Civil Engineers
Structural Engineers
Traffic Engineers
Land Surveyors
Landscape Architects
Planners

January 22, 2013

Planning Board
Town of Barrington
333 Calef Highway
Barrington NH 03825

Re: Trinity Conservation LLC
Proposed Sand & Gravel Operation
Map 210 Lot 57
Green Hill Road, Barrington, NH

Dear Chairman Huckins and Members of the Town of Barrington Planning Board:

On behalf of the applicant, Trinity Conservation LLC, please accept this letter and the enclosed documents as our official response to technical comments from the town's consulting engineer Dubois & King in addition to our formal response to recommendations made by Strafford County Regional Planning Commission via its letter to the Board dated December 21, 2012.

In summary, we have modified these plans in the following ways:

- Relocation of gate at access road to provide queue of up to 6 trucks away from the Green Hill Road residences/ intersection;
- Provision for graveled area for truck turn around at gate;
- Provision for one row of staggered supplemental 5 tall evergreen plantings spaced at 10 feet within 75 foot buffer to supplement existing vegetation/ screening;
- Provision of 6' tall chain link fence to prohibit trespass within 75 foot buffer north proximate to Stillwater Circle;
- Enlarge sediment forebay at infiltration pond;
- Implement specification for warm season grasses to be utilized on floor of excavation site;
- Add Operation and Maintenance Notes to Phasing plans where we have specified requirements of the operator including advance notice of blasting, and use of monitors for noise and vibration during blasting.

Enclosed please find a report from H.T.E. Northeast Inc., which analyzes the structural capacity of Green Hill Road to support the expected traffic from the development. Based on the conclusions presented in the report, we have formulated a proposed cost sharing plan to support these improvements for the town's consideration.

As requested by the Planning Board at its meeting on January 8, 2013, we have enclosed a draft Operational Stormwater Pollution Prevention Plan (SWPPP) which dictates the methods, management practices, and inspection procedures to prevent pollution and contamination of surface waters.

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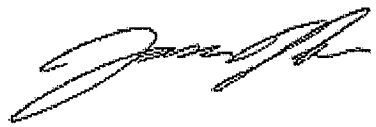
We have also enclosed a plan prepared from available tax maps which illustrates the 2000 foot envelope around the expected blasting zone.

We look forward to meeting with the Board on February 5, to discuss these issues and plans. Please contact me at (603)472-4488 with any questions or concerns.

Sincerely,
TFMoran Inc.



Jason Hill
Project Manager

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January 18, 2013

Planning Board
Town of Barrington
333 Calef Highway
Barrington NH 03825

Re: Excavation Site Plan
Map 210 Lot 57
Green Hill Road, Barrington, NH

Dear Chairman Huckins and Members of the Town of Barrington Planning Board:

I am writing to you on behalf of Trinity Conservation LLC in response to Dubois & King Inc.'s (D&K) comment letter, dated January 14, 2013. The purpose of this letter is to address those concerns. The following outlines our response to D&K's comments:

1. The plans were not stamped by a professional engineer, surveyor or wetland scientist.

We have enclosed plans certified by a NH Professional engineer and CWS. We are currently surveying the rear of Lot 57 in the vicinity of the Stillwater Circle neighborhood as requested by the planning board. Upon the completion of this survey we are adding the appropriate LLS certification and notes.

2. The stormwater report was not stamped by a professional engineer.

We have enclosed an updated stormwater report certified by a NH Professional engineer.

3. A small portion of the riprap outlet from the sedimentation basin is located within the 250' shoreland buffer.

We have revised the plan to remove the stone shown within the 250 foot buffer. However the contractor/ operator is required to obtain any necessary permits from the NHDES for temporary and/or grading impacts required within the buffer.

4. The forebay, as designed, will not collect all graded runoff prior to entering the sedimentation basin.

We have modified the design of the sediment trap forebay to accommodate the phase 3 expansion.

5. The drainage analysis did not model the forebay; therefore, we could not verify the capacity and its effectiveness of handling the design storms.

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We have added the forebay to the hydroCAD mode to demonstrate compliance with the NHDES BMP worksheet.

6. The forebay (sheet 3) shows a 1-foot depth. The minimum depth of a forebay per NHDES regulations is 2 feet.

We have modified the forebay depth (plan and detail) to indicate 2 feet in compliance with the NHDES criteria.

7. There were no calculations provided for sizing the level spreader located at Sta. 20+30 right.

We have provided the NHDES BMP worksheet for a ditch turn out / level spreader and buffer design. The contributing area is 5000 square feet of gravel driveway. 100 feet of buffer is provided prior to entering the wetland. Therefore the length of spreader equals 5000 sf / 100 lf or 50 feet.

8. General Note #9 (sheet 10) states the maximum disturbed area shall not exceed 5 acres. Other plan sheets refer to a 10 acre maximum disturbance. The NHDES regulations set a maximum allowable open area of 5 acres unless additional information is provided and/or an environmental consultant is employed during construction.

We have modified General Note 9 to indicate the proposed 10 acre maximum disturbance.

9. The restoration plan (sheet 8) shows an area to remain as exposed gravel.

We have eliminated this designation.

10. We would recommend that the reclamation plan specify a warm season grass mix which does very well in dry, sandy soils.

We have modified the reclamation plan to proposed warm season grasses on the floor of the excavation site and the use of USDA Conservation type B mix on the embankments.

11. We would recommend that the police/fire departments review the plan for emergency access.

We understand that the town planner Marcia Gasses is coordinating police and fire departmental reviews.

12. The plans do not show best management practices for fueling and maintenance of excavation and earthmoving equipment in accordance with NHDES Regulations.

We have added a detail to sheet 10 (Vehicle Maintenance Pad) identifying these BMP's.

13. There was no intersection site distance plan provided in accordance with Article 4.8.6 of the Site Plan Regulations.

We are in the process of preparing this plan and will submit to the town for your review upon completion.

14. There was no evaluation of the structural impact of truck loads on local roads provided for review.

We have enclosed a report from H T E Northeast evaluating the project impacts regarding Green Hill Road structural capacity. We have enclosed a proposed cost allocations breakdown relating to the issue.

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15. The future development plan (sheet 9) shows a proposed road which exceeds the maximum road length in accordance with Article 15.2.1 of the Subdivision Regulations.

| We understand have revised the Future Development Plan in reference to these regulations. |
|---|

We trust these responses address your concerns. Please do not hesitate to contact me with any questions or comments.

Sincerely,
TFMoran Inc.

Jason S. Hill
Project Manager

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Civil Engineers
Structural Engineers
Traffic Engineers
Land Surveyors
Landscape Architects
Planners

January 18, 2013

Planning Board
Town of Barrington
333 Calef Highway
Barrington NH 03825

Re: Excavation Site Plan
Map 210 Lot 57
Green Hill Road, Barrington, NH

Dear Chairman Huckins and Members of the Town of Barrington Planning Board:

I am writing to you on behalf of Trinity Conservation LLC in response to Strafford County Regional Planning Commission's (SCRPC) comment letter to the board, dated December 31, 2012. The purpose of this letter is to address those concerns. The following outlines our response to SRPC's recommendations:
We concur with the New Hampshire Department of Transportation District 6 Bridge Engineers to consider performing a structural calculation on the Greenhill Road C-2 bridge to determine the anticipated impacts on the structure as a result of this project. We now know that the project calls for a combination of tri-ale dump and tractor trailer dump trucks.

We have provided the design specifications of the anticipated trucks to Marcia Gasses for coordination with Steve Liakos PE, bridge engineer with NH Department of Transportation. We have received an email from Mr. Liakos stating that the vehicles appear to be in compliance with the bridge posting.

We recommend the applicant contact the New Hampshire Department of Transportation Division of Highway Design to seek input regarding potential safety impacts at the intersections of Route 202/Greenhill Road and Route 125/Greenhill Road as a result of the proposed heavy truck traffic associated with this project. A future signalization project is scheduled for the intersection of Route 125/Greenhill Road during the spring of 2013 which may warrant further consideration, including truck turning movements, during the planning process.

We have contacted Bill Oldenberg PE, administrator, of NHDOT to discuss the Trinity proposal and coordinate as necessary. As such, NHDOT has modified the design of the Route 125/ Green Hill Road/ Tollend Road intersection project to accommodate traffic from the gravel pit.

We concur with New Hampshire Fish & Game Staff recommendation to preserve a large tract of the site reclaimed (in the order of 5-10 acres minimum) after operations in that phase have ceased to provide nesting opportunities for wood turtle and potentially Blanding's turtle. We further recommend carrying the preserved "turtle nesting area" over into the future subdivision plan and working with New Hampshire Department of Environmental Services and New Hampshire Fish & Game to generate a plan for preserving this area in the future.

The specific limits of the future/ ultimate site development footprint and layout is unknown at this time. As such, it is not prudent or feasible to place covenants or restrictions on the property.

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As recommended by New Hampshire Fish & Game Staff project personnel working on tile job site should be made aware of the potential to encounter protected turtles in the work area especially during turtle nesting season which extends from late May through the end of June. If Blanding's or other protected turtle species are found nesting in the work area, contact New Hampshire Fish & Game. .

We have added a note to the General Notes indicating this condition.

Consider requiring greater vegetative buffer to the Still Water Circle Residences in excess of the proposed 200 feet. Considering the proposed time schedule (Phase I & 2 proposed to last at least two (2) years each – Total duration of project expected to last a minimum of 12 years), use of heavy machinery, blasting, crushing and hauling activities, and incompatibility with this existing cross-border development.

We have added to the plans the provision for supplemental plantings within the proposed 75 foot buffer.

Consider requiring he use of a decibel meter on site to measure the actual DBA readings at the property lines during on-site blasting and crushing activities to ensure the 75 DBA threshold is being met.

We have added a note to the General Notes indicating this condition.

Consider supplying abutting property owners with a 48 hour notice before each day scheduled for blasting activities in order to alleviate potential complaints and noise nuisance issues.

We have added a note to the General Notes indicating this condition.

Consider requiring the implementation of vibratory equipment/methods in order to measure actual ground borne vibration levels generated during blasting and crushing activities to ensure that the project will not generate or expose persons to excessive ground borne vibration or noise levels.

We have added a note to the General Notes indicating this condition.

Consider amending General Note #9 to reference the proposed 10 acre maximum area of disturbance criteria.

We have added revised General Note 9.

There appears to be a discrepancy between the Phasing Note on Sheet 3 of the submitted plans and note #9 under General Notes on Sheet 10.

We have added revised General Note 9.

Consider pulling the emergency overflow spillway of the sediment basin further away from the 250 foot shoreland buffer in order to alleviate potential future violations. We find it reasonable to anticipate impacts to the buffer during construction considering how close the spillway overflow is to the shoreland buffer limits.

The elevation of the floor of the gravel pit and the infiltration basin design are constraints that dictate the elevation and location of the overflow spillway. For these reasons, we cannot relocate the emergency overflow spillway of the sediment basin. The operator will be required obtain permits necessary from the NHDES Shoreland Bureau if impacts are necessary to construct the spillway.

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Consider any recommendation made by the Isinglass River Local Advisory Committee. We highly recommend the applicant review the Isinglass River Management Plan in order to maximize the protection of the river corridor and the natural communities which depend on it.
We are meeting with the committee in the coming month.

Consider requiring the utilization of stump pulp berms, silt sock or hay bale perimeter erosion controls instead of silt fencing. We find that silt fencing is easily compromised and is often times left to deteriorate on-site after project completion.

We have provided notes requiring the removal of the siltfence upon stabilization of surrounding areas. Additionally, monitoring will be performed by an environmental consultant during construction and SWPPP implementation should prohibit the fence from being left in the ground.

Consider requiring a water truck to be stationed on-site during dry conditions in order to alleviate potential air quality concerns associated with dust.

We have added notes to the plan requiring the use of water trucks on windy days and when conditions warrant. Additionally we have added numerous dust control BMPs to the plans.

Consider revising operating hours from October through March as daytime hours will be altered during these months. We recommend hours of operation during these months be from 8: OOAM to 4: OOPM.

The proposed operation will operate 7AM to 6PM Monday through Friday and on Saturdays periodically. The proposed operational duration is consistent with similar facilities in the region.

We trust these responses address your concerns. Please do not hesitate to contact me with any questions or comments.

Sincerely,
TFMoran Inc.

Jason S. Hill
Project Manager

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NORTHEAST, INC.
Environmental Engineering
Geotechnical Engineering
Water Resources
Hydrogeology

January 3, 2013
Project No. 4895A

Mr. Jason Hill, Project Manager
T. F. Moran, Inc.
48 Constitution Drive
Bedford, New Hampshire 03110

RE: Pavement Section Assessments
Proposed Roadway Use Change
Proposed Borrow Pit: #204 Green Hill Road
Barrington, New Hampshire

Dear Jason:

This correspondence presents HTE Northeast's, Inc. (HTE's) letter report of a generalized pavement section analysis for Green Hill Road. This work was performed in general accordance with our proposal No. P-9581A dated December 13, 2012. The analyses also consider the in-place subgrade soils information presented in out 'Nov. 6, 2012 Test Borings Results Tables' correspondence dated November 12, 2012. The test boring data indicated that, except for the east 1,250± feet of the road, the in-place support soils were medium dense to dense inorganic granular materials to depths ≥3'±. Subgrades for the east 1,250± feet of the road included intermittent organic soils and relatively shallow groundwater.

We were requested to perform analyses and provide recommendations for the Green Hill Road pavement section considering school bus loads as well as to support trailer-dump trucks from the borrow pit, assuming that the tractor trailer dump trucks will be transporting from the pit (23 CY maximum load). We have been informed to assume a maximum 30 hauls / day each way (60 trips total) with each haul as 18 CY gravel (generally).

Green Hill Road outlets to Route 202 to the west and Route 125 to the east. It is understood that paving (binder course only) was performed for the east portion of Green Hill Road in 2009 and for the west portion of Green Hill Road in 2010. Full box re-construction to Town specification did not occur. NHDOT traffic count data indicates a traffic volume of 1800 vehicles per day (vpd) for 2011 for Green Hill Road over Isinglass River (up from 1700 vpd in 2008). Dale Transportation indicated the following relative to school bus traffic: three AM runs per day for pickup (1 each for elementary/ middle/ and high school) and correspondingly three PM runs per day for drop-offs (all with full-size school bus).

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Information on existing heavy truck traffic was not available; for our analyses, we assumed that less than ten (10) heavy trucks (5-axel) travel the road per day.

## A) SUMMARY of ANALYSES

Our assessment of pavement section performance was based on softwares based on the 'mechanistic/empirical' method of pavement support analysis. Analyses were performed using the 'MnPave' program developed by Minnesota Department of Transportation (MNDOT) and the SW-1 Asphalt Pavement Thickness Design Software program developed by the Asphalt Institute.

SW-1 was used to model traffic conditions before and after the construction of the borrow pit and subsequent addition of thirty 5-axle trailer-dump trucks a day to the existing traffic volume. MnPave is a program created by the MN DOT for asphalt reliability calculations based on traffic volume, subsurface conditions, and asphalt thickness. Given the existing and proposed traffic conditions, MnPAVE was used to calculate the reliability of the existing Green Hill Road. The following information or assumptions were considered for our analyses:

1) ESALs (Equivalent Single Axle Loads) derived from SW-1 Asphalt Pavement Thickness Design Software (refer to two attached SW-1 analyses results printouts):

   a. ESALs Existing: 127,000 / 20 years
   b. ESALs Proposed: 411,000 / 20 years
   c. Traffic volume estimates for the existing Green Hill Road were 1800 vpd with an estimated 5% trucks.
   d. Traffic volume estimates for the proposed Greenhill Road were 1830 vpd with 6.6% trucks. Additional trailer-dump trucks were categorized as 5-Axle Multiple Unit Trucks.
   e. SW-1 recommends 4 inches minimum of asphalt, this is the program minimum. Three inches (3"), asphalt thickness per the specifications of the Town of Barrington, was used in the Reliability Analysis.
   f. Resilient Modulus of 38500 psi obtained from Special Report 99-14, Resilient Modulus for New Hampshire Subgrade Soils for Use in Mechanistic AASHTO Design, US Army Corps of Engineers, 1999.

2) Reliability Estimates generated using MnPAVE from the MN DOT (refer to six attached MnPave analyses results printouts):

   a. Houston County (MN) was selected for its similar climate to Barrington (NH), average, max and min temps.

b. Calculations based on assumption final wearing course of asphalt is installed to bring the total thickness to >3 inches.
c. Green Hill Road was analyzed considering the east 1,250± feet of road and then the remainder (west section) based on subsurface explorations and the presence of unsuitable road base material observed under the east (1,250'±) portion of the road.
d. Road structure based on Town of Barrington Road Design and Construction Standards and
e. MNDOT Class 7 gravel is most similar to NHDOT 304.3 based on gradation requirements and was used in the analysis.

**Table 1 – Tabulated Results Based on MnPave**

| Reliability Estimates (Fatigue, Rutting) % | Existing Rd. East | Existing Rd. West |
|---|---|---|
| Existing ESAL | | |
| 127,000 / 20 years | | |
| Fatigue | 100% | 100% |
| Rutting | 99.8% | 100% |
| | | |
| Proposed ESAL | | |
| 411,000 / 20 years | | |
| Fatigue | 96.8% | 99.7% |
| Rutting | 76.5% | 100% |
| | | |
| Maximum ESAL | 340,000 / 20 years | 880,000 / 20 years |
| Fatigue | 85.8% | 85.4% |
| Rutting | 85.8% | 99.9% |
| | | |
| | | |

Note: Acceptable reliability is >85%.

## B) CONCLUSIONS

Based on our generalized pavement section analyses, the following conclusions are offered:

Existing Roadway Traffic

- It is considered, that with the addition of a 1" thickness wearing course, that the existing roadway can support the current traffic with limited impact (overall) to the road condition.

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- Except that the section of road (east portion) in the vicinity of test borings B-1 and B-2 was constructed over unsuitable organic and/or silty materials (groundwater also appeared to be more shallow in this area), and this section of road is already showing signs of wear and cracking.

With the Proposed Borrow Pit

- The majority of the existing Green Hill Road, if completed with addition of a 1.5" wearing course, would be suitable to support the projected increase in heavy truck traffic resultant from the activation of the borrow gravel pit and subsequent increase of thirty 5-axle trailer-dump trucks.

- The entrance to the borrow pit will see approximately 50% more ESALs from the heavy trucks as well as the additional wear from turning vehicles. Accordingly, two inches of wearing course is recommended for the 100 feet of Green Hill Road to either side of the proposed borrow pit entrance.

- It is recommended that the east 1,250± feet of roadway (includes in the vicinity of test borings B-1 and B-2) should have full box reconstruction to Town specifications.

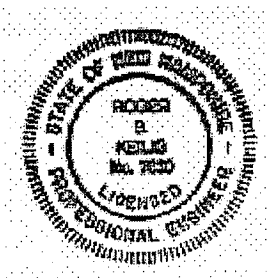
We trust that your office will find this information helpful. Please do not hesitate to contact the undersigned for further information as necessary.

Very truly yours,

HTE NORTHEAST, INC.

Roger B. Keilig

Roger B. Keilig, PE, PG, CPESC
Sr. Project Manager




Attachments: A) SW-1 analyses results printouts (2); b) MnPave analyses results printouts (6)

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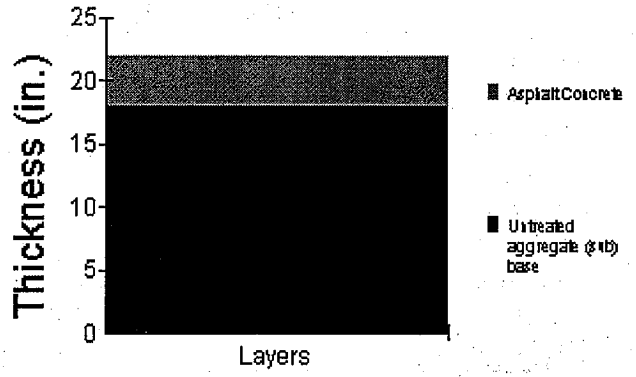
# Pavement Design Detail Report

## SW-1 Thickness Design Software version 1.0




| User: | sdoherty | Date: | 1/3/2013 | Time: | 10:06 |
|---|---|---|---|---|---|
| **Project Information** | | | | | |
| Project Name: | Green Hill Rd. Existing | | | | |
| Description: | Green Hill Rd. ESALs under current conditions. | | | | |
| Pavement Use: | General Roadway | | | | |
| Problem Type: | New Pavement Design | | | | |
| **Design Input Summary** | | | | | |
| Climate: | 45° F | | | | |
| Design Traffic (ESAL): | 126,627 | | | | |
| Subgrade $M_r$ (psi): | 38,500 | | | | |
| **Design Traffic Details** | | | | | |
| Design Life (years): | 20 | | | | |
| Design Lane Factor: | 0.8 | | | | |
| Initial Average Annual Daily Traffic (AADT): | 1800 | | | | |
| Truck Volume, as a percentage of AADT: | 5 | | | | |
| Annual Compound Growth Rate (%): | 2 | | | | |
| Type of usage: | Rural | | | | |
| Truck Classification | % Trucks | Truck Factor | | | |
| TRUCK(2-AXLE,4-TIRE) | 70 | 0.01 | | | |
| TRUCK(2-AXLE,6-TIRE) | 15 | 0.30 | | | |
| TRUCK(3-AXLE or MORE) | 10 | 0.90 | | | |

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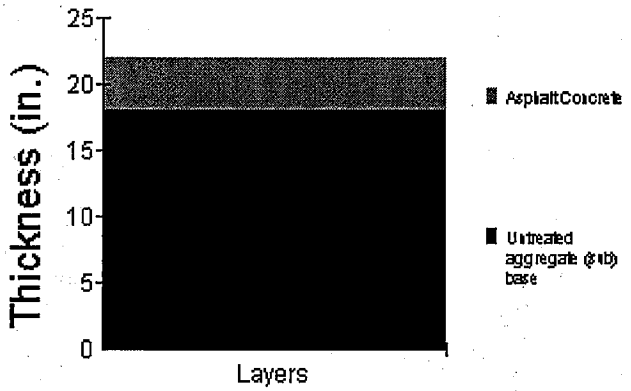
| | | |
|---|---|---|
| MULT.TRUCK(<=4-AXLE) | 2 | 0.64 |
| MULT.TRUCK(5-AXLE) | 2 | 1.36 |
| MULT.TRUCK(>=6-AXLE) | 1 | 1.63 |
| TOTAL: | 100 | N/A |
| **Calculated Equivalent Single Axle Loads (ESAL)** | | |
| Initial Year Traffic (ESAL): | 5,211 | |
| Design Life (ESAL): | 126,627 | |
| **Subgrade Information** | | |
| Type of Measurement: | Resilient Modulus ($M_r$) | |
| Correlation Equation: | N/A | |
| Recommended Design Strength Percentile | 75.0 | |
| Design Strength Percentile: | N/A | |
| Individual $M_r$ Values | $M_r$ | |
| | 38,500 | |
| Average: | 38,500 | 38,500 |
| Std Dev: | 0 | 0 |
| Design $M_r$ | 38,500 | |
| **Design Results** | | |
| HMA Thickness (in) | 4.0 | |
| Aggregate Base Thickness (in) | 18.0 | |

Asphalt Institute

# Pavement Design Detail Report

**SW-1 Thickness Design Software version 1.0**




| User: | sdoherty | Date: | 1/3/2013 | Time: | 10:51 |
|---|---|---|---|---|---|
| **Project Information** | | | | | |
| Project Name: | | Green Hill Rd. Proposed | | | |
| Description: | | Green Hill Rd. ESALs under proposed conditions. | | | |
| Pavement Use: | | General Roadway | | | |
| Problem Type: | | New Pavement Design | | | |
| **Design Input Summary** | | | | | |
| Climate: | | 45° F | | | |
| Design Traffic (ESAL): | | 411,885 | | | |
| Subgrade $M_r$ (psi): | | 38,500 | | | |
| **Design Traffic Details** | | | | | |
| Design Life (years): | | 20 | | | |
| Design Lane Factor: | | 0.8 | | | |
| Initial Average Annual Daily Traffic (AADT): | | 1830 | | | |
| Truck Volume, as a percentage of AADT: | | 6.6 | | | |
| Annual Compound Growth Rate (%): | | 2 | | | |
| Type of usage: | | Rural | | | |
| Truck Classification | | % Trucks | | Truck Factor | |
| TRUCK(2-AXLE,4-TIRE) | | 53 | | 0.01 | |
| TRUCK(2-AXLE,6-TIRE) | | 12 | | 0.30 | |

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| | | |
|---|---|---|
| TRUCK(3-AXLE or MORE) | 7 | 0.90 |
| MULT.TRUCK(<=4-AXLE) | 1 | 0.64 |
| MULT.TRUCK(5-AXLE) | 26 | 1.36 |
| MULT.TRUCK(>=6-AXLE) | 1 | 1.63 |
| TOTAL: | 100 | N/A |
| **Calculated Equivalent Single Axle Loads (ESAL)** | | |
| Initial Year Traffic (ESAL): | 16,950 | |
| Design Life (ESAL): | 411,885 | |
| **Subgrade Information** | | |
| Type of Measurement: | Resilient Modulus ($M_r$) | |
| Correlation Equation: | N/A | |
| Recommended Design Strength Percentile | 75.0 | |
| Design Strength Percentile: | N/A | |
| Individual $M_r$ Values | $M_r$ | |
| | 38,500 | |
| Average: | 38,500 | 38,500 |
| Std Dev: | 0 | 0 |
| Design $M_r$ | 38,500 | |
| **Design Results** | | |
| HMA Thickness (in) | 4.0 | |
| Aggregate Base Thickness (in) | 18.0 | |

# MnPAVE Design Summary

MnPAVE 6.210 Simulation  Input File: Greenhill East Existing

Confidence and Reliability do not necessarily agree. All layer values are reduced based on Confidence. Monte Carlo Reliability randomly selects values for each layer. Use Reliability for final design.

| Preliminary Life Estimate | | 20-Year Reliability | |
|---|---|---|---|
| **Fatigue** | **Rutting** | **Fatigue** | **Rutting** |
| **>50 years** | **46 years** | **100%** | **99.8%** |

## Project Information

| District | County | City |
|---|---|---|
| 6 | Houston | Barrington |

| Project Number | Route | Reference Post |
|---|---|---|
| 4895A | Green Hill Rd | from to |

| Letting Date | Construction Type |
|---|---|
| 12/27/12 | |

| Designer | Soils Engineer |
|---|---|
| Sean Doherty | Roger Keilig |

## Climate Information

| Season Mode | Location |
|---|---|
| Days | 43° 44' Latitude, 91° 25' Longitude |

## Structural Information (Design Level: Intermediate)

| Layer | Type | Subtype | Height (in.) |
|---|---|---|---|
| 1 | Hot-Mix Asphalt | PG52-34 | 3.00 |
| 2 | Aggregate Base | FDR / Class 7 | 12.00 |
| 3 | Engineered Soil | Silt | 6.00 |
| 4 | Engineered Soil | Silt Loam (plastic) | 12.00 |
| 5 | Engineered Soil | Silty Clay | |

## Traffic Information

| Load Type | Total Repetitions |
|---|---|
| ESALs | 127,000 |

**Notes**

Reliability Statistics for Green Hill Road east of the proposed gravel pit under current conditions.

20 Year Reliability of > 85% recommended for ESALs <1,000,000
Houston County MN selected for climate similarities with Barrington NH

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# MnPAVE Design Summary

MnPAVE 6.210 Simulation  Input File: Greenhill East Max

Confidence and Reliability do not necessarily agree. All layer values are reduced based on Confidence. Monte Carlo Reliability randomly selects values for each layer. Use Reliability for final design.

| Preliminary Life Estimate | | 20-Year Reliability | |
|---|---|---|---|
| Fatigue | Rutting | Fatigue | Rutting |
| 37 years | 20 years | 98.5% | 86.7% |

## Project Information

| District | County | City |
|---|---|---|
| 6 | Houston | Barrington |

| Project Number | Route | Reference Post |
|---|---|---|
| 4895A | Greenhill Rd | from to |

| Letting Date | Construction Type |
|---|---|
| 12/27/12 | |

| Designer | Soils Engineer |
|---|---|
| Sean Doherty | Roger Keilig |

## Climate Information

| Season Mode | Location |
|---|---|
| Days | 43° 44' Latitude, 91° 25' Longitude |

## Structural Information (Design Level: Intermediate)

| Layer | Type | Subtype | Height (in.) |
|---|---|---|---|
| 1 | Hot-Mix Asphalt | PG52-34 | 3.00 |
| 2 | Aggregate Base | FDR / Class 7 | 12.00 |
| 3 | Engineered Soil | Silt | 6.00 |
| 4 | Engineered Soil | Silt Loam (plastic) | 12.00 |
| 5 | Engineered Soil | Silty Clay | |

## Traffic Information

| Load Type | Total Repetitions |
|---|---|
| ESALs | 340,000 |

**Notes**

Maximum load Reliability Statistics for Green Hill Road east of the proposed gravel pit.

20 Year Reliability of > 85% recommended for ESALs <1,000,000
Houston County MN selected for climate similarities with Barrington NH

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# MnPAVE Design Summary

MnPAVE 6.210 Simulation Input File: Greenhill East Proposed

Confidence and Reliability do not necessarily agree. All layer values are reduced based on Confidence. Monte Carlo Reliability randomly selects values for each layer. Use Reliability for final design.

| Preliminary Life Estimate | | 20-Year Reliability | |
|---|---|---|---|
| **Fatigue** | **Rutting** | **Fatigue** | **Rutting** |
| **31 years** | **17 years** | **95%** | **77.2%** |

## Project Information

| District | County | City |
|---|---|---|
| 6 | Houston | Barrington |

| Project Number | Route | Reference Post |
|---|---|---|
| 4895A | Greenhill Rd | from to |

| Letting Date | Construction Type |
|---|---|
| 12/27/12 | |

| Designer | Soils Engineer |
|---|---|
| Sean Doherty | Roger Keilig |

## Climate Information

| Season Mode | Location |
|---|---|
| Days | 43° 44' Latitude, 91° 25' Longitude |

## Structural Information (Design Level: Intermediate)

| Layer | Type | Subtype | Height (in.) |
|---|---|---|---|
| 1 | Hot-Mix Asphalt | PG52-34 | 3.00 |
| 2 | Aggregate Base | FDR / Class 7 | 12.00 |
| 3 | Engineered Soil | Silt | 6.00 |
| 4 | Engineered Soil | Silt Loam (plastic) | 12.00 |
| 5 | Engineered Soil | Silty Clay | |

## Traffic Information

| Load Type | Total Repetitions |
|---|---|
| ESALs | 412,000 |

**Notes**

Reliability Statistics for Green Hill Road east of the proposed gravel pit under propused conditions.

20 Year Reliability of > 85% recommended for ESALs <1,000,000
Houston County MN selected for climate similarities with Barrington NH

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# MnPAVE Design Summary

MnPAVE 6.210 Simulation Input File: Greenhill West Existing

Confidence and Reliability do not necessarily agree. All layer values are reduced based on Confidence. Monte Carlo Reliability randomly selects values for each layer. Use Reliability for final design.

| Preliminary Life Estimate | | 20-Year Reliability | |
|---|---|---|---|
| Fatigue | Rutting | Fatigue | Rutting |
| >50 years | >50 years | 100% | 100% |

## Project Information

| District | County | City |
|---|---|---|
| 6 | Houston | Barrington |

| Project Number | Route | Reference Post |
|---|---|---|
| 4895A | Greenhill Rd | from to |

| Letting Date | Construction Type |
|---|---|
| 12/27/12 | |

| Designer | Soils Engineer |
|---|---|
| Sean Doherty | Roger Keilig |

## Climate Information

| Season Mode | Location |
|---|---|
| Days | 43° 44' Latitude, 91° 25' Longitude |

## Structural Information (Design Level: Intermediate)

| Layer | Type | Subtype | Height (in.) |
|---|---|---|---|
| 1 | Hot-Mix Asphalt | PG58-34 | 3.00 |
| 2 | Aggregate Base | FDR / Class 7 | 6.00 |
| 3 | Aggregate Base | MNDOT Class 6 | 12.00 |
| 4 | Engineered Soil | Sand | |

## Traffic Information

| Load Type | Total Repetitions |
|---|---|
| ESALs | 127,000 |

**Notes**

Reliability Statistics for Green Hill Road west of the proposed gravel pit under current conditions.

20 Year Reliability of > 85% recommended for ESALs <1,000,000
Houston County MN selected for climate similarities with Barrington NH

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# MnPAVE Design Summary

MnPAVE 6.210 Simulation Input File: Greenhill West Max

Confidence and Reliability do not necessarily agree. All layer values are reduced based on Confidence. Monte Carlo Reliability randomly selects values for each layer. Use Reliability for final design.

| Preliminary Life Estimate | | 20-Year Reliability | |
|---|---|---|---|
| **Fatigue** | **Rutting** | **Fatigue** | **Rutting** |
| **22 years** | **49 years** | **85.4%** | **99.9%** |

## Project Information

| District | County | City |
|---|---|---|
| 6 | Houston | Barrington |

| Project Number | Route | Reference Post |
|---|---|---|
| 4895A | Greenhill Rd | from to |

| Letting Date | Construction Type |
|---|---|
| 12/27/12 | |

| Designer | Soils Engineer |
|---|---|
| Sean Doherty | Roger Keilig |

## Climate Information

| Season Mode | Location |
|---|---|
| Days | 43° 44' Latitude, 91° 25' Longitude |

## Structural Information (Design Level: Intermediate)

| Layer | Type | Subtype | Height (in.) |
|---|---|---|---|
| 1 | Hot-Mix Asphalt | PG58-34 | 3.00 |
| 2 | Aggregate Base | FDR / Class 7 | 6.00 |
| 3 | Aggregate Base | MNDOT Class 6 | 12.00 |
| 4 | Engineered Soil | Sand | |

## Traffic Information

| Load Type | Total Repetitions |
|---|---|
| ESALs | 880,000 |

**Notes**

Maximum Load Reliability Statistics for Green Hill Road west of the proposed gravel.

20 Year Reliability of > 85% recommended for ESALs <1,000,000
Houston County MN selected for climate similarities with Barrington NH

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# MnPAVE Design Summary

MnPAVE 6.210 Simulation Input File: Greenhill West Proposed

Confidence and Reliability do not necessarily agree. All layer values are reduced based on Confidence. Monte Carlo Reliability randomly selects values for each layer. Use Reliability for final design.

| Preliminary Life Estimate | | 20-Year Reliability | |
|---|---|---|---|
| Fatigue | Rutting | Fatigue | Rutting |
| 41 years | >50 years | 99.8% | 100% |

## Project Information

| District | County | City |
|---|---|---|
| 6 | Houston | Barrington |

| Project Number | Route | Reference Post |
|---|---|---|
| 4895A | Greenhill Rd | from to |

| Letting Date | Construction Type |
|---|---|
| 12/27/12 | |

| Designer | Soils Engineer |
|---|---|
| Sean Doherty | Roger Keilig |

## Climate Information

| Season Mode | Location |
|---|---|
| Days | 43° 44' Latitude, 91° 25' Longitude |

## Structural Information (Design Level: Intermediate)

| Layer | Type | Subtype | Height (in.) |
|---|---|---|---|
| 1 | Hot-Mix Asphalt | PG58-34 | 3.00 |
| 2 | Aggregate Base | FDR / Class 7 | 6.00 |
| 3 | Aggregate Base | MNDOT Class 6 | 12.00 |
| 4 | Engineered Soil | Sand | |

## Traffic Information

| Load Type | Total Repetitions |
|---|---|
| ESALs | 412,000 |

**Notes**

Reliability Statistics for Green Hill Road west of the proposed gravel pit under proposed conditions.

20 Year Reliability of > 85% recommended for ESALs <1,000,000
Houston County MN selected for climate similarities with Barrington NH

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Civil Engineers
Structural Engineers
Traffic Engineers
Land Surveyors
Landscape Architects
Planners

January 4, 2013
TFM No. 47052.00
Trinity Conservation LLC
Barrington NH

**Table 1: Green Hill Road Estimated Improvements Cost and Proposed Contributions Allocation**

| | | |
|---|---|---|
| Total Road Length of Need | 5300 | LF |
| Average Road width | 22 | LF |

| **Task 1: Pavement Overlay** | | |
|---|---|---|
| *Condition 1: Existing Roadway Traffic* | | |
| 1" Wearing coarse Overlay | 4050 | LF |
| (Excludes eastern 1250 feet) | 545 | TON |
| | | Cost per |
| | $70 | ton |
| | $38,150 | Cost |
| Engineering & Contingencies 1.15 | $43,872.50 | Total Cost |
| Town's Contribution | $43,872.50 | |
| *Condition 2: With Proposed Borrow Pit* | | |
| 1.5" Wearing coarse Overlay | 3850 | LF |
| | 776 | TON |
| | | Cost per |
| | $70 | ton |
| | $54,320 | Cost |
| Engineering & Contingencies 1.15 | $62,468.00 | Total Cost |
| TC's Contribution | $18,595.50 | |
| 2" Wearing coarse overlay | 200 | LF |
| (within 100 feet of driveway) | 54 | TON |
| | | Cost per |
| | $70 | ton |
| | $3,780 | Cost |
| Engineering & Contingencies 1.15 | $4,347.00 | Total Cost |
| TC's Contribution for Total Overlay | $22,942.50 | |

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48 Constitution Drive
Bedford, NH 03110
Phone (603) 472-4488
Fax (603) 472-9747
www.tfmoran.com

4 January 2013

Re: Green Hill Road Estimated Improvements Cost and Proposed Contributions Allocation

| | | |
|---|---|---|
| **Task 2: Full Box Reconstruction 22' wide (Eastern 1250 feet)** | 1250 | LF |
| 3" HBP/6" Crushed Gravel/12" BR Gravel | $100.00 | $/ LF |
| | $125,000.00 | Total Cost |
| Town Contribution | $83,333 | |
| TC's Contribution | $41,667 | |

| **Overall Project** | TC's Contribution |
|---|---|
| Task 1 | $22,943 |
| Task 2 | $41,667 |
| Net | $64,609 |

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