New Jersey Department of Environmental Protection. 2003. *Freshwater Wetlands Protection Act Rules.* NJAC 7:7A.

New Jersey Department of Environmental Protection. 1996. GIS Resource Data, Series 1, Volume 2.

New Jersey Department of Environmental Protection. 2008. *Surface Water Quality Standards* (NJAC 7:9B).

Reed, Porter B. Jr. 1988. *National List of Plant Species that Occur in Wetlands: New Jersey.* US Fish and Wildlife Service.

US Department of Agriculture, Natural Resource Conservation Service. 1999. *Soil Survey Geographic (SSURGO) Database, Salem County, New Jersey.*

US Department of Agriculture, Soil Conservation Service. 1991. *Hydric Soils of the United States.* Third Edition. Miscellaneous Publication Number 1491.

US Environmental Protection Agency, Region 2. Marine and Wetlands Protection Branch. 1994. *Priority Wetlands for the State of New Jersey.*

US Fish and Wildlife Service. 1970. Penns Grove, NJ-DEL Quadrangle. *National Wetlands Inventory.*

US Geological Survey. 1993. Penns Grove, NJ-DEL Quadrangle 7.5 Minute Topographic Map.

# *APPENDIX A*
# *ROUTINE WETLAND DETERMINATION DATA FORMS*

# WETLAND DATA FORM
# ROUTINE ONSITE DETERMINATION METHOD

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Project Site: | Route 48 MP 3.06 – Laytons Lake Dam | | | | | Date: | 04/15/10 |
| Applicant/Owner: | NJDOT | | | | | County: | Salem |
| Investigator(s): | JLD/TRM | | | | | State: | NJ |
| Do normal conditions exist on the site? | | Yes | X | No | | Community ID: | Upland |
| Is the site significantly disturbed? | | Yes | | No | X | Transect ID: | Upstream, West |
| Is the area a potential Problem Area? | | Yes | | No | X | Plot ID: | B-1 |

Remarks:
Boring taken on the upstream side of the dam, west of the lake.

## VEGETATION

**Dominant Plant Species**

| | Common Name | Scientific Name | Stratum | Indicator |
|---|---|---|---|---|
| 1. | White Pine | *Pinus strobus* | T | FACU |
| 2. | Eastern red cedar | *Juniperus virginiana* | T | FACU |
| 3. | American holly | *Ilex opaca* | S | FACU |
| 4. | Red maple | *Acer rubrum* | T | FAC |
| 5. | Common dandelion | *Taraxacum officinale* | H | FACU |
| 6. | Common plantain | *Plantago major* | H | FACU |
| 7. | | | | |
| 8. | | | | |
| 9. | | | | |
| 10. | | | | |

Percent of Dominant Species that are OBL, FACW, or FAC: **17%**

Remarks:

Hydrophytic vegetation criterion not met.

## HYDROLOGY

| Recorded Data (Describe in Remarks) | | Field Indicators | |
|---|---|---|---|
| | Stream Gauge Data | | Inundated |
| | Lake Gauge Data | | Saturated in Upper 12 Inches |
| | Tidal Gauge Data | | Water Marks |
| | Flood Prediction Data | | Drift Lines |
| | Historical Flood Records | | Water-Borne Sediment Deposits |
| | Aerial Photographs | | Drainage Patterns |
| | Other | | Surface Scouring/Eroded Sediments |
| | No Recorded Data Available | | Oxidized Root Channels |
| **Field Observations** | | | Water-Stained Leaves |
| Depth of Surface Water (inches): | Absent | | Morphological Plant Adaptations |
| Depth to Free-Standing Water in Pit (inches): | >18 | | Hydric Soil Characteristics |
| Depth to Saturated Soil (inches): | ~18 | | Other (Describe in Remarks) |

Remarks:

Wetland hydrology criteria not met.

| Community ID: | Upland | Transect ID: | Upstream, West | Plot ID: | B-1 |
|---|---|---|---|---|---|

## SOILS

| | | | | | |
|---|---|---|---|---|---|
| Soil Series and Phase: | Downer-Galestown Complex, 0-5% slopes | | | | |
| Soil Drainage Class: | Well drained to somewhat excessively drained | | | | |
| Taxonomy (Subgroup): | Silaceous, mesic, Typic (Downer) and Psammentic (Galestown) Hapludults | | | | |
| Field Observations Confirm Mapped Type? | Yes | | No | X | |

| | | | | | |
|---|---|---|---|---|---|
| Soil Series and Phase: | - | | | | |
| Soil Drainage Class: | | | | | |
| Taxonomy (Subgroup): | | | | | |
| Field Observations Confirm Mapped Type? | Yes | | No | | |

**Soil Profile Description**

| Depth (inches) | Horizon | Matrix Color (Munsell Moist) | Mottle Colors (Munsell Moist) | Mottle Abundance/Contrast | Textures, Concretions, Structures, etc. |
|---|---|---|---|---|---|
| 0-10 | | 7.5YR 3/1 | - | - | Silty loam |
| 10-20 | | 7.5YR 3/1 | - | - | Loamy sand |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

| | Organic and Mineral Hydric Soil Indicators | | Coarse-Textured or Sandy Hydric Soil Indicators |
|---|---|---|---|
| | Histosol (*Organic Only*) | | High Organic Matter Content in Surface Horizon |
| | Histic Epipedon (*Mineral w/ Organic Layer*) | | Organic Streaking in Subsurface Horizons |
| | Sulfidic Odor (*Any Soil*) | | Wet Spodosols |
| | Aquic or Peraquic Moisture Regime (*Any Soil*) | | **Miscellaneous Indicators** |
| | Reducing Conditions (*Colorimetric Field Tested*) | | Listed for County as Hydric Soil Map Unit |
| | Gleyed or Low-Chroma Colors (*Mineral Only*) | | Listed in National/State/County Hydric Soils List(s) |
| | Iron and/or Manganese Concretions (*Mineral Only*) | | Other (Describe in Remarks) |

Remarks:

Hydric soils criteria not met. While low chroma colors were observed, no additional indicators were identified within this sandy soil.

## WETLAND DETERMINATION

| | | | | | | |
|---|---|---|---|---|---|---|
| Hydrophytic Vegetation Present? | Yes | | No | X | Inconclusive | |
| Wetland Hydrology Present? | Yes | | No | X | | |
| Hydric Soils Present? | Yes | | No | X | | |
| Is This Sampling Point Within a Wetland? | Yes | | No | X | | |

Remarks:

All three parameters are absent.

# WETLAND DATA FORM
# ROUTINE ONSITE DETERMINATION METHOD

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Project Site: | Route 48 MP 3.06 – Laytons Lake Dam | | | | | Date: | 04/15/10 |
| Applicant/Owner: | NJDOT | | | | | County: | Salem |
| Investigator(s): | JLD/TRM | | | | | State: | NJ |
| Do normal conditions exist on the site? | Yes | X | No | | Community ID: | Upland | |
| Is the site significantly disturbed? | Yes | | No | X | Transect ID: | Downstream, East | |
| Is the area a potential Problem Area? | Yes | | No | X | Plot ID: | B-2 | |

Remarks:
Boring taken on the downstream side of the dam, east of the Game Creek.

## VEGETATION

**Dominant Plant Species**

| | Common Name | Scientific Name | Stratum | Indicator |
|---|---|---|---|---|
| 1. | Sycamore | *Platanus occidentals'* | T | FAC |
| 2. | Sweet gum | *Liquidambar styraciflua* | T | FAC |
| 3. | Japanese honeysuckle | *Lonicera japonica* | WV | FAC |
| 4. | Multiflora rose | *Rosa multiflora* | WV | FACU |
| 5. | Wild onion | *Allium canadense* | H | FACU |
| 6. | Green brier | *Smilax rotundifolia* | WV | FAC |
| 7. | | | | |
| 8. | | | | |
| 9. | | | | |
| 10. | | | | |

Percent of Dominant Species that are OBL, FACW, or FAC: **67%**

Remarks:

Hydrophytic vegetation criterion met.

## HYDROLOGY

| Recorded Data (Describe in Remarks) | |
|---|---|
| | Stream Gauge Data |
| | Lake Gauge Data |
| | Tidal Gauge Data |
| | Flood Prediction Data |
| | Historical Flood Records |
| | Aerial Photographs |
| | Other |
| | No Recorded Data Available |

| Field Observations | |
|---|---|
| Depth of Surface Water (inches): | Absent |
| Depth to Free-Standing Water in Pit (inches): | 22 |
| Depth to Saturated Soil (inches): | 20 |

| Field Indicators | |
|---|---|
| | Inundated |
| | Saturated in Upper 12 Inches |
| | Water Marks |
| | Drift Lines |
| | Water-Borne Sediment Deposits |
| | Drainage Patterns |
| | Surface Scouring/Eroded Sediments |
| | Oxidized Root Channels |
| | Water-Stained Leaves |
| | Morphological Plant Adaptations |
| | Hydric Soil Characteristics |
| | Other (Describe in Remarks) |

Remarks:

Wetland hydrology criteria not met.

| Community ID: | Upland | Transect ID: | Downstream, East | Plot ID: | B-2 |
|---|---|---|---|---|---|

## SOILS

| | | | | | |
|---|---|---|---|---|---|
| Soil Series and Phase: | Downer-Galestown Complex, 0-5% slopes | | | | |
| Soil Drainage Class: | Well drained to somewhat excessively drained | | | | |
| Taxonomy (Subgroup): | Silaceous, mesic, Typic (Downer) and Psammentic (Galestown) Hapludults | | | | |
| Field Observations Confirm Mapped Type? | Yes | X | No | | |

| | | | | | |
|---|---|---|---|---|---|
| Soil Series and Phase: | - | | | | |
| Soil Drainage Class: | | | | | |
| Taxonomy (Subgroup): | | | | | |
| Field Observations Confirm Mapped Type? | Yes | | No | | |

**Soil Profile Description**

| Depth (inches) | Horizon | Matrix Color (Munsell Moist) | Mottle Colors (Munsell Moist) | Mottle Abundance/Contrast | Textures, Concretions, Structures, etc. |
|---|---|---|---|---|---|
| 0-5 | | 7.5YR 2.5/1 | - | - | Silty sand with organics |
| 5-10 | | 10YR 4/2 | - | - | Medium sand |
| 10-18 | | 10YR 4/1 | - | - | Sand |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

| | Organic and Mineral Hydric Soil Indicators | | Coarse-Textured or Sandy Hydric Soil Indicators |
|---|---|---|---|
| | Histosol (*Organic Only*) | | High Organic Matter Content in Surface Horizon |
| | Histic Epipedon (*Mineral w/ Organic Layer*) | | Organic Streaking in Subsurface Horizons |
| | Sulfidic Odor (*Any Soil*) | | Wet Spodosols |
| | Aquic or Peraquic Moisture Regime (*Any Soil*) | | **Miscellaneous Indicators** |
| | Reducing Conditions (*Colorimetric Field Tested*) | | Listed for County as Hydric Soil Map Unit |
| | Gleyed or Low-Chroma Colors (*Mineral Only*) | | Listed in National/State/County Hydric Soils List(s) |
| | Iron and/or Manganese Concretions (*Mineral Only*) | | Other (Describe in Remarks) |

Remarks:

Hydric soils criteria not met. While low chroma colors were observed, no additional indicators were identified within this sandy soil.

## WETLAND DETERMINATION

| | | | | | | |
|---|---|---|---|---|---|---|
| Hydrophytic Vegetation Present? | Yes | X | No | | Inconclusive | |
| Wetland Hydrology Present? | Yes | | No | X | | |
| Hydric Soils Present? | Yes | | No | X | | |
| Is This Sampling Point Within a Wetland? | Yes | | No | X | | |

Remarks:

Two of three parameters are absent. While FAC vegetation is dominant, no species wetter than FAC, and no evidence of hydric soils or wetland hydrology were observed.

# WETLAND DATA FORM
# ROUTINE ONSITE DETERMINATION METHOD

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Project Site: | Route 48 MP 3.06 – Laytons Lake Dam | | | | | Date: | 04/15/10 |
| Applicant/Owner: | NJDOT | | | | | County: | Salem |
| Investigator(s): | JLD/TRM | | | | | State: | NJ |
| Do normal conditions exist on the site? | Yes | X | No | | Community ID: | Upland | |
| Is the site significantly disturbed? | Yes | | No | X | Transect ID: | Downstream, West | |
| Is the area a potential Problem Area? | Yes | | No | X | Plot ID: | B-3 | |

Remarks:
Boring taken on the downstream side of the dam, west of the Game Creek.

## VEGETATION

**Dominant Plant Species**

| | Common Name | Scientific Name | Stratum | Indicator |
|---|---|---|---|---|
| 1. | Red maple | *Acer rubrum* | T | FAC |
| 2. | Slippery elm | *Ulmus rubra* | T | FAC |
| 3. | Multiflora rose | *Rosa multiflora* | WV | FACU |
| 4. | Japanese honeysuckle | *Lonicera japonica* | WV | FAC |
| 5. | Poison ivy | *Toxicodendron radicans* | WV | FAC |
| 6. | Horsetail | *Equisetum sp.* | H | FAC |
| 7. | | | | |
| 8. | | | | |
| 9. | | | | |
| 10. | | | | |

Percent of Dominant Species that are OBL, FACW, or FAC: **83%**

Remarks:

Hydrophytic vegetation criterion met.

## HYDROLOGY

| Recorded Data (Describe in Remarks) | |
|---|---|
| | Stream Gauge Data |
| | Lake Gauge Data |
| | Tidal Gauge Data |
| | Flood Prediction Data |
| | Historical Flood Records |
| | Aerial Photographs |
| | Other |
| | No Recorded Data Available |

| Field Observations | |
|---|---|
| Depth of Surface Water (inches): | Absent |
| Depth to Free-Standing Water in Pit (inches): | >22 |
| Depth to Saturated Soil (inches): | 18 |

| Field Indicators | |
|---|---|
| | Inundated |
| | Saturated in Upper 12 Inches |
| | Water Marks |
| | Drift Lines |
| | Water-Borne Sediment Deposits |
| | Drainage Patterns |
| | Surface Scouring/Eroded Sediments |
| | Oxidized Root Channels |
| | Water-Stained Leaves |
| | Morphological Plant Adaptations |
| | Hydric Soil Characteristics |
| | Other (Describe in Remarks) |

Remarks:

Wetland hydrology criteria not met.

| Community ID: | Upland | Transect ID: | Downstream, West | Plot ID: | B-3 |
|---|---|---|---|---|---|

## SOILS

| | | | | | |
|---|---|---|---|---|---|
| Soil Series and Phase: | Pedricktown, Askecksy, and Mullica, 0-2% slopes, Rarely Flooded | | | | |
| Soil Drainage Class: | Poorly to very poorly drained | | | | |
| Taxonomy (Subgroup): | Humaqueptic Fluvaquents (Pedrickstown), Typic Psammaquents (Askeckey), and Typic Humaquepts (Mullica) | | | | |
| Field Observations Confirm Mapped Type? | Yes | X | No | | |

| | | | | | |
|---|---|---|---|---|---|
| Soil Series and Phase: | - | | | | |
| Soil Drainage Class: | | | | | |
| Taxonomy (Subgroup): | | | | | |
| Field Observations Confirm Mapped Type? | Yes | | No | | |

**Soil Profile Description**

| Depth (inches) | Horizon | Matrix Color (Munsell Moist) | Mottle Colors (Munsell Moist) | Mottle Abundance/Contrast | Textures, Concretions, Structures, etc. |
|---|---|---|---|---|---|
| 0-5 | | 10YR 3/1 | - | - | Silty sand with organics |
| 5-15 | | 10YR 4/2 | - | - | Silty sand |
| 15-24 | | 10YR 4/2 | - | - | Medium-fine Sand |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

| | Organic and Mineral Hydric Soil Indicators |
|---|---|
| | Histosol (*Organic Only*) |
| | Histic Epipedon (*Mineral w/ Organic Layer*) |
| | Sulfidic Odor (*Any Soil*) |
| | Aquic or Peraquic Moisture Regime (*Any Soil*) |
| | Reducing Conditions (*Colorimetric Field Tested*) |
| | Gleyed or Low-Chroma Colors (*Mineral Only*) |
| | Iron and/or Manganese Concretions (*Mineral Only*) |

| | Coarse-Textured or Sandy Hydric Soil Indicators |
|---|---|
| | High Organic Matter Content in Surface Horizon |
| | Organic Streaking in Subsurface Horizons |
| | Wet Spodosols |
| | **Miscellaneous Indicators** |
| | Listed for County as Hydric Soil Map Unit |
| | Listed in National/State/County Hydric Soils List(s) |
| | Other (Describe in Remarks) |

Remarks:

Hydric soils criteria not met. While low chroma colors were observed, no additional indicators were identified within this sandy soil.

## WETLAND DETERMINATION

| | | | | | | |
|---|---|---|---|---|---|---|
| Hydrophytic Vegetation Present? | Yes | X | No | | Inconclusive | |
| Wetland Hydrology Present? | Yes | | No | X | | |
| Hydric Soils Present? | Yes | | No | X | | |
| Is This Sampling Point Within a Wetland? | Yes | | No | X | | |

Remarks:

Two of three parameters are absent. While FAC vegetation is dominant, no species wetter than FAC, and no evidence of hydric soils or wetland hydrology were observed.

# WETLAND DATA FORM
# ROUTINE ONSITE DETERMINATION METHOD

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Project Site: | Route 48 MP 3.06 – Laytons Lake Dam | | | | | Date: | 04/15/10 | |
| Applicant/Owner: | NJDOT | | | | | County: | Salem | |
| Investigator(s): | JLD/TRM | | | | | State: | NJ | |
| Do normal conditions exist on the site? | Yes | X | No | | Community ID: | Wetland | | |
| Is the site significantly disturbed? | Yes | | No | X | Transect ID: | Downstream, West | | |
| Is the area a potential Problem Area? | Yes | | No | X | Plot ID: | B-4 | | |

Remarks:
Boring taken on the downstream side of the dam, west of the Game Creek.

## VEGETATION

| Dominant Plant Species | | | | |
|---|---|---|---|---|
| | Common Name | Scientific Name | Stratum | Indicator |
| 1. | Reed canary grass | *Phalaris arundinacea* | H | FACW |
| 2. | Horsetail | *Equisetum sp.* | H | FAC |
| 3. | Red maple | *Acer rubrum* | T | FAC |
| 4. | Silky dogwood | *Cornus amomum* | S | FACW |
| 5. | | | | |
| 6. | | | | |
| 7. | | | | |
| 8. | | | | |
| 9. | | | | |
| 10. | | | | |

Percent of Dominant Species that are OBL, FACW, or FAC: **100%**

Remarks:

Hydrophytic vegetation criterion met.

## HYDROLOGY

| Recorded Data (Describe in Remarks) | | Field Indicators | |
|---|---|---|---|
| | Stream Gauge Data | | Inundated |
| | Lake Gauge Data | X | Saturated in Upper 12 Inches |
| | Tidal Gauge Data | | Water Marks |
| | Flood Prediction Data | X | Drift Lines |
| | Historical Flood Records | | Water-Borne Sediment Deposits |
| | Aerial Photographs | | Drainage Patterns |
| | Other | | Surface Scouring/Eroded Sediments |
| | No Recorded Data Available | | Oxidized Root Channels |
| **Field Observations** | | X | Water-Stained Leaves |
| Depth of Surface Water (inches): | Absent | | Morphological Plant Adaptations |
| Depth to Free-Standing Water in Pit (inches): | 10 | | Hydric Soil Characteristics |
| Depth to Saturated Soil (inches): | 3 | | Other (Describe in Remarks) |

Remarks:

Wetland hydrology criteria met.

| Community ID: | Wetland | Transect ID: | Downstream, West | Plot ID: | B-4 |
|---|---|---|---|---|---|

## SOILS

| | | | | | |
|---|---|---|---|---|---|
| Soil Series and Phase: | Pedricktown, Askecksy, and Mullica, 0-2% slopes, Rarely Flooded | | | | |
| Soil Drainage Class: | Poorly to very poorly drained | | | | |
| Taxonomy (Subgroup): | Humaqueptic Fluvaquents (Pedrickstown), Typic Psammaquents (Askeckey), and Typic Humaquepts (Mullica) | | | | |
| Field Observations Confirm Mapped Type? | Yes | X | No | | |

| | | | | | |
|---|---|---|---|---|---|
| Soil Series and Phase: | - | | | | |
| Soil Drainage Class: | | | | | |
| Taxonomy (Subgroup): | | | | | |
| Field Observations Confirm Mapped Type? | Yes | | No | | |

**Soil Profile Description**

| Depth (inches) | Horizon | Matrix Color (Munsell Moist) | Mottle Colors (Munsell Moist) | Mottle Abundance/Contrast | Textures, Concretions, Structures, etc. |
|---|---|---|---|---|---|
| 0-5 | | 10YR 3/1 | - | - | Silty clay |
| 5-15 | | 10YR 4/1 | - | - | Silty loam |
| 15-24 | | 2.5Y 5/1 | - | - | Medium sand |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

| | Organic and Mineral Hydric Soil Indicators |
|---|---|
| | Histosol (*Organic Only*) |
| | Histic Epipedon (*Mineral w/ Organic Layer*) |
| | Sulfidic Odor (*Any Soil*) |
| | Aquic or Peraquic Moisture Regime (*Any Soil*) |
| | Reducing Conditions (*Colorimetric Field Tested*) |
| X | Gleyed or Low-Chroma Colors (*Mineral Only*) |
| | Iron and/or Manganese Concretions (*Mineral Only*) |

| | Coarse-Textured or Sandy Hydric Soil Indicators |
|---|---|
| | High Organic Matter Content in Surface Horizon |
| | Organic Streaking in Subsurface Horizons |
| | Wet Spodosols |
| | **Miscellaneous Indicators** |
| | Listed for County as Hydric Soil Map Unit |
| | Listed in National/State/County Hydric Soils List(s) |
| | Other (Describe in Remarks) |

Remarks:

Hydric soils criteria met.

## WETLAND DETERMINATION

| | | | | | | |
|---|---|---|---|---|---|---|
| Hydrophytic Vegetation Present? | Yes | X | No | | Inconclusive | |
| Wetland Hydrology Present? | Yes | X | No | | | |
| Hydric Soils Present? | Yes | X | No | | | |
| Is This Sampling Point Within a Wetland? | Yes | X | No | | | |

Remarks:

All three parameters are present.

# WETLAND DATA FORM
# ROUTINE ONSITE DETERMINATION METHOD

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Project Site: | Route 48 MP 3.06 – Laytons Lake Dam | | | | | Date: | 04/15/10 |
| Applicant/Owner: | NJDOT | | | | | County: | Salem |
| Investigator(s): | JLD/TRM | | | | | State: | NJ |
| Do normal conditions exist on the site? | | Yes | X | No | | Community ID: | Upland |
| Is the site significantly disturbed? | | Yes | | No | X | Transect ID: | Downstream, West |
| Is the area a potential Problem Area? | | Yes | | No | X | Plot ID: | B-5 |

Remarks:
Boring taken on the downstream side of the dam, west of the Game Creek.

## VEGETATION

| Dominant Plant Species | | | | |
|---|---|---|---|---|
| | Common Name | Scientific Name | Stratum | Indicator |
| 1. | Poison ivy` | *Toxicodendron radicans* | WV | FAC |
| 2. | Black cherry | *Prunus serotina* | T | FACU |
| 3. | Red maple | *Acer rubrum* | T | FAC |
| 4. | Japanese honeysuckle | *Lonicera japonica* | WV | FAC |
| 5. | Multiflora rose | *Rosa multiflora* | WV | FACU |
| 6. | Virginia creeper | *Parthenocissus quinquefolia* | WV | FACU |
| 7. | | | | |
| 8. | | | | |
| 9. | | | | |
| 10. | | | | |

Percent of Dominant Species that are OBL, FACW, or FAC: **50%**

Remarks:

Hydrophytic vegetation criterion not met.

## HYDROLOGY

| Recorded Data (Describe in Remarks) | |
|---|---|
| | Stream Gauge Data |
| | Lake Gauge Data |
| | Tidal Gauge Data |
| | Flood Prediction Data |
| | Historical Flood Records |
| | Aerial Photographs |
| | Other |
| | No Recorded Data Available |

| Field Observations | |
|---|---|
| Depth of Surface Water (inches): | Absent |
| Depth to Free-Standing Water in Pit (inches): | >20 |
| Depth to Saturated Soil (inches): | >20 |

| Field Indicators | |
|---|---|
| | Inundated |
| | Saturated in Upper 12 Inches |
| | Water Marks |
| | Drift Lines |
| | Water-Borne Sediment Deposits |
| | Drainage Patterns |
| | Surface Scouring/Eroded Sediments |
| | Oxidized Root Channels |
| | Water-Stained Leaves |
| | Morphological Plant Adaptations |
| | Hydric Soil Characteristics |
| | Other (Describe in Remarks) |

Remarks:

Wetland hydrology criteria not met.

| Community ID: | Upland | Transect ID: | Downstream, West | Plot ID: | B-5 |
|---|---|---|---|---|---|

## SOILS

| | | | | | |
|---|---|---|---|---|---|
| Soil Series and Phase: | Pedricktown, Askecksy, and Mullica, 0-2% slopes, Rarely Flooded | | | | |
| Soil Drainage Class: | Poorly to very poorly drained | | | | |
| Taxonomy (Subgroup): | Humaqueptic Fluvaquents (Pedrickstown), Typic Psammaquents (Askeckey), and Typic Humaquepts (Mullica) | | | | |
| Field Observations Confirm Mapped Type? | Yes | X | No | | |

| | | | | | |
|---|---|---|---|---|---|
| Soil Series and Phase: | - | | | | |
| Soil Drainage Class: | | | | | |
| Taxonomy (Subgroup): | | | | | |
| Field Observations Confirm Mapped Type? | Yes | | No | | |

**Soil Profile Description**

| Depth (inches) | Horizon | Matrix Color (Munsell Moist) | Mottle Colors (Munsell Moist) | Mottle Abundance/Contrast | Textures, Concretions, Structures, etc. |
|---|---|---|---|---|---|
| 0-20 | | 10YR 3/2 | - | - | Medium-fine sand |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

| | Organic and Mineral Hydric Soil Indicators | | Coarse-Textured or Sandy Hydric Soil Indicators |
|---|---|---|---|
| | Histosol (*Organic Only*) | | High Organic Matter Content in Surface Horizon |
| | Histic Epipedon (*Mineral w/ Organic Layer*) | | Organic Streaking in Subsurface Horizons |
| | Sulfidic Odor (*Any Soil*) | | Wet Spodosols |
| | Aquic or Peraquic Moisture Regime (*Any Soil*) | | **Miscellaneous Indicators** |
| | Reducing Conditions (*Colorimetric Field Tested*) | | Listed for County as Hydric Soil Map Unit |
| | Gleyed or Low-Chroma Colors (*Mineral Only*) | | Listed in National/State/County Hydric Soils List(s) |
| | Iron and/or Manganese Concretions (*Mineral Only*) | | Other (Describe in Remarks) |

Remarks:

Hydric soils criteria not met.

## WETLAND DETERMINATION

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Hydrophytic Vegetation Present? | Yes | | No | X | Inconclusive | |
| Wetland Hydrology Present? | Yes | | No | X | | |
| Hydric Soils Present? | Yes | | No | X | | |
| Is This Sampling Point Within a Wetland? | Yes | | No | X | | |

Remarks:

All three parameters are absent.

# *APPENDIX B*
# *SITE PHOTOGRAPHS*



Photo 1: View southeast from Laytons Lake Dam, facing downstream. Note bulkheading, as indicated.



Photo 2: View northwest of NJ Route 48 over Laytons Lake Dam, facing upstream. Note bulkheading, as indicated.

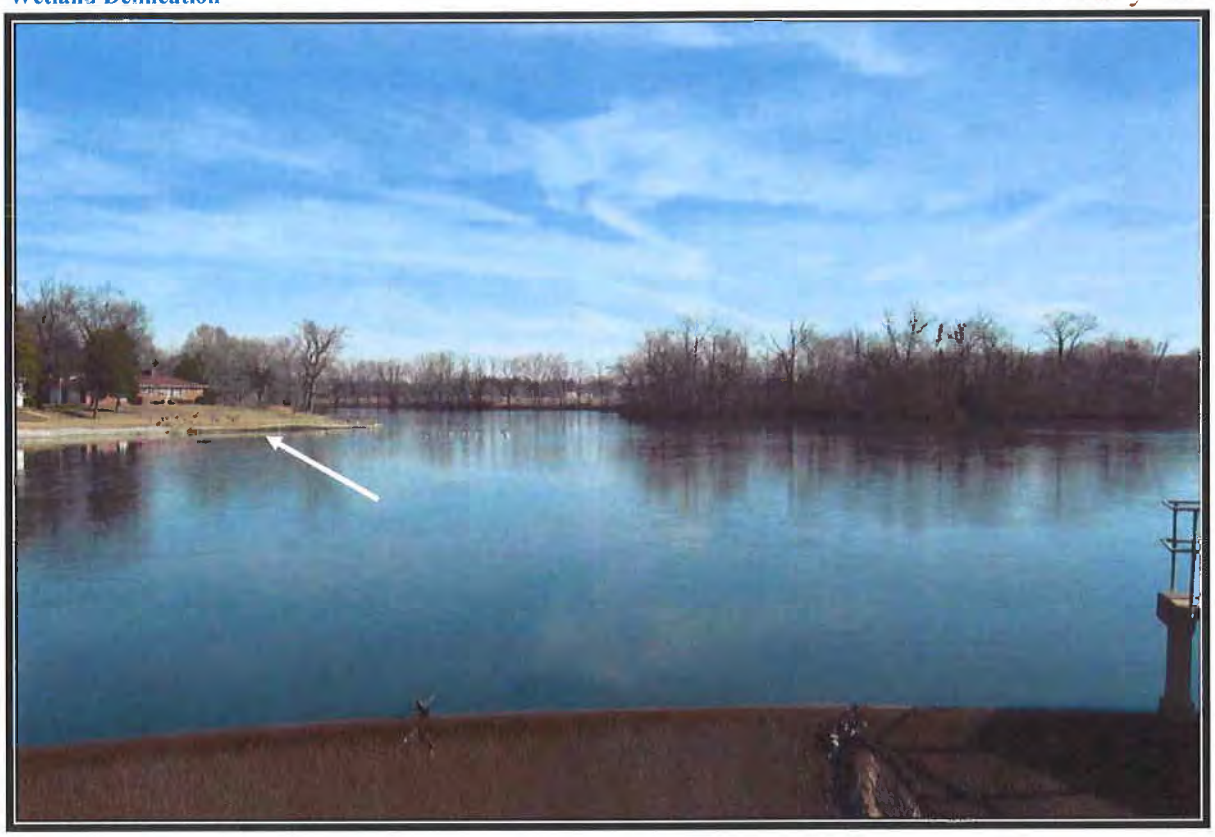


Photo 3: View northwest of Laytons Lake, facing upstream from NJ Route 48 bridge. Note extensive bulkheading, as indicated.



Photo 4: View northwest of eastern shore of Laytons Lake. Note extensive bulkheading.



Photo 5: View southwest of shore of Laytons Lake (OW1).



Photo 6: View southwest of shore of Laytons Lake (OW1).



Photo 7: View southwest of shore of Laytons Lake along NJ Route 48. Dam spillway is in back right.



Photo 8: View northeast of B-2.



Photo 9: View east of the downstream side of Laytons Lake Dam.



Photo 10: View southeast of downstream side of Laytons Lake Dam. Note manhole cover and Wetland 1 to the left of the farm structure.

# *APPENDIX C*
# *WETLAND DELINEATION PLANS*

| STATE | FEDERAL PROJECT NO. |
|---|---|
| N.J. | |

TOWNSHIP OF CARNEYS POINT

SALEM COUNTY

NAD 1983

N.J. State Coordinate System

LAYTON LAKE

BLOCK 233
LOT 14

BLOCK 235
LOT 12

BLOCK 236
LOT 2

BLOCK 236
LOT 3

**OPEN WATER #1**

**LAYTONS LAKE**

Inlet Type 'B'
Gr. 15.82
Inv. 10.82

Headwall
Top 13.15
Inv. 10.41

TO REMAIN

PLUG

TEMPORARY CONSTRUCTION EASEMENT LINE

Inlet Type 'B'
Gr. 14.25
Inv. 9.25

Inlet Type 'ES'
Gr. 13.64
Inv. 9.34 (12" RCP In)
Inv. 8.74 (18" RCP In)
Inv. 8.74 (Out)

Inlet Type 'E'
Gr. 12.62
Inv. 11.02

Inlet Type 'B'
Gr. 13.76
Inv. 10.35

S57°59'04.38"E

S53°41'34.49"E

38.00'

NJ ROUTE 48 LAYTON LAKE

R = 4042.44

S07°55'50"W 12

12" HDPE

15" RCP (104')

15" RCP

PLUG

24" RCP (79')

15" RCP

24" RCP

T.B.R.

15" RCP (101')

24" RCP

PLUG

18" RCP (129')

18" RCP (236')

6" FORCE MAIN

Inlet Type 'ES'
Gr. 13.82
Inv. 9.12 (In)
Inv. 9.12 (Out)

Inlet Type 'B'
Gr. 14.47
Inv. 9.67 (In)
Inv. 9.67 (Out)

Inlet Type 'ES'
Gr. 23.50
Inv. 19.70

15" RCP (39')

Inlet Type
Gr. 14.57
Inv. 10.07

Inv. 12.33

STONE RIPRAP D50=6"

STONE RIPRAP D50=6"

Telephone line
6" FORCE MAIN
End Section
Top 13.55
Inv. 12.49

Inlet Type 'B'
Gr. 18.35
Inv. 11.35

15" Plastic (PVC) Telephone line

Not Surveyed

**WETLAND 1**

BLOCK 249
LOT 9

BLOCK 249
LOT 9.01

**OPEN WATER #2**

30' 20' 10' 0 30' 60'

WD-1
WD-1

## LEGEND

- PHOTOGRAPH LOCATION
- WETLAND LINE
- OPEN WATER LINE
- WETLAND BORING LOCATION

NEW JERSEY DEPARTMENT OF TRANSPORTATION

# WETLAND DELINIATION & PHOTOGRAPH LOCATION PLAN

**NJ ROUTE 48**
**LAYTON LAKE DAM**
**CONTRACT NO.**

McCormick Taylor, Inc.
CERTIFICATION OF AUTHORIZATION NO. 24GA28044300

NABIL M. HOURANI
NEW JERSEY PROFESSIONAL ENGINEER LICENSE NO. 24GE38888900

McCormick Taylor
Engineers & Planners
Since 1946

FILE NAME: $FILES
PROJ. MGR.: $OPERATORS
REV. DATE: $DATES
SCALE: $SCALES

STATE OF NEW JERSEY
DEPARTMENT OF TRANSPORTATION

# *HAZARDOUS WASTE SCREENING REPORT*

*for*

## NJ ROUTE 48 (HARDING HIGHWAY), LAYTONS LAKE DAM IMPROVEMENTS

CARNEYS POINT TOWNSHIP
SALEM COUNTY, NJ

***Prepared for:***

New Jersey Department of Transportation
Division of Environmental Resources
1035 Parkway Avenue, PO Box 600
Trenton, New Jersey 08625-0600

***Prepared by:***

McCormick Taylor, Inc.
700 East Gate Drive, Suite 201
Mt. Laurel, New Jersey 08054

March 2011

# *Hazardous Waste Screening Report*

## NJ ROUTE 48 (HARDING HIGHWAY), LAYTONS LAKE DAM IMPROVEMENTS

### CARNEYS POINT TOWNSHIP
### SALEM COUNTY, NEW JERSEY

***Table of Contents***

**Page No.**


**Executive Summary** ..... 1

**1.0 Introduction** ..... 4
1.1 Project Need and Project Description ..... 4
**2.0 Methodology** ..... 7
2.1 Historical Land Use Review ..... 7
2.2 Environmental Database Research ..... 7
2.3 File Reviews and Agency Coordination ..... 8
2.4 Site Reconnaissance ..... 9
**3.0 Summary of Findings** ..... 9
3.1 Historical Land Use Review ..... 9
3.2 Environmental Database Research ..... 10
3.3 File Reviews and Agency Coordination ..... 10
3.4 Site Reconnaissance ..... 12
**4.0 Conclusions and Recommendations** ..... 13
**5.0 Limitations** ..... 14


***List of Figures***


Figure 1 – Project Location Map ..... 5
Figure 2 – Areas of Potential Environmental Concern ..... 6


***List of Tables***


Table 1 – Properties of Potential Environmental Concern ..... 3


***List of Appendices***


Appendix A – Site Photographs
Appendix B – Correspondence, File Review & Agency Coordination Information
Appendix C – EDR Database Report Maps
Appendix D – Historical Aerial Photographs

# NJ ROUTE 48 (HARDING HIGHWAY), LAYTONS LAKE DAM IMPROVEMENTS

**CARNEYS POINT TOWNSHIP**
**SALEM COUNTY, NEW JERSEY**

## *Hazardous Waste Screening Report*

# EXECUTIVE SUMMARY

McCormick Taylor conducted a Hazardous Waste Screening within the limits of the NJDOT's proposed NJ Route 48 (Harding Highway), Laytons Lake Dam Improvements Project, which is located in the Carneys Point Township, Salem County, New Jersey. (see ***Figure 1***).

The purpose of the screening was to identify the presence or likely presence of hazardous substances or properties with contamination within the study area, and to determine the potential impact that such areas may have on the proposed dam improvement project.

Properties that were assessed included those within 250 feet of the proposed drainage improvements, and those properties located along the major and minor roadways within approximately 250 feet of the proposed construction disturbance area *(*see ***Figure 2 – Areas of Potential Environmental Concern***, located at end of ***Section 1.0***).

Based on the findings presented in this report and the limits of the proposed scope of work for the project, three properties/areas of potential environmental concern were identified within the immediate construction limits. The first area consists of the entire project area being historically used for agricultural purposes. The second is the Suzie Belle Farm/J Boys Inc. property, located at 772 Harding Highway; and the third property is a Farm/residence, located at 762 Harding Highway. **Table 1** provides a summary of the properties of potential environmental concern within the project study area.

Based on the proposed scope-of-work for the project It is not anticipated that construction activities and/or right-of-way (ROW) acquisition will occur downstream of Laytons Lake, adjacent to either of the Suzie Belle Farm/J. Boys Inc. or the Farm/residence property. Should the scope-of-work for the project change and include construction activities involving soil excavation and/or activities that will encounter groundwater on or adjacent to these properties, it is recommended that further investigation (i.e., soil sampling) be conducted to determine if surface or subsurface soils have been impacted by past farm-related activities.

The review of historical aerial photographs revealed that entire project area was historically or is currently utilized as agricultural fields. However, at no time during the project area history reviewed (historical aerial photographs) for this screening did it appear that the agricultural fields were utilized to grow fruit orchards. According to the NJDEP's Findings and Recommendations for the Remediation of Historic Pesticide Contamination Final Report, dated March 1999, around the turn of the 20$^{th}$ century, the use of lead arsenate pesticides was employed extensively on apple orchards but was

also used for control of agricultural pests in vegetable fields and other fruit orchards in the United States. Dichloro diphenyl trichloroethane (DDT) was broadly recommended as a pesticide for the control of a wide range of insect pests on vegetables and fruits and mosquito control. By 1949, additional organochlorine pesticides such as aldrin and dieldrin were in common usage. Both compounds were used against insects in field, forage, vegetable, and fruit crops. Some of these pesticides are persistent in the environment, and thus may be present in soils long after they have been applied. As a result, residues of a number of pesticides (including arsenical pesticides, DDT and dieldrin) can be found in soils at levels that may pose a human health risk. However, the primary concern with historical pesticide residues is human health risk from inadvertent ingestion of contaminated soil, particularly by children. Based on the nature of the project (dam improvement) and limited scope of work, no further investigation is recommended regarding potential pesticide/herbicide contamination associated with the historical agricultural activities conducted within the project limits.

# Table 1
## Properties of Potential Environmental Concern

| Facility | Location | Property Operations | Database Listings | Area(s) of Concern | Hazardous Waste ID #'s | UST Information | Further Investigation |
|---|---|---|---|---|---|---|---|
| Current and historically used agricultural fields | Entire project study area | Historical agricultural-use fields | NA | Potential herbicide and pesticide contamination resulting historic farming activity. | NA | NA | No |
| Suzie Belle Farm/J Boys Inc. | 772 Harding Highway Carneys Point, NJ Block: 249, Lot: 10 | Residential/ Agricultural/ Commercial | NA | Multiple ASTs, construction/farm equipment storage areas, pesticide application business, and historic farming activity | NA | unknown | No |
| Farm Residence | 762 Harding Highway Carneys Point, NJ Block: 249, Lot: 8 | Residential/ agricultural | NA | Farming activity, storage areas, possible equipment maintenance/storage areas | NA | unknown | No |

Notes: NA = not applicable
UST = underground storage tank
AST = aboveground storage tank

# 1.0 INTRODUCTION

McCormick Taylor conducted a Hazardous Waste Screening within the limits of the NJDOT's proposed NJ Route 48 (Harding Highway), Laytons Lake Dam Improvements Project, which is located in the Carneys Point Township, Salem County, New Jersey. (see ***Figure 1***).

Properties that were assessed included those within 250 feet of the proposed improvements, and those properties located along the major and minor roadways within approximately 250 feet of the proposed construction disturbance area.

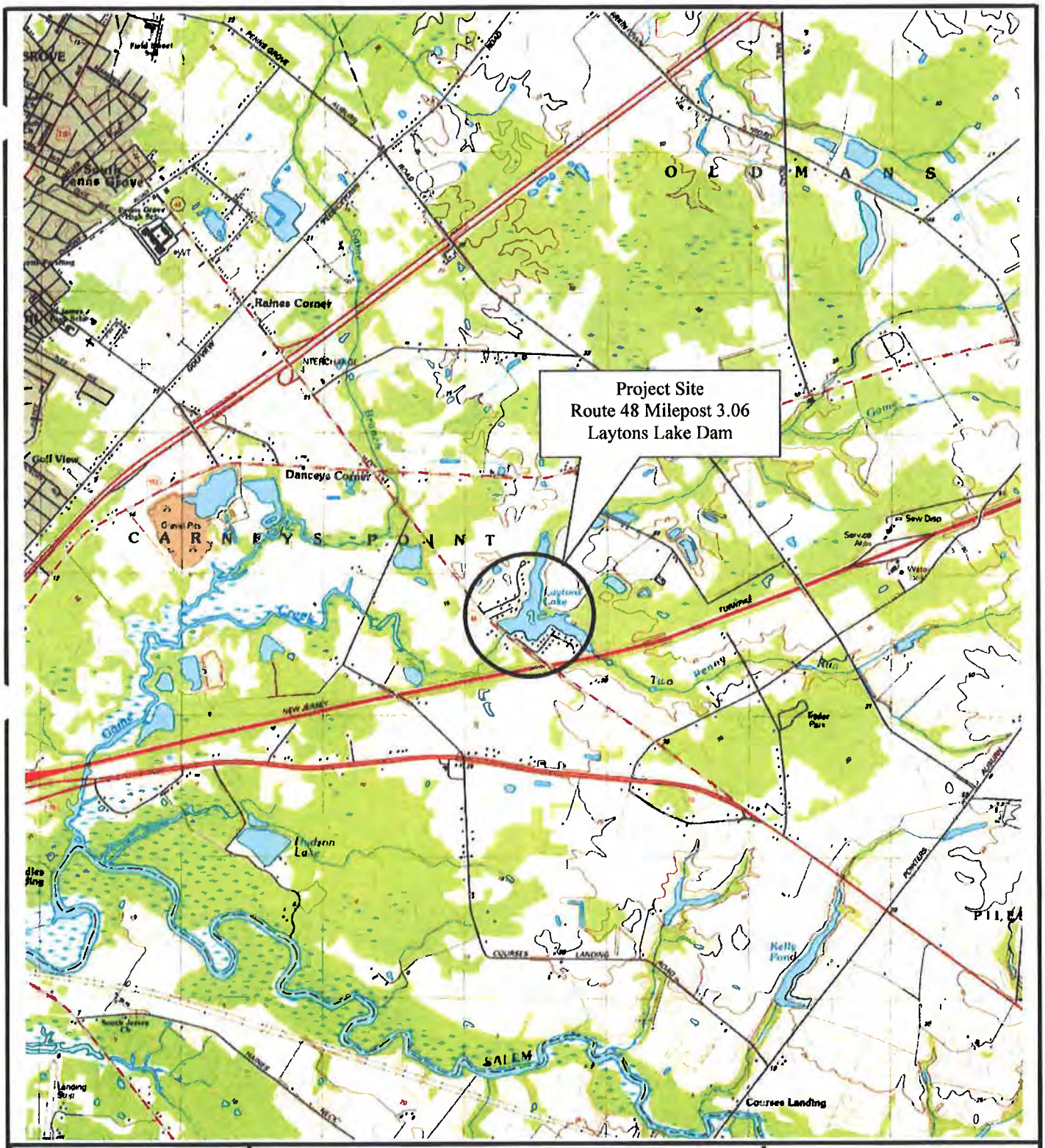
The project study area consists of NJ Route 48 (Harding Highway), Laytons Lake, residential properties, and agricultural-use properties. Site Photographs of the project area have been included in ***Appendix A***.

## 1.1. Project Need and Project Description

Laytons Lake Dam (Dam No. 30-15) is located at Milepost 3.06 of NJ Route 48 in Carneys Point Township, Salem County, NJ (***Figure 1***). The dam embankment carries NJ Route 48 in a southeast to northwest direction over Game Creek. The dam is classified as "Significant Hazard" and does not conform to current dam safety regulations. Laytons Lake Dam was also determined to be affected by Alkali-Silica Reactivity (ASR). ASR is caused by a reaction between the alkaline cement pore solution in the concrete and reactive forms of silica in the aggregate. It can cause expansion and cracking of the concrete resulting in structural problems and possible failure.

The existing Laytons Lake Dam is about 13 feet high and 500 feet in length. The spillway is a concrete ogee type in a semi-circular configuration with an effective length of about 90 feet. Two 48-inch diameter sluice gates are located near the eastern limit of the spillway. The gates are operated with hand cranks accessed from a concrete walkway. The bridge under NJ Route 48 (Structure No. 1706199) has a span of about 32 feet and a rise of about 11 feet.

The NJDOT is proposing improvements to the dam structure which consist of construction of a new bridge with a span of 40 feet, a new 90-foot long ogee spillway (same size as existing, an anticipated preference of adjacent landowners), and elevation of the roadway profile by 1.1 feet. The improvements will convey the Spillway Design Storm with the required one-foot of freeboard. The 100-year water surface elevations under both the existing and proposed conditions for the downstream area remain the same. A stormwater management basin is also proposed west of NJ Route 48 and north of Game Creek.




**ROUTE 48 AT LAYTONS LAKE DAM**
**CARNEYS POINT TOWNSHIP**
**SALEM COUNTY, NEW JERSEY**

**FIGURE 1 – PROJECT LOCATION MAP (USGS)**

PENNS GROVE, NJ-DEL QUADRANGLE
US GEOLOGICAL SURVEY, 1993
1 INCH = 3,000 FEET

McCormick Taylor
Engineers & Planners Since 1946

# 2.0 METHODOLOGY

The study methods consisted of: Historical land use review, research of environmental database records, agency coordination, and site investigation. Information from the various portions of the study was utilized together to develop an overall picture of the study area regarding the presence or potential for hazardous substances or contaminated conditions. An assessment of the likelihood of hazardous waste involvement with particular properties was conducted based on: Geographic and topographic position of the identified site relative to the proposed ROW and improvement areas; the nature of any database(s) listing the site; and any other pertinent information obtained during the course of the assessment.

Due to the various methods utilized in conducting this study, environmental concerns may be documented under conditions that indicate an existing release, a past release, or a material threat of a release of hazardous substances. Presented below is a description of the methodologies employed by McCormick Taylor in completing this assessment. ***Sections 3.1 - 3.4*** detail the findings of the individual components of this study. ***Section 4.0*** presents conclusions and recommendations for the study area, which consider all information available at the time of the assessment.

## 2.1 Historical Land Use Review

Historical information sources were reviewed for indications of past property usage and/or operations that may have had adverse environmental impacts on the properties within the study area. Historical aerial photographs for the years: 1954, 1975, 1981, 1997, and 2006 provided by Environmental Data Resources, Inc. (EDR) were reviewed to determine historical land uses. The results of the historical property review are provided in ***Section 3.1***.

## 2.2 Environmental Database Research

There are several state and federal agencies responsible for compiling environmental information, which is available to the public in the form of electronic databases. A third party environmental database search firm (EDR) provided a summary report for the study area. Thirty-four (34) environmental databases were reviewed, with search distances varying from one-quarter (¼) mile to one (1) mile from the site (depending on the database). The following federal and state environmental records were reviewed in the course of this assessment:

**Federal Databases**

- National Priority List (NPL)
- Proposed National Priority List Sites (Proposed NPL)
- Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS)
- CERCLIS, No Further Remedial Action Planned (CERC-NFRAP)
- RCRA Corrective Action Activity (CORRACTS)
- Resource Conservation and Recovery Information System (RCRIS-TSD)

- Resource Conservation and Recovery Information System Large Quantity Generator (RCRIS-LQG)
- Resource Conservation and Recovery Information System Small Quantity Generator (RCRIS-SQG)
- Emergency Response Notification System (ERNS)
- Superfund (CERCLA) Consent Decrees (CONSENT)
- Records of Decision (ROD)
- NPL Delisted (DELISTED NPL)
- Facility Index System (FINDS)
- Hazardous Materials Information Reporting System (HMIRS)
- Material Licensing Tracking System (MLTS)
- Mines Master Index File (MINES)
- Federal Superfund Liens (NPL Liens)
- PCB Activity Database System (PADS)
- RCRA Administrative Action Tracking System (RAATS)
- Toxic Chemical Release Inventory System (TRIS)
- Toxic Substances Control Act (TSCA)
- FIFRA/TSCA Tracking System–FIFRA (Federal Insecticide, Fungicide, & Rodenticide Act /TSCA (Toxic Substances Control Act)

**State Databases**

- New Jersey Known Contaminated Sites List (SHWS)
- New Jersey Licensed Solid Waste Facilities/Land Fill Sites (SWF/LF)
- New Jersey Leaking Underground Storage Tank Incident Report (LUST)
- New Jersey Underground Storage Tank database (UST)
- List of Major Facilities (NJ MAJOR)
- New Jersey Spills Database (NJ SPILLS)
- Hazardous Material Incident Database (NJ RELEASE)
- Publicly Funded Cleanups Site Status Report (NJ PF)
- Brownfields Database (BROWNFIELDS)
- New Jersey Pollutant Discharge Elimination System (NJPDES)
- Chromate Chemical Production Waste Sites (NJ CHROME)
- Former Manufactured Gas Sites (Coal Gas)

Relevant information from the database report was utilized in conducting the file reviews and agency coordination. The results of the database review are provided in ***Section 3.2***. Copies of the EDR Database Report Maps are provided in ***Appendix C***.

## 2.3 File Reviews and Agency Coordination

State, county, and local agencies were consulted to determine if there have been any regulatory actions pertaining to properties within the project study area.

The following offices were contacted during the course of this assessment:

- New Jersey Department of Environmental Protection (NJDEP)
- Construction Official, Township Engineer, and Fire Chief for Carneys Point Township

The results of the File Reviews and Agency Coordination are presented in ***Section 3.3***. Correspondence and any other data received from these agencies have been included in ***Appendix B***.

## 2.4 Site Reconnaissance

Site reconnaissance was performed to identify properties and land uses of environmental concern, and in order to confirm and/or augment the findings of the other components of the study. The reconnaissance consisted of a visual assessment of the general characteristics of the study area including, but not limited to, stressed vegetation, man-made structures, drainage features, soil discoloration or staining, and storage tanks. The reconnaissance was limited to visual inspection of accessible exterior portions of the properties within the study area. Results of the site reconnaissance are provided in ***Section 3.4***.

# 3.0 SUMMARY OF FINDINGS

A summary of findings based on the historical land use review, research of environmental database records, applicable file review, agency coordination, and site investigation of the project study area is provided below. ***Table 1***, which may be found immediately following the ***Executive Summary*** of this report, provides the condensed substance of this information.

## 3.1 Historical Land Use Review

Historical aerial photographs for the years: 1954, 1975, 1981, 1997, and 2006 provided by Environmental Data Resources, Inc. (EDR) were reviewed to determine historical land uses. Copies of the historical aerial photographs have been included in ***Appendix D.*** A brief description of the historical aerial photographs reviewed is presented below:

**AERIAL PHOTOGRAPHS**

**1954:** The 1954 aerial photograph shows NJ Route 48 (Harding Highway), the NJ Turnpike, Laytons Lake Drive, Lake Lane, and Oak lane as they exist today. Oak Lane was surrounded by agricultural fields on both sides. Oak Lane and Lake Lane was developed with three residences that appear at Block: 235, Lots 5, 8, & 10. Laytons Lake Drive was surrounded by mostly agricultural fields. On Laytons Lake Drive, the properties at Block: 236, Lots: 4, 8, & 9 appear developed with residential structures. The farm/residential structures associated with the properties at Block: 249, Lots: 8, 9.01, & 10 appear in this photograph.

**1975:** The 1975 aerial photograph appears similar to the 1954 photograph. An increase in residential development is noted on Lakeside Lane, Oak Lane, and Laytons

Lake Drive. Residential structures located on Laytons Lake Drive at Block: 236, Lots: 2 & 3, first appear in this photograph.

**1981:** The 1981 aerial photograph appears similar to the 1975 photograph. This photograph shows an overall increase in residential development around Laytons Lake. Besides the agricultural/residential structures located at (Block: 249, Lots: 8, 9.01, & 10), the area downstream of Laytons Lake is agricultural fields. An area approximately 750-feet southwest of the agricultural/residential structures of the property located at Block: 249, Lot: 10, appears to have been cleared of vegetation. This area could have been used historically as a dump area.

**1997:** The 1997 aerial photograph appears similar to the 1981 photograph.

**2006:** The 2006 aerial photograph shows the project area as it appeared at the time of the 2010 site visit.

## 3.2 Environmental Database Research

A list of the federal and state environmental records that were reviewed in the course of this assessment is provided above in ***Section 2.2***. Several sites were identified in the vicinity of the project study area. However, only those sites with the potential to have a negative environmental effect to the project study area are addressed in detail in this report. The following database listing was identified in the immediate project vicinity:

EDR ID:

#1 **Garden State Fuel, 760 Harding Highway, Upper Pittsgrove Twp., NJ -** Project area reconnaissance has determined that this site is located outside of the project limits.

#A2-3 **Laytons Lake Homes (former farm residence), 745 Harding Highway, Carneys Point** – This site is listed in the database report as a State Hazardous Waste Site (SHWS) and Voluntary Cleanup Program (VCP).

#4 **27 Oak Lane, Carneys Point** – This site is listed in the database report as a SHWS, Historic Hazardous Waste Site (Hist HWS), and VCP.

#5 **Woodstown State Police, 796 Harding Highway, Pilesgrove, NJ -** Project area reconnaissance has determined that this site is located outside of the project limits.

No other sites listed in the database report are likely to have a negative environmental impact on the project study area. Copies of the EDR Database Report Maps for the project study area are provided in ***Appendix C***.

## 3.3 File Reviews and Agency Coordination

State and local agencies that were contacted regarding known or suspected environmental conditions within the study area are listed in ***Section 2.3***. The County

Health Department was not contacted due to the excessive fees involved with reviewing files maintained by the Health Department. The file reviews and agency consultation focused primarily on those properties with documented environmental conditions adjacent to the proposed ROW acquisition areas; but also included agencies that may maintain general records regarding environmental conditions within the study area. Copies of correspondence, file review, and agency coordination information are provided in ***Appendix B***. The results of the agency coordination have been summarized below:

**New Jersey Department of Environmental Protection**

The NJDEP was issued online requests under the New Jersey Open Public Records Act (OPRA) on April 1, 2010, for information regarding known environmental conditions within the study area. Based on the site investigation and review of NJDEP's NJ Known Contaminated Sites List, three properties were stipulated in the request as properties of potential environmental concern. On May 7, 2010, file reviews were conducted at NJDEP in Trenton to review the following available files:

1. **Laytons Lake Homes, 745 Harding Highway, Carneys Point Township, NJ -** Files for this property included an Unrestricted Use No Further Action & Covenant Not to Sue letter dated December 27, 2006 for NJDEP Case #: 06-04-29-0110-20. The files indicated that an environmental assessment was conducted on the property that resulted in the findings of two areas of potential concern. The areas of potential concern consist of potential pesticide/herbicide involvement with former agricultural fields, and a UST area located adjacent to the residential structure on the property. A Remedial Investigation/Remedial Action Workplan, dated March 30, 2006, prepared by Marathon Engineering & Environmental documented the removal of a residential heating fuel UST; forty (40) tons of petroleum contaminated soils excavated and properly disposed from the former UST area; and surface sampling activities of the former agricultural fields. A total of sixteen (16) surface soil samples were collected within the agricultural fields and analyzed for lead and arsenic. The results of the sampling event indicated that none of the samples exceeded the NJDEP Cleanup Criteria for lead and arsenic.

2. **Residence, 27 Oak Lane, Carneys Point Township, NJ** – Files for this property included an Unrestricted Use No Further Action & Covenant Not to Sue letter dated January 15, 2001 for NJDEP Case #: 01-11-29-112944. The files indicated that a 275-gallon heating fuel UST was removed from the property. Contaminated soils were observed in the excavation during UST removal activities; and approximately 13-tons of petroleum contaminated soils were excavated and disposed of at an approved facility. Post excavation samples collected from the former UST area revealed levels below the NJDEP required cleanup criteria. It was noted that there was no evidence that groundwater was impacted at the site.

3. **Suzie Belle Farm/J Boys Inc., 772 Harding Highway, Carneys Point Township, NJ** – The NJDEP OPRA request response indicated that no files are maintained for this property. NJDEP Data Miner information identified J Boys Inc. as a pesticide applicator business and solid waste transporter.

**Carneys Point Township Fire Department**

The Carneys Point Township Fire Department was issued a written request on April 14, 2010, for information regarding known environmental conditions within the study area. As of the date of this report, the Carneys Point Township Fire Department has not responded to our request.

**Carneys Point Township Engineering Department**

The Carneys Point Township Engineering Department was issued a written request on April 14, 2010, for information regarding known environmental conditions within the study area. As of the date of this report, the Carneys Point Township Engineering Department has not responded to our request.

**Carneys Point Township Construction Official**

The Carneys Point Township Construction Official was issued a written request on April 14, 2010, for information regarding known environmental conditions within the study area. As of the date of this report, the Carneys Point Township Construction Official has not responded to our request.

## 3.4 Site Reconnaissance

Site reconnaissance was conducted on March 8, 2010. The study area consists of Harding Highway (NJ Route 48), residential properties, and some commercial properties located throughout the project area. Site Photographs are provided in ***Appendix A***. The site reconnaissance revealed three properties/areas of potential environmental concern within proximity to the proposed construction activities:

- **Suzie Belle Farm/J Boys Inc., 772 Harding Highway (Block: 249, Lot: 10), Carneys Point Township** – This property presents a potential environmental concern due to its listing as a pesticide applicator business and past farming activities. Several ASTs and storage structures were observed on the property at the time of the site reconnaissance. USTs and/or ASTs are commonly associated with properties that conduct farming activities to store fuel for farm equipment/vehicles. Pesticides and herbicides are often stored onsite and commonly used during farming activities.

- **Residence, 762 Harding Highway (Block: 249, Lot: 8), Carneys Point Township** – This property presents a potential environmental concern due to its former agricultural land-use activities. Equipment storage and equipment maintenance were most likely conducted within structures located on the property. USTs and/or ASTs are commonly associated with properties that conduct farming activities to store fuel for farm equipment/vehicles. Pesticides and herbicides are often stored onsite and commonly used during farming activities.

- **Current and historically used agricultural fields, Carneys Point Township** – The entire project study area around Laytons Lake was used for

agricultural purposes as far back as the 1950's. The potential for soil and/or groundwater contamination resulting from the long term application or misapplication of herbicides and pesticides exists within the project study area.

# 4.0 CONCLUSIONS AND RECOMMENDATIONS

The key methods in completing this assessment included field reconnaissance, a review of available environmental database records, historical land use background research, file reviews, and agency coordination. These conclusions represent McCormick Taylor's best professional judgment based on the information available during the course of the hazardous waste screening effort.

Based on the findings presented in this report and the limits of the proposed scope of work for the project, three properties/areas of potential environmental concern were identified within the immediate construction limits. The first area consists of the entire project area being historically used for agricultural purposes. The second is the Suzie Belle Farm/J Boys Inc. property, located at 772 Harding Highway; and the third property is a Farm/residence, located at 762 Harding Highway. **Table 1** provides a summary of the properties of potential environmental concern within the project study area.

Based on the proposed scope-of-work for the project, it is not anticipated that construction activities and/or right-of-way (ROW) acquisition will occur downstream of Laytons Lake, adjacent to either of the Suzie Belle Farm/J. Boys Inc. or the Farm/residence property. Should the scope-of-work for the project change and include construction activities involving soil excavation and/or activities that will encounter groundwater on or adjacent to these properties, it is recommended that further investigation (i.e., soil sampling) be conducted to determine if surface or subsurface soils have been impacted by past farm-related activities.

The review of historical aerial photographs revealed that entire project area was historically or is currently utilized as agricultural fields. However, at no time during the project area history reviewed (historical aerial photographs) for this screening did it appear that the agricultural fields were utilized to grow fruit orchards. According to the NJDEP's Findings and Recommendations for the Remediation of Historic Pesticide Contamination Final Report, dated March 1999, around the turn of the 20$^{th}$ century, the use of lead arsenate pesticides was employed extensively on apple orchards but was also used for control of agricultural pests in vegetable fields and other fruit orchards in the United States. Dichloro diphenyl trichloroethane (DDT) was broadly recommended as a pesticide for the control of a wide range of insect pests on vegetables and fruits and mosquito control. By 1949, additional organochlorine pesticides such as aldrin and dieldrin were in common usage. Both compounds were used against insects in field, forage, vegetable, and fruit crops. Some of these pesticides are persistent in the environment, and thus may be present in soils long after they have been applied. As a result, residues of a number of pesticides (including arsenical pesticides, DDT and dieldrin) can be found in soils at levels that may pose a human health risk. However, the primary concern with historical pesticide residues is human health risk from inadvertent ingestion of contaminated soil, particularly by children.

Based on the nature of the project (dam improvement) and limited scope of work, no further investigation is recommended regarding potential pesticide/herbicide contamination associated with the historical agricultural activities conducted within the project limits.

# 5.0 LIMITATIONS

The scope of this assessment was limited to visual observations made during the site reconnaissance, interviews with public agency personnel, and the review of readily available reports, literature, and environmental database listings. Additional information, which was not readily available at the time of this report, may result in the modification of the information presented herein.

The information summarized in this report does not confirm or guarantee the absence of disposed hazardous waste or environmental concerns. This report assesses the potential for environmental concerns being present throughout the project study area. McCormick Taylor Inc. assumes no responsibility for conditions that were not specifically evaluated or conditions that were not recognized as environmentally unacceptable at the time this assessment was performed.

# *Appendix A*

# *Site Photographs*

# NJ Route 48 (Harding Highway), Laytons Lake Dam Improvements

## Carneys Point Township, Salem County, NJ



PHOTO 1 - View northwest of Harding Highway (Route 48) over Game Creek. Laytons Lake is to the right.



PHOTO 2 - View southeast of the existing Laytons Lake spillway.



PHOTO 3 - View northwest of Layton Lake Dam and existing spillway.



PHOTO 4 - View downstream of Game Creek taken from Harding Highway (Route 48).



PHOTO 5 - View of the bridge structure at Laytons Lake taken from down stream.



PHOTO 6 - View of Suzie Belle Farm/J Boys Inc. Located at 772 Harding Highway (Route 48).

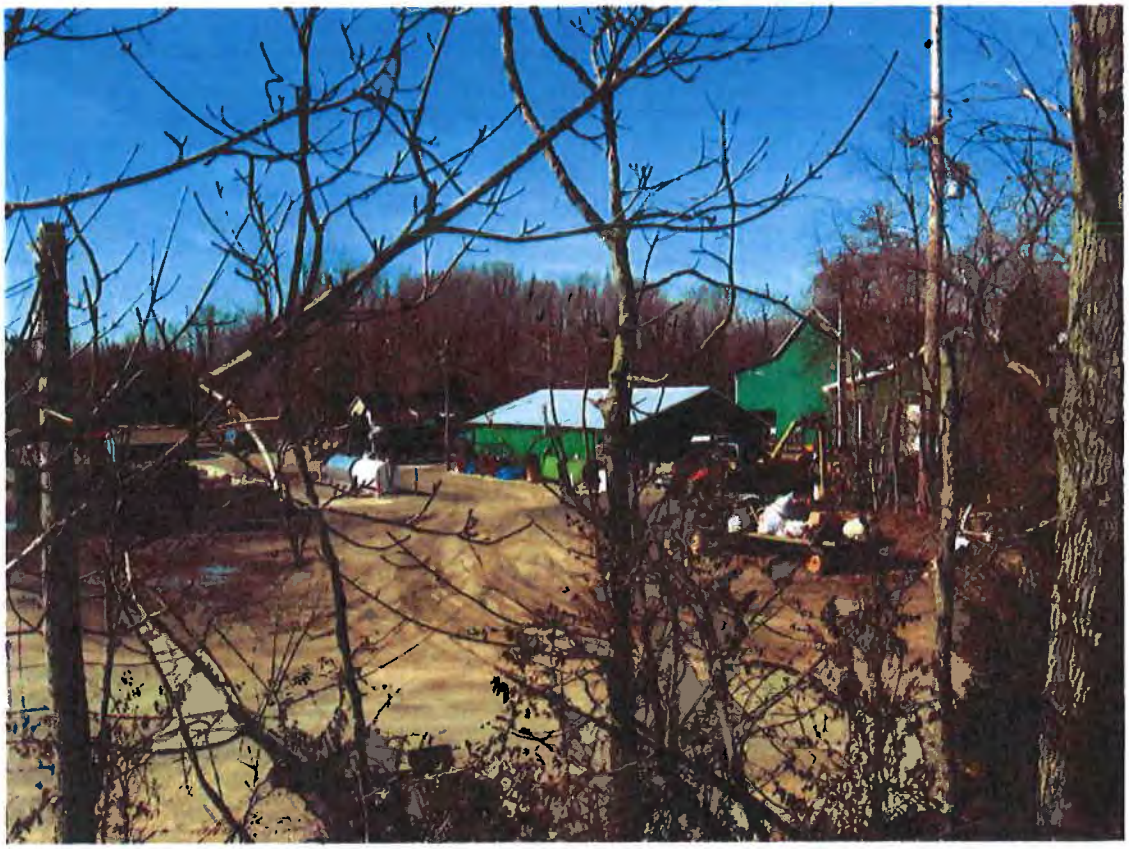


PHOTO 7 - View of Suzie Belle Farm/J Boys Inc. Property from the Route 48 over the NJ Turnpike overpass.



PHOTO 8 - View west of farm property located at 762 Harding Highway (Route 48).



PHOTO 9 - View west of farm structures located at 762 Harding Highway (Route 48).

# *Appendix B*

# *Correspondence, File Review, and Agency Coordination Information*

27 OAK LANE

State of New Jersey
***Department of Environmental Protection***
**GOVERNMENT RECORDS REQUEST FORM**

**IMPORTANT NOTICE**

Please read this entire form carefully as it contains important information concerning the response to your record request, accessing records, disputing denials, and your rights concerning government records. For further information, access WWW.NJ.GOV/DEP/OPRA.

**Requestor Information**

First Name: JIM MI L Last Name DI VIETRO

Company: MCCORMICK TAYLOR INC.

Mailing Address: 700 EAST GATE DRIVE, SUITE 201

City: Mount Laurel Twp State: NJ Zip: 08054 Email: jldivietro@mccormicktaylor.com

Business Telephone: (856) 793-0800 Extension

Facsimile Telephone: (856) 793-0819

**State Use Only**

| | |
|---|---|
| **Tracking #** | 91146 |
| **Received Date** | 04/01/2010 |
| **Access Method** | On-site access, visit, copy |

All matters relating to the response and access of any records identified for this request should be directed to:

**NJDEP – Office of Record Access**
**401 East State Street**
**PO Box 442**
**Trenton, New Jersey 08625-0442**
**Tele #: (609) 341-3121**
Fax #: (609) 292-1177

**Record Request Details:**

Property Desc: Residential Any files regarding UST, LUSTs, Site remediation, and/or violations.

**Disposition Notes**

Based on this record request,responsive records have been identified and available for access. Requester should contact the Office of Record Access at 609-341-3121 to schedule a file review, copies, or to obtain further information.

**Addendum Disposition Notes:** NONE

**Record Request Response**

| | | | |
|---|---|---|---|
| In Progress | - | Open | |
| Filled | - | Closed | X |
| Denied | - | Closed | |
| Partial | - | Closed | |

Matthew J. Coyle 04/08/2010

**Custodian Signature** **Date**

# Access to Government Records Under the New Jersey Open Public Records Act (N.J.S.A. 47:1A-1 et seq.)

| Information Regarding the Requested Records | | |
|---|---|---|
| If your request is in reference to a single facility, please provide the name of the facility, and the name of the operator name of the facility: | Facility Name: Residence, 27 Oak lane<br>Operator Name: | |
| Please provide the owner name the facility or parcel of land: | Owner Name: | |
| If your request is in reference to a specific parcel of land, please provide the street address, block, lot and property owner of the parcel of land:<br>(Note: if the property in question is over multiple blocks and lots, please list all in the description field below) | Street Address 1: 27 Oak Lane<br>Street Address 2:<br>Block: Lot: | |
| If your request is in reference to a facility, site or parcel of land, please provide the Municipality and County where the facility, site or parcel of land is located: | County: Salem<br>Municipality: Carneys Point Twp | |
| If the request is in reference to a particular permit issued by NJDEP, please provide the type of permit and any identifying numbers such as permit, incident or case numbers. (I.e. Fishing, Hunting, Hazardous Waste, Solid Waste, Land Use, NJPDES, Pesticides, Stream Encroachment, TWA, UST, Water Allocation) | List Permit Type: | List ID Numbers:<br>shws 93306HIST hws 131404VCP 01-11-29-1129-44 |
| If your request is in reference to an individual, please provide the individual's name and type, and if the individual is a DEP employee, your relationship with the individual: | Individual's name:<br>Type of Individual:<br>Relationship: | |
| If the an individual was specified above, the individual was DEP Licensed, please specify the license type the individual holds: | License Type: | |

The New Jersey Department of Environmental Protection has responded to your submitted Open Public Records Act (OPRA) record request. The following information will help you understand the response and your next available actions.

**Tracking #:** This is the Department's assigned Tracking # to your OPRA record request, which should be used in all corresponding matters.

**Record Request Response:**

- **In Progress** – Based on the nature of the request, the records sought, and/or the manner to which the records may exists, the Department requires additional time to investigate and respond to the request.
- **Filled** – Based on the information provided in your request, the Department was able to investigate and respond to your record request.
- **Denied** – Based on the nature of the request and/or the records sought, the Department has denied your request pursuant to a specific exemption(s) cited in N.J.S.A. 47:1A-1 seq.
- **Partial** – The Department has identified both responsive government records and records being denied based on the nature of the request and/or the records sought, that do not meet the definition of a government record pursuant to a specific exemption(s) cited in N.J.S.A. 47:1A-1 seq.

**Disposition Notes:** Provides detailed information concerning the Department's response to your request.

**Accessing Records**: Dependent on the volume of records and your interest, there are four (4) methods available to access the responsive government records:

- **File Review** – Schedule a file review with the Department to directly access the records and take notes or tag records of interest for copying. Copying can be performed by either the onsite Department of Treasury's DEP Copying Unit at State duplication fee costs or by the requester employing a Copy Vendor Service. If there are records stored in archives, a five-day processing period will be included prior to scheduling a review.
- **Copy Request** – All records of interest will be copied by the onsite Department of Treasury's DEP Copying Unit at State duplication fee costs unless a Copy Vendor Service is employed.
- **Fax Request** – Based on the number of pages, the Department faxes the responsive records.
- **Web Access** – The responsive records can be access directly through the Department's web site. Web address will be provided.

## Access to Government Records Under the New Jersey Open Public Records Act (N.J.S.A. 47:1A-1 et seq.)

1. The fees for duplication of a government record are specified below. We will notify you of any special charges, special service charges or other additional charges authorized by State law or regulation before processing your request. Payment shall be made by cash, check or money order payable to the State of New Jersey and mailed to the address specified below.

| | | | |
|---|---|---|---|
| **Hard Copies:** | Pages 1 through 10 = $0.75 per page | **Electronic Records:** | Compact Discs (CDs) = $9.77 per CD |
| | Pages 11 through 20 = $0.50 per page | | Diskettes = $ 0.55 per diskette |
| | Pages 21 on = $0.25 per page | **Over-sized Maps:** | = $5.00 per map |

2. Pursuant to OPRA (C.47:1A-5C), whenever the nature, format, manner of collation, or volume of a government record embodied in the form of printed matter to be inspected, examined, or copied pursuant to this section is such that the record cannot be reproduced by ordinary document copying equipment in ordinary business size or involves an extraordinary expenditure of time and effort to accommodate the request, the public agency may charge, in addition to the actual cost of duplicating the record, a special service charge that shall be reasonable and shall be based upon the actual direct cost of providing the copy or copies.

   The Department charges $48/Hr Fee for Extra-Ordinary Time (EOT) Service Charges. If a request is applicable for an EOT charge, the Requester will be notified of such and payment of the charge must be received prior to access of the subject records. Please note, based on the nature of a request and the records being sought, if the record request processing time is over the Department's normal request processing time, the Department may assess an EOT charge. Being that there is no manner for the Department to ascertain the charge prior to the time being incurred, the Department will notify the Requester in its response to a record request and payment must occur prior to accessing records.

3. By law, the Department must notify you that it grants or denies a request for access to government records within seven business days after the custodian of the record requested receives the request, provided that the record is currently available and not in storage. If the record requested is not currently available or is in storage, the custodian will advise you within seven business days when the record can be made available and the estimated cost. You may agree with the custodian to extend the time for making records available, or granting or denying your request.

4. You may be denied access to a government record if your request would substantially disrupt agency operations and the custodian is unable to reach a reasonable solution with you.

5. If the Department was unable to comply with your request for access to a government record, the custodian will indicate the reasons for denial on the request form.

6. Except as otherwise provided by law or by agreement with the requester, if the custodian of the record requested fails to respond to you within seven business days of receiving a request form, the failure to respond will be considered a denial of your request.

7. **Resolution of Disputed Findings:**

   In the event that a requester does not agree with the Department's record response, the requester should:

   **No Records** - Reexamined the request details to evaluate if all of the information was provided that could aid the Department in locating records. The Department's ability to identify records of interest is in direct correlation to matching the Department information with the information provided on the request. Such important identifiers are Facility/Site Name, Address, Case #, Permit #, Block/Lot.

   **Denial** - If your request for access to a government record has been denied or unfilled within the time permitted by law, you have a right to challenge the decision by the Department to deny access. The Department denies access to records only when those records do not meet the definition of a government record and/or public access is not allowed pursuant to the law. At your option, you may either:

   a. Contact the Office of Record Access to re-visit the matter or provide further explanation.

   b. Institute a proceeding in the Superior Court of New Jersey

   c. File a complaint in writing with the Government Records Council (GRC). You may contact the GRC by toll-free telephone at 866-850-0511, by mail at PO Box 819, Trenton, NJ, 08625, by e-mail at *grc@dca.state.nj.us*, or at their web site at *www.state.nj.us/grc*. The Council can also respond to other questions about the law.

8. Information provided on this form may be subject to disclosure under the Open Public Records Act.

**Revised Addendum Disposition Notes:** NONE

SUZIE BENC FARM

State of New Jersey
***Department of Environmental Protection***
**GOVERNMENT RECORDS REQUEST FORM**

**IMPORTANT NOTICE**

Please read this entire form carefully as it contains important information concerning the response to your record request, accessing records, disputing denials, and your rights concerning government records. For further information, access WWW.NJ.GOV/DEP/OPRA.

**Requestor Information**

First Name: JIM MI L Last Name DI VIETRO

Company: MCCORMICK TAYLOR INC.

Mailing Address: 700 EAST GATE DRIVE, SUITE 201

City: Mount Laurel Twp State: NJ Zip: 08054 Email: jldivietro@mccormicktaylor.com

Business Telephone: (856) 793-0800 Extension

Facsimile Telephone: (856) 793-0819

**State Use Only**

| | |
|---|---|
| **Tracking #** | 90500 |
| **Received Date** | 03/15/2010 |
| **Access Method** | **On-site access, visit, copy** |

All matters relating to the response and access of any records identified for this request should be directed to:

**NJDEP – Office of Record Access**
**401 East State Street**
**PO Box 442**
**Trenton, New Jersey 08625-0442**
**Tele #: (609) 341-3121**
Fax #: (609) 292-1177

**Record Request Details:**

Property Desc: Agricultural Looking for UST, LUST, Site remediation, violations, or Land Use Regulation Permits on property

**Disposition Notes**

Based on the record request, no responsive records have been identified. Requester should contact the Office of Record Access at 609-341-3121 with any questions.

**Addendum Disposition Notes:** NONE

**Record Request Response**

| | | | |
|---|---|---|---|
| In Progress | - | Open | |
| Filled | - | Closed | X |
| Denied | - | Closed | |
| Partial | - | Closed | |

Matthew J. Coyle 03/23/2010

**Custodian Signature** **Date**

# Access to Government Records Under the New Jersey Open Public Records Act (N.J.S.A. 47:1A-1 et seq.)

| Information Regarding the Requested Records | | |
|---|---|---|
| If your request is in reference to a single facility, please provide the name of the cility, and the name of the operator name of the facility: | Facility Name: Suzie Belle Farm<br>Operator Name: James M. Thorpe | |
| Please provide the owner name the facility or parcel of land: | Owner Name: James M. Thorpe | |
| If your request is in reference to a specific parcel of land, please provide the street address, block, lot and property owner of the parcel of land:<br>(Note: if the property in question is over multiple blocks and lots, please list all in the description field below) | Street Address 1: 772 Harding Highway (Route 48)<br>Street Address 2:<br>Block: 249 Lot: 10 | |
| If your request is in reference to a facility, site or parcel of land, please provide the Municipality and County where the facility, site or parcel of land is located: | County: Salem<br>Municipality: Carneys Point Twp | |
| If the request is in reference to a particular permit issued by NJDEP, please provide the type of permit and any identifying numbers such as permit, incident or case numbers. (i.e. Fishing, Hunting, Hazardous Waste, Solid Waste, Land Use, NJPDES, Pesticides, Stream Encroachment, TWA, UST, Water Allocation) | List Permit Type: | List ID Numbers: |
| If your request is in reference to an individual, please provide the individual's name and type, and if the individual is a DEP employee, your relationship with the individual: | Individual's name:<br>Type of Individual:<br>Relationship: | |
| If the an individual was specified above, the individual was DEP Licensed, please specify the license type the individual holds: | License Type: | |

The New Jersey Department of Environmental Protection has responded to your submitted Open Public Records Act (OPRA) ecord request. The following information will help you understand the response and your next available actions.

**Tracking #:** This is the Department's assigned Tracking # to your OPRA record request, which should be used in all corresponding matters.

**Record Request Response:**

- **In Progress** – Based on the nature of the request, the records sought, and/or the manner to which the records may exists, the Department requires additional time to investigate and respond to the request.
- **Filled** – Based on the information provided in your request, the Department was able to investigate and respond to your record request.
- **Denied** – Based on the nature of the request and/or the records sought, the Department has denied your request pursuant to a specific exemption(s) cited in N.J.S.A. 47:1A-1 seq.
- **Partial** – The Department has identified both responsive government records and records being denied based on the nature of the request and/or the records sought, that do not meet the definition of a government record pursuant to a specific exemption(s) cited in N.J.S.A. 47:1A-1 seq.

**Disposition Notes:** Provides detailed information concerning the Department's response to your request.

**Accessing Records**: Dependent on the volume of records and your interest, there are four (4) methods available to access the responsive government records:

- **File Review** – Schedule a file review with the Department to directly access the records and take notes or tag records of interest for copying. Copying can be performed by either the onsite Department of Treasury's DEP Copying Unit at State duplication fee costs or by the requester employing a Copy Vendor Service. If there are records stored in archives, a five-day processing period will be included prior to scheduling a review.
- **Copy Request** – All records of interest will be copied by the onsite Department of Treasury's DEP Copying Unit at State duplication fee costs unless a Copy Vendor Service is employed.
- **Fax Request** – Based on the number of pages, the Department faxes the responsive records.
- **Web Access** – The responsive records can be access directly through the Department's web site. Web address will be provided.

## Access to Government Records Under the New Jersey Open Public Records Act (N.J.S.A. 47:1A-1 et seq.)

1. The fees for duplication of a government record are specified below. We will notify you of any special charges, special service charges or other additional charges authorized by State law or regulation before processing your request. Payment shall be made by cash, check or money order payable to the State of New Jersey and mailed to the address specified below.

| | | | |
|---|---|---|---|
| **Hard Copies:** | Pages 1 through 10 = $0.75 per page | **Electronic Records:** | Compact Discs (CDs) = $9.77 per CD |
| | Pages 11 through 20 = $0.50 per page | | Diskettes = $ 0.55 per diskette |
| | Pages 21 on = $0.25 per page | **Over-sized Maps:** | = $5.00 per map |

2. Pursuant to OPRA (C.47:1A-5C), whenever the nature, format, manner of collation, or volume of a government record embodied in the form of printed matter to be inspected, examined, or copied pursuant to this section is such that the record cannot be reproduced by ordinary document copying equipment in ordinary business size or involves an extraordinary expenditure of time and effort to accommodate the request, the public agency may charge, in addition to the actual cost of duplicating the record, a special service charge that shall be reasonable and shall be based upon the actual direct cost of providing the copy or copies.

   The Department charges $48/Hr Fee for Extra-Ordinary Time (EOT) Service Charges. If a request is applicable for an EOT charge, the Requester will be notified of such and payment of the charge must be received prior to access of the subject records. Please note, based on the nature of a request and the records being sought, if the record request processing time is over the Department's normal request processing time, the Department may assess an EOT charge. Being that there is no manner for the Department to ascertain the charge prior to the time being incurred, the Department will notify the Requester in its response to a record request and payment must occur prior to accessing records.

3. By law, the Department must notify you that it grants or denies a request for access to government records within seven business days after the custodian of the record requested receives the request, provided that the record is currently available and not in storage. If the record requested is not currently available or is in storage, the custodian will advise you within seven business days when the record can be made available and the estimated cost. You may agree with the custodian to extend the time for making records available, or granting or denying your request.

4. You may be denied access to a government record if your request would substantially disrupt agency operations and the custodian is unable to reach a reasonable solution with you.

5. If the Department was unable to comply with your request for access to a government record, the custodian will indicate the reasons for denial on the request form.

6. Except as otherwise provided by law or by agreement with the requester, if the custodian of the record requested fails to respond to you within seven business days of receiving a request form, the failure to respond will be considered a denial of your request.

7. **Resolution of Disputed Findings:**

   In the event that a requester does not agree with the Department's record response, the requester should:

   **No Records** - Reexamined the request details to evaluate if all of the information was provided that could aid the Department in locating records. The Department's ability to identify records of interest is in direct correlation to matching the Department information with the information provided on the request. Such important identifiers are Facility/Site Name, Address, Case #, Permit #, Block/Lot.

   **Denial** - If your request for access to a government record has been denied or unfilled within the time permitted by law, you have a right to challenge the decision by the Department to deny access. The Department denies access to records only when those records do not meet the definition of a government record and/or public access is not allowed pursuant to the law. At your option, you may either:

   a. Contact the Office of Record Access to re-visit the matter or provide further explanation.

   b. Institute a proceeding in the Superior Court of New Jersey

   c. File a complaint in writing with the Government Records Council (GRC). You may contact the GRC by toll-free telephone at 866-850-0511, by mail at PO Box 819, Trenton, NJ, 08625, by e-mail at *grc@dca.state.nj.us*, or at their web site at *www.state.nj.us/grc*. The Council can also respond to other questions about the law.

8. Information provided on this form may be subject to disclosure under the Open Public Records Act.

**Revised Addendum Disposition Notes:** NONE

Layton Lake Homes

State of New Jersey
***Department of Environmental Protection***
**GOVERNMENT RECORDS REQUEST FORM**

**IMPORTANT NOTICE**

Please read this entire form carefully as it contains important information concerning the response to your record request, accessing records, disputing denials, and your rights concerning government records. For further information, access WWW.NJ.GOV/DEP/OPRA.

**Requestor Information**

First Name: JIM MI L Last Name DI VIETRO

Company: MCCORMICK TAYLOR INC.

Mailing Address: 700 EAST GATE DRIVE, SUITE 201

City: Mount Laurel Twp State: NJ Zip: 08054 Email: jldivietro@mccormicktaylor.com

Business Telephone: (856) 793-0800 Extension

Facsimile Telephone: (856) 793-0819

**State Use Only**

| | |
|---|---|
| **Tracking #** | 91145 |
| **Received Date** | 04/01/2010 |
| **Access Method** | **On-site access, visit, copy** |

All matters relating to the response and access of any records identified for this request should be directed to:

**NJDEP – Office of Record Access**
**401 East State Street**
**PO Box 442**
**Trenton, New Jersey 08625-0442**
**Tele #: (609) 341-3121**
Fax #: (609) 292-1177

**Record Request Details:**

Property Desc: Residential Any files regarding UST, LUSTs, Site remediation, and/or violations.

**Disposition Notes**

Based on this record request,responsive records have been identified and available for access. Requester should contact the Office of Record Access at 609-341-3121 to schedule a file review, copies, or to obtain further information.

**Addendum Disposition Notes:** NONE

**Record Request Response**

| | | | |
|---|---|---|---|
| **In Progress** | - | Open | |
| **Filled** | - | Closed | X |
| **Denied** | - | Closed | |
| **Partial** | - | Closed | |

Matthew J Cosper 04/09/2010

**Custodian Signature** **Date**

# Access to Government Records Under the New Jersey Open Public Records Act (N.J.S.A. 47:1A-1 et seq.)

| Information Regarding the Requested Records | | |
|---|---|---|
| f your request is in reference to a single facility, please provide the name of the acility, and the name of the operator name of the facility: | Facility Name: Layton Lake Homes<br>Operator Name: | |
| Please provide the owner name the facility or parcel of land: | Owner Name: | |
| If your request is in reference to a specific parcel of land, please provide the street address, block, lot and property owner of the parcel of land:<br>(Note: If the property in question is over multiple blocks and lots, please list all in the description field below) | Street Address 1: 745 Harding Highway<br>Street Address 2:<br>Block: Lot: | |
| If your request is in reference to a facility, site or parcel of land, please provide the Municipality and County where the facility, site or parcel of land is located: | County: Salem<br>Municipality: Carneys Point Twp | |
| If the request is in reference to a particular permit issued by NJDEP, please provide the type of permit and any identifying numbers such as permit, incident or case numbers. (i.e. Fishing, Hunting, Hazardous Waste, Solid Waste, Land Use, NJPDES, Pesticides, Stream Encroachment, TWA, UST, Water Allocation) | List Permit Type: | List ID Numbers:<br>shws 214938VCP 06-04-29-0110-20 |
| If your request is in reference to an individual, please provide the individual's name and type, and if the individual is a DEP employee, your relationship with the individual: | Individual's name:<br>Type of Individual:<br>Relationship: | |
| If the an individual was specified above, the individual was DEP Licensed, please specify the license type the individual holds: | License Type: | |

The New Jersey Department of Environmental Protection has responded to your submitted Open Public Records Act (OPRA) record request. The following information will help you understand the response and your next available actions.

**Tracking #:** This is the Department's assigned Tracking # to your OPRA record request, which should be used in all corresponding matters.

**Record Request Response:**

- **In Progress** – Based on the nature of the request, the records sought, and/or the manner to which the records may exists, the Department requires additional time to investigate and respond to the request.
- **Filled** – Based on the information provided in your request, the Department was able to investigate and respond to your record request.
- **Denied** – Based on the nature of the request and/or the records sought, the Department has denied your request pursuant to a specific exemption(s) cited in N.J.S.A. 47:1A-1 seq.
- **Partial** – The Department has identified both responsive government records and records being denied based on the nature of the request and/or the records sought, that do not meet the definition of a government record pursuant to a specific exemption(s) cited in N.J.S.A. 47:1A-1 seq.

**Disposition Notes:** Provides detailed information concerning the Department's response to your request.

**Accessing Records:** Dependent on the volume of records and your interest, there are four (4) methods available to access the responsive government records:

- **File Review** – Schedule a file review with the Department to directly access the records and take notes or tag records of interest for copying. Copying can be performed by either the onsite Department of Treasury's DEP Copying Unit at State duplication fee costs or by the requester employing a Copy Vendor Service. If there are records stored in archives, a five-day processing period will be included prior to scheduling a review.
- **Copy Request** – All records of interest will be copied by the onsite Department of Treasury's DEP Copying Unit at State duplication fee costs unless a Copy Vendor Service is employed.
- **Fax Request** – Based on the number of pages, the Department faxes the responsive records.
- **Web Access** – The responsive records can be access directly through the Department's web site. Web address will be provided.

## Access to Government Records Under the New Jersey Open Public Records Act (N.J.S.A. 47:1A-1 et seq.)

1. The fees for duplication of a government record are specified below. We will notify you of any special charges, special service charges or other additional charges authorized by State law or regulation before processing your request. Payment shall be made by cash, check or money order payable to the State of New Jersey and mailed to the address specified below.

| | | | |
|---|---|---|---|
| **Hard Copies:** | Pages 1 through 10 = $0.75 per page | **Electronic Records:** | Compact Discs (CDs) = $9.77 per CD |
| | Pages 11 through 20 = $0.50 per page | | Diskettes = $ 0.55 per diskette |
| | Pages 21 on = $0.25 per page | **Over-sized Maps:** | = $5.00 per map |

2. Pursuant to OPRA (C.47:1A-5C), whenever the nature, format, manner of collation, or volume of a government record embodied in the form of printed matter to be inspected, examined, or copied pursuant to this section is such that the record cannot be reproduced by ordinary document copying equipment in ordinary business size or involves an extraordinary expenditure of time and effort to accommodate the request, the public agency may charge, in addition to the actual cost of duplicating the record, a special service charge that shall be reasonable and shall be based upon the actual direct cost of providing the copy or copies.

   The Department charges $48/Hr Fee for Extra-Ordinary Time (EOT) Service Charges. If a request is applicable for an EOT charge, the Requester will be notified of such and payment of the charge must be received prior to access of the subject records. Please note, based on the nature of a request and the records being sought, if the record request processing time is over the Department's normal request processing time, the Department may assess an EOT charge. Being that there is no manner for the Department to ascertain the charge prior to the time being incurred, the Department will notify the Requester in its response to a record request and payment must occur prior to accessing records.

3. By law, the Department must notify you that it grants or denies a request for access to government records within seven business days after the custodian of the record requested receives the request, provided that the record is currently available and not in storage. If the record requested is not currently available or is in storage, the custodian will advise you within seven business days when the record can be made available and the estimated cost. You may agree with the custodian to extend the time for making records available, or granting or denying your request.

4. You may be denied access to a government record if your request would substantially disrupt agency operations and the custodian is unable to reach a reasonable solution with you.

5. If the Department was unable to comply with your request for access to a government record, the custodian will indicate the reasons for denial on the request form.

6. Except as otherwise provided by law or by agreement with the requester, if the custodian of the record requested fails to respond to you within seven business days of receiving a request form, the failure to respond will be considered a denial of your request.

7. **Resolution of Disputed Findings:**

   In the event that a requester does not agree with the Department's record response, the requester should:

   **No Records** - Reexamined the request details to evaluate if all of the information was provided that could aid the Department in locating records. The Department's ability to identify records of interest is in direct correlation to matching the Department information with the information provided on the request. Such important identifiers are Facility/Site Name, Address, Case #, Permit #, Block/Lot.

   **Denial** - If your request for access to a government record has been denied or unfilled within the time permitted by law, you have a right to challenge the decision by the Department to deny access. The Department denies access to records only when those records do not meet the definition of a government record and/or public access is not allowed pursuant to the law. At your option, you may either:

   **a.** Contact the Office of Record Access to re-visit the matter or provide further explanation.

   **b.** Institute a proceeding in the Superior Court of New Jersey

   **c.** File a complaint in writing with the Government Records Council (GRC). You may contact the GRC by toll-free telephone at 866-850-0511, by mail at PO Box 819, Trenton, NJ, 08625, by e-mail at *grc@dca.state.nj.us*, or at their web site at *www.state.nj.us/grc*. The Council can also respond to other questions about the law.

8. Information provided on this form may be subject to disclosure under the Open Public Records Act.

**Revised Addendum Disposition Notes:** NONE

McCormick Taylor
Engineers & Planners Since 1946

April 14, 2010

Carneys Point Municipal Building
Construction Official
303 Harding Highway
Carneys Point, New Jersey 08069

ATTENTION: Mr. Lou Palena

REFERENCE: Layton Lake Dam, NJ Route 48 (Harding Highway), MP 3.06
Carneys Point Township, Salem County, New Jersey

SUBJECT: Hazardous Waste Incidents

Dear Mr. Palena:

The New Jersey Department of Transportation (NJDOT) is proposing improvements to the Layton Lake Dam. Layton Lake Dam is classified as a "Significant Hazard" dam, and does not conform to current NJDEP Dam Safety regulations.

NJDOT is proposing improvements to the dam structure which may include clearing and grubbing of vegetation, overtopping protection, upstream and downstream slope stabilization, and spillway improvements.

Since portions of the project study area is located within your municipality, I am requesting that your office inform me of any files/information that your Department might maintain regarding hazardous waste incidents or site conditions within our project study area. I have enclosed a map of our study area to assist you.

Should you have any questions regarding this request or require further information, please contact me at (856) 793-0800. Thank you in advance for your assistance.

Sincerely,

**MCCORMICK, TAYLOR & ASSOCIATES, INC.**

James L. Di Vietro
Environmental Project Manager

Enclosures: As Stated

700 East Gate Drive • Suite 201 • Mt. Laurel, NJ 08054 • Phone: 856-793-0800 • Fax: 856-793-0819
www.mccormicktaylor.com

McCormick Taylor
Engineers & Planners Since 1946

April 14, 2010

Carneys Point Fire Department
258 D Street
Carneys Point, New Jersey 08069

ATTENTION: Chief Michael Hanna

REFERENCE: Layton Lake Dam, NJ Route 48 (Harding Highway), MP 3.06
Carneys Point Township, Salem County, New Jersey

SUBJECT: Hazardous Waste Incidents

Dear Chief Hanna:

The New Jersey Department of Transportation (NJDOT) is proposing improvements to the Layton Lake Dam. Layton Lake Dam is classified as a "Significant Hazard" dam, and does not conform to current NJDEP Dam Safety regulations.

NJDOT is proposing improvements to the dam structure which may include clearing and grubbing of vegetation, overtopping protection, upstream and downstream slope stabilization, and spillway improvements.

Since portions of the project disturbance area is located within your municipality, I am requesting that your office inform me of any files/information that your Department might maintain regarding hazardous waste incidents or site conditions within our project study area. I have enclosed a map of our study area to assist you.

Should you have any questions regarding this request or require further information, please contact me at (856) 793-0800. Thank you in advance for your assistance.

Sincerely,

**MCCORMICK, TAYLOR & ASSOCIATES, INC.**

James L. Di Vietro
Environmental Project Manager

Enclosures: As Stated

McCormick Taylor
Engineers & Planners Since 1946

April 14, 2010

Carneys Point Township Engineer c/o
Professional Consulting Inc. (PCI)
1719 Route 10, Suite 314
Parsippany NJ 07054

ATTENTION: Mr. Fred Margron

REFERENCE: Layton Lake Dam, NJ Route 48 (Harding Highway), MP 3.06
Carneys Point Township, Salem County, New Jersey

SUBJECT: Hazardous Waste Incidents

Dear Mr. Margron:

The New Jersey Department of Transportation (NJDOT) is proposing improvements to the Layton Lake Dam. Layton Lake Dam is classified as a "Significant Hazard" dam, and does not conform to current NJDEP Dam Safety regulations.

NJDOT is proposing improvements to the dam structure which may include clearing and grubbing of vegetation, overtopping protection, upstream and downstream slope stabilization, and spillway improvements.

Since portions of the project study area is located within your municipality, I am requesting that your office inform me of any files/information that your Department might maintain regarding hazardous waste incidents or site conditions within our project study area. I have enclosed a map of our study area to assist you.

Should you have any questions regarding this request or require further information, please contact me at (856) 793-0800. Thank you in advance for your assistance.

Sincerely,

**MCCORMICK, TAYLOR & ASSOCIATES, INC.**

James L. Di Vietro
Environmental Project Manager

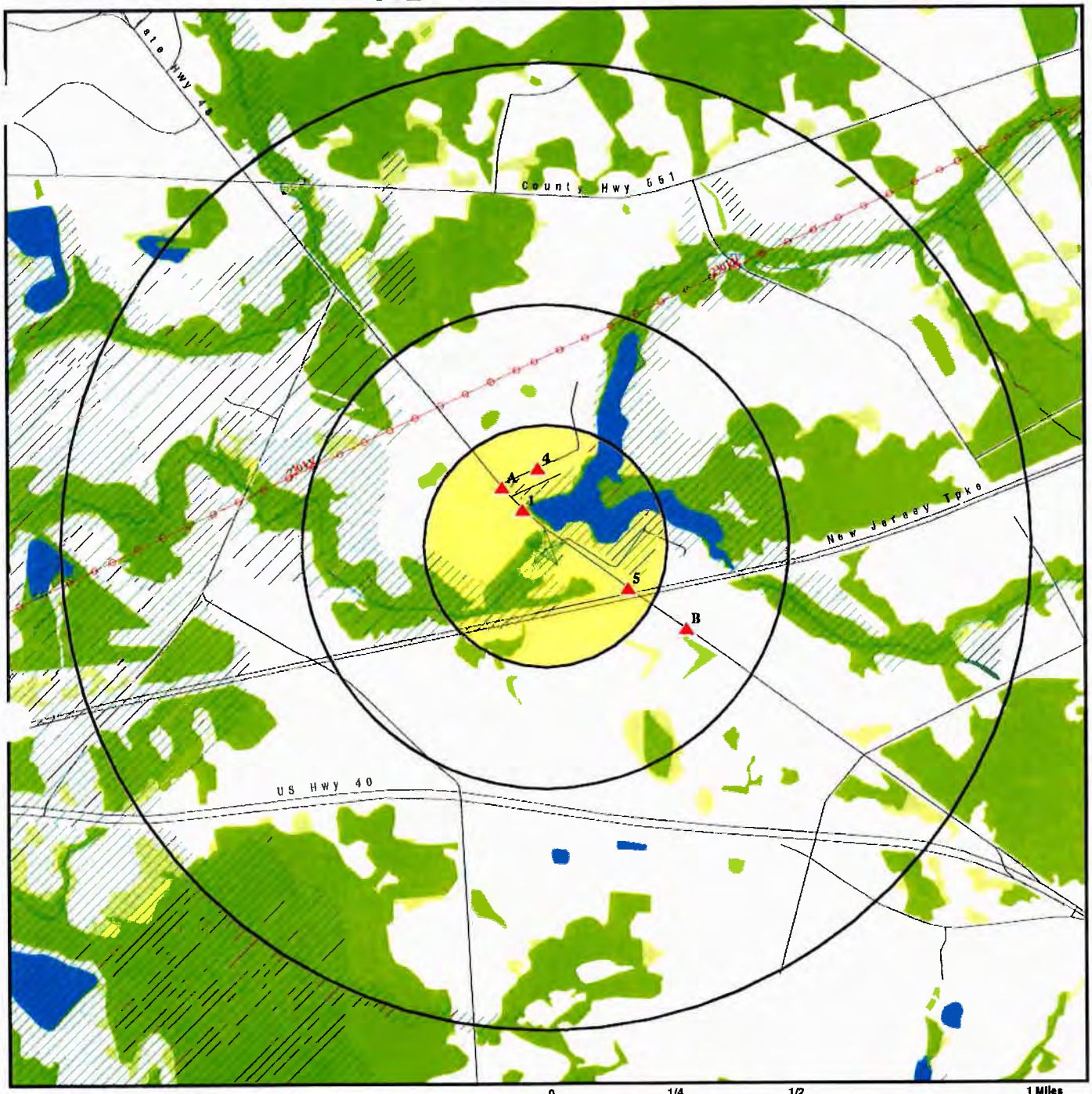
Enclosures: As Stated

700 East Gate Drive • Suite 201 • Mt. Laurel, NJ 08054 • Phone: 856-793-0800 • Fax: 856-793-0819
www.mccormicktaylor.com

# *Appendix C*

# *EDR Database Report Maps*

# OVERVIEW MAP - 2685333.2s



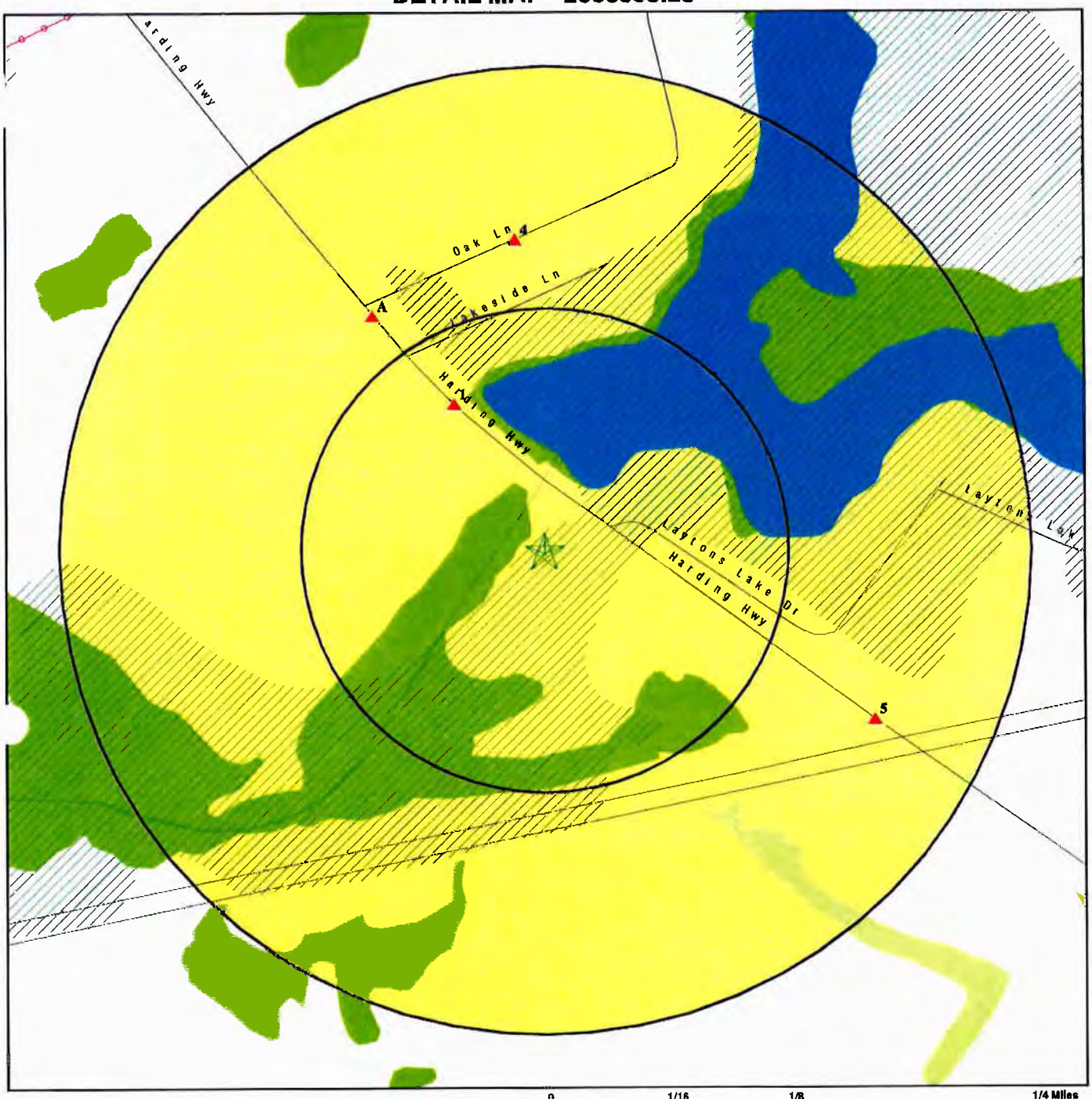

- Target Property
- Sites at elevations higher than or equal to the target property
- Sites at elevations lower than the target property
- Manufactured Gas Plants
- National Priority List Sites
- Dept. Defense Sites
- Indian Reservations BIA
- Power transmission lines
- Oil & Gas pipelines
- 100-year flood zone
- 500-year flood zone
- National Wetland Inventory
- State Wetlands

This report includes Interactive Map Layers to display and/or hide map information. The legend includes only those icons for the default map view.

| | | | |
|---|---|---|---|
| SITE NAME: | NJ Route 48 Laytons Lake Dam | CLIENT: | McCormick, Taylor & Associates |
| ADDRESS: | NJ Route 48 Laytons Lake Dam<br>Salem County NJ 08069 | CONTACT: | Jim DiVietro |
| | | INQUIRY #: | 2685333.2s |
| LAT/LONG: | 39.6908 / 75.4283 | DATE: | January 26, 2010 10:05 am |

Copyright © 2010 EDR, Inc. © 2010 Tele Atlas Rel. 07/2007.

# DETAIL MAP - 2685333.2s




0 1/16 1/8 1/4 Miles

- Target Property
- Sites at elevations higher than or equal to the target property
- Sites at elevations lower than the target property
- Manufactured Gas Plants
- Sensitive Receptors
- National Priority List Sites
- Dept. Defense Sites
- Indian Reservations BIA
- Power transmission lines
- Oil & Gas pipelines
- 100-year flood zone
- 500-year flood zone
- National Wetland Inventory
- State Wetlands

This report includes Interactive Map Layers to display and/or hide map information. The legend includes only those icons for the default map view.

| | |
|---|---|
| SITE NAME: NJ Route 48 Laytons Lake Dam<br>ADDRESS: NJ Route 48 Laytons Lake Dam<br>Salem County NJ 08069<br>LAT/LONG: 39.6908 / 75.4283 | CLIENT: McCormick, Taylor & Associates<br>CONTACT: Jim DiVietro<br>INQUIRY #: 2685333.2s<br>DATE: January 26, 2010 10:05 am |

Copyright © 2010 EDR, Inc. © 2010 Tele Atlas Rel. 07/2007.

# *Appendix D*

# *Historical Aerial Photographs*



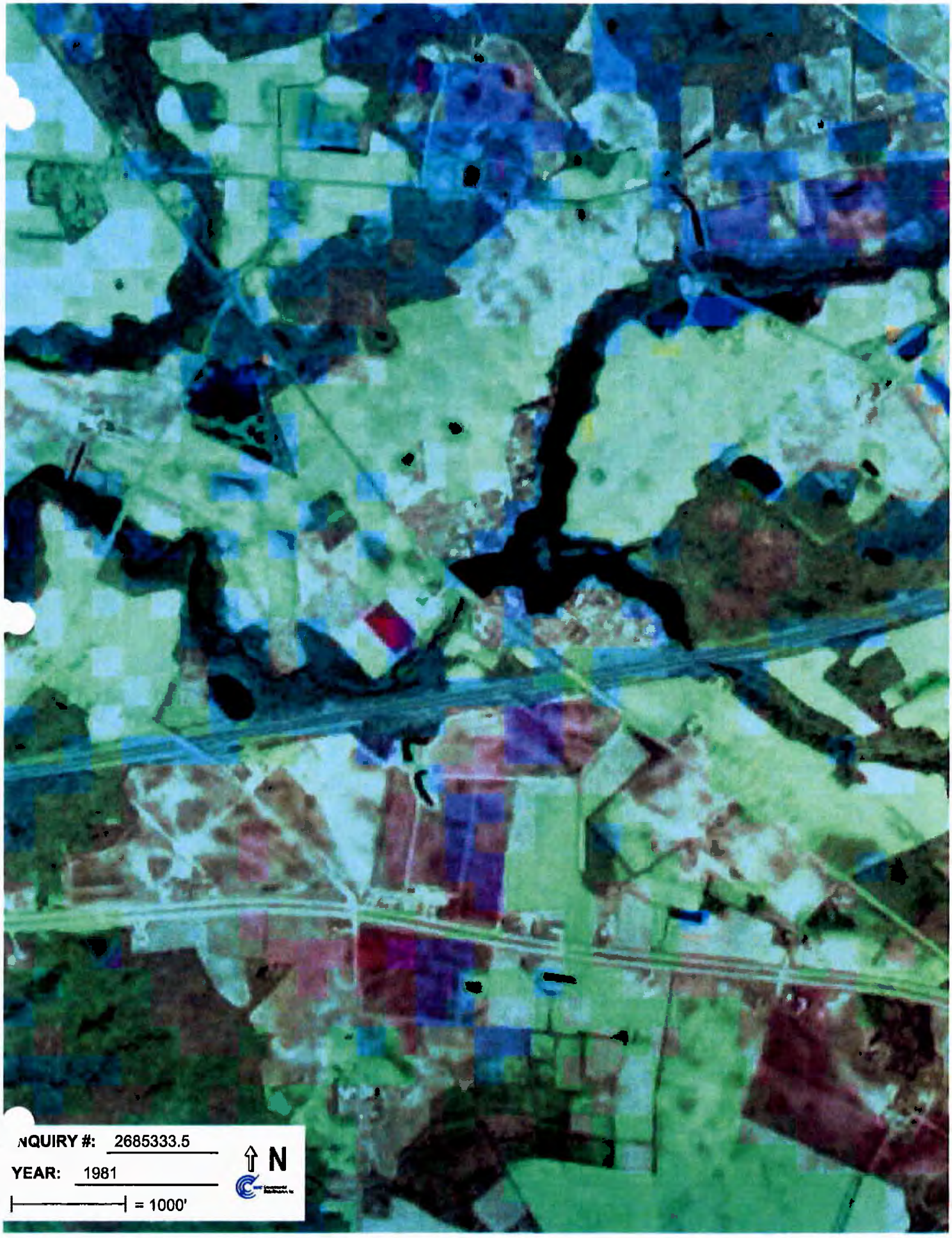
INQUIRY #: 2685333.5

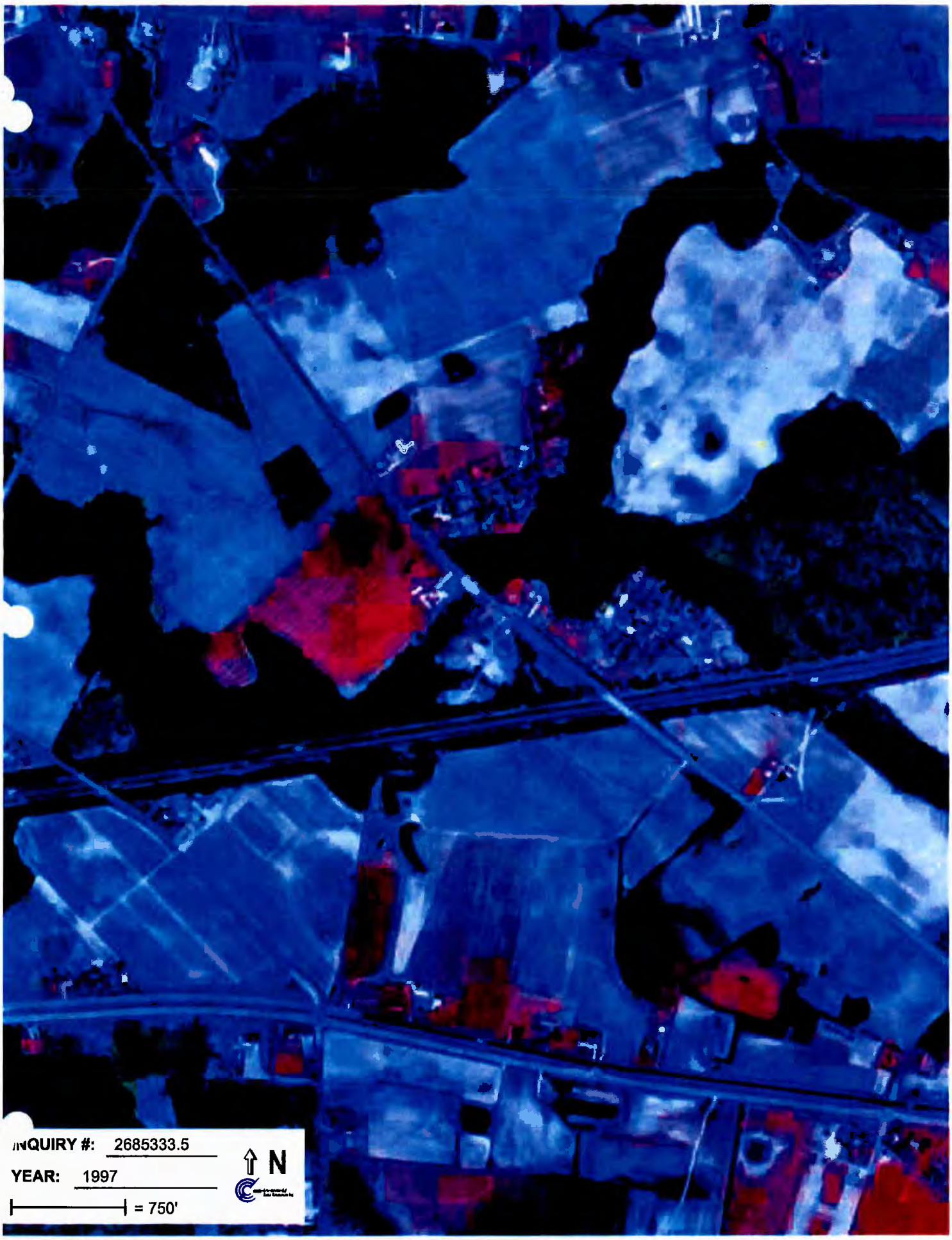
YEAR: 1954

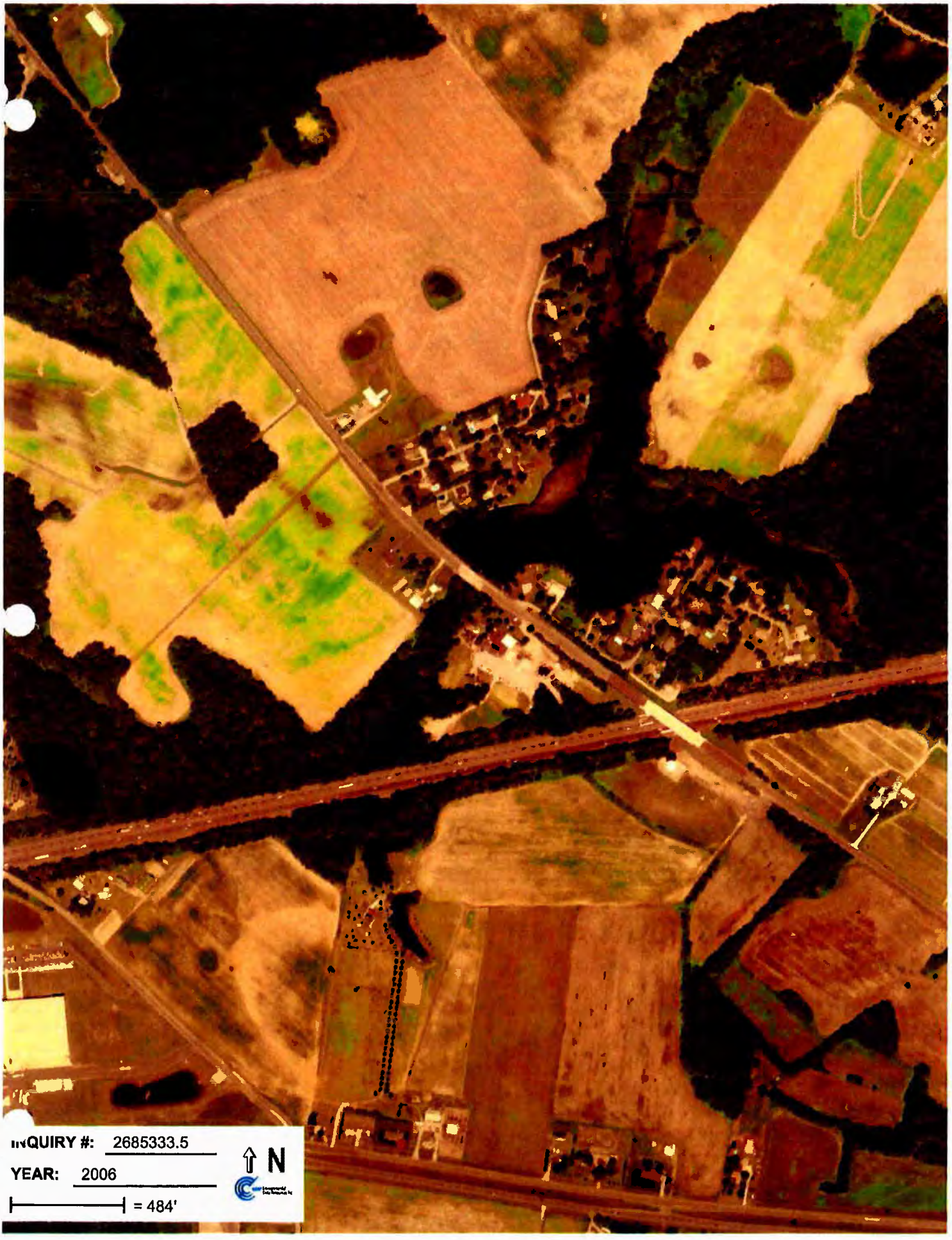
= 750'

N


INQUIRY #: 2685333.5
YEAR: 1975
= 1000'
N


NQUIRY #: 2685333.5
YEAR: 1981
= 1000'
N


INQUIRY #: 2685333.5
YEAR: 1997
= 750'
N


INQUIRY #: 2685333.5
YEAR: 2006
= 484'
N

# NEW JERSEY DEPARTMENT OF TRANSPORTATION

# CATEGORICAL EXCLUSION DOCUMENTATION

CED Form Updated May 27, 2009

## I. GENERAL INFORMATION

| | | | |
|---|---|---|---|
| **DOT Job Code No.** | | **Federal Project No.** | |
| **Project Management Team** | | **UPC No.** | 023100 |
| **Route & Section** | NJ Route 48 Milepost 3.06 | **Structure No.** | Bridge: 1706199; Dam: 30-15 |
| **Local Road Name** | Harding Highway | | |
| **Municipality(ies)** | Carneys Point Township | **County(ies)** | Salem |
| **Type of Project** | Dam Replacement | **Length** | 0.15 mile |
| **From Milepost** | 2.96 | **To Milepost** | 3.11 |
| **Congressional District** | 2 | **Legislative District** | 3 |
| **ROW Cost** | $50,000 | **Construction Cost** | $10,800,285 |

| **EXISTING FACILITY** | | | |
|---|---|---|---|
| **ROW Width** | 150' | | |
| **No. Lanes & Width** | Two 12' lanes | | |
| **Shoulder Width** | 8-12 | **Median** | NA |
| **Overall Roadway Width** | 44-48' | | |

| **PROPOSED FACILITY** | | | |
|---|---|---|---|
| **ROW Width** | 150' | | |
| **No. Lanes & Width** | Two 12' lanes | | |
| **Shoulder Width** | 8-12 | **Median** | NA |
| **Overall Roadway Width** | 44-48' | | |

## II. PROJECT DESCRIPTION (attach location map; USGS map suggested)

**See Figure 1 – Project Location Map**

**A. Project Need** (briefly explain why the project is needed):

The purpose of the proposed project is to bring the existing dam into compliance with NJDEP Dam Safety Regulations. Laytons Lake Dam is currently classified as a "Significant Hazard" facility. The existing spillway and bridge at Laytons Lake Dam do not have capacity to convey discharge during the 100-year Flood storm event (NJDEP-approved Spillway Design Storm). Laytons Lake Dam spillway and bridge abutments and walls were also determined to be affected by Alkali-Silica Reactivity (ASR). ASR is caused by a reaction between the alkaline cement pore solution in the concrete and reactive forms of silica in the aggregate. It can cause expansion and cracking of the concrete resulting in structural problems and possible failure.

**B. Proposed Improvements** (provide a brief description of proposed improvements):

The NJDOT is proposing improvements to the dam structure which consist of construction of a new 90-foot long ogee spillway, construction of a new bridge with a span of 40 feet to replace the existing 30-foot span, and raising the elevation of the roadway profile by 1.1 feet. The improvements will convey the Spillway Design Storm with the required one-foot of freeboard. The 100-year water surface elevations under both the existing and proposed conditions for the downstream area remain the same. Two new outfall structures will be installed on the eastbound side of Route 48, each fitted with a water quality structure to maintain the required 50 % TSS removal.

**C. Right-of-Way Taking**

| | | | |
|---|---|---|---|
| Total area needed: 0.24 acre | Est. No. parcels: 3 | In fee- 1 (0.01 acre) | easements- 2 (0.2 & 0.03 ac) |
| Est. No. relocations: | residences-0 | businesses-0 | parking spaces-0 |
| Community Facilities Affected: 0 | | | |
| Area of public recreation land taken: 0 (acres) | | Out of a total area of: | (acres) |
| ☐ Green Acres/State-owned Land Involvement | | | |
| ☐ Federally Owned/Federally Funded Land Involvement | | | |

**Comments:** The acquisition of 0.01 acre of Block 235 Lot 12 is required for this project. In addition, two temporary construction easements will be used during the construction; one temporary easement of 0.2 acre on Block 233 Lot 14 for construction of the spillway, and one of 0.03 acre on Block 236 Lot 2.

## III. ENVIRONMENTAL CONSIDERATIONS

### A. Noise

| | |
|---|---|
| ☒ | Sensitive receptors exist within 200 feet for two lanes or 400 feet for four lanes. |
| ☐ | Project substantially changes the vertical or horizontal alignment of the roadway. |
| ☐ | Traffic volumes or speeds substantially increase. |

**Conclusion:**

| | |
|---|---|
| ☒ | Noise study not required. No significant impact anticipated. |
| ☐ | Potential noise impacts were studied and are discussed in comments. Project still meets CE criteria. |

**Comments:**
While sensitive receptors do occur within 200 feet of the project area, the project will not result in substantial changes to the horizontal or vertical roadway alignment, or result in an increase in vehicle travel speeds or volumes. Therefore, no change in traffic noise levels will occur due to the project. Standard measures will be implemented during construction to minimize construction related noise impacts to nearby residences.

### B. Air Quality: CONFORMITY WITH THE CLEAN AIR ACT AMENDMENTS (CAAA) OF 1990

**Section 1:** Regional Emissions Analysis (STIP or MPO's conforming transportation plan)

| | |
|---|---|
| ☒ | Project is included in the FY 2010 - 2011 approved State Transportation Improvement Plan (STIP). |
| ☐ | Project is not listed in the FY 20_ - 20_ approved STIP but is included in the MPO's conforming transportation plan. |
| ☐ | Project is not included in either the approved STIP or the MPO's conforming transportation plan. |

**Section 2:** Based on its scope, the project is categorized by the Transportation Conformity Rule (TCR) as:

| | |
|---|---|
| ☒ | A project type listed in **Table 2** of the TCR, i.e., **Exempt** from the conformity requirements of the CAAA (i.e., exempt from regional emissions analysis, Carbon Monoxide (CO) analysis, and Particulate Matter PM2.5 and PM10 analyses requirements) and may proceed towards implementation even in the absence of a conforming transportation plan and TIP. |
| ☐ | A project listed in **Table 3** of the TCR, i.e., **Exempt** from regional emissions analysis requirement, but local effects of this project with respect to CO, PM2.5 and PM10 concentrations must be considered to determine if a hot-spot analysis is required. *Complete Section 2a below.* |
| ☐ | A project type **not listed in Table 2 or Table 3** of the TCR, i.e., must be part of a conforming STIP and/or a MPO's conforming transportation plan and requires CO, PM2.5 and PM10 hot-spot analyses. *Complete Section 2a below.* |

**Section 2a(1):** **Project type listed in Table 3 of the TCR for CO analysis**
**Project type not listed in either Table 2 or Table 3 of the TCR for CO analysis**

| | |
|---|---|
| ☐ | Project located in **CO Attainment Area**. CO analysis not required. Project may proceed to the project development process. |
| ☐ | The total eight-hour Carbon Monoxide levels are expected to be reasonably below the NAAQS of 9 ppm. This is based on LOS data for the intersection(s) and the total highest traffic volumes at this (those) intersection(s) and the distance of the sensitive receptors to the roadway. No quantitative analysis is required. Project may proceed to the project development process even in the absence of a conforming transportation plan and TIP. |
| ☐ | Project located in a Carbon Monoxide **Non-Attainment/Maintenance Area** and requires a Carbon Monoxide hot-spot analysis. A CO Analysis was completed at the following intersection(s): ____ |

| | |
|---|---|
| ☐ | And the results are: _____ |

| **Section 2a(2): Project type listed in Table 3 of the TCR for PM2.5 analysis<br>Project type not listed in Table 2 or Table 3 of the TCR for PM2.5 analysis** | |
|---|---|
| ☐ | The project is located in PM2.5 **Attainment Area.** PM2.5 hot-spot analysis is not required. Project may proceed to the project development process. |
| ☐ | The project is located in a PM2.5 **Non-Attainment/Maintenance Area** and the project is **not an air quality concern** under 40CFR 93.123(b) (1). Quantitative/qualitative analysis is not required. Project may proceed to the project development process. |
| ☐ | The project is located in a PM2.5 **Non-Attainment/Maintenance Area** and the project **is an air quality concern** under 40CFR 93.123(b) (1). A PM2.5 hot-spot analysis was completed at the following location(s): _____<br><br>And the results are: _____ |

| **Section 2a(3): Project type listed in Table 3 of the TCR for PM10 analysis<br>Project type not listed in Table 2 or Table 3 of the TCR for PM10 analysis** | |
|---|---|
| ☐ | The project is located in PM10 **Attainment Area.** PM10 hot-spot analysis is not required. Project may proceed to the project development process. |
| ☐ | The project is located in a PM10 **Non-Attainment/Maintenance Area** and the project is **not an air quality concern** under 40CFR 93.123(b) (1). Quantitative/qualitative analysis is not required. Project may proceed to the project development process. |
| ☐ | The project is located in a PM10 **Non-Attainment/Maintenance Area** and the project **is an air quality concern** under 40CFR 93.123(b) (1). A PM10 hot-spot analysis was completed at the following location(s): _____<br><br>And the results are: _____ |

**Comments** (include LOS, if appropriate):
Although some air quality sensitive receptors are located within the proposed project area, no significant air quality impacts are anticipated. Implementation of this project will not result in a significant increase in diesel vehicles on the project roadway. Furthermore, USEPA's *Transportation Conformity Rule, part 93.126 Table 2 – Exempt Projects* identifies the Hazard Elimination Program and Safety Improvement Program projects as exempt from the requirement that a conformity determination be made.

| **C. Potential Ecological Constraints** (check those that apply) | | | |
|---|---|---|---|
| ☒ | Floodplains | ☐ | Shellfish Habitat |
| ☒ | Wetlands | ☒ | Acid Producing Soils |
| ☐ | Vernal Pools | ☐ | Submerged Aquatic Vegetation |
| ☒ | Waterbody:<br>☐ Category One<br>☐ Trout Production<br>☐ Trout Maintenance<br>☒ Non-Trout | ☒ | Sole Source Aquifer |
| | | ☐ | Forested Areas |
| | | ☒ | Threatened and Endangered Species:<br>☒ State-listed species<br>☐ Federally listed species |
| ☐ | Wild and Scenic River | ☐ | Other (specify): |
| ☐ | Essential Fish Habitat | | |

| Federally Listed Threatened & Endangered Species Checklist: |
|---|
| (Please see http://www.fws.gov/northeast/njfieldoffice/Endangered/consultation.html for guidance on the current US Fish and Wildlife Service (USFWS) Consultation Procedures. County/municipal |

species lists are only valid for 90 days.)

| | |
|---|---|
| ☒ | The proposed project is **not** located in a municipality with extant, historic, or potential occurrence of a federally listed species. The municipality list was checked within the last 90 days and documentation of this determination is included in the project file. No further action is required under the Endangered Species Act (ESA). |
| ☐ | The proposed project **is** located in a municipality with extant, historic, or potential occurrence of a federally listed species. Habitat requirements for each of the species have been reviewed and the project's impact area (*i.e., action area) was assessed to determine whether it contains potentially suitable habitat. *Based on existing information or field surveys, the results revealed:* |
| ☐ | The project's impact area (i.e., action area) does **not** contain potentially suitable habitat for a federally listed species. Documentation of this determination is in the project file. No further action is required under the ESA. Concurrence from the USFWS is not required. |
| ☐ | The project's impact area (i.e., action area) **does or may** contain potentially suitable habitat for a federally listed species. *The assessment and all relevant project information:* |
| ☐ | Have been submitted to the US Fish and Wildlife Service's NJ Field Office for ESA **Section 7 consultation.** Correspondence is attached. See comments below. |
| ☐ | Will be submitted to the New Jersey Division of Land Use Regulation Program during the **permitting process.** Project requires authorization under the NJ Freshwater Wetlands Protection Act. See comments below. |

*Action Area: The action area is defined by regulation as all areas to be affected **directly or indirectly** by the Federal action and **not merely the immediate area involved in the action** (50 CFR §402.02). This analysis is not limited to the "footprint" of the action nor is it limited by the Federal agency's authority. Rather, it is a biological determination of the reach of the proposed action on listed species. Subsequent analyses of the environmental baseline, effects of the action, and levels of incidental take are based upon the action area.

**Conclusion:**

| | |
|---|---|
| ☐ | No significant impact anticipated |
| ☒ | Further studies are needed to obtain permits. Project still satisfies CE criteria. |

**Comments** (briefly describe *all* potential ecological constraints):

Floodplains

The 100-year Floodplain for Game Creek will be affected by the proposed project. According to the floodplain mapping for Salem County, portions of the construction impact area are located within the 100-year Flood Boundary. Based upon available preliminary design plans, it is anticipated that impacts to the floodplain will be minor.

Wetlands

Based on the field investigations and review of available mapping resources, freshwater wetlands and State open waters exist within the project limits. State open water will be impacted as the result of construction of the proposed spillway. Wetland transition areas will also be temporarily disturbed during construction activities for this project. Upon completion of the construction activities the wetland transition areas will be returned to their original condition. Mitigation requirements for all impacts will be addressed during the permitting process, as needed.

Waterbody

Laytons Lake (Game Creek and Two Penny Run) and Game Creek will be affected by the proposed project. The NJDEP Surface Water Quality Classification for these waters is FW2-NT (Freshwater, Not-trout).

Sole Source Aquifer

The project is located within the NJ Coastal Plain Sole Source Aquifer System. Due to the limited scope of the proposed project, no significant impacts are anticipated. Pursuant to the Memorandum of Understanding between the FHWA, Region I and the EPA, Region II, dated 7/9/84, the proposed project

would not require review under Section1424 (e) of the Safe Drinking Water Act.

Threatened and Endangered Species

The NJDEP Natural Heritage Program (NHP) was contacted for information regarding rare, threatened, and endangered species within or in the immediate vicinity of the project area. In a letter (attached) dated February 18, 2010, the NHP reported the occurrences of bald eagle (Haliaeetus leucocephalus) foraging and great blue heron (*Ardea herodias*) on the referenced site, and bobcat (*Lynx rufus*) within ¼-mile of the site.

Carneys Point Township does not appear on either The NJDEP *Freshwater Wetlands Permit Program Attachment C - Known Locations of Swamp Pink* (Helonias bullata) *in New Jersey (as of October 2008)*, nor the NJDEP *Freshwater Wetlands Permit Program Attachment D – Known Locations of Bog Turtles (*Clemmys muhlenbergii*) in New Jersey* (October 2008).

Carneys Point Township does not appear on *the Federally Listed and Candidate Species Occurrences in New Jersey by County and Municipality* (USFWS, December 2009).

**D. Anticipated Environmental Permits/Approvals/Coordination** (check those that apply)

| | | | |
|---|---|---|---|
| ☐ | US Coast Guard | ☐ | NJDEP Pollutant Discharge |
| ☐ | USACOE Section 10 (Navigable Waters) | ☒ | NJDEP Dam Safety |
| ☐ | USACOE Section 404 (Nationwide) | ☐ | NJDEP Remediation Approval |
| ☐ | USACOE Section 404 (Individual) | ☐ | NJDEP Tidelands Conveyance |
| ☐ | USEPA Sole Source Aquifer | ☒ | EO 11990 Wetlands |
| ☒ | NJDEP Freshwater Wetlands—GP | ☒ | EO 11988 Floodplains |
| ☐ | NJDEP Freshwater Wetlands—IP | ☐ | NJDEP Highlands Preservation Area:<br>☐ Exempt<br>☐ Highlands Applicability Determination<br>☐ Highlands Preservation Area Approval |
| ☐ | NJDEP Transition Area Waiver | | |
| ☐ | NJDEP Coastal Wetlands | | |
| ☐ | NJDEP Waterfront Development | | |
| ☐ | NJDEP CAFRA | ☐ | USDA-Farmland Conversion (Form AD 1006) |
| ☐ | NJDEP Flood Hazard Area Permit—GP | ☐ | NJ Agriculture Development Area |
| ☐ | NJDEP Flood Hazard Area Permit—IP | ☐ | NJDEP Green Acres Program/State House Comm. |
| ☒ | NJDEP Stormwater Management:<br>☐ ≥ 0.25 acre impervious surface<br>☒ ≥ 1.0 acre disturbance<br>☐ Unknown at this time | ☐ | National Marine Fisheries Service |
| | | ☐ | NJDEP Parks & Forestry (PL 2001 Chapter 10 Reforestation) |
| | | ☐ | D&R Canal Commission |
| | | ☐ | Meadowlands Commission |
| | ☒ Approval through NJDEP LURP Permit (or)<br>☐ NJDOT self-certification | ☐ | Pinelands Commission |
| | | ☐ | Endangered Species Act Section 7 Consultation |
| ☐ | NJPDES Construction Activity Stormwater GP (RFA) | ☐ | NJDEP Threatened & Endangered Species Coordination |
| ☒ | NJDEP Water Quality Certificate | ☐ | Other (specify): |

**Comments:**

The project will involve minor impacts to State Open waters and freshwater wetland transition areas in the vicinity of the Laytons Lake Dam. Based upon the available preliminary design plans, it is anticipated that a NJDEP Freshwater Wetlands General Permit (GP#18 – Dam Repair) will be required. The NJDEP Water Quality Certificate will be addressed with the NJDEP GP#18. EO 11990 and EO 11988 will be addressed through the permitting process. While the proposed project will not increase the amount of impervious surfaces, greater than one acre of total disturbance is proposed. As such, compliance with applicable sections of the Stormwater Management Rules (N.J.A.C. 7:8) will be required.

The required Dam Safety Permit precludes the need for a Flood Hazard Area Permit.

| E. Cultural Resources | |
|---|---|
| | **Technical Findings:** |
| ☐ | Project is not an undertaking for Section 106 purposes; concurrence has been received from FHWA. |
| ☐ | No Effect per DOT/SHPO Agreement of 05/14/09; subject to conditions identified in the Agreement. |
| ☐ | No Section 106 Consultation per 5/25/01 SHPO concurrence with *Section 106 Compliance Procedures, Federally Funded Drainage Improvement Program*; subject to conditions identified in the Agreement. |
| ☐ | No Effect to significant properties if they exist in APE per 36CFR800.3(a)(1) with SHPO concurrence. (Because the Section 106 regulations allow for a level of effort for conducting and evaluating cultural resources to be commensurate with the undertaking, this category of finding was developed to be used for certain projects when no cultural resources survey has been conducted; and self-imposed conditions, if applicable, are presented as part of the undertaking, e.g., Pipeline 3 or other small-scale projects.) |
| ☒ | No National Register (NR) listed or eligible properties in APE (Section 106 Findings = No Historic Properties Affected). |
| ☐ | National Register listed/eligible properties exist within APE (***see consultation summary below***). |

| Archaeology | Architecture | | | | Section 106 Finding |
|---|---|---|---|---|---|
| | Bridge | Building | District | Other | |
| | | | | | NR listed/eligible property(ies)—No Historic Properties Affected |
| | | | | | NR listed/eligible property(ies)—No Adverse Effect (NAE) |
| | | | | | NR listed/eligible property(ies)—NAE with conditions |
| | | | | | NR listed/eligible property(ies)—Adverse Effect |

| | Section 106 Consultation Summary | Date |
|---|---|---|
| ☐ | FHWA concurred with Adverse Effect Finding | |
| ☒ | SHPO provided Section 106 consultation comments | 04/19/2011 |
| ☐ | FHWA concurred with No Adverse Effect with Conditions | |
| ☐ | ACHP notified of Adverse Effect | |
| ☐ | ACHP responded to notification (check one/enter date):<br>☐ ACHP will participate in consultation<br>☐ ACHP declined to participate in consultation | |
| ☐ | MOA executed by FHWA (check one/enter date):<br>☐ MOA filed with ACHP<br>☐ ACHP accepted/signed MOA | |

**Comments** (include MOA stipulations or other conditions, if applicable): Results of the technical study concluded that no National Register eligible or listed properties were identified within the project "Area of Potential Effect". SHPO concurrence for the technical survey results and a finding of No Historic Properties Affected was received on April 19, 2011 (letter attached).

| F. Section 4(f) Involvement | |
|---|---|
| **Section 1: Historic Sites** | |
| ☒ | No Section 4(f) Involvement |
| ☐ | Project results in a "constructive use" of Section 4(f) property. |

| | |
|---|---|
| ☐ | Project results in a use of Historic site(s) on or eligible for the National Register of Historic Places (check one below): |
| ☐ | Section 4(f) Involvement. Project is covered under ***de minimis* Evaluation of Impacts** and all applicability criteria have been met, including concurrence *first* by the FHWA that the project meets the applicability criteria, and *then* concurrence by SHPO with the "No Effect" or "No Adverse Effect" determination *after* they are notified of the intent to use a *de minimis* finding. |
| ☐ | Section 4(f) Involvement. Project is covered under the **Nationwide Section 4(f) Programmatic Evaluation for minor involvement** and all applicability criteria have been met, including concurrence by the SHPO (or ACHP) with the "No Effect" or "No Adverse Effect" determination. |
| ☐ | Section 4(f) Involvement. Project is covered under the **Nationwide Section 4(f) Programmatic Evaluation for Net Benefits** and all applicability criteria have been met, including notification to and concurrence by the FHWA with the determination. |
| ☐ | Section 4(f) Involvement. Project has an "Adverse Effect" determination. **Individual Section 4(f)** was prepared. |
| **Comments:** | |

| **Section 2: Historic Bridges** | |
|---|---|
| ☒ | No Section 4(f) Involvement |
| ☐ | Section 4(f) Involvement. Project is covered under the **Nationwide Section 4(f) Programmatic Evaluation for Historic Bridges.** |
| **Comments:** | |

| **Section 3: Publicly Owned Park, Recreation Area, Wildlife or Waterfowl Refuge** | |
|---|---|
| ☒ | No Section 4(f) Involvement |
| ☐ | Project results in a "Constructive Use" of Section 4(f) property (fill out Site Information below) |
| ☐ | Project requires acquisition from publicly owned recreation land (fill out Site Information below): |
| ☐ | Section 4(f) Involvement. Project is covered under ***de minimis* Evaluation of Impacts** and all applicability criteria and conditions have been met, including concurrence *first* by the FHWA that the project meets the applicability criteria, and *then* notification to the officials with jurisdiction of the intent to use a *de minimis* finding. |
| ☐ | Section 4(f) Involvement. Project is covered under **Nationwide Section 4(f) Programmatic Evaluation for minor involvement** and all applicability criteria and conditions have been met, including concurrence by the officials having jurisdiction over the property. |
| ☐ | Section 4(f) Involvement. Project is covered under the **Nationwide Section 4(f) Programmatic Evaluation for Net Benefits** and all applicability criteria have been met, including notification to and concurrence by the FHWA with the determination. |
| ☐ | Section 4(f) Involvement. Nationwide Section 4(f) Programmatic applicability criteria were not met; **Individual Section 4(f) Evaluation** was prepared. |
| **Site Information** (for projects involving "Constructive Use" or acquisition from publicly owned recreation land, wildlife or waterfowl refuge):<br><br>**Name of Site** (use local name): _____<br>**Lot and Block**: _____<br>**Total acreage of site**: _____<br>**Acreage of site affected** (acquisition and permanent easements): _____ | |
| ☐ | Federal encumbrances involved (e.g., Wild and Scenic Rivers Act, Land and Water Conservation Fund Act, Rivers and Harbors Act). |
| **Comments:** No Publicly Owned Parks, Recreation Areas, and Wildlife or Waterfowl Refuge areas were identified within the project limits. | |

| Section 4: Independent Walkway & Bikeway Construction Projects | |
|---|---|
| ☒ | No Section 4(f) Involvement |
| ☐ | Section 4(f) Involvement. Project is covered under the **Nationwide Section 4(f) Programmatic Evaluation**. Project requires use of recreation and park areas established and maintained primarily for active recreation, open space, or similar purposes. All applicability criteria have been met, including approval in writing by the official with jurisdiction over the property that the project is acceptable and consistent with the designated use of the property and that all possible planning to minimize harm has been accomplished in the location and design of the bikeway or walkway facility. |
| **Comments:** | |

| G. Hazardous Materials and Landfills | |
|---|---|
| ☒ | Involvement with known or suspected contaminated site. |
| ☐ | Involvement with underground storage tanks. |
| **Conclusion:** | |
| ☒ | Low potential for involvement with contamination; no further investigation required. |
| ☐ | Further investigation and/or sampling required to determine extent of involvement with contamination. Project still meets FHWA criteria for a CE. |

**Comments**: Three properties/areas of potential environmental concern were identified within the immediate construction limits:

- The entire project was historically used for agricultural purposes.
- Suzie Belle Farm/J Boys Inc. property, located at 772 Harding Highway
- Farm/residence, located at 762 Harding Highway.

Based on the proposed scope-of-work for the project It is not anticipated that construction activities and/or ROW acquisition will occur downstream of Laytons Lake, adjacent to the Suzie Belle Farm/J. Boys Inc. or the Farm/residence property. Also, based on the nature of the project (dam repair) and limited construction proposed for the project, no further investigation is recommended regarding the historical agricultural activities conducted within the project limits.

| H. Socioeconomics | |
|---|---|
| ☒ | The project will **not** result in any significant socioeconomic impacts. |

**Comments:**
Construction of the proposed project will not result in displacement of residences or businesses. Further, no open space or park areas, or community facilities will be affected by the proposed project.

| I. Environmental Justice | |
|---|---|
| ☒ | Project will have **no** disproportionately high or adverse effects on low income and/or minority communities. |
| ☐ | Project will have disproportionately high and adverse effects on low income and/or minority communities. |
| **Conclusion:** | |
| ☒ | Project is in compliance with the goals of Executive Order 12898 and the requirements of the Civil Rights Act of 1964. |
| ☐ | Project is in compliance with the goals of Executive Order 12898 and the requirements of the Civil Rights Act of 1964, through the identification of measures to address disproportionate effects, including actions to avoid or mitigate them. Project satisfies CE criteria. |

**Comments:**
Due to the limited scope of this Dam Safety project, no impacts to low-income or minority populations are anticipated.

**J. Public Reaction** (briefly describe input from the Office of Community Relations or current status of

public reaction):
An Officials briefing on the project was held on February 17, 2011. The township indicated their support for the project and affirmed that they would issue a Resolution of Support for the project as proposed in the future.

A briefing of Layton Lake, Inc., the homeowners association that collectively owns the lake, was conducted on March 14, 2011. The president of Layton Lake, Inc. indicated that the corporation would issue a Resolution of Support.

A Public Information Center (PIC) for the project was held on December 8, 2011. The residents were agreeable to the proposed improvements. The Homeowners Association confirmed that they would provide resolution of support for the project in future stages of planning.

**K. Environmental Commitments** (refer to MOA stipulations or other conditions noted in Section D, if applicable; permit conditions, etc.):

1. Implement soil erosion and sediment control measures during construction.
2. Implement standard measures for minimization of construction-related noise and air quality (dust) impacts.
3. Obtain and comply with applicable NJDEP permits, including any possible mitigation requirements.
4. Implement standard measures for addressing potential acid soil involvements during construction activities.

**DETERMINATION OF CATEGORICAL EXCLUSION**

**Project name and location:** Route 48, Laytons Lake Dam – Carneys Point Township, Salem County, NJ

**CE #:** 23 CFR 771.117(d)(2)

The proposed project satisfies the Categorical Exclusion definition outlined in 23 CFR 771.117 (a) and will not result in significant environmental impacts.

| | | |
|---|---|---|
| | Project Manager, Div. of Local Aid and Econ. Dev. | Date |
| Recommended by: | Environmental Supervisor | Date |
| **Certified** ☐ (or) **Approved** ☐ | Manager, BLAES | Date |
| **Concurrence** (non-self certified CEs) | Division Administrator, Federal Highway Administration | Date |

enclosures (please include any correspondence referenced in the CED):

- ☒ Project Location Map
- ☒ NJ Natural Heritage Program letter
- ☐ USFWS coordination letter(s)
- ☐ NMFS coordination letter
- ☒ SHPO Eligibility & Effects concurrence letter
- ☐ Signed MOA
- ☐ Final Nationwide Section 4(f) Programmatic Evaluation for:
  - ☐ Minor Involvement with Historic Sites
  - ☐ Use of Historic Bridges
  - ☐ Minor Involvement with Publicly Owned Park, Recreation Area, Wildlife or Waterfowl Refuge
  - ☐ Independent Walkway and Bikeway Construction Projects
  - ☐ Net Benefits
  - ☐ *De minimis* Evaluation of Impacts documentation (i.e., notice to SHPO, *de minimis* template)
- ☐ Final Individual Section 4(f)
- ☐ Resolution of Support from Municipality/County
- ☐ Other (specify): _____

# *Appendix J – Cost Estimates*

New Jersey Department of Transportation
DATE : 12/15/2011

JOB ESTIMATE REPORT

JOB NUMBER : 023100PDS SPEC YEAR: 07
DESCRIPTION: RT 48 TWO PENNY RUN BRIDGE / LAYTON LAKE DAM
BRIDGE AND SPILLWAY REPLACEMENT AND ROADWAY CONSTRUCTION

COST GROUPS FOR JOB 023100PDS

| COST GROUP | DESCRIPTION | QUANTITY | PRICE | AMOUNT | ACTIVE? |
|---|---|---|---|---|---|
| OTHR1 | PERFORMANCE/PAYMENT BOND & INSURANCE (OWNER'S/POLLUTION) LS | 1.000 | 80000.00000 | 80000.00 | Y |
| SCHD1 | PROGRESS SCHEDULE/UPDATE & TRAINEES (LUMP SUM) | 1.000 | 40000.00000 | 40000.00 | Y |
| MOBL3 | MOBILIZATION (12% OF JOB) | 82202.841 | 12.00000 | 986434.09 | Y |
| GENR1 | FIELD OFFICE, MATERIALS LAB, CURING FACILITY & EQUIPMENT (U) | 1.000 | 200000.00000 | 200000.00 | Y |
| SURV1 | CONSTRUCTION LAYOUT (LUMP SUM) | 1.000 | 165000.00000 | 165000.00 | Y |
| UDEF1 | EROSION & SEDIMENT CONTROL/POLLUTION CONTAINMENT ITEMS (LS) | 1.000 | 100000.00000 | 100000.00 | Y |
| MNTC1 | MAINTENANCE OF TRAFFIC, TEMPORARY (IN UNITS) | 1.000 | 500000.00000 | 500000.00 | Y |
| UDEF1 | FUEL & ASPHALT PRICE ADJUSTMENT | 1.000 | 35000.00000 | 35000.00 | Y |
| CLER1 | CLEARING SITE-ROADWAY (LUMP SUM) | 1.000 | 150000.00000 | 150000.00 | Y |
| EART1 | EARTHWORK (IN CUBIC YARDS) | 1000.000 | 25.00000 | 25000.00 | Y |
| RMVP1 | REMOVAL OF PAVEMENT (IN SQUARE YARDS) | 4450.000 | 15.00000 | 66750.00 | Y |
| UDEF1 | I-14 SOIL AGGREGATE (BORROW EXCAVATION) S.Y. | 4500.000 | 8.00000 | 36000.00 | Y |
| UDEF1 | SUBBASE, 10'' THK. (S.Y.) | 4450.000 | 15.00000 | 66750.00 | Y |
| UDEF1 | DENSE GRADED AGGREGATE, 12'' THK. (S.Y.) | 4450.000 | 10.00000 | 44500.00 | Y |
| MILL1 | MILLING (IN SQUARE YARDS) | 4450.000 | 5.00000 | 22250.00 | Y |
| UDEF1 | ASPHALT PAVEMENT, 12" THK. (S.Y.) | 5200.000 | 50.00000 | 260000.00 | Y |
| UDEF1 | TEMPORARY COFFERDAM (LUMP SUM) | 1.000 | 350000.00000 | 350000.00 | Y |
| DRAN1LF | DRAINAGE PIPES (IN LINEAR FEET) | 1800.000 | 140.00000 | 252000.00 | Y |
| DRAN1U | DRAINAGE, INLETS & MANHOLES (IN UNITS) | 30.000 | 3000.00000 | 90000.00 | Y |
| FENC1 | FENCES AND GATES (IN LINEAR FEET) | 700.000 | 40.00000 | 28000.00 | Y |
| UDEF1 | SIDEWALK & DRIVEWAY (S.Y.) | 700.000 | 55.00000 | 38500.00 | Y |
| CURB1 | CURBING (IN LINEAR FEET) | 1500.000 | 30.00000 | 45000.00 | Y |
| GDRL1 | GUARDRAIL/GUIDERAIL (IN LINEAR FEET) | 2700.000 | 30.00000 | 81000.00 | Y |
| TRFP1 | TRAFFIC CONTROL & SIGNS, PERMANENT (IN UNITS) | 1.000 | 20000.00000 | 20000.00 | Y |
| UDEF1 | UTILITY ITEMS (LUMP SUM) | 1.000 | 200000.00000 | 200000.00 | Y |
| LAND1U | LANDSCAPE ITEMS (LUMP SUM) | 1.000 | 30000.00000 | 30000.00 | Y |
| UDEF1 | CLEARING SITE-BRIDGE & SPILLWAY | 1.000 | 150000.00000 | 150000.00 | Y |
| UDEF1 | BRIDGE (LUMP SUM) | 1.000 | 2000000.00000 | 2000000.00 | Y |
| UDEF1 | RETAINING WALLS (LUMP SUM) | 1.000 | 300000.00000 | 300000.00 | Y |
| UDEF1 | SLUICE GATE (LUMP SUM) | 1.000 | 50000.00000 | 50000.00 | Y |
| UDEF1 | SPILLWAY PILES -FURNISHED & DRIVEN (LUMP SUM) | 1.000 | 450000.00000 | 450000.00 | Y |
| UDEF1 | OGEE WALL & SPILLWAY WALLS/SLAB & SLAB UNDER BRIDGE (LS) | 1.000 | 908100.00000 | 908100.00 | Y |
| UDEF1 | SPILLWAY WALL RAILING (LUMP SUM) | 1.000 | 50000.00000 | 50000.00 | Y |

New Jersey Department of Transportation
DATE : 12/15/2011

JOB ESTIMATE REPORT

| | | | | | |
|---|---|---|---|---|---|
| UDEF1 | SPILLWAY STEEL(CUT OFF) SHEET PILING LS | 1.000 | 180000.00000 | 180000.00 | Y |
| UDEF1 | WATER DIVERSION (LUMP SUM) | 1.000 | 150000.00000 | 150000.00 | Y |
| UDEF1 | WATER QUALITY TREATMENT - NORMAL CALCULATION RULE (IN UNITS) | 2.000 | 35000.00000 | 70000.00 | Y |
| ACTIVE COST GROUP TOTAL | | | | 8220284.09 | |
| INFLATED COST GROUP TOTAL | | | | 8220284.09 | |

TOTALS FOR JOB 023100PDS

| | |
|---|---|
| ESTIMATED COST: | 8220284.09 |
| CONTINGENCY PERCENT ( 0.0 ): | 0.00 |
| ESTIMATED TOTAL: | 8220284.09 |

# RECONSTRUCTION, WIDENING & DUALIZATION - English

| | | | |
|---|---|---|---|
| Route 48 | | Section/Contract # | TWO PENNY RUN BF |
| PM WILLIE COLQUITT, JR | | UPC No. | 23100 |

| | |
|---|---|
| **Project Total from Trns•port CES** | 8220284 |

**CONTINGENCIES & ESCALATION**

| Y = Number of Years until midpoint of construction duration plus number of years until construction start. If midpoint is less than 2 years from the date of this estimate, no escalation is required. Maximum value = 10% | Y |
|---|---|
| | 3.00 |

| Project Total | Contingencies (1+C) | 1 + [0.01 (Y+1) (Y-2)] | **Construction Estimate for PD** |
|---|---|---|---|
| 8220284 | 1.025 | 1.04 | 8762823 |

| Project Cost(Mil.) | Contingencies (C) Percent | Average Construction Duration in Years |
|---|---|---|
| 0-5 | 3% | 1 |
| 5-20 | 2.50% | 2 |
| Over 20 | 2% | 3 |

**CONSTRUCTION ENGINEERING (CE)**

| Project Cost (Mil.) | % of Construction Cost |
|---|---|
| Less than 1.0 | 31.10% |
| 1.0 to 5.0 | 20.30% |
| 5.0 to 10.0 | 16.20% |
| 10.0 & above | 12.20% |

CONSTRUCTION ENGINEERING AMOUNT $1,419,577.28

**CONSTRUCTION CHANGE ORDER CONTINGENCIES**

| Total Federal Participating Items in Millions of $ | Construction Change Order Contingency Amount |
|---|---|
| $0 to 0.1 | $6,000 |
| 0.1 to 0.5 | $25,000 |
| 0.5 to 5.0 | 25,000 + 4% of amount in excess of $500,000 |
| 5.0 to 10.0 | 205,000 + 3% of amount in excess of $5,000,000 |
| 10.0 to 15.0 | 355,000 + 2% of amount in excess of $10,000,000 |
| 15.0 and above | $500,000 |

For State Funded Projects, Contingencies for Change orders = 0

**CHANGE ORDER CONTINGENCY AMOUNT =** 317885

**UTILITIES RELOCATIONS BY COMPANIES/OWNERS**

| Construction Cost for Initial Estimate | Use % or utilities detailed estimate | | Utility Relocation Cost for Initial Estimate |
|---|---|---|---|
| 8762823 | 0.034 | for Urban use 0.12, Rural 0.055 or + Estimate | 300000 = |

If there are no utility relocations on the project indicate "No Utilities" in the box above.

**RIGHT OF WAY COST** "No ROW"

If there is no ROW cost on the project indicate "No ROW" the box

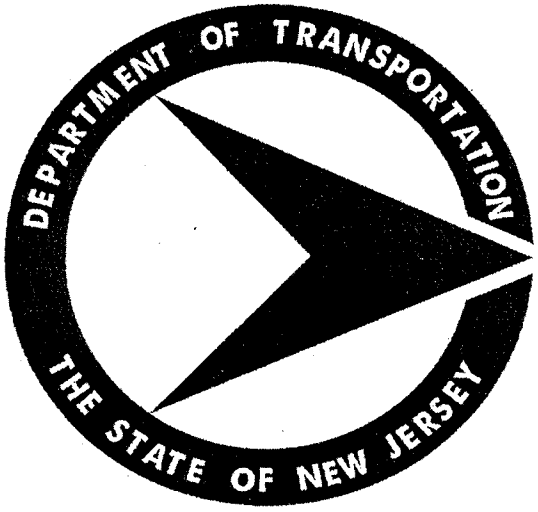
## SUMMARY

| | |
|---|---|
| Construction Estimate for Initial | $8,762,823 |
| Construction Engineering (CE) | $1,419,577 |
| Construction Change Order Contingencies | $317,885 |
| Utilities Relocations | $300,000 |
| Total Construction Cost | $10,800,285 |
| Right of Way Cost | "No ROW" |

# *Appendix K – Project Management Plan*

# State of New Jersey
# Department of Transportation

# Project Management Plan
# Route 48 Layton Lake Dam Drainage Improvements
# UPC # 023100




## Prepared by
## Division of Project Management
## January 2012

## Document Information and Revision History

| | |
|---|---|
| File Name | Project Management Plan Layton Lake Dam.doc |
| Original Author(s) | Willie Colquitt |
| Current Revision Author(s) | |

| Version | Date | Author(s) | Revision Notes |
|---|---|---|---|
| | | | |
| | | | |
| | | | |

## Approval of the Project Management Plan

| **Concept Development** | |
|---|---|
| Approved By: | |
| Title | Regional Manager, Division of Project Development |
| Signature | |
| Date of Approval | |
| | |
| **Preliminary Engineering** | |
| Approved By: | Thomas Saylor, P.E. |
| Title | Manager, Division of Project Management, Group (D) |
| Signature | |
| Date of Approval | |
| | |
| **Final Design** | |
| Approved By: | |
| Title | |
| Signature | |
| Date of Approval | |

# Table of Contents

1.0 Project Overview ..... 1
2.0 Project Management Processes and Approaches ..... 1
2.1 Integration Management ..... 1
2.2 Scope Management ..... 1
2.3 Schedule Management ..... 1
2.4 Cost Management ..... 1
2.5 Quality Management ..... 1
2.6 Human Resource Managment ..... 1
2.7 Communications Management ..... 1
2.8 Risk Management ..... 1
2.9 Procurement Management ..... 2

# 1.0 Project Overview

## Existing Condition:

Laytons Lake Dam is located at milepost 3.06 of NJ Route 48 in Carneys Point Township, Salem County, NJ. The dam embankment carries NJ Route 48 in a west to east direction over Game Creek. New Jersey Department of Transportation (NJDOT) owns NJ Route 48 and maintains the dam and spillway of Laytons Lake. The lake is used for recreational activities and adjacent landowners have operated the existing sluice gates.

Layton Lake Dam is classified as "Significant Hazard" and does not conform to current dam safety regulations. As a result, New Jersey Department of Environmental Protection – Bureau of Dam Safety and Flood Control (NJDEP-BDSFC) mandated that New Jersey Department of Transportation (NJDOT) perform a detailed study of the dam. A "Significant Hazard" dam is generally required to have a spillway with capacity to discharge flow during a 0.5 Probable Maximum Flood (PMF). However, there are some conditions that may support a decrease of the spillway design storm (SDS). Based on the analysis performed in 2009 NJDEP-BDSFC accepted the recommendation to decrease the SDS for Laytons Lake Dam to the 100 – year storm event. The existing facility, bridge and spillway do not have capacity to convey the SDS.

The dam is about 13 feet high and 500 feet in length. The spillway is a concrete ogee type in a semi-circular configuration with an effective length of about 90 feet. Two 48 inch diameter sluice gates are located near the eastern limit of the spillway. The gates are operated with hand cranks accessed from a catwalk pier. Laytons Lake Dam and bridge were determined to be affected by Alkali-Silica Reactivity (ASR). ASR is caused by a reaction between the alkaline cement pore solution in the concrete and reactive forms of silica in the aggregate. It can cause expansion and cracking of the concrete resulting in structural problems and possible failure. In addition, the existing bridge (30 ft span x 10 clearance) does not have capacity to handle the spillway design storm (SDS) which the 100- year storm.

There are three existing storm drain systems within the project limits. The existing systems will be replaced/plugged as part of the proposed road construction. The overall drainage area and discharges will not increase as part of the proposed improvements.

**Existing System 1** begins at a headwall west of Oak Lane and north of NJ Route 48 at about baseline station 32+00. The headwall intercepts flow from a storm drain system carrying stormwater south along the western side of Oak Lane. The headwall is connected to a 15" RCP that conveys flow to an inlet on the north side of NJ Route 48. It crosses beneath NJ Route 48 to an inlet and runs east along the southern side of the roadway to an inlet at about baseline station 33+90. The inlet intercepts a storm drain system from the northwestern side of Lakeside Lane and also from a 12" TCP that carries stormwater north from a lowpoint south of NJ Route 48. The storm drain system then continues along the southern side of NJ Route 48 to an inlet located at about baseline station 35+40 where it crosses to an inlet on the northern side of the roadway. From that inlet the system turns to the northeast and discharges to the western bank of Laytons Lake via an 18" RCP.

**Existing System 2** is located at about baseline station 38+25. It consists of 18" RCP that carries flow from an inlet on the south side of NJ Route 48 to an inlet on the north side of the roadway. The system turns in a northeast direction and discharges through the west bridge abutment on the northern side of NJ Route 48.

**Existing System 3** begins at an inlet located at about baseline station 45+00 on the northern side of NJ Route 48 and conveys stormwater to an inlet on the southern side of the roadway. It then continues in a westerly direction to an inlet, intercepting flow from the northern side of the roadway, east of Laytons Lake Drive, at about baseline station 42+00. The system continues along the south side of NJ Route 48

to an inlet located at about baseline station 41+00. The system crosses to an inlet on the northern side of NJ Route 48 at about baseline station 40+70, west of Laytons Lake Drive. A 12" RCP discharges stormwater from the east to the inlet. From that point the system continues along the northern side of NJ Route 48 to discharge through the east bridge abutment at about baseline station 39+00 via an 18" RCP.

## Proposed Improvements:

The proposed work includes raising the roadway profile by about one foot, a new bridge with a span of 40 feet by 10 feet clearance and a new ogee spillway in a semi-circular shape with an effective length of 90 feet. The proposed spillway will be constructed at the same length and at the same elevation as the existing spillway and the alignment of the roadway will not be changed. New Jersey Dam Safety Regulations require dams which impound water on a permanent basis include a means to allow reduction of the reservoir water surface elevation 5 feet in 10 days at a rate not to exceed one (1) foot per day. There may be exceptions that allow/require faster drawdown rates with agency approval. A low-level outlet is recommended for drawdown of Laytons Lake. A gate with a span of 3 feet and a rise of 5 feet is proposed through the ogee spillway. De-watering rates of the lake will vary depending on tailwater conditions and height of gate opening.

Although the proposed work includes reconstruction of a portion of roadway, there will be no net increase in impervious area. Existing pavement will be removed and replaced with new full depth pavement. The proposed storm drainage facilities will comply with NJDOT drainage requirements. Therefore, the proposed systems have capacity to convey stormwater runoff during a 25-year storm event and to control spread of stormwater during a 10-year storm event.

There are two main storm drainage systems proposed for the project. The proposed storm drainage facilities are described as follows:

**Proposed System 1** begins at the existing headwall west of Oak Lane described in **Existing System 1** and continues to the inlet located on the south side of NJ Route 48 approximately opposite of baseline station 32+00. The existing inlet will be replaced by a new inlet. From the new inlet a new 18" RCP will convey stormwater east along the south side of NJ Route 48 about 190 feet to a new inlet, replacing an existing inlet, at about baseline station 33+90. At this inlet an existing 12" RCP will be removed and replaced with 15" RCP that collects stormwater from low areas south of the roadway and connects to the roadway storm drainage system. From the new inlet about 150 feet of 18" RCP is proposed along the south side of NJ Route 48 to about baseline station 35+40 where the existing inlet will be replaced by a new inlet and the existing 18" RCP beneath the roadway will be plugged at both its south and north ends. The existing inlet located on the north side of NJ Route 48 will remain with its 18" RCP discharge to Layton Lake. The proposed storm drainage system along the south side of NJ Route 48 will continue through about 160 feet of new 24" RCP from about baseline station 35+40 to a new inlet at about baseline station 37+00 near the roadway lowpoint. From the lowpoint new 24" RCP will be constructed along the south side of NJ Route 48 to about baseline station 37+36 where a new inlet will be constructed. The inlet will be connected to new sections of storm drainage system that begin at a new inlet on the north side of NJ Route 48 at about baseline station 36+22. From that inlet 15" RCP will be constructed along the north side of the roadway to another new inlet at about baseline station 37+12. From the inlet a new section of 18" RCP will cross under NJ Route 48 to the new inlet previously noted at baseline station 37+36. The water quality storm flow exits this inlet through an 18" RCP to a water quality structure or Manufactured Treatment Device (MTD) located in the east bound shoulder at about baseline station 37+50. Bypass flow continues through a 24" RCP and combines with outflow from MTD at a manhole at about baseline station 37+55. The system continues along the south side of NJ Route 48 through a 24" RCP and discharges through the new bridge wing wall into Game Creek.

**Existing System 2** will be removed. **Proposed System 2** will replace **Existing System 3** except where noted, the existing pipes and inlets of system 3 will be removed or plugged. The proposed system will begin with replacing the existing inlets and cross pipe at about baseline station 45+00. Flow will be collected in a new inlet on the north side of NJ Route 48 and conveyed beneath the roadway to the second new inlet via new 18" RCP. From the new inlet flow is conveyed west via 18" RCP along the south side of NJ Route 48 to a new inlet at about baseline station 42+00.

A new storm drain system conveys flow from an inlet on the northwest side of Laytons Lake Drive crossing to an inlet on the southeast at about baseline station 11+45 of Laytons Lake Drive approximately offset north of NJ Route 48 baseline station 42+00. This new inlet is also connected to a new inlet on the north side of NJ Route 48 at about baseline station 42+22 via a 15" RCP. The proposed storm drain system crosses under NJ Route 48 via an 18" RCP connecting the proposed inlet north of baseline station 42+00 to the new inlet proposed on the south side of the roadway baseline station 42+00+/-.

The proposed 18" RCP continues west along the south side of NJ Route 48 from the inlet at baseline station 42+00+/- to another new inlet at about baseline station 40+93. The existing pipe under NJ Route 48 will be plugged and the proposed 18" RCP will continue along the south side of NJ Route 48 to a new inlet at about station 40+31. The proposed inlet at this location will be connected to new 18" RCP conveying stormwater from the north side of NJ Route 48. The proposed storm drainage facilities on the northern side of NJ Route 48 consist of 15" RCP connecting a proposed inlet at about baseline station 39+55 to the northern inlet proposed at baseline station 40+31. The proposed improvements also include new 15" RCP connecting inlets proposed at about baseline stations 41+10 and at 40+66 to the northern inlet at 40+31.

A 24" RCP is proposed along the south side of the roadway from the new inlet at about baseline station 40+31. It connects to an inlet proposed at about baseline station 39+65. The water quality storm flow exits this inlet through a 15" RCP to a water quality structure or Manufactured Treatment Device (MTD) located in the eastbound shoulder at about baseline station 39+60. Bypass flow continues through a 24" RCP and combines with outflow from MTD at a manhole at about baseline station 39+55. The system continues along the south side of NJ Route 48 through a 24" RCP and discharges through the new bridge wing wall into Game Creek.

## 2.0 Project Management Processes and Approaches

The project team will address the project management areas as described below.

### 2.1 Integration Management

At this time, no atypical efforts are required to maintain integration during project execution

### 2.2 Scope Management

At this time, no atypical requirements are needed to address the original problem.

### 2.3 Schedule Management

At this time, no atypical requirements are needed to establish and maintain the formal schedule.

### 2.4 Cost Management

At this time, no atypical cost requirements are needed to estimate, budget or control funding for the effort

### 2.5 Quality Management

At this time, no atypical requirements are needed to address the original problem. No additional quality requirements were identified.

### Additional Quality Requirements

N/A

## 2.6 Human Resource Management

At this time, no atypical human resources approaches are required.

## 2.7 Communications Management

The project is located within a residential community and there has been significant interest in the project by the surrounding property owners. There have been several issues or concerns raised by the residents. Many of these concerns were addressed during the Public Information Center held in December 2011. A primary concern for most residents was the previously proposed relocation of NJ Route 48 in the downstream direction. All were pleased to find that the relocation of Route 48 had been eliminated from the design and that NJ Route 48 would remain in its current location.

The most common secondary concern for most attendees was the maintenance of a natural and pleasing appearance of the lake and associated surroundings (for maintenance of aesthetics, property values, recreation, etc.). Residents requested aesthetic treatments be used during placement of concrete. It was suggested that decorative concrete formliners could be applied to the spillway walls and bridge parapets. Residents were informed that the lake may be lowered up to six inches during construction of the spillway for contractor safety. No objections were raised.

Clarification was given that new inlets will be constructed where Layton Lake Drive intersects NJ Route 48. It was explained that the profile of Layton Lake Drive will be raised to meet NJ Route 48 at the intersection and that new a drainage system was proposed for the areas downstream and west of the dam.

In response to a concern expressed regarding the potential for closure of Route 48 during construction, it was affirmed that two lanes would be maintained throughout construction with no proposed detours.

Attendees requested clarification regarding ownership of the dam and the associated liabilities, need for easements, etc. It was explained all of the proposed work would be confined to the NJDOT right-of-way except for the new spillway, and that a temporary construction easement will be required for construction of the spillway. While the spillway belongs to NJDOT, the property of the dam and the lake is privately owned by the Association. For this reason, and for proximity (residents are on location), the Association will remain responsible for operation of the new and improved sluice gate. It was suggested that this new spillway would provide for a safer dam, which would reduce the burden of liability for the Association.

The Association was asked if they would be open to issuing a Resolution of Support for the project in future stages of planning and the residents responded affirmatively.

## 2.8 Risk Management

At this time, no atypical risk management requirements are needed to ensure reasonable and appropriate risk management is followed.

### Additional Risk Requirements

N/A

## 2.9 Procurement Management

At this time, no atypical procurement management requirements are needed to obtain the necessary resources to complete the effort.

### Additional Procurement Requirements

N/A

# *Appendix L – NJDOT Scope Statement – Final Design*

NJDOT Scope Statement

# Final Design

## Laytons Lake Dam Reconstruction

**Purpose:** The Final Design (FD) Scope Statement lists the project's deliverables and the activities required to create those deliverables in the Final Design phase of the project delivery process. The scope statement also provides a common understanding of the project's scope to stakeholders, subject matter experts and the designer, and it lists the project's major objectives. It enables the Project Manager to perform Final Design and it helps guide the design team's work during execution, and provides the baseline for evaluating whether change requests or additional work are contained within or outside the project's boundaries.

**Notes:** The intent of the FD Scope Statement is to provide useful project information to designers who will be performing the FD work for this project. In addition, it will be used to solicit a man-hour estimate and cost proposal. The FD Scope Statement identifies the key elements of FD that are necessary to advance the proposed project to construction.

The FD Scope Statement is developed by the Division of Project Management (DPM) Project Manager and the Preliminary Engineering (PE) Designer near the conclusion of the PE phase, prior to requesting the services of a designer to perform FD. The Scope of Work section is approved by the appropriate Subject Matter Experts (SMEs).

Section 1 of the document focuses on Proposed Project Identification Information and FD and Construction data including the project's location and description. Section 2 of the document specifies the Scope of Work for FD.

# PROPOSED PROJECT IDENTIFICATION INFORMATION

### PROPOSED PROJECT SPECIFICS

| Proposed Project Name | Limits |
|---|---|
| Laytons Lake Dam Reconstruction | 2.9-3.2 |
| **NJDOT Project Manager** | **NJDOT Program Manager** |
| Willie Colquitt | Tom Saylor |
| **Counties** | **Municipalities** |
| Salem Not Selected Not Selected | Carneys Point Township ____ ____ |
| **UPC Number** | ____ |
| **DB Number** | ____ |
| **Legislative District(s)** | 3 ____ ____ |
| **Congressional District (s)** | 2 ____ ____ |
| **Route** | NJ Route 48 |
| **Start Milepost** | 2.9 |
| **End Milepost** | 3.2 |
| **Alternate Route** | ____ |
| **Alternate Start Milepost** | ____ |
| **Alternate End Milepost** | ____ |
| **STIP Information** | ____ |
| **Structure Numbers** | 1706152 |
| **Project Classification:** | 2 - Reconstruction |
| **MPO** | ____ |

## Project Estimate

List the Project Estimates for each category.

| Project Item: | FD Phase Estimated Amount |
|---|---|
| Design | $1,800,000 |
| ROW | $ 50,000 |
| Utility Relocation | $ 300,000 |
| Construction | $8,763,000 |
| Construction Engineering | $1,420,000 |
| Contingencies | $ 318,000 |
| | |
| Total | $12,651,000 |

## Concept Development and Preliminary Engineering Information

| | | | |
|---|---|---|---|
| **Date of Concept Development Report:** | _____ | **Date of Federal Approval of CD Report:** | _____ |
| **Date of Preliminary Engineering Report:** | January 2012 | **Date of Design Exception Report:** | _____ |
| **Date of Federal Approval of Environmental Classification: NEPA** | _____ | **Date of Project Plan:** | _____ |
| **Date of CPC decision to advance project to PE:** | _____ | | |
| **PE Designer:** | _____ | | |
| **FD to be Completed by (check one):** | ☐ In-House<br>☐ Consultant | | |

**Purpose and Need**: Layton Lake Dam is classified as "Significant Hazard" and does not conform to current dam safety regulations. As a result, New Jersey Department of Environmental Protection – Bureau of Dam Safety and Flood Control (NJDEP-BDSFC) mandated that New Jersey Department of Transportation (NJDOT) perform a detailed study of the dam. McCormick Taylor, Inc. (MT) was authorized to perform an analysis of the dam. MT submitted a Spillway Design Report to NJDEP-BDSFC in 2009. A "Significant Hazard" dam is generally required to have a spillway with capacity to discharge flow during a 0.5 Probable Maximum Flood (PMF). However, there are some conditions that may support a decrease of the spillway design storm (SDS). Based on the analysis performed NJDEP-BDSFC accepted the recommendation of MT to decrease the SDS for Laytons Lake Dam to the 100 – year storm event. The existing facility does not have capacity to convey the SDS with the required one foot of freeboard. Laytons Lake Dam was also determined to be affected by Alkali-Silica Reactivity (ASR). ASR is caused by a reaction between the alkaline cement pore solution in the concrete and reactive forms of silica in the aggregate. It can cause expansion and cracking of the concrete resulting in structural problems and possible failure.

**Description of Preliminary Preferred Alternative**: The NJDOT is proposing improvements to the dam structure which consist of construction of a new bridge with a span of 40 feet, a new 90-foot long ogee spillway (same size as existing, an anticipated preference of adjacent landowners), and elevation of the roadway profile by 1.1 feet. The improvements will convey the Spillway Design Storm with the required one-foot of freeboard. The 100-year water surface elevations under both the existing and proposed conditions for the downstream area remain the same. Two water quality structures are proposed downstream at existing outfalls.

**Project Goals and Objectives**: Bring the dam and spillway into compliance with applicable Dam Safety Regulations.

NJDOT Scope Statement

# Final Design

## Final Design Information (to be filled in upon selection of a designer)

| | | | |
|---|---|---|---|
| **FD Designer:** | _____ | | |
| **FMIS Contract ID Number (e.g., 89 00766):** | _____ | **Funding Source:** _____ | |
| **Agreement Number (e.g., 2001PM03):** | _____ | | |
| **Type of Specifications:** | _____ | | |

## Construction Information

| | | | |
|---|---|---|---|
| **CM Job Number:** | _____ | **Duration of Construction:** | _____ |
| **Award Date (actual/anticipated):** | _____ | **Estimated Construction Year:** | 2014 |

## Final Design Deliverables

| | | |
|---|---|---|
| **4.1 Final Design Initiation** | ☒ Seismic Retrofit Analysis | ☒ Alternatives of Accommodation plan |
| ☒ Financial Plan (for Major Projects) | ☐ Noise Barrier Detail Plans | **4.6 Quality Management-Certifications** |
| **4.2 Roadway Engineering** | ☒ Geotechnical Roadway and Rock Engineering Report | ☒ FD Quality Management Certification |
| ☒ Pavement Life Cycle Cost Analysis | ☒ Boring and In-situ Testing Layout Plan | ☒ Department Certification |
| ☒ Final Horizontal/Vertical Geometry | ☒ Boring Contract Specifications | **4.7 Communications** |
| ☒ Final Design Supplemental Survey | ☒ Boring Data Submission | ☒ Design Communications Report |
| ☒ Traffic Lighting Design Report | **4.4 Right of Way and Access** | ☒ Community Relations |
| ☒ Traffic Control and Staging Plans | ☒ Final Right of Way Cost Estimate | ☒ Resolution of Support |
| ☒ Soil Erosion and Sediment Control Report | ☒ Pre-Final Right of Way Submission | **4.8 Environmental Documents** |
| ☒ Soil Erosion and Sediment Control Plans | ☒ Final Right of Way Submission | ☒ Environmental Reevaluations |
| ☒ Jurisdictional Limit Maps and Agreement | ☒ Right of Way Authorization | ☒ Environmental Permits and Licenses |
| ☒ Final Drainage Plans | ☒ Acquired Right of Way | ☒ Final Environmental Plans |
| ☐ Final Drainage Design Report | ☒ Riparian License Application | ☐ State House Commission Approval for Green Acres Parcels |
| ☐ Final Lighting Plans | ☒ Access Cut-Outs | ☐ Conceptual Wetlands Mitigation Plans |
| ☒ Final Roadway Plans | ☐ Access Impact Assistance Report | ☐ Final Noise Study |
| ☒ Final Traffic Signing, Striping and Signal Plans | ☐ Lot Owner Lease Agreement | ☐ Reforestation Application |
| ☒ Final Landscape Plans | ☐ Lot Owner Access Concurrence | ☐ Final Wetlands Mitigation Plans |
| ☐ Final ITS Facilities Plans | ☐ Green Acres Compensation Appraisal | ☐ Asbestos Survey |
| ☒ Hydrologic and Hydraulic Stream Analysis | ☐ Title Summary Document | ☐ Remedial Action Workplan |
| ☒ Flood Hazard Area Permit Application | ☒ Entire Tract Map | ☐ PAECE Report |
| ☐ Railroad 60% Submission | ☒ General Property Parcel Maps | ☐ Noise Mitigation Questionnaire |
| ☐ Diagnostic Team Meeting (DTM) Memo of Record or Order | ☒ Individual Parcel Maps | ☐ Wetlands Monitoring Plan |
| ☐ Railroad 100% Submission | ☒ Parcel Descriptions | ☒ Wetlands Delineation Report |
| ☐ Final Design Systems Engineering Review Form (SERF) | **4.5 Utility Engineering** | ☐ Cultural Resources Mitigation Report |
| **4.3 Structural Engineering** | ☒ Utility Owner Design Authorization Checklist | ☒ Environmental Summary Memorandum |
| ☒ Final Structure Appraisal and Design Report | ☒ Utility Agreement Plans, Specs., & Estimates | ☐ Site Investigation Report |
| ☒ Geotechnical Foundation gineering Report | ☒ Utility Agreement Modifications | ☐ Remedial Investigation Report |
| ☒ Final Structures Documents | ☒ Utility Master Agreement Change Order | |
| ☒ Scour Analysis | ☒ Utility Authorization | |

NJDOT Scope Statement

# Final Design

| 4.9 Final Design Submission | 4.10 Certified Plans, Specifications, and Estimate | 4.11 Contracts |
|---|---|---|
| ☒ Interim Design Submission (Optional) | ☒ Pre-PS&E Package (Full Oversight Only) | ☒ Consultant Agreement Addendums |
| ☒ Project Plans | ☒ Final Project Plans | ☒ Municipal Police Agreements |
| ☒ Project Specifications | ☒ Final Project Specifications | ☒ Final Invoice |
| ☒ Construction Cost Estimate | ☒ Final Construction Cost Estimate | **4.12 Final Design Approvals** |
| ☒ Construction Schedule | ☒ Final Construction Schedule | ☒ Advertising Authorization Package |
| | ☒ Certifications and Clearances | ☒ Authorization to Advertise |
| | | ☒ Updated PM Plans (Major Projects) |

## Summary of Commitments

List any commitments made to the public, local officials or other government agencies:

| Project Commitment | Unit Requesting the Commitment | Unit Fulfilling Commitment | Special Needs |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

List any anticipated commitments that may be made:

| | | | |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |

NJDOT Scope Statement

# Final Design

## APPROVAL

| Name | Title | Date Approved |
|---|---|---|
| | Project Manager<br>Division of Project Management | |
| | Program Manager<br>Division of Project Management | |
| | Director<br>Division of Project Management | |
| | Manager<br>Bureau of Landscape Architecture and Environmental Solutions | |
| | Director<br>Division of Construction Services and Materials | |

# FINAL DESIGN SCOPE STATEMENT

Table of Contents

Page

## Table of Contents

Right of Way ..... 9
Access ..... 15
Drainage ..... 17
Landscape ..... 21
Environmental ..... 24
Quality Management Services ..... 30
Utilities ..... 31
Jurisdiction ..... 35
Geometrics & Roadway ..... 36
Pavement ..... 41
Structures ..... 42
Geotechnical ..... 46
Survey ..... 49
Railroads ..... 51
Construction ..... 53
Traffic Signal and Safety Engineering ..... 57
Electrical ..... 59
Maintenance and Operations ..... 60
Traffic Operations and Intelligent Transportation System (ITS) Engineering ..... 64
Commuter Mobility ..... 66
Technical and Administrative Activities ..... 67
Summary of Approvals ..... 72

**NOTE**: The FD Designer will perform the tasks associated with FD as marked, in preparation for construction. The Project Manager will review and negotiate the proposal, execute the Agreement and instruct the designer to begin work. The Project Manager will direct the project through FD.

## Right of Way

| Activity No. | Activity Name | Execute | Responsible Unit | Comments |
|---|---|---|---|---|
| 4600 | Conduct Title Search | ☒ Yes ☐ No | ☒ Designer<br>☐ ROW | |
| 4605 | Prepare ROW Plans and Documents | ☒ Yes ☐ No | ☒ Designer | |
| 4610 | Review ROW Plans and Documents | ☒ Yes ☐ No | ☒ DPM | |
| 4615 | Prepare Pre-Final ROW Submission | ☒ Yes ☐ No | ☒ Designer | |
| 4620 | Review Pre-Final ROW Submission | ☒ Yes ☐ No | ☒ ROW ☒ DPM<br>☒ Designer | |
| 4625 | Prepare Final ROW Submission | ☒ Yes ☐ No | ☒ Designer | |

| | | | | |
|---|---|---|---|---|
| 4630 | Process Final ROW Submission | ☒ Yes ☐ No | ☒ ROW | |
| 4635 | Hold ROW Acquisition Kickoff Meeting | ☒ Yes ☐ No | ☒ ROW ☒ DPM<br>☐ Designer | |
| 4650 | Authorize Right of Way | ☒ Yes ☐ No | ☒ DPM ☒ ROW<br>☒ FHWA | |
| 4655 | Prepare Riparian License Application | ☐ Yes ☒ No | ☐ ROW<br>☐ Designer | |
| 4660 | Secure Riparian License | ☐ Yes ☒ No | ☐ ROW | |
| 4665 | Perform Asbestos Survey | ☐ Yes ☒ No | ☐ ROW ☐ DPM<br>☐ Designer ☐ CM<br>☐ Consultant | |
| 4670 | Acquire ROW | ☒ Yes ☐ No | ☒ ROW ☒ DAG<br>☐ Consultant ☒ DPM<br>☐ Designer ☒ CM | |

Total Number of Parcels: 3

## 1. Fee Parcel /Easements

| | | | | | |
|---|---|---|---|---|---|
| **Number of fee parcels (partial):** | 1 | **Number of fee parcels (entire):** | 0 | **Number of residential relocations:** | 0 |
| **Number of permanent easements (E parcels):** | 0 | **Number of temporary easements:** | 2 | **Number of commercial relocations:** | 0 |

**2. List any known or potential environmental problems or issues that may impact Right of Way processes or decisions (cross reference with the Environmental section of the Scope Statement document:** Implementation of the project is not anticipated to have an adverse effect on freshwater wetlands, endangered species and/or their habitat, or cultural resources within the project limits. Based on the scope of work for the project, no involvemnt with hazardous waste is anticipated.

**3. List any environmentally sensitive parcels (ESPs), underground storage tanks, freshwater wetlands:** Block 249, Lots 9 & 10 were identified as agricultural use properties with the potential for envolvement with hazardous waste. Freshwater wetlands were identified on Block 249, Lot 9.01.

Based on the scope of work for the project, involvement with these properties is not anticipated.

**4. Identify Riparian Parcels (currently flowed), Easements and/or Green Acres Diversions by contacting NJDEP for any Right of Way to be acquired:**

Not applicable

**5. Identify parcels that can be eliminated by design change modifications and attempts to mitigate damages suffered by the remaining properties.** Not applicable

**6. Decision to expand parcel for further use or contingency.** _____

**7. List the number of Non Real Estate Engineering (NRE) parcels.** _____

**8. List any commitments and conditions made to the public or to private property owners that may impact Right of Way processes or decisions:** Not

Applicable

**(Also list commitments in the Summary of Commitments page in Section 1 above.)**

**9. Green Acres mitigation method:** ☐ **Dollar Reimbursement** ☐ **Property Replacement**

**10. List any full parcel takings:** NA **How much lead time is needed to meet the schedule?** _____

**11. List any parcels containing structures that need maintenance, or other parcels that may need maintenance, and the type of maintenance:**
**(e.g., boarding up windows, mowing, shoveling snow off sidewalks, etc.)** NJDOT will maintain the dam spillway located within Block 233, Lot 14 and two stormwater treatment devices proposed within the NJDOT right-of-way.

**12. List any parcels that will need asbestos testing or asbestos removal:** Not Applicable

**List any parcels that have structures that will have a demo contract:** Not Applicable

**How much lead time is needed to meet the schedule?** _____

**ADDITIONAL INPUT**

*This section has been provided for the PE designer and the functional units to state any assumptions, to clarify and customize standard activities, and to add important information. Please be clear and concise. Provide your unit's contact person and number.*

*Examples of information for this section include number and type of parcels, known environmental problems, riparian parcels, public commitments, etc.*

Two temporary construction easements are necessary for construction of the proposed spillway and bridge abutments - located in the lake Block 233

Lot 14 and Block 236 Lot 2, and 1 partial take located on Block 235, Lot 12.

## Access

| Activity No. | Activity Name | Execute | Responsible Unit | Comments |
|---|---|---|---|---|
| 4705 | Prepare Access Cut-Outs | ☒ Yes ☐ No | ☒ Designer | |
| 4710 | Review Access Cut-Outs | ☒ Yes ☐ No | ☒ OAD<br>☐ Designer | |
| 4715 | Administer Access Alterations | ☐ Yes ☒ No | ☐ OAD<br>☐ Designer | |

| Number of Adjustments: | | Number of Modifications: | | Number of Revocations: | |
|---|---|---|---|---|---|

**Note any pending agreements or access applications within the project limits:** _____

1. **Are left turn lanes in compliance with the Access Level?** ☐ **Yes** ☐ **No**
2. **Is the Typical Section of the roadway in compliance with the Highway Access Code?** ☐ **Yes** ☐ **No**
3. **Total Number of Driveways impacted:** 4
4. **Are there any commercial properties with access modifications and/or Revocations that have potential impacts to site parking slots, circulations and operation of business?** ☒ **Yes** ☐ **No**
   **If yes, provide details of impact with Block and Lot Nos.** Block 249 Lot 10 (Suzie Belle Farm & J Boys Inc.)
5. **Are there any commercial properties that will require necessary assistance in the establishment of the alternative access (as per NJAC 16:47-4.33)?**

☐ Yes ☐ No

**If yes, provide details of assistance with Block and Lot Nos. _____**

6. **Are there any commercial properties that will require the preparation of an Access Impact Assistance (AIA) report.** ☐ **Yes** ☐ **No**

**If yes, provide Block and Lot Nos. _____**

**ADDITIONAL INPUT**

*This section has been provided for the PE designer and the functional units to state any assumptions, to clarify and customize standard activities, and to add important information. Please be clear and concise. Provide your unit's contact person and number.*

*List any commitments in the Summary of Commitments in Section 1 above.*

*Examples of information for this section include number of driveways impacted, pending agreements or major access permit applications, driveway modifications causing circulation issues, alternative access issues, Access Impact Assistance issues, etc.*

## Drainage

| Activity No. | Activity Name | Execute | Responsible Unit | Comments |
|---|---|---|---|---|
| 4270 | Complete Drainage Design | ☒ Yes ☐ No | ☐ H & H<br>☒ Designer | |
| 4310 | Complete Hydrologic & Hydraulic Analysis | ☒ Yes ☐ No | ☐ H & H<br>☒ Designer | |
| 4315 | Complete Final Bridge Analysis | ☒ Yes ☐ No | ☐ H & H<br>☒ Designer | |

1. **Identify all existing drainage deficiencies (undersized system, excessive spread into travel lanes, insufficient inlets, flooding at low points, etc.):**
The existing outfalls of the existing drainage systems drain into the lake. Back water from the lake creates problems during large storm events making the drainge system deficient. Additionally there is an insufficient number of inlets on both sides of the roadway to control spread of runoff. The existing spillway and dam control the design of this project.

2. **List proposed improvements including outfalls (especially tidal):** In addition to the reconstruction of the spillway and bridge, proposed improvements would also include new/upgraded storm drainage facilities. Two storm drainage systems are proposed in this alternative. The first or western most system begins near the intersection of Oak Lane with NJ Route 48 and runs east along NJ Route 48 to Game Creek. The second proposed drainage system is located east of the existing bridge and spillway. The system runs along NJ Route 48 to Game Creek. Field investigations were made within the project area

to determine if construction of an infiltration basin was viable to provide improvement to the quality of water discharged to Game Creek. It was determined that the depth to the water table would prohibit infiltration as an option for water quality improvement.

3. **Is compliance with Stormwater Management rules triggered (> 1/4 acre new impervious surface, or 1 acre disturbance)?** ☒ **Yes** ☐ **No**

4. **Identify all NJDEP permits required:** NJDEP Dam Safety, NJDEP Freshwater Wetlands General Permit #18-Dam Repair, NJDEP NJPDES General Permit for Stormwater Dischage Associated with a Construction Activity

5. **List proposed structural Best Management Practices (BMP) (Bioretention System, Constructed Wetlands, extended detention basins, infiltration system, wet ponds, porous pavement and etc.):** Two manufactured treatment devices (MTDs) will be installed inline with the outfalls located downstream of the spillway.

6. **List proposed nonstructural BMP (such as Vegetation and Landscaping, Minimized Site Disturbance, Impervious Area Management, and Time of Concentration Modifications):** N/A

7. **Identify drainage outflow owner:** NJDOT **Will property rights need to be acquired?** No

**ADDITIONAL INPUT**

*This section has been provided for the PE designer and the functional units to state any assumptions, to clarify and customize standard activities, and to add important information. Please be clear and concise. Provide your unit's contact person and number.*

*Examples of information for this section include drainage deficiencies, new/improved outfalls, storm water management rules, permits, Best Management Practices (structural and non-structural), easements/right of way, etc. List any commitments in the Summary of Commitments in Section 1 above.*

## Landscape

| Activity No. | Activity Name | Execute | Responsible Unit | Comments |
|---|---|---|---|---|
| 4175 | Prepare Noise Barrier Details | ☐ Yes ☒ No | ☐ Designer<br>☐ Landscape | |
| 4260 | Develop Landscape Architectural Design | ☒ Yes ☐ No | ☒ Designer<br>☒ Landscape | |
| 4265 | Complete Landscape Architectural Design | ☒ Yes ☐ No | ☒ Landscape<br>☒ Designer | |
| 4375 | Prepare Final Wetlands Mitigation Plans | ☐ Yes ☒ No | ☐ Environmental<br>☐ Designer<br>☐ Landscape | |
| 4440 | Submit Reforestation Applicaton | ☐ Yes ☒ No | ☐ Landscape | |
| 4450 | NJDEP Reviews Reforestation Application | ☐ Yes ☒ No | ☐ Comm. Forest Council ☐ DEP | |

**1. List any landscape architecture related commitments such as:**

| | |
|---|---|
| a. Wetland or Riparian Mitigation Planting: | |
| b. Historic Site commitments | |
| c. Vegetative Screens or Buffers | |
| d. Noise Barrier Aesthetics: | |
| e. Architectural Treatments on Structures (e.g., Bridges, Retaining Walls, Parapets, Noise Barriers, Visible drainage culverts/structures, etc.) | |
| f. Tree Removal Mitigation: | |
| g. Urban Design Work (paving, streetscapes): | |
| h. Aesthetic plantings: | |
| i. Existing tree preservation and protection: | |
| j. Reforestation Application: | |
| k. Pocket Parks | |
| l. Green Acres Mitigation | |
| m. Acid Soils | Implement standard measures for addressing potential acid soil involvements during construction activities. |
| n. Storm Water Management facilities | The areas temporarily disturbed during the installation of the two manufactured treatment devices (MTDs) and drainage systems will be replanted with native, non-invasive vegetation. |

**2. Anticipated visualization work for in-house and public information meetings:**

| | |
|---|---|
| a. Rendered Plans: | |
| b. 2D computer generated before & after photographs: | |
| c. 3D computer generated mode: | |

**ADDITIONAL INPUT**

*This section has been provided for the PE designer and the functional units to state any assumptions, to clarify and customize standard activities, and to add important information. Please be clear and concise. Provide your unit's contact person and number.*

*List any commitments in the Summary of Commitments in Section 1 above.*

*Examples of information for this section include screens or buffers, aesthetic plantings, mitigation plantings, reforestation, etc.*

## Environmental

| Activity No. | Activity Name | Execute | Responsible Unit | Comments |
|---|---|---|---|---|
| 4075 | Obtain Utility Environmental Reevaluation | ☒ Yes ☐ No | ☒ Environmental | |
| 4140 | Submit Draft Final Noise Study | ☐ Yes ☒ No | ☐ Environmental<br>☐ Designer | |
| 4145 | Obtain Noise Mitigation Community Support | ☐ Yes ☒ No | ☐ Environmental<br>☐ CCR<br>☐ Designer | |
| 4150 | Submit Final Noise Study | ☐ Yes ☒ No | ☐ Environmental<br>☐ Designer | |
| 4360 | Delineate Wetlands | ☒ Yes ☐ No | ☐ Environmental<br>☐ Designer | |
| 4350 | Prepare Conceptual Wetlands Mitigation Plans | ☐ Yes ☒ No | ☐ Environmental<br>☐ Designer | |
| 4355 | Prepare Wetlands Monitoring Plan | ☐ Yes ☒ No | ☐ Environmental | |
| 4375 | Prepare Final Wetlands Mitigation Plans | ☐ Yes ☒ No | ☐ Environmental<br>☐ Designer<br>☐ Landscape | |
| 4380 | NJDEP Approves Wetland Mitigation Plans | ☐ Yes ☒ No | ☐ Environmental<br>☐ DEP | |
| 4385 | Prepare Permit Application | ☒ Yes ☐ No | ☒ Environmental<br>☒ Designer | |
| 4390 | Review and Submit Permit Application | ☒ Yes ☐ No | ☒ Environmental<br>☒ Designer ☒ H&H | |
| 4395 | Secure Permits | ☒ Yes ☐ No | ☒ Environmental<br>☒ Designer ☒ H&H<br>☒ Permit. Agencies | |

| | | | | |
|---|---|---|---|---|
| 4410 | Prepare Soil Erosion and Sediment Control Report and Plans | ☒ Yes ☐ No | ☒ Designer | |
| 4430 | Review Soil Erosion and Sediment Control Report | ☒ Yes ☐ No | ☒ Environmental<br>☒ Landscape | |
| 4520 | Conduct Contamination Site Investigation (Intial Sampling) | ☐ Yes ☒ No | ☐ Environmental<br>☐ Designer | |
| 4540 | Conduct Remedial Investigation (Delineation Sampling) | ☐ Yes ☒ No | ☐ Environmental<br>☐ Designer | |
| 4550 | Develop Cultural Resources Mitigation Measures | ☐ Yes ☒ No | ☐ Environmental<br>☐ Landscape<br>☐ Designer ☐ DPM | |
| 4570 | Prepare Remedial Action Workplan | ☐ Yes ☒ No | ☐ Environmental<br>☐ Designer | |
| 4580 | NJDEP Reviews Remedial Action Workplan | ☐ Yes ☒ No | ☐ DEP | |
| 4585 | Complete Environmental Plans | ☒ Yes ☐ No | ☐ Environmental<br>☒ Designer | |
| 4590 | Prepare PAECE Report | ☐ Yes ☒ No | ☐ Environmental<br>☐ Designer | |
| 4645 | Obtain ROW Environmental Reevaluation | ☒ Yes ☐ No | ☐ Environmental | |
| 4720 | Prepare Green Acres Pre-Application | ☐ Yes ☒ No | ☐ Environmental | |
| 4725 | Owner Submits Green Acres Pre-Application | ☐ Yes ☒ No | ☐ Owner<br>☐ Environmental | |
| 4730 | Obtain Resolution of Support for Green Acres Pre-Application | ☐ Yes ☒ No | ☐ Owner<br>☐ Environmental | |
| 4735 | NJDEP Reviews Green Acres Pre-Application | ☐ Yes ☒ No | ☐ DEP (Green Acres) | |
| 4740 | Prepare Green Acres Final Application | ☐ Yes ☒ No | ☐ Environmental | |

| | | | | |
|---|---|---|---|---|
| 4745 | Owner Submits Green Acres Final Application | ☐ Yes ☒ No | ☐ Owner<br>☐ Environmental | |
| 4750 | Hold Green Acres Public Hearing | ☐ Yes ☒ No | ☐ Environmental<br>☐ DPM ☐ Owner<br>☐ Comm. Relations | |
| 4755 | Obtain Resolution of Support for Green Acres Final Application | ☐ Yes ☒ No | ☐ Owner<br>☐ Environmental | |
| 4760 | Submit Green Acres Final Application Supplemental Information | ☐ Yes ☒ No | ☐ Owner<br>☐ Environmental | |
| 4765 | NJDEP Reviews Green Acres Final Application | ☐ Yes ☒ No | ☐ DEP (Green Acres) | |
| 4770 | Obtain State House Commission Approval | ☐ Yes ☒ No | ☐ DEP (Green Acres)<br>☐ State House Comm | |
| 4775 | Acquire Green Acres Parcels | ☐ Yes ☒ No | ☐ ROW ☐ DAG<br>☐ DPM | |
| 4780 | Obtain Green Acres Compensation Appraisal | ☐ Yes ☒ No | ☐ Environmental<br>☐ DAG ☐ ROW<br>☐ DPM | |
| 4850 | Certify Soil Erosion and Sediment Control | ☒ Yes ☐ No | ☒ Environmental | |

| | | | | |
|---|---|---|---|---|
| 4860 | Obtain Construction Environmental Reevaluation | ☒ Yes ☐ No | ☒ Environmental | |

☒ CE ☐ EA ☐ EIS ☐ EO 215

Environmental Document: Approval Date: _____

Total Number of Permits: 2

1. List any environmental impacts and/or issues: Based on the current design and right-of-way plans, it appears that the proposed project will result in the disturbance (both permanent and temporary) of less than one-half acre of freshwater wetlands, transition areas, and State/Federal open waters (inclusive).

2. List any environmental commitments (made in approved environmental documents, through Memoranda of Agreement with environmental agencies, other commitments made to the public, local officials or other government agencies) such as 4f, Section 106 (historic architecture, archaeology), air, noise, hazardous waste and ecology: none List commitments that other units must fulfill in the Summary of Commitments table in Section 1 above.

3. Check the environmental clearances or permits required on the project:

**Federal**

- ☐ U.S. Coast Guard (Bridge)
- ☐ USACOE Section 404 (Individual/Nationwide) discharge of fill
- ☐ USACOE Section 10 (Navigable Waters)
- ☐ USACOE Section 9 (Dam or Dike)
- ☐ National (or State) Wild & Scenic Rivers
- ☐ USDOA Forms AS-1006
- ☐ Section 7 Endangered Species Consultation
- ☐ NMFS Essential Fish Habitat Study

**State**

- ☐ CAFRA
- ☐ NJDEP Water Lowering
- ☐ NJDEP Riparian
- ☐ Hazardous Waste Site Investigation (SI/RI)
- ☐ HazWaste Remedial Action Work plan
- ☐ NJDEP Sanitary Facilities
- ☐ NJDEP Tidal Wetlands
- ☐ NJDEP Waterfront Development
- ☒ NJDEP Freshwater Wetlands
- ☒ NJDEP NJPDES Stormwater Construction GP (RFA)
- ☐ NJDEP Pollutant Discharge
- ☒ NJDEP Flood Hazard Area
- ☒ NJDEP Water Quality Certificate

**Other**

- ☐ Delaware River Basin Commission
- ☐ Delaware & Raritan Canal Commission
- ☐ Hackensack Meadowlands Commission
- ☐ Pinelands Commission
- ☐ Highlands Commission
- ☐ State Agriculture Development Commission

**ADDITIONAL INPUT**

*This section has been provided for the PE designer and the functional units to state any assumptions, to clarify and customize standard activities, and to add important information. Please be clear and concise. Provide your unit's contact person and number.*

*List any commitments that other units must fulfill in the Summary of Commitments in Section 1 above.*

*Examples of information for this section include any additional information related to permits anticipated, anticipated environmental impacts and environmental commitments made in any of the previous phases, etc.*

## Quality Management Services

| Activity No. | Activity Name | Execute | Responsible Unit | Comments |
|---|---|---|---|---|
| 4810 | Review Final Design Submission | ☒ Yes ☐ No | ☒ QMS<br>☐ Procurement ☒ CM<br>☐ Civil Rights ☒ DPM<br>☐ Designer ☒ SMEs | |

Quality Management Services Reviewed: ☒ Yes ☐ No
Value Analysis to be Performed: ☐ Yes (if total cost of project >$20 million) ☒ No
Combined Estimated Cost of Construction, ROW and Utilities: ☐ <$3 million ☐ $3-5 million ☒ $5-$15 million ☐ >$15 million
Lane Occupancy Charges and Road User Costs to be completed: ☒ Yes ☐ No

**ADDITIONAL INPUT**

*This section has been provided for the PE designer and the functional units to state any assumptions, to clarify and customize standard activities, and to add important information. Please be clear and concise. Provide your unit's contact person and number.*

*List any commitments in the Summary of Commitments in Section 1 above.*

*Examples of information for this section include QMS review, lane occupancy charges/road user cost information, etc.*

## Utilities

| Activity No. | Activity Name | Execute | Responsible Unit | Comments |
|---|---|---|---|---|
| 4035 | Determine Utility Master Agreement Applicability | ☒ Yes ☐ No | ☐ DPM ☒ Designer<br>☐ Utilities<br>☒ Utility Companies | |
| 4040 | Prepare Utility Master Agreement Change Order | ☒ Yes ☐ No | ☒ DPM<br>☒ Utilities | |
| 4045 | Execute Utility Master Agreement Change Order | ☒ Yes ☐ No | ☒ DPM<br>☒ Utilities | |
| 4050 | Develop Alternatives of Accommodation | ☒ Yes ☐ No | ☐ DPM ☒ Designer<br>☒ Utility Companies | |
| 4055 | Prepare Utility Owner Design Authorization Checklist | ☒ Yes ☐ No | ☒ Utility Companies<br>☒ DPM ☒ Designer | |
| 4060 | Prepare Utility Agreement Plans, Specifications and Estimates | ☒ Yes ☐ No | ☒ Designer<br>☒ Utility Companies | |

| | | | | |
|---|---|---|---|---|
| 4065 | Approve Utility Agreement Plans, Specifications and Estimates | ☒ Yes ☐ No | ☒ DPM<br>☒ Designer | |
| 4070 | Prepare Utility Agreement Modifications | ☒ Yes ☐ No | ☒ DPM ☒ Designer | |
| 4080 | Authorize Utility Work | ☒ Yes ☐ No | ☒ DPM ☒ Designer<br>☒ Program Coord. | |
| 4090 | Incorporate Utility Design in Contract Documents | ☒ Yes ☐ No | ☒ Designer | |

Total Number of Utility Companies: _____

| Utility Type | Utility Company | Size (Units of Measure) | Location (aerial/underground) |
|---|---|---|---|
| Gas | PSE&G | Pipe | No gas main between Golfwood Ave. and NJ Turnpike on Rt. 48. |
| Electric | Atlantic City Electric Company | Volts | Utility Poles/Aerial |
| Cable | Comcast Cable Communications Mgmt | Pairs/ Strands | Aerial |
| Telephone | Verizon - New Jersey Inc. | Pairs/ Strands | |
| Water | New Jersey American Water Company | 12" H.D.P.E. Pipe | Underground |
| Sewer | Carneys Point Township Sewer Authority | 6" Force Main Pipe | Underground |
| Fiber-Optic (non-Department) | | | |
| NJDOT ITS Utilities | | | |
| Other: | | | |
| Other: | | | |
| Other: | | | |

1. **Identify if the Utility Discovery and Verification requires subsurface utility exploration:** Yes

2. **Is a SUE (Subsurface Utility Exploration) Consultant required?** ☒ **Yes** ☐ **No**

3. **Identify Potential Conflicts:** 10 conflicts

4. **Identify Temporary Relocations that are needed during construction:** Utility poles

5. **Number of poles?** 2

6. **Number of guy wires on existing poles?** none

7. **Are there cell towers or substations?** NO

8. **Can utility relocations be avoided or performed in advance of the project?** yes

9. **Can utility design/construction be performed by designer/contractor?** yes

10. **Can ROW needed for utilities be identified?** no
    **Will guying rights be obtained by the utility owner, if outside the State ROW?** no

**11. List any known seasonal restrictions to working on the utility facilities (e.g., electric transmission in summer).** none

**ADDITIONAL INPUT**

*This section has been provided for the PE designer and the functional units to state any assumptions, to clarify and customize standard activities, and to add important information. Please be clear and concise. Provide your unit's contact person and number.*

*List any commitments that other units must fulfill in the Summary of Commitments in Section 1 above.*

*Examples of information for this section include location of cell towers, location/presence of fiber optic lines, etc.*

## Jurisdiction

| Activity No. | Activity Name | Execute | Responsible Unit | Comments |
|---|---|---|---|---|
| 4100 | Prepare Jurisdicitional Limit Maps and Agreements | ☒ Yes ☐ No | ☒ Designer ☒ DPM ☒ DAG | |
| 4105 | Execute Jurisdictional Agreements | ☒ Yes ☐ No | ☒ DPM ☒ Various Agencies | |

**Total number of maps:** _____ **Total number of agreements:** _____

**Are there streetscape or aesthetic items intended for this project?** ☐ **Yes** ☐ **No**

**If yes, has a resolution of support been acquired for jurisdictional assignment?** ☐ **Yes** ☐ **No** ☐ **NA**

**ADDITIONAL INPUT**

*This section has been provided for the PE designer and the functional units to state any assumptions, to clarify and customize standard activities, and to add important information. Please be clear and concise. Provide your unit's contact person and number.*

*List any commitments in the Summary of Commitments in Section 1 above.*

*An example of information for this section: details of a local approval.*

## Geometrics & Roadway

| Activity No. | Activity Name | Execute | Responsible Unit | Comments |
|---|---|---|---|---|
| 4210 | Complete Horizontal / Vertical Geometry | ☒ Yes ☐ No | ☒ Designer | |
| 4220 | Prepare Final Roadway Plans | ☒ Yes ☐ No | ☒ Designer | |

## Construction Plans/Estimated Number of Sheets

### Roadway and Bridges

| | | | | | |
|---|---|---|---|---|---|
| 1 | Key Map | 4 | Grades | 1 | Method of Cross Sections |
| 2 | Estimate-Distribution of Quantities | 10 | Traffic Control and Staging Plans | 10 | Cross Sections |
| 2 | Typical Sections | 10 | Traffic Control Plans | 4 | Alternate Retaining Wall System |
| 1 | Plan Sheet Index | 0 | ITS Plans | 1 | Estimate of Quantities – Bridge |
| 24+ 8 | Construction Plans | 0 | Electrical Details | 1 | Earthwork Summary |
| | Drainage Plans | | Traffic Signal Plans | | |
| 4 | Environmental Plans | 0 | Highway Lighting Plans | 1 | Earthwork Chart Sheet |
| 1 | Profiles | 4 | Landscape Plans | 5 | Non-standard Roadway Construction Details |
| 1 | Ties | 5 | Traffic Signing and Striping Plans | 8 | Non-standard Bridge Construction Details |
| 6 | Construction Details | | | | |

### Right of Way Documents

| | | | | | |
|---|---|---|---|---|---|
| 2 | Entire Tract Map | 1 | Tabulation Sheets | 2 | Individual Property Maps (IPM) |
| 2 | General Property Parcel Maps | 2 | Parcel Descriptions | 1 | Alignment Sheets |

### Other Documents

| | | | | | |
|---|---|---|---|---|---|
| 1 | Jurisdictional Maps | 6 | Utility Agreements Plans | 0 | Railroad Crossing Element Plans |
| 1 | Project specific Specifications | 18 | Utility Plans | | |

**Are there any additional documents?** ☐ **Yes** ☒ **No**

**Please identify any additional documents: _____**

**1. Existing Roadway(s):**

| | Roadway No. 1 | Roadway No. 2 | Roadway No. 3 | Roadway No. 4 |
|---|---|---|---|---|
| **Roadway Name:** | NJ Route 48 | | | |
| **Posted Speed(s):** | **50 MPH** | | | |
| **Highway Classification:** | Rural Major Collector | | | |
| **Significance (local or regional):** | regional | | | |
| **No. of Interchanges:** | | | | |
| **Traffic Volumes:** | | | | |
| **Design Speeds:** | | | | |
| **Development Class:** | | | | |
| **No. of Traffic Signals:** | | | | |
| **No. of Intersections:** | | | | |

**2. Typical Section(s):**

| | Typical Section No. 1 | Typical Section No. 2 | Typical Section No. 3 | Typical Section No. 4 |
|---|---|---|---|---|
| **Right of Way Width:** | | | | |
| **Number of Lanes:** | 2 | | | |
| **Lane width & cross slope:** | | | | |
| **Shoulder width & cross slope:** | | | | |
| **Median width:** | | | | |
| **Sidewalk/border width:** | | | | |
| **Median description and the overall roadway width:** | | | | |

**3. Intersection/Interchange (describe the existing intersections and/or interchanges including turning and auxiliary lanes.):** _____

**4. Existing Deficiencies (provide an overview of the existing deficiencies. *Geometric*: Substandard horizontal and vertical sight distance, insufficient sight triangle, substandard vertical clearance, substandard or no shoulders, acceleration, deceleration lanes, etc. *Safety Issues*: Check crash data for indicators of specific problems. Substandard/nonexistent guiderail, attenuators, pavement condition, skid resistance, median, etc.). Note on substandard guiderail: the project limits should be extended to include upgrading any existing substandard guiderail run that extends beyond the proposed work limits as required by the Design Manual.** _____

**5. Proposed Improvements (provide a brief narrative of the proposed improvements and how they address the identified deficiencies. Note changes to be made to profiles, alignment, guiderail, and typical section):** _____

**6. Bicycle/Pedestrian Compatible?** ☐ Yes ☐ No

**If no, please explain:** _____

**7. Has Design Exception approval been obtained?** ☐ **Yes** ☐ **No** ☐ **N/A** **Comments:** _____

**8. List any commitments made to the public, local officials or other government agencies in the Summary of Commitments table in Section 1 above.**

**ADDITIONAL INPUT**

*This section has been provided for the PE designer and the functional units to state any assumptions, to clarify and customize standard activities, and to add important information. Please be clear and concise. Provide your unit's contact person and number.*

*List any commitments that other units must fulfill in the Summary of Commitments in Section 1 above.*

*Examples of information for this section include a discussion of substandard design elements, design exceptions, perhaps a quick description of the proposed geometry if it is unusual, and commitments made to the community, etc.*

## Pavement

| Activity No. | Activity Name | Execute | Responsible Unit | Comments |
|---|---|---|---|---|
| 4340 | Perform Pavement Life Cycle Cost Analysis | ☒ Yes ☐ No | ☒ Designer<br>☒ Pavement | |

**ADDITIONAL INPUT**

*This section has been provided for the PE designer and the functional units to state any assumptions, to clarify and customize standard activities, and to add important information. Please be clear and concise. Provide your unit's contact person and number.*

*List any commitments in the Summary of Commitments in Section 1 above.*

*Examples of information for this section include evidence of subsurface drainage issues, settlement problems, stability problems, etc.*

## Structures

| Activity No. | Activity Name | Execute | Responsible Unit | Comments |
|---|---|---|---|---|
| 4175 | Prepare Noise Barrier Details | ☐ Yes ☒ No | ☐ Designer<br>☐ Landscape | |
| 4160 | Prepare Final Structures Documents | ☒ Yes ☐ No | ☒ Designer ☐ H&H<br>☒ Structures | |
| 4315 | Complete Final Bridge Analysis | ☒ Yes ☐ No | ☒ Designer ☐ H&H<br>☒ Structures | |

| | | | |
|---|---|---|---|
| **Total Number of New Bridges:** | | **Total Number of New Spans:** | |
| **Total Number of Rehab Bridges:** | | **Total Number of Rehab Spans:** | |
| **Total Number of Replacement Bridges:** | 1 | **Total Number of Replacement Spans:** | 1 |

**1. Condition of existing bridge(s):**

| | Bridge No. 1 | Bridge No. 2 | Bridge No. 3 | Bridge No. 4 |
|---|---|---|---|---|
| a. NJDOT Structure Number: | 1706-152 | | | |
| b. Year Built: | 1972 | | | |
| c. Date/type of any major modifications: | | | | |
| d. Type & material of superstructure: | concrete | | | |
| e. Type and material of substructure: | concrete | | | |
| f. Feature that is spanned: | Game Creek | | | |
| g. Type of roadway it carries: | Rural Major Collector | | | |
| h. Vertical Clearance of structure: | | | | |

| | Bridge No. 1 | Bridge No. 2 | Bridge No. 3 | Bridge No. 4 |
|---|---|---|---|---|
| i. Number of Spans: | 1 | | | |
| j. Length of Structure: | 30 | | | |
| k. Width of Structure: | 38 | | | |
| l. Horizontal Clearance of the pier / abutment with respect to the riding lane: | | | | |
| m. Typical Section (number of lanes, width and cross slope, shoulders and width of each sidewalk): | (2)12' lanes,(2)8' shoulder | | | |
| n. Parapet railing type: | | | | |
| o. Existing aesthetic/historical architectural treatments: | none | | | |
| p. Identify the structural deficiencies: | ASR | | | |
| q. Bridges over waterways: Identify scouring evaluation, bridge opening capacity, and frequency of storm, etc. | | | | |

**2. Proposed Bridge(s)/Bridge Improvements:**

| | Bridge No. 1 | Bridge No. 2 | Bridge No. 3 | Bridge No. 4 |
|---|---|---|---|---|
| a. Number of spans: | 1 | | | |
| b. Identify the type of maintenance of traffic that will be used (staging or detour): | staging | | | |
| c. Identify the changes to the typical section of the existing structure: | none | | | |
| d. Number of Spans: | 1 | | | |
| e. Vertical Clearance of structure:: | | | | |
| f. Length of Structure: | 40 | | | |
| g. Width of Structure: | 38 | | | |
| h. Type & material of superstructure: | | | | |
| i. Type and material of substructure: | | | | |
| j. Horizontal Clearance of the pier/abutment with respect to the riding lane: | | | | |

| | Bridge No. 1 | Bridge No. 2 | Bridge No. 3 | Bridge No. 4 |
|---|---|---|---|---|
| k. Typical Section (number of lanes, width and cross slope, shoulders and width of each sidewalk): | (2)12' lanes,(2)8' shoulder | | | |
| l. Parapet railing type: | | | | |
| m. Existing aesthetic/historical architectural treatments: | | | | |
| n. Identify the structural deficiencies: | | | | |
| o. Coast Guard Permit Required: | No | | | |

**3. Are the minimum vertical clearance requirements over waterways, roadways, railroads met?** ☐ **Yes** ☐ **No**
**If no, please explain?** _____

**4. List other substandard features of proposed bridge:** _____

**5. Other Existing Structure(s):**
**5a. Identify existing minor structures (Noise barriers, Retaining Walls (cast in place or alternate system), Gabions, High Tower Lighting foundations, Pre-cast Culverts, Culvert extensions, Type and number of Overhead Sign Structures):** _____

**5b. Specify type and number of each substandard feature:** _____

**6. If there is a deck replacement: Has a site inspection been completed by Structures personnel** ☐ **Yes Date:** _____ ☐ **No**

**Has a bridge inspection report which is less than two years old been reviewed?** ☐ **Yes Date of inspection report:** _____ ☐ **No.**

**State reasons to justify that the superstructure is not being replaced:** _____

**7. Proposed Other Structure(s):**

| | Structure No. 1 | Structure No. 2 | Structure No. 3 | Structure No. 4 |
|---|---|---|---|---|
| a. Identify changes in the existing minor structure that are being improved: | | | | |
| b. List substandard features to be included in the design exception: | | | | |
| c. Length: | | | | |
| d. Width: | | | | |
| e. Number of spans/units: | | | | |
| | | | | |

**ADDITIONAL INPUT**

*This section has been provided for the PE designer and the functional units to state any assumptions, to clarify and customize standard activities, and to add important information. Please be clear and concise. Provide your unit's contact person and number.*

*List any commitments in the Summary of Commitments in Section 1 above.*

*Examples of information for this section include scour, unusual existing or proposed structural elements, clearances, substandard elements, design exceptions, etc.*

## Geotechnical

| Activity No. | Activity Name | Execute | Responsible Unit | Comments |
|---|---|---|---|---|
| 4300 | Develop Subsurface Exploration Program | ☒ Yes ☐ No | ☒ Geotech<br>☒ Designer | |
| 4305 | Gather Subsurface Information | ☒ Yes ☐ No | ☒ Geotech<br>☒ Designer<br>☒ Contractor | |
| 4320 | Conduct Geotechnical Foundation, Roadway and Rock Slope Design | ☒ Yes ☐ No | ☒ Geotech<br>☒ Designer | |

1. **Is there evidence of subsurface drainage problems?** no

2. **Is there evidence of settlement problems?** no

3. **Is there evidence of stability problems?** no

4. **Is there evidence of scour problems?** no

5. **Are there existing soil-borings within the project limits?** yes

6. **Are there rock slopes/cuts located within the project limits?** no

   a. **Are there rock cuts listed in the Rockfall Hazard Rating System?** NA

   b. **Do catchment areas need to be cleaned or modified?** NA

   c. **Are there apparent safety problems with protruding rock, sight lines, rock-fall, and substandard existing mitigation measure?** NA

7. **Alternate site exploration (test pits)? _____**

8. **Is a foundation report required? ☒ Yes ☐ No**

9. **List any existing or proposed structures that may be impacted by construction activities such as vibration, settlement, or noise:**

   **Structure: _____ impacted by: _____**

**ADDITIONAL INPUT**

*This section has been provided for the PE designer and the functional units to state any assumptions, to clarify and customize standard activities, and to add important information. Please be clear and concise. Provide your unit's contact person and number.*

*List any commitments that other units must fulfill in the Summary of Commitments in Section 1 above.*

*Examples of information for this section include rock slope issues, soil borings, scour, unusual existing or proposed structural elements, clearances, etc.*

## Survey

| Activity No. | Activity Name | Execute | Responsible Unit | Comments |
|---|---|---|---|---|
| 4215 | Conduct Supplemental Surveys | ☒ Yes ☐ No | ☒ Designer<br>☒ Survey | |

1. **Identify available mapping information (aerial/conventional methods/ 3-D surface models):** _____
2. **How were the existing and proposed baselines established?** _____
3. **How were the existing and proposed ROW lines established?** _____
4. **How was the horizontal and vertical control established and which existing monumentation was used?** _____
5. **Is project in Tidal area?** ☐ **Yes** ☒ **No** **If yes, then current mean high water elevation must be established in tidal water areas under Tidelands Bureau jurisdiction.** _____
6. **Has NJDOT Regional Survey office been contacted regarding existing Control, and as built plans within the project area?** _____
7. **Is compliance with MAP filing law required?** ☐ **Yes** ☐ **No**
8. **Has NJDOT Geodetic Survey been contacted regarding existing control within the project?** ☐ Yes ☐ No
9. **Does Primary Control exist within the project limits or immediately adjacent to the project?** ☐ Yes ☐ No

**If yes, what year was control established in?** _____

**If no, will primary control be required?** _____

**10. Will plans be developed from aerial photogrammetry or as-built plans and conventional survey?** Aerial photogrammetry

**11. Geodetic Survey Services will be provided by:** ☐ In-House ☒ Consultant

**ADDITIONAL INPUT**

*This section has been provided for the PE designer and the functional units to state any assumptions, to clarify and customize standard activities, and to add important information. Please be clear and concise. Provide your unit's contact person and number.*

*Examples of information for this section include base mapping obtained during PE or earlier, tidal issues, compliance with MAP filing laws, geodetic control issues, etc.*

## Railroads

| Activity No. | Activity Name | Execute | Responsible Unit | Comments |
|---|---|---|---|---|
| 4110 | Prepare Railroad 60% Submission | ☐ Yes ☒ No | ☐ Railroads<br>☐ Designer | |
| 4115 | Address Railroad 60% Comments | ☐ Yes ☒ No | ☐ Railroad Co.<br>☐ Utilities<br>☐ Designer | |
| 4120 | Prepare Railroad 100% Submission | ☐ Yes ☒ No | ☐ Railroads<br>☐ Designer | |
| 4125 | Review Railroad 100% Submission | ☐ Yes ☒ No | ☐ Railroad Company | |
| 4130 | Revisit Railroad Diagnostic Team Meeting | ☐ Yes ☒ No | ☐ Railroads | |

**Railroads Affected** Select RR Line Select RR Line 2 Select RR Line 3 ____ ____ ____

1. **Grade Crossings Affected?** ☐ Yes ☒ No **How many?** ____

## Construction

| Activity No. | Activity Name | Execute | Responsible Unit | Comments |
|---|---|---|---|---|
| 4275 | Develop Construction Cost Estimate | ☒ Yes ☐ No | ☒ Designer ☐ Construction | |
| 4280 | Develop Specifications | ☒ Yes ☐ No | ☒ Designer ☐ Construction | |
| 4285 | Develop Construction Schedule | ☒ Yes ☐ No | ☒ Designer ☐ Construction | |

1. **List any commitments made to the public, local officials or other government agencies:** _____

2. **Traffic Staging: How many lanes of traffic need to be maintained?** 2 **What will be the available working hours?** _____ **Can the project duration be significantly reduced by reducing the number of stages?** no **Can detours be used?** no **Provide a brief summary of the proposed staging.** There will be one lane of traffic open in each direction during construction. The project will be constructed in stages to maintain traffic on Route 48 by shifting traffic onto the existing shoulder and one travel lane so the other shoulder and travel lane can be reconstructed.

3. **Schedule: Identify scheduling constraints (environmental, seasonal construction limitations, community).** Cofferdam installation for construction of the spillway will have to be coordinated with Fish & Wildlife so in-water work is not performed during spawning season. **What is the optimum period to start construction?** _____
4. **Utilities: Can utility relocations be avoided or performed in advance of the project?** _____ **Can utility design/construction be performed by designer/contractor?** yes **Can ROW needed for utilities be identified?** yes
5. **Is the scope focused on replacement or rehabilitation of road/bridge?** Replacement **Is condition likely to change/deteriorate between scoping and construction?** Yes

6. **Lane Miles:** **(Lane Miles = Length of Road * Number of Lanes)** **(Shoulders are not included in these calculations.)**

| Lane Miles for: | New | Rehabilitation |
|---|---|---|
| Interstate Highway | | |
| State Routes | | 0.6 |
| Primary Routes | | |
| County Routes | | |
| Side Streets | | |
| All Ramps | | |

in

*This*
*units to*
*and to add*
*unit's contact person and number.*

*List any commitments in the Summary of Commitments in Section 1 above.*

7. **Total Number of Bridges:** 1
8. **Total new bridge span lanes (width is in feet): Bridge Span Lanes = (Width * #Spans) / 12′** 5
9. **Total superstructure replacement span lanes (width is feet): Bridge Span Lanes = (Width * #Spans) / 12′** 0
10. **Total culvert span lanes (width is in feet): Culvert Span Lanes = Width / 12′** 0
11. **Total square feet of retaining walls:** 0
12. **Total square feet of noise walls:** 0

**ADDITIONAL INPUT**

*section has been provided for the PE designer and the functional*
*state any assumptions, to clarify and customize standard activities,*
*important information. Please be clear and concise. Provide your*

*Examples of information for this section include commitments made to local officials or other agencies, staging details, detour discussion, schedule constraints, utility conflicts, etc.*

## Traffic Signal and Safety Engineering

| Activity No. | Activity Name | Execute | Responsible Unit | Comments |
|---|---|---|---|---|
| 4230 | Complete Lighting Design | ☐ Yes ☒ No | ☐ TSSE ☐ Designer | |
| 4240 | Complete Traffic Signal, Signing and Striping Plans | ☒ Yes ☐ No | ☒ TSSE ☒ Designer | |

| | | | |
|---|---|---|---|
| **Number of New Traffic Signals:** | | **Number of Revised Traffic Signals:** | |
| **New overhead signs and sign structures** | ☐ Yes ☒ No | **Revised overhead signs and sign structures** | ☐ Yes ☒ No |
| **New Guide Signs** | ☐ Yes ☒ No | **Revised Guide Signs** | ☒ Yes ☐ No |
| **Number of Roundabouts** | | **Signal pre-emption (Rail/Movable Bridge/emergency vehicles/etc.)** | ☐ Yes ☒ No |
| **Revised Highway Lighting** | ☐ Yes ☒ No | **Temporary Lighting for staging or diversion roadways** | ☐ Yes ☒ No |
| **Raised Pavement Markers** | ☒ Yes ☐ No | | |

1. **What type of maintenance of traffic will be used during construction (i.e., staging, detour, permanent lane closures, or diversion road):** staging

2. **Identify the number and location of temporary traffic signal(s) required during Staging or Detours:** none

3. **Is there adequate corner ROW cutout for signal equipment installation?** ☐ **Yes** ☐ **No**

4. **Identify if a new or revised traffic signal agreement is required?** _____

5. **Identify overhead utility conflicts for traffic signals to be identified and resolved:** _____

6. **Is current traffic count data and analysis available? (If so provide year of data.):** _____

7. **For new traffic signals, are the signal warrants met? (provide year it meets):** _____

8. **For existing traffic signals, are the current TS and Electrical plans available in MicroStation format?** _____ **filename:** _____

9. **Is the existing or proposed signal interconnected to other signals, time based coordination or an isolated intersection?** _____

**ADDITIONAL INPUT**

*This section has been provided for the PE designer and the functional units to state any assumptions, to clarify and customize standard activities, and to add important information. Please be clear and concise. Provide your unit's contact person and number.*

*List any commitments in the Summary of Commitments in Section 1 above.*

*Examples of information for this section include discussion of need for temporary signals, right of way constraints (related to traffic signal equipment), utility conflicts, etc.*

## Electrical

| Activity No. | Activity Name | Execute | Responsible Unit | Comments |
|---|---|---|---|---|
| | | ☐ Yes ☐ No | | |

1. **Do any elements of this project scope include new roadway / electrical appurtenances that would require specialized training, equipment or materials to properly maintain the item (e.g., ornamental lighting)? ☐ Yes ☐ No**

   **If yes, provide details: _____**

**ADDITIONAL INPUT**

*This section has been provided for the PE designer and the functional units to state any assumptions, to clarify and customize standard activities, and to add important information. Please be clear and concise. Provide your unit's contact person and number.*

*List any commitments in the Summary of Commitments in Section 1 above.*

*Examples of information for this section include elements of the design that will necessitate an increase in maintenance personnel or equipment, etc.*

## Maintenance and Operations

| Activity No. | Activity Name | Execute | Responsible Unit | Comments |
|---|---|---|---|---|
| | Manufactured Treatment Device Cleaning and inspection | ☐ Yes ☐ No | NJDOT | Structural inspection annually and MTD cleaning/sediment removal at least four (4) times annually, as well as, after every storm exceeding 1 inch of rainfall. |

**1. Regional Maintenance has been consulted for needs and impacts?** ☐ **Yes** ☐ **No**

**Identify needs and impacts.** _____

**Maintenance agrees with the scope, and impact of the project:** ☐ **Yes** ☐ **No** **Comments:** _____

**2. Operations Support has been consulted for needs and impacts?** ☐ **Yes** ☐ **No**

**Identify needs and impacts.** _____

3. **Do any elements of this project scope require additional planned maintenance activities that would necessitate an increase in personnel or equipment resources?** ☒ **Yes** ☐ **No** **If yes, provide details:** The NJDOT Bureau of Maintenance Engineering and Operations shall keep detailed written logs of all inspections, preventative and corrective maintenance performed at the stormwater management facilities including all maintenance-related work orders. The NJDOT Bureau of Maintenance Engineering and Operations shall retain and, upon request, make available the maintenance plan and associated logs and other records for review by a public entity with administrative, health, environmental, or safety authority over the site. The maintenance plan and detailed logs shall be made available to any public agency upon request. The NJDOT Bureau of Maintenance Engineering and Operations shall evaluate the maintenance plan for effectiveness at least annually and revise as necessary. The NJDOT Bureau of Maintenance Engineering and Operations shall incur all costs associated with the application of this maintenance plan. The NJDOT Bureau of

Maintenance Engineering and Operations shall keep a copy of maintenance plan attached with a copy of as-built construction plans, construction details, and Freshwater Wetlands Permit plans for reference. The spillway outlet gate will require annual maintenance.

4. **Do any elements of this project scope include new roadway / electrical appurtenances that would require specialized training, equipment or materials to properly maintain the item (e.g., Vortech drainage chamber, ornamental lighting, brick pavers)?** ☒ **Yes** ☐ **No**

**If yes, provide details:** All MTD components expected to receive and/or trap debris and sediment must be inspected for clogging and excessive debris and sediment accumulation at least four (4) times annually as well as after every storm exceeding 1 inch of rainfall. Sediment removal should take place when the MTD is thoroughly dry. Disposal of debris, trash, sediment, and other waste material should be done at suitable disposal/recycling sites and in compliance with all applicable local, state, and federal waste regulations. All MTD structural components must be inspected for cracking, subsidence, spalling, erosion, and deterioration at least annually.

**2. Does this project scope include or overlap sections of roadway that are simultaneously being planned or scheduled for Operations**

**maintenance/construction activities? ☐ Yes ☐ No If yes, provide details: _____**

**3. Should consideration be given to canceling or postponing the Operations activity? ☐ Yes ☐ No If yes, provide details: _____**

**ADDITIONAL INPUT**

*This section has been provided for the PE designer and the functional units to state any assumptions, to clarify and customize standard activities, and to add important information. Please be clear and concise. Provide your unit's contact person and number.*

*List any commitments in the Summary of Commitments in Section 1 above.*

*Examples of information for this section include maintenance repairs, operational issues, simple safety improvements, etc.*

## Traffic Operations and Intelligent Transportation System (ITS) Engineering

| Activity No. | Activity Name | Execute | Responsible Unit | Comments |
|---|---|---|---|---|
| 4235 | Complete Final Design Systems Engineering Review Form | ☐ Yes ☐ No | ☐ Designer ☐ ITS ☐ Traffic Ops | |
| 4250 | Prepare ITS Facilities Layout Plan | ☐ Yes ☐ No | ☐ Designer ☐ ITS ☐ Traffic Ops | |
| 4255 | Complete ITS Facililties Plans | ☐ Yes ☐ No | ☐ Designer ☐ ITS ☐ Traffic Ops | |

**1. Project scope complies with the requirements of the latest ITS Investment Strategy and ITS Architecture?** ☐ **Yes** ☐ **No**

**2. Traffic Operations (North / South) has been consulted for needs and impacts?** ☐ **Yes** ☐ **No**

**Identify needs and impacts.** _____

**3. Transportation Data Development has been consulted for needs and impacts?** ☐ **Yes** ☐ **No**

**Identify needs and impacts.** _____

**4. Project limits have been visually inspected for the existing ITS facilities?** ☐ **Yes** ☐ **No**

**5. Check if the project includes the construction or relocation of any of the following Intelligent Transportation System (ITS) facilities:**

☐ Controlled Traffic Signal Systems (CTSS)
☐ Weigh-in-Motion (WIM)
☐ Closed Circuit TV Cameras (CCTV)
☐ Traffic Volume Stations
☐ Dynamic Message Signs (DMS)
☐ Roadway Weather Information Systems (RWIS)
☐ Highway Advisory Radio (HAR)
☐ In-Road Sensors
☐ Traffic Detection systems
☐ Fiber Optic Conduit and/or Cable
☐ Bridge Sensors

☐ Electrical or Communication Installations for the above systems
☐ Other ITS Devices: _____

**ADDITIONAL INPUT**

*This section has been provided for the PE designer and the functional units to state any assumptions, to clarify and customize standard activities, and to add important information. Please be clear and concise. Provide your unit's contact person and number.*

*List any commitments in the Summary of Commitments in Section 1 above.*

*Examples of information for this section include compliance with latest ITS Investment Strategy and Architecture, consultation with Traffic Ops during CD or PE, etc.*

## Commuter Mobility

| Activity No. | Activity Name | Execute | Responsible Unit | Comments |
|---|---|---|---|---|
| | | ☐ Yes ☐ No | | |

**Has NJ Transit or other affected bus companies been contacted? _____ (NJ Transit has strongly expressed their desire to be "in the loop" early and again during construction.)**

**ADDITIONAL INPUT**

*This section has been provided for the PE designer and the functional units to state any assumptions, to clarify and customize standard activities, and to add important information. Please be clear and concise. Provide your unit's contact person and number.*

*List any commitments in the Summary of Commitments in Section 1 above.*

*Examples of information for this section include bicycle and pedestrian compatibility, Complete Streets compliance, presence of bus stops, interruption of pedestrian accommodations during construction, ADA issues, etc.*

## Technical and Administrative Activities

| Activity No. | Activity Name | Execute | Responsible Unit | Comments |
|---|---|---|---|---|
| 4010 | Intiate FD | ☒ Yes ☐ No | ☒ DPM | |
| 4015 | Prepare Municipal Police Agreement | ☒ Yes ☐ No | ☒ DPM ☐ Designer ☒ CM | |
| 4020 | Approve Municipal Police Agreement | ☒ Yes ☐ No | ☒ Municipality ☒ DPM | |
| 4025 | Request Municipal Agreement Funding and DAG Approval | ☒ Yes ☐ No | ☒ DPM ☒ CIPD ☒ DAG | |
| 4030 | Execute Municipal Police Agreement | ☒ Yes ☐ No | ☒ DPM ☒ CPM | |
| 4290 | Prepare Final Design Submission Package | ☒ Yes ☐ No | ☐ DPM ☒ Designer | |

| | | | | |
|---|---|---|---|---|
| 4785 | Prepare Financial Plan (Major Projects) | ☒ Yes ☐ No | ☒ DPM | |
| 4790 | Update Project Management Plan (Major Projects) | ☒ Yes ☐ No | ☐ DPM ☐ FHWA ☐ SMEs ☐ Designer | |
| 4795 | Execute Final Design Public Involvement Action Plan | ☒ Yes ☐ No | ☐ DPM ☐ DAG ☒ Comm. Relations | |
| 4805 | FHWA Reviews Final Design Submission | ☒ Yes ☐ No | ☒ DPM ☒ FHWA | |
| 4815 | Finalize Specifications (Projects >$10M) | ☒ Yes ☐ No | ☒ DPM ☒ Designer ☒ Construction | |
| 4825 | Comptroller Approves Specifications (Projects >$10M) | ☒ Yes ☐ No | ☒ State Comptroller | |
| 4830 | Resolve Final Design Submission Comments | ☒ Yes ☐ No | ☒ DPM ☒ Designer | |

| | | | | |
|---|---|---|---|---|
| 4835 | Prepare Pre-PS&E Package | ☒ Yes ☐ No | ☐ DPM ☐ Designer | |
| 4840 | Submit PS&E Package | ☒ Yes ☐ No | ☐ DPM ☒ Designer | |
| 4845 | FHWA Reviews Pre-PS&E (Projects >$10M) | ☒ Yes ☐ No | ☒ DPM ☒ FHWA | |
| 4865 | Execute Consultant Agreement Addendum (CAA) | ☒ Yes ☐ No | ☐ DPM ☒ Designer | |
| 4875 | Prepare Advertising Authorization Package | ☒ Yes ☐ No | ☒ DPM ☐ CM<br>☐ EDU ☐ FHWA<br>☐ Designer<br>☐ Prog Coordination | |
| 4885 | Receive Authorization to Advertise | ☒ Yes ☐ No | ☒ CM ☐ FHWA<br>☒ Prog Coordination | |
| 4895 | Complete FD Closeout | ☒ Yes ☐ No | ☒ DPM ☒ Designer | |

**1. Have the objectives of the Public Involvement Action Plan (PIAP) been satisfied:** ☒ Yes ☐ No

**2. Number of Local Workshop Meetings conducted in PE:** _____

**3. Public Information Centers conducted in PE (number of meetings, location & dates):** A Public Information Center (PIC) for the project was held on December 8, 2011 in Carneys Point Township.

**4. Number of Officials Briefings conducted in PE:** 1

**5. List Issues, Commitments or Concerns:** No detour during construction, clarification on ownership of the spillway and lake, and the need for easements.

**6. Is the mailing list up to date?** ☐ Yes ☐ No

**7. Are the Displays adequate to reuse in FD:** ☐ Yes ☐ No

**8. Resolution of Support Number:** _____ **Resolution of Support Date:** _____

**9. Other Coordination:**

**a. List additional organizations (e.g., Historic Society, Chamber of Commerce, Board of Education, Fire Company's etc.) or authorities (NJ Transit, NJ Turnpike, NJ Highway Authority, Port Authority, etc.) that have interest in the project:** _____

**b. Proposed Formal Public Involvement Program (estimate number of Official Briefings and Public Info Centers/Meetings/Hearings):** _____

**c. If additional displays are required, provide the specifics (number, scale, special graphics 3D, simulations, models, etc):** _____

**d. If a mailing list is required, provide the approximate number of property owners:** ~20 **Who is responsible for putting the mailing list together and providing mail labels?** ☒ Consultant ☐ In-house Design ☐ Other (Specify) _____

**e. If handouts are required (provide the specifics, number, size, color or black and white, mapping, etc):** _____

**f. List special needs (e.g., Community Involvement Sub-Consultant, Facility Needs, Interpreter, Website, etc.):** _____

**ADDITIONAL INPUT**

*This section has been provided for the PE designer and the functional units to state any assumptions, to clarify and customize standard activities, and to add important information. Include any commitments made to the community or outside agencies including NJDEP in Section 1 above. Please be clear and concise. Provide your unit's contact person and number.*

## Summary of Approvals

| SME Unit | Manager | Approval | SME Involved | Remarks |
|---|---|---|---|---|
| Right of Way | | | | |
| Access | | | | |
| Drainage | | | | |
| Landscape | | | | |
| Environmental | | | | |
| Quality Management Services | | | | |
| Utilities | | | | |
| Jurisdiction | | | | |
| Geometrics & Roadway | | | | |
| Pavement | | | | |
| Structures | | | | |
| Geotechnical | | | | |
| Survey | | | | |
| Railroads | | | | |
| Construction | | | | |
| Traffic Signal Design | | | | |
| Electrical | | | | |

| | | | | |
|---|---|---|---|---|
| Traffic Operations & ITS | | | | |
| Commuter Mobility | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

# *Appendix M – Design Communication Report*

new
jersey
department of
transportation

# Design Communications Report Approval

| | |
|---|---|
| Project Name: Route 48 Layton Lake Dam<br>Carneys Point Township, Salem County, NJ | UPC #: 023100 |
| Consulting Firm: McCormick Taylor | Designer Project Manager: Nabil M Hourani, PE |
| DOT Project Manager: Mike Kasbekar, PE | DOT Program Manager: Tom Saylor, PE |

***Design Communications Report (DCR) Entry No(s). 3 , 4 and 5***

*Pursuant to the Interactive Communications Procedure and the Interactive Communications Process of the New Jersey Department of Transportation (the Department), the Department's Project Manager has approved the DCR identified above, (approved by Entry No(s).) subject to the certification below of the Designer.*

*This approval by the Department's Project Manager is not a certification by the Department that the above project has been designed in accordance with all applicable State and Federal design standards and requirements or that comments and decisions made during Interactive Communications with the Department on design elements and features of the project to this point have been incorporated or satisfactorily resolved and the Contract Documents have been revised accordingly, and the Department is fully relying in this regard upon the certification below by the Designer.*

*Furthermore, the Project Manager, by signing below on behalf of the Department, has not waived the Designer's obligation to provide contract documents that are constructible and free from errors and/or omissions.*

02/20/2012

*Designer's Project Manager/Date*

2/21/12

*NJDOT Project Manager/Date*

***Project Review Certification CD***

*In accordance with the Interactive Communications procedure and the Interactive Communication Process of the Department, in the Designer's professional opinion, and to the best of the Designer's knowledge, information and belief and based upon the performance of the Designer's duties as set forth in the NJDOT and the Designer Agreement, the Designer represents that the above project has been designed in accordance with all applicable State and Federal design standards and requirements. Comments and decisions made during the Interactive Communications with the Department on design elements and features of the project to this point have been incorporated or satisfactorily resolved, and that the approved DCR entry (or entries) identified above will be incorporated into the Contract Documents accordingly.*



02/20/2012

*Designer's Project Manager/Date*

02/20/2012

*Designer's Principal/Date*

# Design Communications Report

For

**Preliminary Engineering (PE)**

## Route 48 Layton Lake Dam

**Program Manager:** Tom Saylor, PE

**Project Manager:** Willie Colquitt

**UPC:** 23100

**Date:** 02/6/12

**Design Communications Report**
**Route 48 Layton Lake Dam**
**Preliminary Engineering**

| Activity | Date: 2/17/11 | DCR Entry #: 3 |
|---|---|---|
| | Officials Briefing | Structures / Drainage |

**SUBJECT:** Officials Briefing

**PLACE:** CARNEYS POINT TOWNSHIP MUNICIPAL BUILDING

**DATE/TIME:** February 17, 2011, 11:00 am

| **ATTENDEES:** | **REPRESENTING** |
|---|---|
| Willie Colquitt | NJDOT - BPD |
| Mike Kasbekar | NJDOT – BPM |
| Kimberley Nance | NJDOT – OCR |
| Wayne D. Pelura | Carneys Point Township Mayor |
| Joe Racite | Carneys Point Township Deputy Mayor |
| Gene Gilbert | Carneys Point Township Public Works Superintendent |
| William Burris | Carneys Point Township Engineer |
| Nabil Hourani | McCormick Taylor, Inc. (MT) |
| Eric Ditchey | MT |

McCormick Taylor presented the hazard classification and spillway design flood for the dam; and the preferred alternative consisting of a new bridge with a 40 foot span, new concrete spillway with a 90 foot weir length, new low level outlet gate, and a raised road way profile by approximately 1 foot. The proposed alternative meets all of NJDEP Dam Safety regulations. Also presented was the proposed construction staging which will not require a detour, one lane of traffic in each direction will be maintained at all times by shifting traffic onto the shoulders and constructing the bridge in two stages. The proposed typical roadway section will be identical to the existing.

The Township asked for clarification regarding ownership of the lake and the need for easements. MT explained all of the proposed work would be confined to the NJDOT right-of-way except for the new spillway. A temporary construction easement will be required for construction of the spillway. The lake is privately owned by a homeowner association. MT asked for a contact name and number for the homeowner association (Bill Schockel 856-299-4183).

NJDOT asked if the Township would issue a Resolution of Support for the project and the Township responded affirmatively.

**Design Communications Report**
**Route 48 Layton Lake Dam**
**Preliminary Engineering**

| Activity | Date: 3/14/2011 | DCR Entry #: 4 |
|---|---|---|
| | Lake Corporation Briefing | |

**SUBJECT:**

**PLACE:** Bill Schockel House

**DATE/TIME:** March 14, 2011, 7:30 pm

| **ATTENDEES:** | **REPRESENTING** |
|---|---|
| Willie Colquitt | NJDOT - BPD |
| Kimberley Nance | NJDOT – OCR |
| Bill Schockel | Layton Lake Inc., President |
| Lucinda Lewis | Resident |
| G. Philip Lewis | Resident |
| Eric Ditchey | McCormick Taylor, Inc. (MT) |

MT presented the proposed alternative as stated above. The proposed alternative meets all of NJDEP Dam Safety regulations. The proposed alternative addresses the identified deficiencies of inadequate spillway capacity and concrete cracking (ASR/AAR). Also presented was the proposed construction staging which will not require a detour, one lane of traffic in each direction will be maintained at all times by shifting traffic onto the shoulders and constructing the bridge in two stages. The proposed typical roadway section will be identical to the existing.

The lake level will also be maintained during construction by installing a temporary cofferdam and by-pass piping to convey base flow through the construction site.

The proposed roadway drainage consists of new inlets constructed where Layton Lake Drive intersects Route 48 and a basin on the south side of Route 48. The profile of Layton Lake Drive will be raised to meet Route 48 at the intersection.

MT explained all of the proposed work would be confined to the NJDOT right-of-way except for the new spillway. A temporary construction easement will be required for construction of the spillway. Typically ownership of the spillway and operation of the sluice gate gets turned over to the lake owner; NJDOT maintains responsibility to inspect, maintain, and repair the dam including the spillway. An agreement between NJDOT and the lake owner would be prepared during final design defining these roles and responsibilities.

| Activity | Date: 12/08/211 | DCR Entry #: 5 |
|---|---|---|
| | Public Information Center | |

**SUBJECT:** Public Information Center

**PLACE:** CARNEYS POINT TOWNSHIP MUNICIPAL BUILDING

**DATE/TIME:** December 08, 2011, 4:00 pm

| **ATTENDEES:** | **REPRESENTING** |
|---|---|
| Willie Colquitt | NJDOT - BPD |
| Mike Kasbekar | NJDOT – BPM |
| Kimberley Nance | NJDOT – OCR |
| Meredith Hammond | NJDOT – OCR |
| Bill Schockel | Resident, President of Homeowners Association |
| Laura Smith | Resident |
| Charles Erhardt | Resident |
| Andrew Merendino | Resident |
| Lucinda Lewis | Resident |
| G. Philip Lewis | Resident |
| Sean Christie | Resident |
| Nabil Hourani | McCormick Taylor, Inc. (MT) |
| Timothy McGuire | MT |

The project is located within a residential community and there has been significant interest in the project by the surrounding property owners. There have been several issues or concerns raised by the residents. A primary concern for most residents was the previously proposed relocation of NJ Route 48 in the downstream direction. All were pleased to find that the relocation of Route 48 had been eliminated from the design and that NJ Route 48 would remain in its current location.

The most common secondary concern for most attendees was the maintenance of a natural and pleasing appearance of the lake and associated surroundings (for maintenance of aesthetics, property values, recreation, etc.). Residents requested aesthetic treatments be used during placement of concrete. It was suggested that decorative concrete formliners could be applied to the spillway walls and bridge parapets. Residents were informed that the lake may be lowered up to six inches during construction of the spillway for contractor safety. No objections were raised.

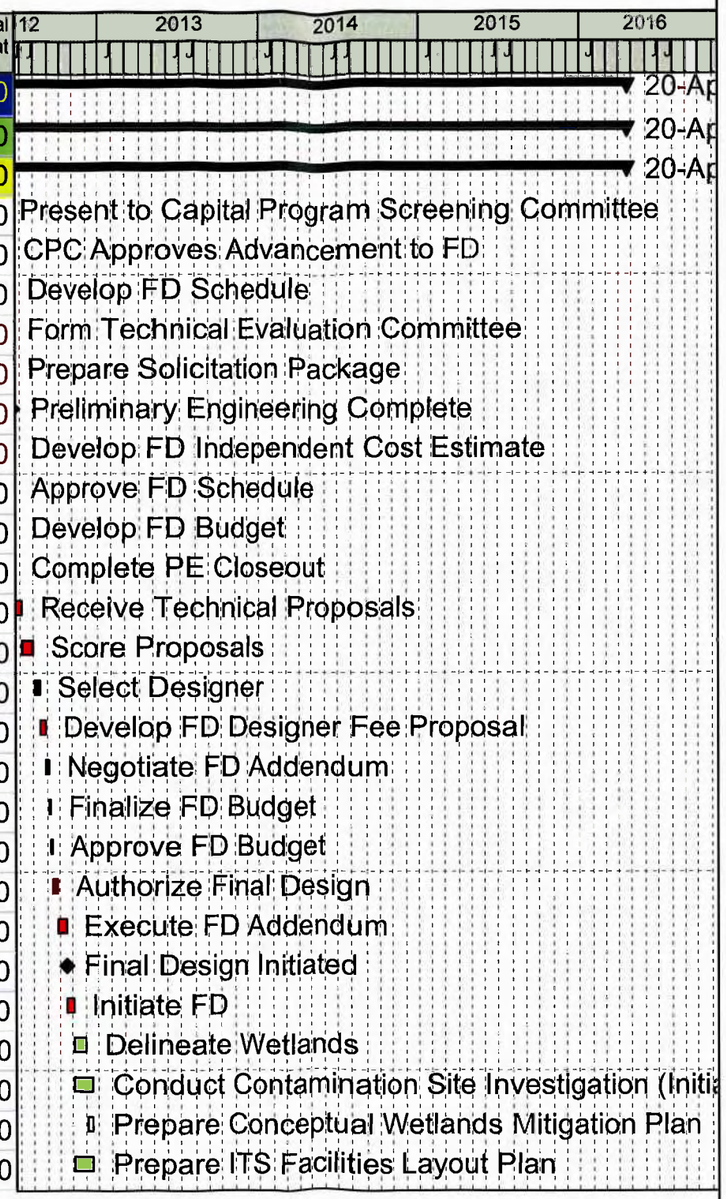
Clarification was given that new inlets will be constructed where Layton Lake Drive intersects NJ Route 48. It was explained that the profile of Layton Lake Drive will be raised to meet NJ Route 48 at the intersection and that new a drainage system was proposed for the areas downstream and west of the dam.

In response to a concern expressed regarding the potential for closure of Route 48 during

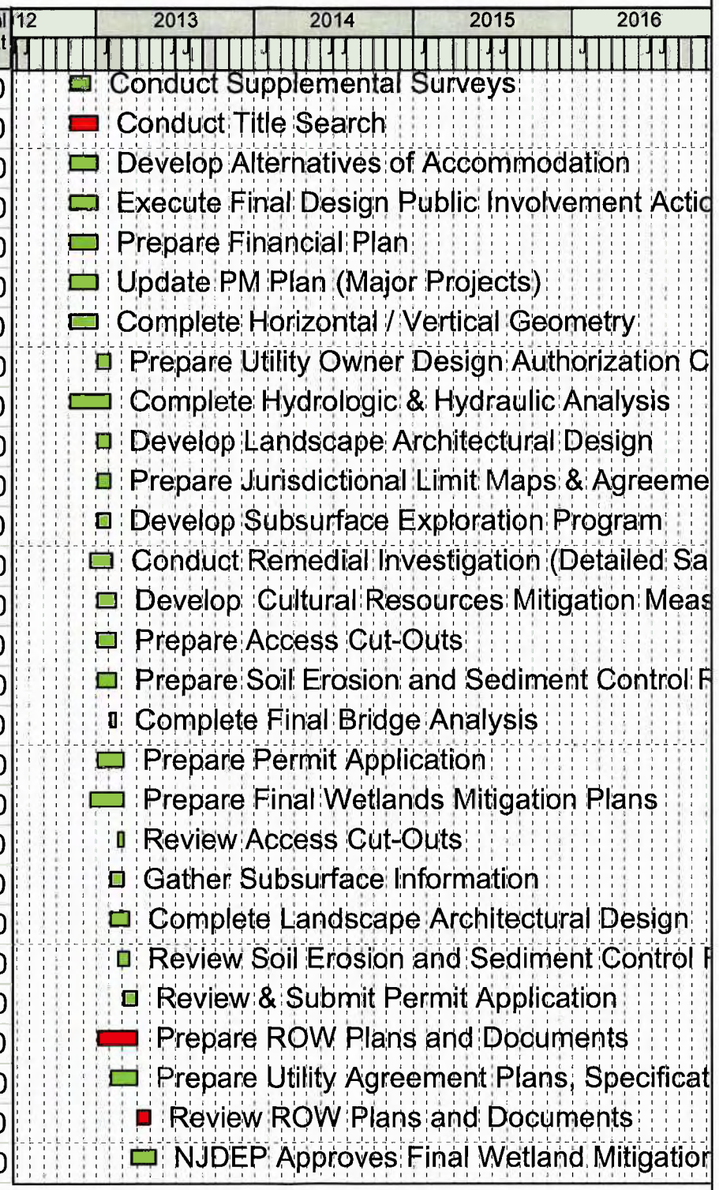
| |
|---|
| construction, it was affirmed that two lanes would be maintained throughout construction with no proposed detours.<br><br>Attendees requested clarification regarding ownership of the dam and the associated liabilities, need for easements, etc. It was explained all of the proposed work would be confined to the NJDOT right-of-way except for the new spillway, and that a temporary construction easement will be required for construction of the spillway. While the spillway belongs to NJDOT, the property of the dam and the lake is privately owned by the Association. For this reason, and for proximity (residents are on location), the Association will remain responsible for operation of the new and improved sluice gate. It was suggested that this new spillway would provide for a safer dam, which would reduce the burden of liability for the Association.<br><br>The Association was asked if they would be open to issuing a Resolution of Support for the project in future stages of planning and the residents responded affirmatively. |
| |
| |

# *Appendix N – Baseline Schedule*

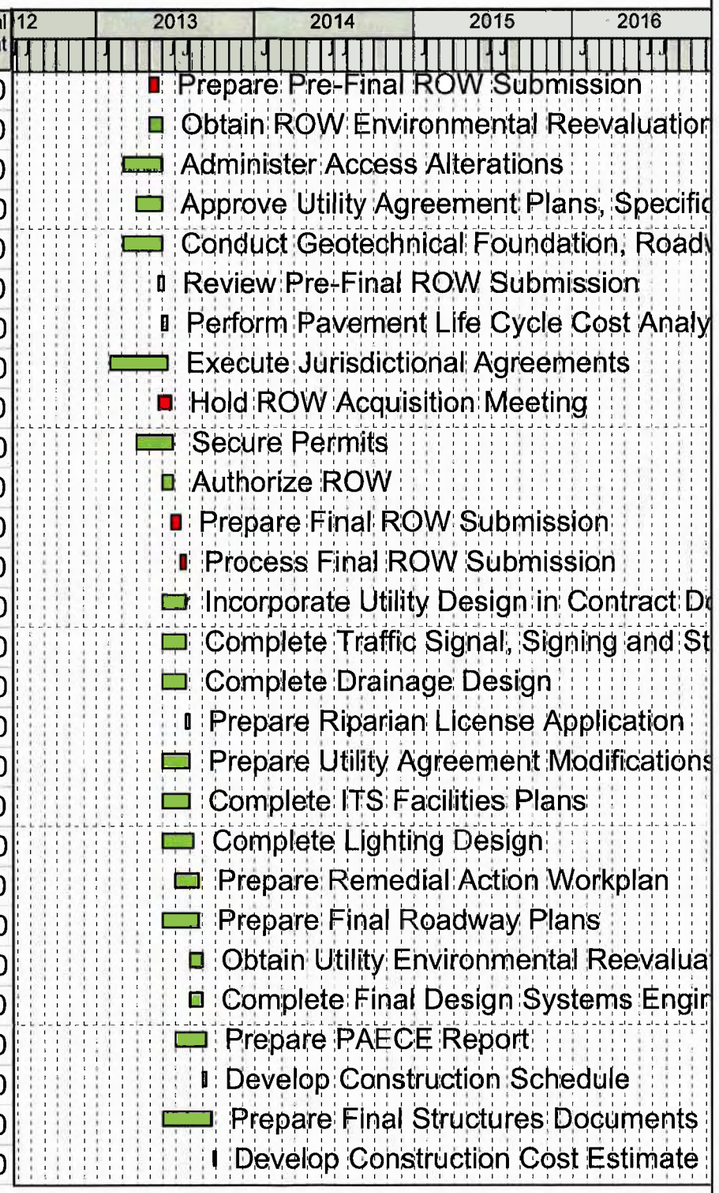
| Activity ID | Activity Name | Original Duration | Remaining Duration | Start | Finish | Free Float | Total Float |
|---|---|---|---|---|---|---|---|
| **023100R** | **Rt 48 Layton Lake Dam** | 983.0 | 983.0 | 15-May-12 | 20-Apr-16 | 0.0 | 0.0 |
| **No Program Manager** | | 983.0 | 983.0 | 15-May-12 | 20-Apr-16 | 0.0 | 0.0 |
| **No Project Manager** | | 983.0 | 983.0 | 15-May-12 | 20-Apr-16 | 0.0 | 0.0 |
| A3215 | Present to Capital Program Screening C... | 5.0 | 5.0 | 15-May-12* | 21-May-12 | 0.0 | 0.0 |
| A3220 | CPC Approves Advancement to FD | 5.0 | 5.0 | 22-May-12 | 29-May-12 | 0.0 | 0.0 |
| A3240 | Develop FD Schedule | 5.0 | 5.0 | 30-May-12 | 05-Jun-12 | 0.0 | 60.0 |
| A2710 | Form Technical Evaluation Committee | 5.0 | 5.0 | 30-May-12 | 05-Jun-12 | 0.0 | 0.0 |
| A2700 | Prepare Solicitation Package | 15.0 | 15.0 | 15-May-12 | 05-Jun-12 | 0.0 | 0.0 |
| A3990 | Preliminary Engineering Complete | 0.0 | 0.0 | | 12-Jun-12 | 89.0 | 89.0 |
| A3235 | Develop FD Independent Cost Estimate | 10.0 | 10.0 | 30-May-12 | 12-Jun-12 | 55.0 | 55.0 |
| A3250 | Approve FD Schedule | 5.0 | 5.0 | 06-Jun-12 | 12-Jun-12 | 64.0 | 64.0 |
| A3255 | Develop FD Budget | 5.0 | 5.0 | 06-Jun-12 | 12-Jun-12 | 60.0 | 60.0 |
| A3285 | Complete PE Closeout | 10.0 | 10.0 | 30-May-12 | 12-Jun-12 | 0.0 | 89.0 |
| A2720 | Receive Technical Proposals | 20.0 | 20.0 | 06-Jun-12 | 03-Jul-12 | 0.0 | 0.0 |
| A2730 | Score Proposals | 20.0 | 20.0 | 05-Jul-12 | 01-Aug-12 | 0.0 | 0.0 |
| A2750 | Select Designer | 10.0 | 10.0 | 02-Aug-12 | 15-Aug-12 | 0.0 | 0.0 |
| A3230 | Develop FD Designer Fee Proposal | 10.0 | 10.0 | 16-Aug-12 | 29-Aug-12 | 0.0 | 0.0 |
| A3245 | Negotiate FD Addendum | 5.0 | 5.0 | 30-Aug-12 | 06-Sep-12 | 0.0 | 0.0 |
| A3260 | Finalize FD Budget | 2.0 | 2.0 | 07-Sep-12 | 10-Sep-12 | 0.0 | 0.0 |
| A3265 | Approve FD Budget | 2.0 | 2.0 | 11-Sep-12 | 12-Sep-12 | 0.0 | 0.0 |
| A3270 | Authorize Final Design | 10.0 | 10.0 | 13-Sep-12 | 26-Sep-12 | 0.0 | 0.0 |
| A3275 | Execute FD Addendum | 15.0 | 15.0 | 27-Sep-12 | 18-Oct-12 | 0.0 | 0.0 |
| A4000 | Final Design Initiated | 0.0 | 0.0 | 19-Oct-12 | | 0.0 | 0.0 |
| A4010 | Initiate FD | 10.0 | 10.0 | 19-Oct-12 | 01-Nov-12 | 0.0 | 0.0 |
| A4360 | Delineate Wetlands | 20.0 | 20.0 | 02-Nov-12 | 04-Dec-12 | 0.0 | 145.0 |
| A4520 | Conduct Contamination Site Investigatio... | 30.0 | 30.0 | 02-Nov-12 | 18-Dec-12 | 0.0 | 140.0 |
| A4350 | Prepare Conceptual Wetlands Mitigation ... | 10.0 | 10.0 | 05-Dec-12 | 18-Dec-12 | 0.0 | 205.0 |
| A4250 | Prepare ITS Facilities Layout Plan | 30.0 | 30.0 | 02-Nov-12 | 18-Dec-12 | 30.0 | 155.0 |



| Activity ID | Activity Name | Original Duration | Remaining Duration | Start | Finish | Free Float | Total Float |
|---|---|---|---|---|---|---|---|
| A4215 | Conduct Supplemental Surveys | 30.0 | 30.0 | 02-Nov-12 | 18-Dec-12 | 10.0 | 90.0 |
| A4600 | Conduct Title Search | 40.0 | 40.0 | 02-Nov-12 | 03-Jan-13 | 0.0 | 0.0 |
| A4050 | Develop Alternatives of Accommodation | 40.0 | 40.0 | 02-Nov-12 | 03-Jan-13 | 0.0 | 125.0 |
| A4795 | Execute Final Design Public Involvement... | 40.0 | 40.0 | 02-Nov-12 | 03-Jan-13 | 340.0 | 340.0 |
| A4785 | Prepare Financial Plan | 40.0 | 40.0 | 02-Nov-12 | 03-Jan-13 | 340.0 | 340.0 |
| A4790 | Update PM Plan (Major Projects) | 40.0 | 40.0 | 02-Nov-12 | 03-Jan-13 | 340.0 | 340.0 |
| A4210 | Complete Horizontal / Vertical Geometry | 40.0 | 40.0 | 02-Nov-12 | 03-Jan-13 | 0.0 | 80.0 |
| A4055 | Prepare Utility Owner Design Authorizati... | 20.0 | 20.0 | 04-Jan-13 | 01-Feb-13 | 0.0 | 125.0 |
| A4310 | Complete Hydrologic & Hydraulic Analysis | 60.0 | 60.0 | 02-Nov-12 | 01-Feb-13 | 0.0 | 90.0 |
| A4260 | Develop Landscape Architectural Design | 20.0 | 20.0 | 04-Jan-13 | 01-Feb-13 | 0.0 | 175.0 |
| A4100 | Prepare Jurisdictional Limit Maps & Agre... | 20.0 | 20.0 | 04-Jan-13 | 01-Feb-13 | 0.0 | 250.0 |
| A4300 | Develop Subsurface Exploration Program | 20.0 | 20.0 | 04-Jan-13 | 01-Feb-13 | 0.0 | 80.0 |
| A4540 | Conduct Remedial Investigation (Detaile... | 35.0 | 35.0 | 19-Dec-12 | 08-Feb-13 | 95.0 | 140.0 |
| A4550 | Develop Cultural Resources Mitigation ... | 30.0 | 30.0 | 04-Jan-13 | 15-Feb-13 | 20.0 | 215.0 |
| A4705 | Prepare Access Cut-Outs | 30.0 | 30.0 | 04-Jan-13 | 15-Feb-13 | 0.0 | 15.0 |
| A4410 | Prepare Soil Erosion and Sediment Cont... | 30.0 | 30.0 | 04-Jan-13 | 15-Feb-13 | 0.0 | 195.0 |
| A4315 | Complete Final Bridge Analysis | 10.0 | 10.0 | 04-Feb-13 | 15-Feb-13 | 10.0 | 90.0 |
| A4385 | Prepare Permit Application | 40.0 | 40.0 | 04-Jan-13 | 04-Mar-13 | 0.0 | 125.0 |
| A4375 | Prepare Final Wetlands Mitigation Plans | 50.0 | 50.0 | 19-Dec-12 | 04-Mar-13 | 10.0 | 205.0 |
| A4710 | Review Access Cut-Outs | 10.0 | 10.0 | 19-Feb-13 | 04-Mar-13 | 0.0 | 15.0 |
| A4305 | Gather Subsurface Information | 20.0 | 20.0 | 04-Feb-13 | 04-Mar-13 | 0.0 | 80.0 |
| A4265 | Complete Landscape Architectural Design | 30.0 | 30.0 | 04-Feb-13 | 18-Mar-13 | 180.0 | 215.0 |
| A4430 | Review Soil Erosion and Sediment Contr... | 20.0 | 20.0 | 19-Feb-13 | 18-Mar-13 | 0.0 | 195.0 |
| A4390 | Review & Submit Permit Application | 20.0 | 20.0 | 05-Mar-13 | 02-Apr-13 | 0.0 | 125.0 |
| A4605 | Prepare ROW Plans and Documents | 60.0 | 60.0 | 04-Jan-13 | 02-Apr-13 | 0.0 | 0.0 |
| A4060 | Prepare Utility Agreement Plans, Specifi... | 40.0 | 40.0 | 04-Feb-13 | 02-Apr-13 | 0.0 | 125.0 |
| A4610 | Review ROW Plans and Documents | 20.0 | 20.0 | 03-Apr-13 | 30-Apr-13 | 0.0 | 0.0 |
| A4380 | NJDEP Approves Final Wetland Mitigatio... | 40.0 | 40.0 | 19-Mar-13 | 14-May-13 | 160.0 | 195.0 |



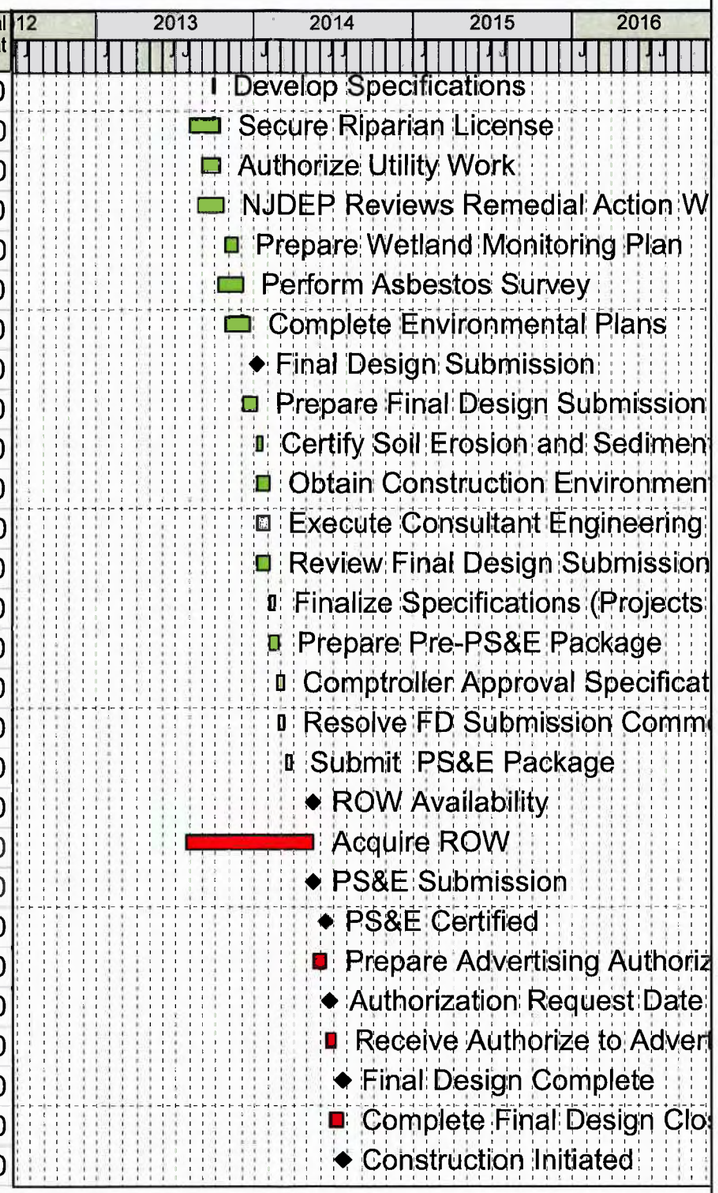
| Activity ID | Activity Name | Original Duration | Remaining Duration | Start | Finish | Free Float | Total Float |
|---|---|---|---|---|---|---|---|
| A4615 | Prepare Pre-Final ROW Submission | 15.0 | 15.0 | 01-May-13 | 21-May-13 | 0.0 | 0.0 |
| A4645 | Obtain ROW Environmental Reevaluation | 20.0 | 20.0 | 01-May-13 | 29-May-13 | 0.0 | 20.0 |
| A4715 | Administer Access Alterations | 60.0 | 60.0 | 05-Mar-13 | 29-May-13 | 15.0 | 15.0 |
| A4065 | Approve Utility Agreement Plans, Specifi... | 40.0 | 40.0 | 03-Apr-13 | 29-May-13 | 0.0 | 125.0 |
| A4320 | Conduct Geotechnical Foundation, Road... | 60.0 | 60.0 | 05-Mar-13 | 29-May-13 | 0.0 | 80.0 |
| A4620 | Review Pre-Final ROW Submission | 10.0 | 10.0 | 22-May-13 | 05-Jun-13 | 10.0 | 10.0 |
| A4340 | Perform Pavement Life Cycle Cost Analy... | 10.0 | 10.0 | 30-May-13 | 12-Jun-13 | 120.0 | 155.0 |
| A4105 | Execute Jurisdictional Agreements | 90.0 | 90.0 | 04-Feb-13 | 12-Jun-13 | 250.0 | 250.0 |
| A4635 | Hold ROW Acquisition Meeting | 20.0 | 20.0 | 22-May-13 | 19-Jun-13 | 0.0 | 0.0 |
| A4395 | Secure Permits | 60.0 | 60.0 | 03-Apr-13 | 26-Jun-13 | 80.0 | 125.0 |
| A4650 | Authorize ROW | 20.0 | 20.0 | 30-May-13 | 26-Jun-13 | 0.0 | 20.0 |
| A4625 | Prepare Final ROW Submission | 15.0 | 15.0 | 20-Jun-13 | 11-Jul-13 | 0.0 | 0.0 |
| A4630 | Process Final ROW Submission | 10.0 | 10.0 | 12-Jul-13 | 25-Jul-13 | 0.0 | 0.0 |
| A4090 | Incorporate Utility Design in Contract Do... | 40.0 | 40.0 | 30-May-13 | 25-Jul-13 | 90.0 | 125.0 |
| A4240 | Complete Traffic Signal, Signing and Stri... | 40.0 | 40.0 | 30-May-13 | 25-Jul-13 | 25.0 | 120.0 |
| A4270 | Complete Drainage Design | 40.0 | 40.0 | 30-May-13 | 25-Jul-13 | 25.0 | 120.0 |
| A4655 | Prepare Riparian License Application | 5.0 | 5.0 | 26-Jul-13 | 01-Aug-13 | 0.0 | 145.0 |
| A4070 | Prepare Utility Agreement Modifications | 45.0 | 45.0 | 30-May-13 | 01-Aug-13 | 0.0 | 145.0 |
| A4255 | Complete ITS Facilities Plans | 45.0 | 45.0 | 30-May-13 | 01-Aug-13 | 0.0 | 95.0 |
| A4230 | Complete Lighting Design | 50.0 | 50.0 | 30-May-13 | 08-Aug-13 | 15.0 | 110.0 |
| A4570 | Prepare Remedial Action Workplan | 40.0 | 40.0 | 27-Jun-13 | 22-Aug-13 | 0.0 | 45.0 |
| A4220 | Prepare Final Roadway Plans | 60.0 | 60.0 | 30-May-13 | 22-Aug-13 | 20.0 | 100.0 |
| A4075 | Obtain Utility Environmental Reevaluation | 20.0 | 20.0 | 02-Aug-13 | 29-Aug-13 | 0.0 | 145.0 |
| A4235 | Complete Final Design Systems Enginee... | 20.0 | 20.0 | 02-Aug-13 | 29-Aug-13 | 0.0 | 95.0 |
| A4590 | Prepare PAECE Report | 50.0 | 50.0 | 27-Jun-13 | 06-Sep-13 | 20.0 | 55.0 |
| A4285 | Develop Construction Schedule | 5.0 | 5.0 | 30-Aug-13 | 06-Sep-13 | 60.0 | 95.0 |
| A4160 | Prepare Final Structures Documents | 80.0 | 80.0 | 30-May-13 | 20-Sep-13 | 0.0 | 80.0 |
| A4275 | Develop Construction Cost Estimate | 5.0 | 5.0 | 23-Sep-13 | 27-Sep-13 | 45.0 | 80.0 |



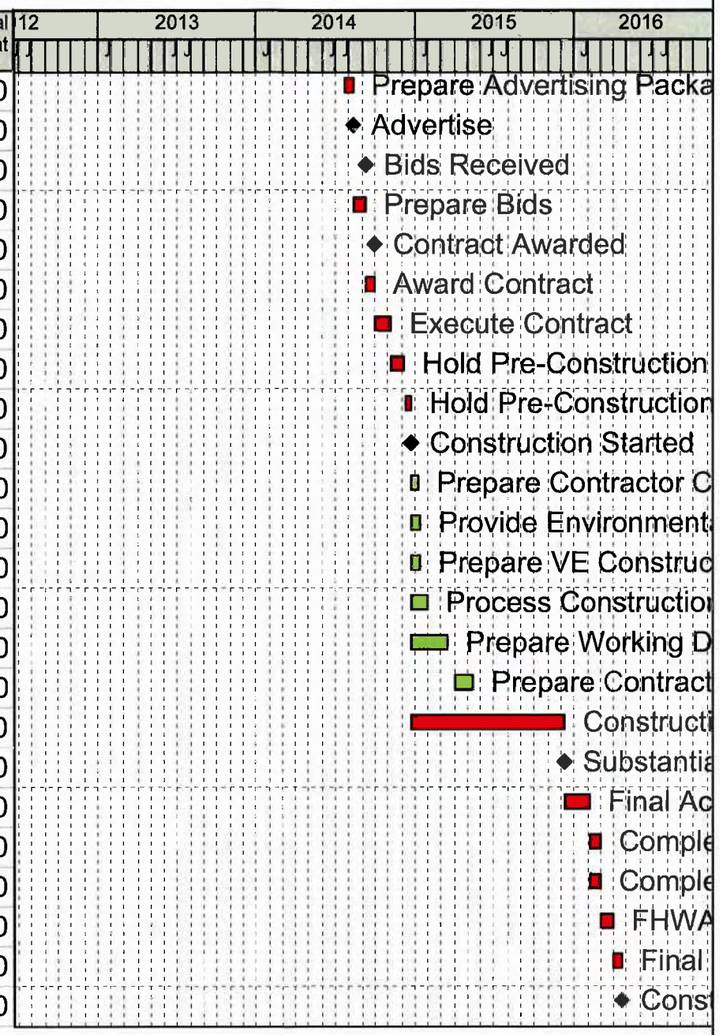

Data Date: 16-Apr-12
Print Date: 09-Apr-12

Actual Work | Critical Remaining Work | Summary
Remaining Work | Milestone

| Activity ID | Activity Name | Original Duration | Remaining Duration | Start | Finish | Free Float | Total Float |
|---|---|---|---|---|---|---|---|
| A4280 | Develop Specifications | 5.0 | 5.0 | 23-Sep-13 | 27-Sep-13 | 45.0 | 80.0 |
| A4660 | Secure Riparian License | 50.0 | 50.0 | 02-Aug-13 | 11-Oct-13 | 145.0 | 145.0 |
| A4080 | Authorize Utility Work | 30.0 | 30.0 | 30-Aug-13 | 11-Oct-13 | 145.0 | 145.0 |
| A4580 | NJDEP Reviews Remedial Action Work ... | 40.0 | 40.0 | 23-Aug-13 | 21-Oct-13 | 0.0 | 45.0 |
| A4355 | Prepare Wetland Monitoring Plan | 20.0 | 20.0 | 22-Oct-13 | 20-Nov-13 | 165.0 | 165.0 |
| A4665 | Perform Asbestos Survey | 40.0 | 40.0 | 07-Oct-13 | 05-Dec-13 | 0.0 | 35.0 |
| A4585 | Complete Environmental Plans | 40.0 | 40.0 | 22-Oct-13 | 19-Dec-13 | 10.0 | 45.0 |
| A4800 | Final Design Submission | 0.0 | 0.0 | | 06-Jan-14 | 0.0 | 35.0 |
| A4290 | Prepare Final Design Submission Package | 20.0 | 20.0 | 06-Dec-13 | 06-Jan-14 | 0.0 | 35.0 |
| A4850 | Certify Soil Erosion and Sediment Control | 10.0 | 10.0 | 07-Jan-14 | 21-Jan-14 | 80.0 | 80.0 |
| A4860 | Obtain Construction Environmental Reev... | 20.0 | 20.0 | 07-Jan-14 | 04-Feb-14 | 70.0 | 70.0 |
| A4865 | Execute Consultant Engineering Addend... | 20.0 | 20.0 | 07-Jan-14 | 04-Feb-14 | 115.0 | 115.0 |
| A4810 | Review Final Design Submission | 20.0 | 20.0 | 07-Jan-14 | 04-Feb-14 | 0.0 | 35.0 |
| A4815 | Finalize Specifications (Projects over $1... | 10.0 | 10.0 | 05-Feb-14 | 19-Feb-14 | 0.0 | 45.0 |
| A4835 | Prepare Pre-PS&E Package | 15.0 | 15.0 | 05-Feb-14 | 26-Feb-14 | 0.0 | 35.0 |
| A4825 | Comptroller Approval Specifications (Proj... | 15.0 | 15.0 | 20-Feb-14 | 12-Mar-14 | 45.0 | 45.0 |
| A4830 | Resolve FD Submission Comments | 10.0 | 10.0 | 27-Feb-14 | 12-Mar-14 | 0.0 | 35.0 |
| A4840 | Submit PS&E Package | 10.0 | 10.0 | 13-Mar-14 | 26-Mar-14 | 35.0 | 35.0 |
| A4675 | ROW Availability | 0.0 | 0.0 | | 15-May-14 | 0.0 | 0.0 |
| A4670 | Acquire ROW | 200.0 | 200.0 | 26-Jul-13 | 15-May-14 | 0.0 | 0.0 |
| A4870 | PS&E Submission | 0.0 | 0.0 | | 15-May-14 | 0.0 | 0.0 |
| A4880 | PS&E Certified | 0.0 | 0.0 | | 13-Jun-14 | 0.0 | 0.0 |
| A4875 | Prepare Advertising Authorization Package | 20.0 | 20.0 | 16-May-14 | 13-Jun-14 | 0.0 | 0.0 |
| A4890 | Authorization Request Date | 0.0 | 0.0 | 23-Jun-14 | | 0.0 | 0.0 |
| A4885 | Receive Authorize to Advertise | 15.0 | 15.0 | 16-Jun-14 | 07-Jul-14 | 0.0 | 0.0 |
| A4950 | Final Design Complete | 0.0 | 0.0 | | 21-Jul-14 | 0.0 | 0.0 |
| A4895 | Complete Final Design Closeout | 20.0 | 20.0 | 23-Jun-14 | 21-Jul-14 | 0.0 | 0.0 |
| A5000 | Construction Initiated | 0.0 | 0.0 | 22-Jul-14 | | 0.0 | 0.0 |



| Activity ID | Activity Name | Original Duration | Remaining Duration | Start | Finish | Free Float | Total Float |
|---|---|---|---|---|---|---|---|
| A5010 | Prepare Advertising Package | 15.0 | 15.0 | 22-Jul-14 | 11-Aug-14 | 0.0 | 0.0 |
| A5020 | Advertise | 0.0 | 0.0 | 12-Aug-14 | | 0.0 | 0.0 |
| A5040 | Bids Received | 0.0 | 0.0 | | 09-Sep-14 | 0.0 | 0.0 |
| A5030 | Prepare Bids | 20.0 | 20.0 | 12-Aug-14 | 09-Sep-14 | 0.0 | 0.0 |
| A5060 | Contract Awarded | 0.0 | 0.0 | | 30-Sep-14 | 0.0 | 0.0 |
| A5050 | Award Contract | 15.0 | 15.0 | 10-Sep-14 | 30-Sep-14 | 0.0 | 0.0 |
| A5070 | Execute Contract | 25.0 | 25.0 | 01-Oct-14 | 06-Nov-14 | 0.0 | 0.0 |
| A5080 | Hold Pre-Construction Meeting | 20.0 | 20.0 | 07-Nov-14 | 08-Dec-14 | 0.0 | 0.0 |
| A5085 | Hold Pre-Construction ITS Meeting | 10.0 | 10.0 | 09-Dec-14 | 22-Dec-14 | 0.0 | 0.0 |
| A5090 | Construction Started | 0.0 | 0.0 | 23-Dec-14 | | 0.0 | 0.0 |
| A5150 | Prepare Contractor Claims | 10.0 | 10.0 | 23-Dec-14 | 07-Jan-15 | 300.0 | 300.0 |
| A5110 | Provide Environmental Permit Notifications | 15.0 | 15.0 | 23-Dec-14 | 14-Jan-15 | 235.0 | 235.0 |
| A5130 | Prepare VE Construction Proposal | 15.0 | 15.0 | 23-Dec-14 | 14-Jan-15 | 235.0 | 235.0 |
| A5140 | Process Construction Change Request | 25.0 | 25.0 | 23-Dec-14 | 28-Jan-15 | 265.0 | 265.0 |
| A5120 | Prepare Working Drawings | 60.0 | 60.0 | 23-Dec-14 | 18-Mar-15 | 10.0 | 190.0 |
| A5160 | Prepare Contractor Evaluations | 30.0 | 30.0 | 02-Apr-15 | 13-May-15 | 190.0 | 190.0 |
| A5100 | Construction | 250.0 | 250.0 | 23-Dec-14 | 09-Dec-15 | 0.0 | 0.0 |
| A5165 | Substantial Completion | 0.0 | 0.0 | 10-Dec-15 | | 0.0 | 0.0 |
| A5170 | Final Acceptance | 40.0 | 40.0 | 10-Dec-15 | 03-Feb-16 | 0.0 | 0.0 |
| A5180 | Complete Consultant Agreement Closeout | 20.0 | 20.0 | 04-Feb-16 | 02-Mar-16 | 0.0 | 0.0 |
| A5190 | Complete Consultant Inspection Agreem... | 20.0 | 20.0 | 04-Feb-16 | 02-Mar-16 | 0.0 | 0.0 |
| A5200 | FHWA Project Agreement Closing & Sus... | 20.0 | 20.0 | 03-Mar-16 | 30-Mar-16 | 0.0 | 0.0 |
| A5210 | Final Audit | 15.0 | 15.0 | 31-Mar-16 | 20-Apr-16 | 0.0 | 0.0 |
| A5220 | Construction Completed | 0.0 | 0.0 | | 20-Apr-16 | 0.0 | 0.0 |



# *Appendix O – Public Involvement Action Plan*

# Layton Lake Dam, NJ Route 48, MP 3.06
# Preliminary Engineering and Final Design
Carneys Point Township, Salem County, NJ

## PUBLIC INVOLVEMENT ACTION PLAN (PIAP)

Date: March 27, 2012

This Public Involvement Action Plan (PIAP) is based on a variety of factors including the community, its context and the concerns within the community, the impacts to the community, as well as the complexity of the project, its needs, the proposed improvements, and technical aspects of the project. The plan includes a number of strategies intended to provide opportunities for the stakeholders, particularly those to be impacted by the project to have dialogue with the project team.

The plan described below will serve as a draft plan for the project. The plan will be based on the information known about the project at the time the document is drafted.

**Project Description:**

**PURPOSE AND NEEDS:**

Layton Lake Dam is classified as "Significant Hazard" and does not conform to current dam safety regulations. As a result, New Jersey Department of Environmental Protection – Bureau of Dam Safety and Flood Control (NJDEP-BDSFC) mandated that New Jersey Department of Transportation (NJDOT) perform a detailed study of the dam. A "Significant Hazard" dam is generally required to have a spillway with capacity to safely discharge flow during a 0.5 Probable Maximum Flood (PMF). However, there are some conditions that may support a decrease of the spillway design storm (SDS). Based on the analysis performed NJDEP-BDSFC accepted the recommendation to decrease the SDS for Laytons Lake Dam to the 100 – year storm event. The existing spillway and bridge do not have capacity to safely convey the SDS.

The dam is about 13 feet high and 500 feet in length. The spillway is a concrete ogee type in a semi-circular configuration with an effective length of about 90 feet. Two 48 inch diameter sluice gates are located near the eastern limit of the spillway. The gates are operated with hand cranks accessed from a catwalk pier. Laytons Lake Dam was also determined to be affected by Alkali-Silica Reactivity (ASR). ASR is caused by a reaction between the alkaline cement pore solution in the concrete and reactive forms of silica in the aggregate. It can cause expansion and cracking of the concrete resulting in structural problems and possible failure. In addition, the existing bridge does not have capacity to handle the spillway design storm (SDS) which the 100- year storm.

## EXISTING CONDITIONS:

Laytons Lake Dam is located at milepost 3.06 of NJ Route 48 in Carneys Point Township, Salem County, NJ. The dam embankment carries NJ Route 48 in a west to east direction over Game Creek. New Jersey Department of Transportation (NJDOT) owns NJ Route 48 and maintains the dam and spillway of Laytons Lake. The lake is used for recreational activities and adjacent landowners have operated the existing sluice gates.

The dam is about 13 feet high and 500 feet in length. The spillway is a concrete ogee type in a semi-circular configuration with an effective length of about 90 feet. Two 48 inch diameter sluice gates are located near the eastern limit of the spillway. The gates are operated with hand cranks accessed from a catwalk pier. Laytons Lake Dam and bridge were determined to be affected by Alkali-Silica Reactivity (ASR). ASR is caused by a reaction between the alkaline cement pore solution in the concrete and reactive forms of silica in the aggregate. It can cause expansion and cracking of the concrete resulting in structural problems and possible failure. In addition, the existing bridge (30 ft span x 10 clearance) does not have capacity to handle the spillway design storm (SDS) which the 100- year storm.

There are three existing storm drain systems within the project limits. The existing systems will be replaced/plugged as part of the proposed road construction. The overall drainage area and discharges will not increase as part of the proposed improvements.

**Existing System 1** begins at a headwall west of Oak Lane and north of NJ Route 48 at about baseline station 32+00. The headwall intercepts flow from a storm drain system carrying stormwater south along the western side of Oak Lane. The headwall is connected to a 15" RCP that conveys flow to an inlet on the north side of NJ Route 48. It crosses beneath NJ Route 48 to an inlet and runs east along the southern side of the roadway to an inlet at about baseline station 33+90. The inlet intercepts a storm drain system from the northwestern side of Lakeside Lane and also from a 12" TCP that carries stormwater north from a lowpoint south of NJ Route 48. The storm drain system then continues along the southern side of NJ Route 48 to an inlet located at about baseline station 35+40 where it crosses to an inlet on the northern side of the roadway. From that inlet the system turns to the northeast and discharges to the western bank of Laytons Lake via an 18" RCP.

**Existing System 2** is located at about baseline station 38+25. It consists of 18" RCP that carries flow from an inlet on the south side of NJ Route 48 to an inlet on the north side of the roadway. The system turns in a northeast direction and discharges through the west bridge abutment on the northern side of NJ Route 48.

**Existing System 3** begins at an inlet located at about baseline station 45+00 on the northern side of NJ Route 48 and conveys stormwater to an inlet on the southern side of the roadway. It then continues in a westerly direction to an inlet, intercepting flow from the northern side of the roadway, east of Laytons Lake Drive, at about baseline station 42+00. The system continues along the south side of NJ Route 48 to an inlet located at

about baseline station 41+00. The system crosses to an inlet on the northern side of NJ Route 48 at about baseline station 40+70, west of Laytons Lake Drive. A 12" RCP discharges stormwater from the east to the inlet. From that point the system continues along the northern side of NJ Route 48 to discharge through the east bridge abutment at about baseline station 39+00 via an 18" RCP.

**Proposed Improvements:**

**INITIALLY PREFERRED ALTERNATIVE**

The proposed work includes raising the roadway profile by about one foot, a new bridge with a span of 40 feet and a new ogee spillway in a semi-circular shape with an effective length of 90 feet. The proposed spillway will be constructed at the same length and at the same elevation as the existing spillway and the alignment of the roadway will not be changed. New Jersey Dam Safety Regulations require dams which impound water on a permanent basis include a means to allow reduction of the reservoir water surface elevation 5 feet in 10 days at a rate not to exceed one (1) foot per day. A low-level outlet is recommended for drawdown of Laytons Lake. A gate with a span of 3 feet and a rise of 5 feet is proposed through the ogee spillway.

Although the proposed work includes reconstruction of a portion of roadway, there will be no net increase in impervious area. Existing pavement will be removed and replaced with new full depth pavement. The proposed storm drainage facilities will comply with NJDOT drainage requirements. Therefore, the proposed systems have capacity to convey stormwater runoff during a 25-year storm event and to control spread of stormwater during a 10-year storm event.

There are two main storm drainage systems proposed for the project. The proposed storm drainage facilities are described as follows:

**Proposed System 1** begins at the existing headwall west of Oak Lane described in **Existing System 1** and continues to the inlet located on the south side of NJ Route 48 approximately opposite of baseline station 32+00. The existing inlet will be replaced by a new inlet. From the new inlet a new 18" RCP will convey stormwater east along the south side of NJ Route 48 about 190 feet to a new inlet, replacing an existing inlet, at about baseline station 33+90. At this inlet an existing 12" RCP will be removed and replaced with 15" RCP that collects stormwater from low areas south of the roadway and connects to the roadway storm drainage system. From the new inlet about 150 feet of 18" RCP is proposed along the south side of NJ Route 48 to about baseline station 35+40 where the existing inlet will be replaced by a new inlet and the existing 18" RCP beneath the roadway will be plugged at both its south and north ends. The existing inlet located on the north side of NJ Route 48 will remain with its 18" RCP discharge to Layton Lake. The proposed storm drainage system along the south side of NJ Route 48 will continue through about 160 feet of new 24" RCP from about baseline station 35+40 to a new inlet at about baseline station 37+00 near the roadway lowpoint. From the lowpoint new 24" RCP will be constructed along the south side of NJ Route 48 to about baseline station 37+36 where a new inlet will be constructed. The inlet will be connected to new sections

of storm drainage system that begin at a new inlet on the north side of NJ Route 48 at about baseline station 36+22. From that inlet 15" RCP will be constructed along the north side of the roadway to another new inlet at about baseline station 37+12. From the inlet a new section of 18" RCP will cross under NJ Route 48 to the new inlet previously noted at baseline station 37+36. The water quality storm flow exits this inlet through an 18" RCP to a water quality structure or Manufactured Treatment Device (MTD) located in the east bound shoulder at about baseline station 37+50. Bypass flow continues through a 24" RCP and combines with outflow from MTD at a manhole at about baseline station 37+55. The system continues along the south side of NJ Route 48 through a 24" RCP and discharges through the new bridge wing wall into Game Creek.

**Existing System 2** will be removed. **Proposed System 2** will replace **Existing System 3** except where noted, the existing pipes and inlets of system 3 will be removed or plugged. The proposed system will begin with replacing the existing inlets and cross pipe at about baseline station 45+00. Flow will be collected in a new inlet on the north side of NJ Route 48 and conveyed beneath the roadway to the second new inlet via new 18" RCP. From the new inlet flow is conveyed west via 18" RCP along the south side of NJ Route 48 to a new inlet at about baseline station 42+00.

A new storm drain system conveys flow from an inlet on the northwest side of Laytons Lake Drive crossing to an inlet on the southeast at about baseline station 11+45 of Laytons Lake Drive approximately offset north of NJ Route 48 baseline station 42+00. This new inlet is also connected to a new inlet on the north side of NJ Route 48 at about baseline station 42+22 via a 15" RCP. The proposed storm drain system crosses under NJ Route 48 via an 18" RCP connecting the proposed inlet north of baseline station 42+00 to the new inlet proposed on the south side of the roadway baseline station 42+00+/-.

The proposed 18" RCP continues west along the south side of NJ Route 48 from the inlet at baseline station 42+00+/- to another new inlet at about baseline station 40+93. The existing pipe under NJ Route 48 will be plugged and the proposed 18" RCP will continue along the south side of NJ Route 48 to a new inlet at about station 40+31. The proposed inlet at this location will be connected to new 18" RCP conveying stormwater from the north side of NJ Route 48. The proposed storm drainage facilities on the northern side of NJ Route 48 consist of 15" RCP connecting a proposed inlet at about baseline station 39+55 to the northern inlet proposed at baseline station 40+31. The proposed improvements also include new 15" RCP connecting inlets proposed at about baseline stations 41+10 and at 40+66 to the northern inlet at 40+31.

A 24" RCP is proposed along the south side of the roadway from the new inlet at about baseline station 40+31. It connects to an inlet proposed at about baseline station 39+65. The water quality storm flow exits this inlet through a 15" RCP to a water quality structure or Manufactured Treatment Device (MTD) located in the eastbound shoulder at about baseline station 39+60. Bypass flow continues through a 24" RCP and combines with outflow from MTD at a manhole at about baseline station 39+55. The system

continues along the south side of NJ Route 48 through a 24" RCP and discharges through the new bridge wing wall into Game Creek.

Additional right-of-way will be acquired along the roadway and in the lake in order to raise the road, and construct the new spillway. . **The construction cost is estimated at $12.6 million (including ROW and Utilities).**

**Project Limits:**

The project limits are along NJ Route 48 between mileposts 2.90 and 3.21 in the Township of Carneys Point, Salem County, NJ.

**Proposed PIAP for Current Project:**

Developing a clear, cooperative message is a necessary pre-requisite to any public involvement program. Based on the project description, the complexity of the project and its history, it is anticipated that the project will include the following components:

- One Local Officials Meeting (Carneys Point Twp and Salem County)
- Local Officials Briefing (Carneys Point Twp and Salem County)
- Public Information Center prior to construction
- NJDEP Dam Safety Section coordination meeting

**Local Officials Meeting:**

This meeting will be held for NJDOT to present improvements and discuss any design and construction staging issues. Participants will include NJDOT, Designer, Carneys Point Township Engineer, Carneys Point Township Fire Chief, Carneys Point Township Police, and Salem County Engineer. This project involves NJDEP coordination.

**Local Officials Briefing:**

Following the design development, the Local Officials meeting will be scheduled so that NJDOT can formally present the recommended improvement to Carneys Point Township and Salem County officials in order to gain endorsement of a design plans and construction staging.

**Notes:**

- Handouts will be developed with OCR input and distributed prior to the briefing. The handout is usually printed on an 11" x 17" sheet. The handouts shall include project location map, construction staging and photographs.
- 1 set of display boards will be prepared for the briefing. The displays shall include design plan of area, construction staging, and roadway x-section diagrams.

**Public Information Center (PIC):**

When the project nears completion during the design phase, a Public Information Center will be held to formally present the project and to solicit comments from the public. The Public Information Center will present a refined design of the preferred approach, where the stakeholders can gain a better understanding of the degree of impact required, major benefits provided, and potential trade-offs required.

The results of the Public Information Center will be documented by identifying the comments, evaluating them, and providing responses/solutions for them.

**Notes:**

- A project information handout will be developed with OCR input and distributed prior to the Public Information Center. The handout is usually printed on an 11" x 17" sheet. One side should contain the purpose of the PIC, a brief description of the existing conditions, the proposed project, estimated cost, tentative schedule and NJDOT-OCR contact information. The reverse side should have a graphic of the selected IPA. The handout will be translated in Spanish language if required by township officials.
- The mailing list will comprise local residents, technical and elected officials, public interest groups, etc. OCR will provide guidance on the extent of the geographic range of property owners and other stakeholders included on the mailing list.
- 1 set of display boards will be prepared for the PIC. The displays shall include an aerial of the study area, display of the design plans, existing and proposed sections, and right-of-way matrix showing the amount of each property impact, and construction staging.

# CARNEYS POINT TOWNSHIP

## RESOLUTION 2012-70

## SUPPORTING THE NJDOT RENOVATION OF THE ROUTE 48/LAYTONS LAKE DAM PROJECT

**WHEREAS,** the New Jersey Department of Transportation has informed the Township of Carneys Point the Laytons Lake Dam is impounded by the Route 48 embankment; and

**WHEREAS,** the Township of Carneys Point agrees that the existing spillway is inadequate. Since the dam and spillway are within NJDOT right-of-way, NJDEP is requiring NJDOT to improve the dam and spillway to meet NJDEP Dam Safety requirements. For this dam it is necessary for the 100 year storm to be conveyed over the spillway and through the bridge opening while maintaining a safe freeboard at the embankment; and

**WHEREAS,** the New Jersey Department of Transportation has attempted to minimize the impact on the adjoining property owners; and

**NOW, THEREFORE, BE IT RESOLVED** by the Mayor and Committee of the Township of Carneys Point, County of Salem and State of New Jersey that the Route 48/Laytons Lake Dam as presently proposed by the New Jersey Department of Transportation is hereby endorsed by the Township of Carneys Point.

ATTEST:

June Proffitt, Township Clerk

CARNEYS POINT TOWNSHIP

Wayne D. Pelura, Mayor

Adopted: April 4, 2012

| COMMITTEE | MOVED | SECONDED | Y | N | ABSTAIN | ABSENT |
|---|---|---|---|---|---|---|
| NEWTON | | | X | | | |
| RACITE | X | | X | | | |
| DENNIS | | X | X | | | |
| BROWN | | | X | | | |
| PELURA | | | X | | | |

I, June Proffitt, Township Clerk of the Township of Carneys Point, do hereby certify that the foregoing Resolution was presented and duly adopted by the Township Committee at a meeting held on April 4, 2012.

June Proffitt, Township Clerk